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Final Final Traffic and Transport Assessment

Daroobalgie Solar Farm

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Terms and Definitions

Term	Meaning
Daroobalgie Solar Farm	Daroobalgie Solar Farm comprises the solar farm site, the Electricity transmission line and switchyard site
ETL	Electricity transmission line
kW	Kilowatts
NB	North Bound
SB	South Bound
LoS	Level of Service
MW	Megawatts
OD	Over-dimensional vehicles
OSOM	Oversize and overmass
TfNSW	Transport for New South Wales
PV	Photovoltaic
SISD	Safe intersection site distance
Solar farm site	The solar farm site is approximately 300 hectares on land legally described as Lot 77 in Deposited Plan 750183
Substation	This refers to the substation within the solar farm site
Switchyard site	This refers to the switchyard site at the point where the transmission line will connect into the Parkes-Forbes 132KV line

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Executive Summary

The Daroobalgie Solar Farm is proposed to comprise a solar farm site which will include the installation of approximately 420,000 solar photovoltaic (PV) panels, associated infrastructure (i.e. substation, Battery Energy Storage System, inverters, power cabling, site offices, car parking, and new access tracks), an Electricity Transmission Line (ETL) and switchyard site (the project) to connect the solar farm to an existing 132kV powerline west of Newell Highway. The project will have an estimated capacity of approximately 100 megawatts (MW) and will provide enough electricity to power up to the equivalent of 34,000 homes each year.

The proposed Daroobalgie Solar Farm is located in Daroobalgie approximately 11 kilometre (km) northeast of Forbes. The proposed solar farm site is approximately 300 hectares (Ha) on land legally described as Lot 77 in Deposited Plan 750183. The solar farm will be accessed by Troubalgie Road to the north of the proposed site.

The ETL connects the solar farm site to the switchyard site located near the existing Forbes-Parkes 132 kilovolts (kV) transmission line. The ETL easement is approximately 8.5 km long and approximately 45metre (m) wide. The easement traverses a number of private properties and road reserves.

The switchyard site is located approximately 5.5 km north of Forbes on Lot 14 in Deposited Plan 750158. The switchyard site is adjacent to the existing Forbes-Parkes 132 kV transmission line located approximately 500 m west of the Newell Highway and will be accessed from Daroobalgie Road.

It is likely that Port of Botany, Port of Newcastle or Port Kembla would be utilised for equipment and construction related materials for the project. It is also likely that construction materials would be transported to the site by road, however rail is another option under consideration. For purposes of this assessment, however, all components and materials have been assumed to travel by road. Upon further investigation, should a decision be taken for rail to be used to transport components, a Modification Application would be lodged, seeking the necessary approvals for this change to the proposal.

There are two likely road options available to transport construction components and materials, namely from the north using Newell Highway (A39) and/or Henry Parkes Way via Parkes, or from the south using The Escort Way and Newell Highway via Forbes. All of these roads are designated heavy vehicle routes and would be able to accommodate additional heavy vehicle movements associated with the project. Both of these routes would require heavy vehicles to access the site from Newell Highway via Back Yamma Road and Troubalgie Road.

Forest Road is generally not considered suitable for use by construction related vehicles for a number of reasons, including the Newell Highway/ Forest Road intersection, which does not have Channelised Right Turn, or Auxiliary Left Turn facilities, tight turning radius at the Forest Road/ Troubalgie Road intersection, as well as due to the general condition of the road and the fact that the road is unsealed making it unsuitable for heavy vehicles following rainfall.

The only heavy vehicle traffic that will be permitted access to Forest Road during construction will be the small number of vehicles required for the construction of the ETL, which will access Forest Road via Back Yamma Road and Troubalgie Road. No construction related vehicles will access Forest Road via the Newell Highway/ Forest Road intersection. A Construction Traffic Management Plan for the project, once developed, will detail mitigation, such as signage and a Driver Code of Conduct, to ensure use of Forest Road is limited during construction and operation.

This traffic assessment has been undertaken for the construction, operation and decommissioning stages of the project.

Construction Stage Impacts

The construction vehicle route via The Escort Way, Newell Highway and Back Yamma Road (between Newell Highway and Livestock Exchange Access Road) is a designated heavy vehicle route and additional construction vehicle movements associated with the project are anticipated to have minor/no impacts on the pavement condition and intersection capacities of these roads. However, Troubalgie Road is an unsealed road and it is anticipated that the additional construction related heavy vehicle movements would have major impacts on the pavement condition of this road. It is also anticipated that heavy vehicle movements would have major impacts on the existing culverts located on Back Yamma Road and Troubalgie Road.

Operational Stage Impacts

Additional vehicle movement numbers associated with the operation of the proposed solar farm would be very low and would have negligible impact on the performance of existing road network.

Decommissioning Stage Impacts

Solar farm decommissioning typically takes place after approximately 25 to 30 years of operation, generating traffic at a level less than or similar to the construction phase. Given the long duration between construction and decommissioning, it is difficult to determine an accurate baseline for this assessment. It is, however recommended to prepare a specific Traffic Management Plan to address the impacts of decommissioning stage traffic movements on the surrounding road network.

Cumulative Impacts

Traffic count surveys were undertaken on Tuesday 2nd of March 2021, one of the sales days of the Livestock Exchange. As such, any traffic movements associated with the Livestock Exchange's peak hours have been captured in the traffic count survey data. This traffic is associated with an existing land use and is already accounted for in background traffic data.

Whilst there are other solar farms in the broader area, either committed, or under construction, vehicles associated with these developments are not anticipated to coincide with project related construction traffic. As such, there are no traffic related cumulative impacts expected to be associated with the project.

Mitigation Measures

The following mitigation measures are identified to minimise impacts and to ensure safe and efficient heavy vehicle movements:

- Engagement of a licensed haulage contractor with experience in operating over-dimensional vehicles and transporting similar loads to be responsible for obtaining all required approvals and permits from the relevant roads authorities and Councils and for complying with conditions specified in the approvals
- Preparation and implementation of a Construction Traffic Management Plan in conjunction with the haulage contractor and roads authorities
- Consider establishing a transport pool for construction staff with common schedules, or use of a shuttle bus to reduce staff vehicle movements on Back Yamma Road during peak hours and to prevent use of Forest Road.
- Undertake safety review of proposed ETL access points at the detailed design stage to ensure safe access of construction vehicles
- Preparation of pre, mid and post road dilapidation reports addressing pavement and drainage structures in consultation with Council for the local roads, namely Back Yamma Road and Troubalgie Road prior to the commencement of construction, during peak construction activities and after construction is complete
- Identification of road improvement requirements, including the upgrade of the Back Yamma Road/Troubalgie Road intersection to accommodate construction vehicles, including OSOM vehicle movements during the construction period
- Upgrade of Troubalgie Road between Back Yamma Road and the site access point to sealed road, as well as widening of Troubalgie Road to accommodate two-way heavy vehicle movements, including oversize and/or overmass (OSOM) vehicles during construction of the proposed solar farm
- Preparation of a specific Construction Traffic Management Plan for the decommissioning phase reflecting changes in traffic volumes and work procedures.

Summary and Conclusions

The introduction of an additional five heavy vehicle movements per hour and 167 light vehicle movements during the AM and PM peaks for the duration of the peak construction period is anticipated to have major impacts on existing pavement conditions and loading capacity of culverts along Back Yamma Road and Troubalgie Road.

Formal discussion has already been undertaken with Forbes Shire Council and it has been agreed to upgrade the Troubalgie Road between Back Yamma Road and the proposed site access point to a sealed road, as well as the widening of Troubalgie Road to accommodate two-way heavy vehicle movements prior to commencing construction of the solar farm. It was also agreed to upgrade the Back Yamma Road/ Troubalgie Road intersection to accommodate appropriate heavy vehicle movements. The impacts during the operation phase are considered to be minimal.

Management strategies required to address traffic impacts relating to the project are outlined in this report. These strategies should be incorporated into a Construction Traffic Management Plan and implemented in consultation with relevant roads authorities, including Forbes Shire Council and Transport for NSW.

Adoption of strategies for minimising traffic impacts will reduce community disruption, maintain roads to an appropriate standard throughout the construction program and maintain safety requirements.

A pre, mid and post-dilapidation survey for the construction route, namely Back Yamma Road and Troubalgie Road and for existing culverts should be conducted and loading capacity of these roads and infrastructures determined prior to commencement of construction.

1 Introduction

1.1 Overview

The proposed Daroobalgie Solar Farm comprises the installation of approximately 420,000 solar photovoltaic (PV) panels, associated infrastructure (i.e. Substation, Battery Energy Storage System, inverters, power cabling, site offices, car parking and new access tracks), as well as an Electricity Transmission Line (ETL) to connect the solar farm to an existing 132kV powerline west of Newell Highway. The project will have an estimated capacity of approximately 100 megawatts (MW) and will provide enough electricity to power up to the equivalent of 34,000 homes each year.

An Environmental Impact Statement (EIS) is a requirement of the approval process. This Traffic Impact Assessment (TIA) forms part of the EIS. It documents the traffic impact assessment methods and results, the initiatives to avoid and minimise associated traffic impacts, as well as mitigation and management measures proposed to address any residual impacts not able to be avoided.

1.2 Assessment Guidelines and Requirements

This TIA has been prepared in accordance with the relevant government assessment requirements, guidelines and policies in consultation with relevant government agencies.

Current guidelines applied in this assessment include those specified in the project's Secretary's Environmental Assessment Requirements (SEARs):

- Guide to Traffic Management – Part 3 Traffic Studies and Analysis (Austroads, 2007)
- Guide to Traffic Generating Developments Version 2.2 (RTA, 2002)
- NSW Sustainable Design Guidelines Version 3.0 (TfNSW, 2013)
- EIS Guidelines – Road and Related Facilities (DoPI).

The project's SEARs were issued on 19 December 2019. The SEARs relating to traffic and transport are provided in Table 1-1.

Table 1-1 SEARs – Traffic and transport

Requirement	Where addressed in this report
An assessment of the peak and average traffic generation, including over dimensional vehicles, construction worker transportation and transport of materials by rail	Section 3
An assessment of the likely transport impacts to the site access route (including The Escort Way, Newell Highway, Back Yamma Road, Forest Road, Troubalgie Road and the Stockinbingal-Parkes railway line), site access point, any Crown land, particularly in relation to the capacity and condition of the roads	Section 3
A cumulative impact assessment of traffic from nearby developments	Section 6
A description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required)	Prior to construction
A description of the measures that would be implemented to mitigate any transport impacts during construction	Section 8

1.3 Site Description

The proposed Daroobalgie Solar Farm is located in Daroobalgie approximately 11 km northeast of Forbes. The proposed site is approximately 300 hectares (ha) on land legally described as Lot 77 in Deposited Plan 750183. The solar farm will be accessed by Troubalgie Road to the north of the proposed site.

The topography of the proposed site is generally uniform with an average elevation of 240 metres (m) above the Australian Height Datum (AHD). The land is largely cleared, having been highly modified by past disturbances associated with land clearing, cropping, and livestock grazing. A number of dams are present within the solar farm site

and a natural watercourse runs to the east of the property boundary, intersecting the site in the southeast corner. Small ephemeral waterholes, known locally as *Gilgai*, are present in some paddocks, predominately in the south-eastern section of the site. These have been progressively ploughed and levelled by farming activities over time.

The surrounding land use is predominately agricultural, and the Forbes Central West Livestock Exchange is located on Back Yamma Road, 2.5 km to the west of the site. Back Yamma State Forest is situated 7 km to the east at an elevation of 340 m AHD, and the closest National Park is Goobang National Park, 30 km to the northeast. The Lachlan River runs approximately 3.5 km from the southern boundary of the project area.

There are no residential dwellings within the proposed site and the nearest dwelling is located approximately 600 m to the northwest of the western boundary. There are eight existing dwellings within 3 km of the solar farm site. The Newell Highway runs north-south, 5.5 km to the west of the proposed site.

The ETL connects the solar farm site to the switchyard site located near the existing Forbes-Parkes 132 kilovolts (kV) transmission line. The ETL easement is approximately 8.5 km long and approximately 45metre (m) wide. The easement traverses a number of private properties and road reserves.

The switchyard site is located approximately 5.5 km north of Forbes on Lot 14 in Deposited Plan 750158. The switchyard site is adjacent to the existing Forbes-Parkes 132 kV transmission line located approximately 500 m west of the Newell Highway and will be accessed from Daroobalgie Road

The location of the project area is shown in Figure 1-1.

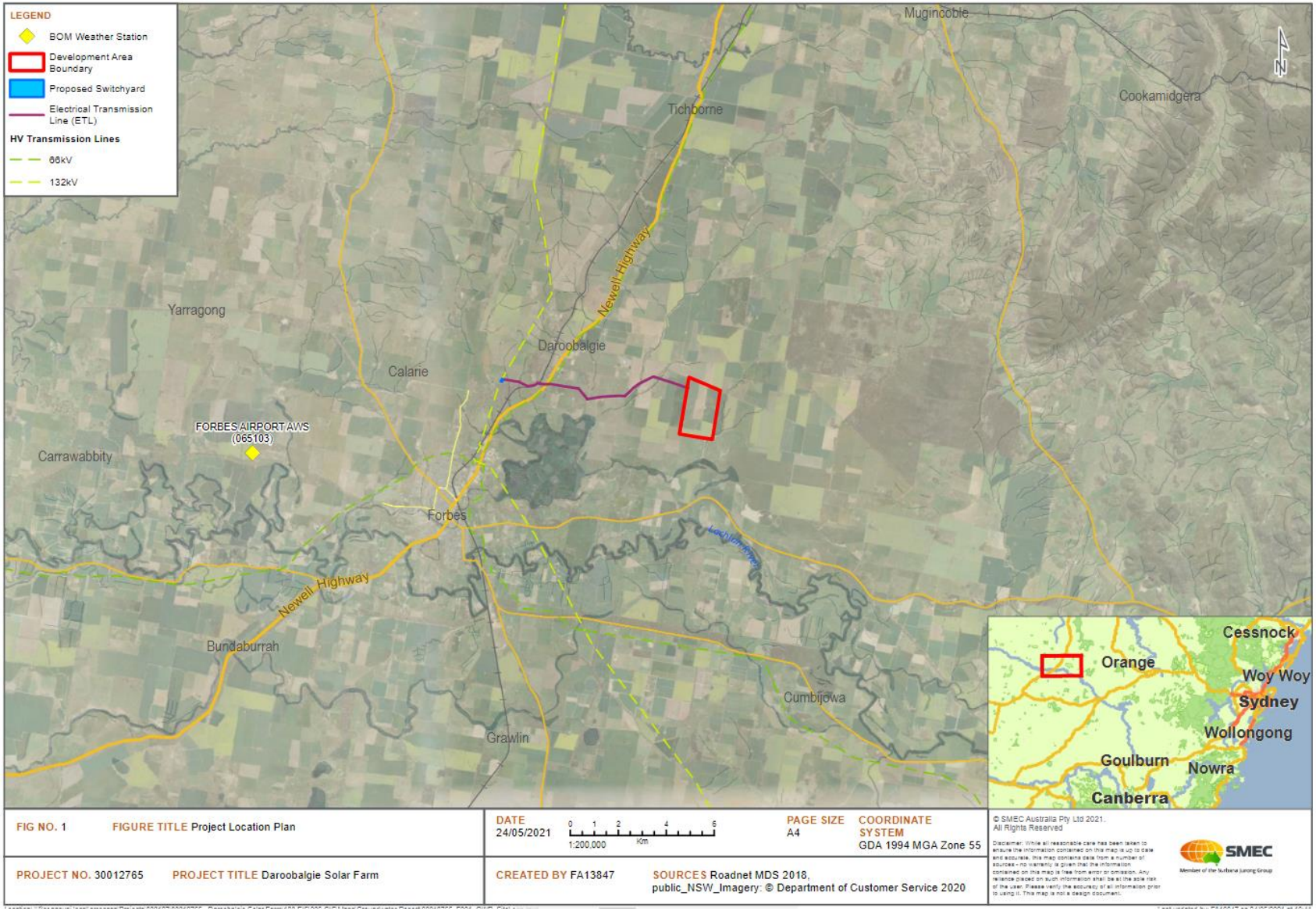


Figure 1-1 Location of Daroobalgie Solar Farm

1.4 The Project

1.4.1 Project Infrastructure

The proposed Daroobalgie Solar Farm project comprises:

- A network of PV solar panel arrays and Power Conversion Units (PCUs) (DC-AC inverters)
- Battery Energy Storage System (BESS) with embedded storage of approximately 40MW/160 MWh
- Electrical collection systems, substation and control room
- Temporary construction compound
- Operations and Maintenance (O&M) facility, including demountable offices, amenities, equipment sheds, storage and parking areas
- Internal access roads
- Electricity Transmission Line (ETL) infrastructure
- Switchyard to connect to TransGrid infrastructure
- Perimeter security fencing.

Figure 1-2 shows the general arrangement of the proposed site, including construction laydown areas and site access points.

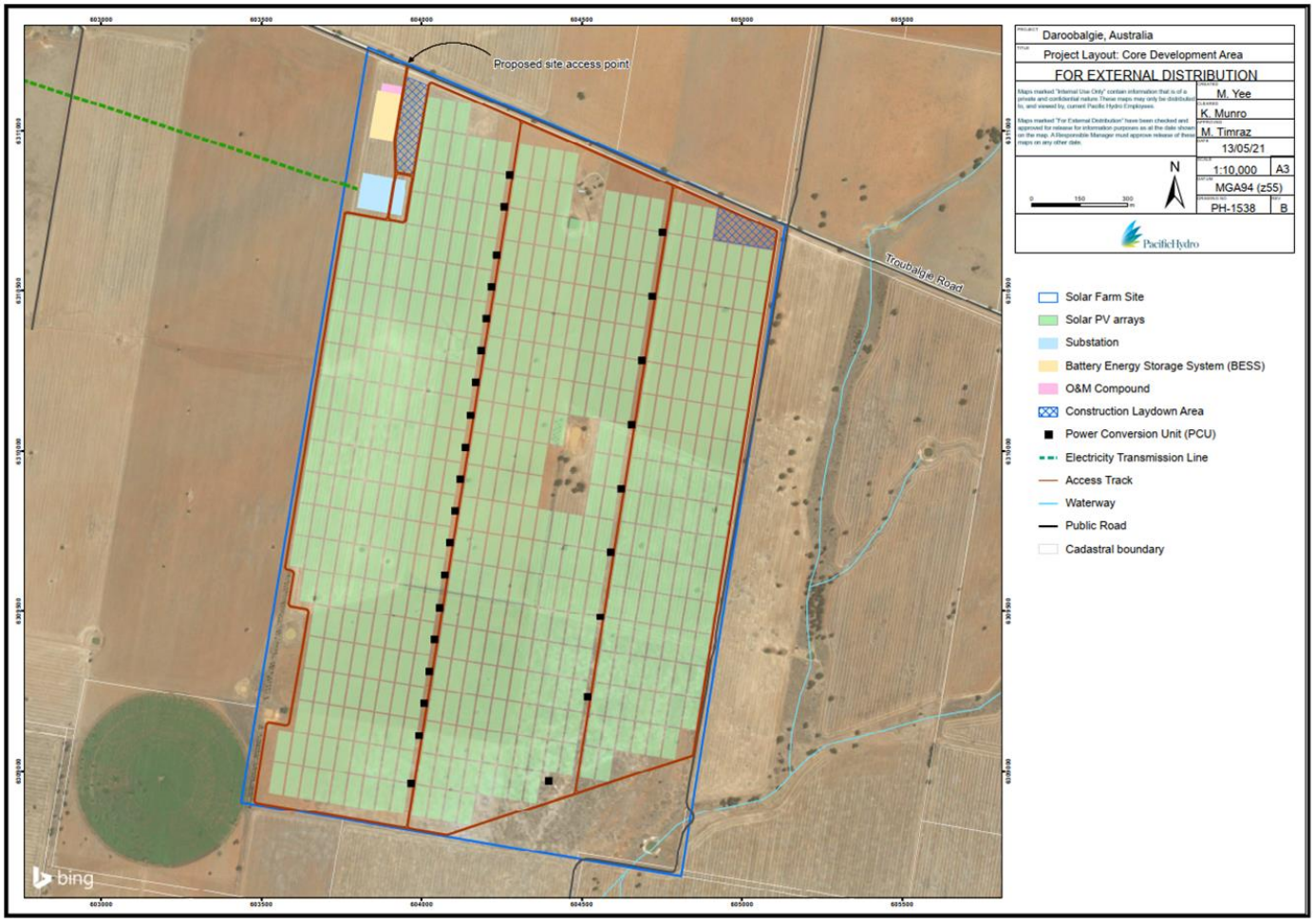


Figure 1-2 General Arrangement of Solar Farm Site

1.4.2 Solar Arrays and PV Modules

The project proposes the installation of PV panels mounted on either fixed-tilt or single-axis-tracking structures that will be configured in rows and columns oriented to the north to optimise power generation achieved at the site.

The PV panels must be elevated on the mounting system to ensure the minimum flood level freeboard requirements at the site and are expected to have a maximum height of up to 4.0 m when fully tilted at 60 degrees.

Initial investigation indicates approximately 420,000 PV panels could be installed for the project, however the final design will depend on a range of factors including available technologies, available grid capacity, economies of scale, grid connection and environmental constraints.

1.4.3 Collector Network and Substation

PV panels are wired in a string array with each group feeding a DC-AC inverter, which converts DC current generated from the PV panels into AC current that can then be stepped up to 132 kV at the substation and subsequently exported to the national electricity grid.

Power Conditioning Units (PCUs) will contain the DC-AC inverters, medium-voltage transformers, switchgear, Supervisory Control and Data Acquisition (SCADA) and communications equipment. They are normally housed within 40-foot shipping container-like structures that measure approximately 12 m long x 2.5 m wide x 2.9 m high.

Underground electrical cabling is proposed to be installed between the PV panels, PCUs and the substation and the electricity generated by the project exported to the grid.

A new 33 kV / 132 kV electrical substation will be constructed to enable a connection of the solar farm to the national electricity grid. The proposed 132 kV substation will occupy a footprint of approximately 140 m long by 40 m wide. Its tallest component is the landing gantry that can reach approximately 12-14 m.

1.4.4 Operation and Maintenance Facility

The proposed Operation and Maintenance facility (O&M) is expected to be co-located with the proposed substation and battery storage facility. Structures will include demountable offices, staff amenities, equipment storage sheds, and at-grade car parking.

1.4.5 Battery Energy Storage System

The Battery Energy Storage System (BESS) storage capacity is proposed to be 40 MW and 160 MWh; however, the final sizing and design of the BESS will be determined during the detailed design process. The most likely technology for the BESS is lithium-ion.

The BESS compound will be approximately 150 m by 75 m, fully fenced and secured and proposed to be located immediately adjacent to the substation.

The compound components will include:

- Battery container (if in containerised solution) with approximate dimensions of 12 m long by 2.5 m wide by 3.0 m high
- Bidirectional inverters that converts power from DC to AC and allow charging of the batteries via AC to DC rectifiers
- Protection devices
- Cooling systems
- Control system.

1.4.6 Electricity Transmission Line (ETL)

A new 132 kV transmission line will be constructed from the substation to a switchyard near the existing Forbes-Parkes 132 kV transmission line located approximately 500 m west of the Newell Highway. The ETL is approximately 8.5 km long and traverses a number of private properties and road reserves. The ETL easement will be 45 m wide. Towers are likely to be monopole structures 25-30 m high.

Figure 1-3 shows the proposed route for the electricity transmission line, access points and the switchyard.

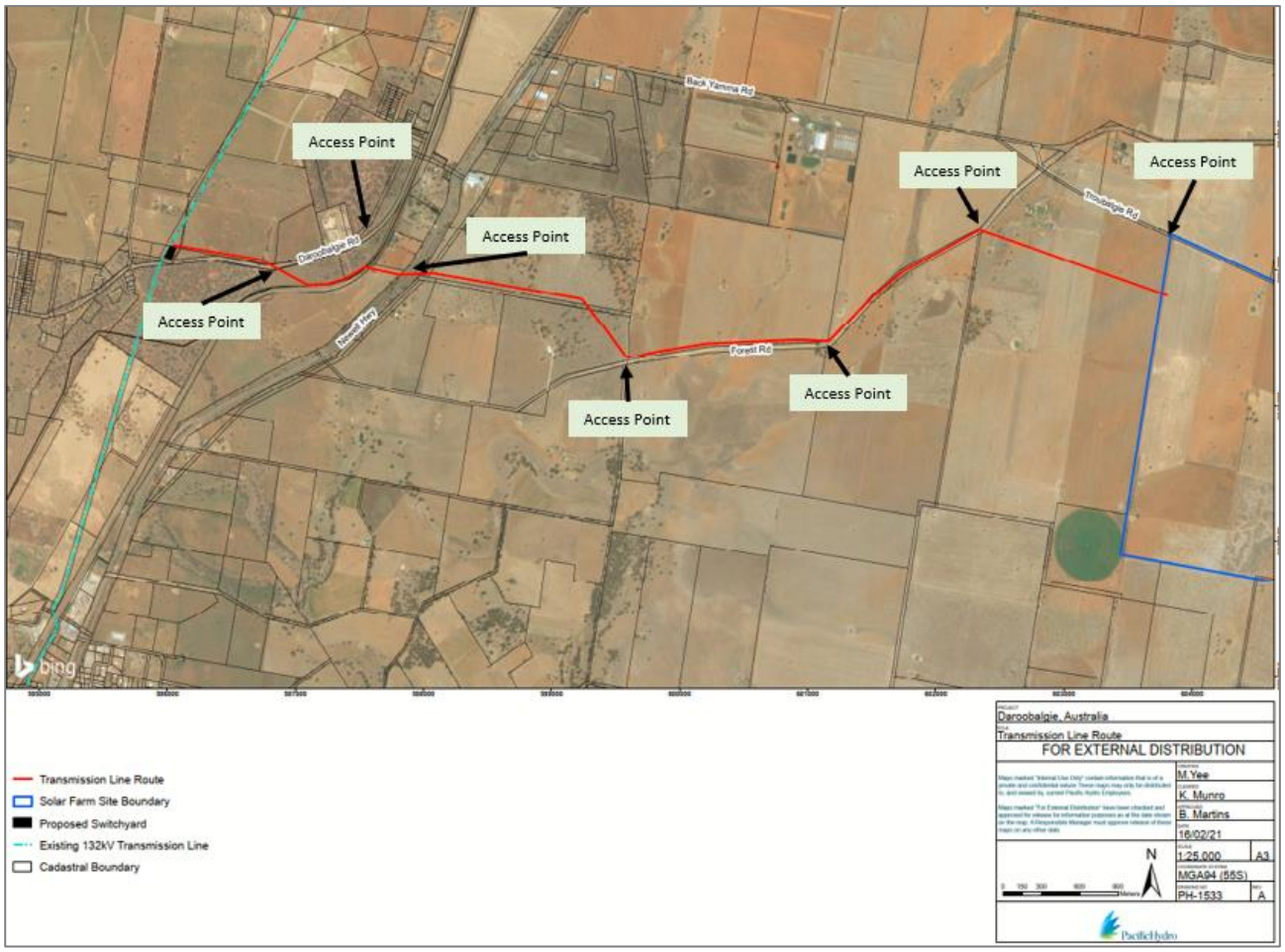


Figure 1-3 Proposed Electricity Transmission Line (ETL) Route and Access Points

1.4.7 Switchyard

The 132 kV Switchyard to connect the proposed ETL to the existing Forbes-Parkes 132 kV TransGrid Transmission Line is expected to occupy a footprint of 90 m long x 55 m wide. Its tallest components are the landing gantries that can reach approximately 12-14 m.

1.4.8 Internal Access Tracks

The main access tracks will be approximately 6m wide with crushed rock (or similar) and internal access tracks approximately 4 m wide constructed with compacted soil (or similar), engineered to withstand light traffic all year round.

1.4.9 Perimeter Security Fencing

The security fencing is expected to be 2.1 m high total and made from 1.8m high chain-wire mesh and strainer wire and 0.3 m high barbed wire.

2 Existing Traffic Conditions

2.1 Road Network – Solar Farm Site

Figure 2-1 shows the existing road network in the vicinity of the proposed solar farm site. This includes The Escort Way, Newell Highway, Forest Road, Daroobalgie Road, Back Yamma Road and Troubalgie Road. The Escort Way and Newell Highway are State Roads and are designated heavy vehicle routes, while Daroobalgie Road (also a designated heavy vehicle route between its intersection with Newell Highway and the Forbes Recycling and Waste Deport), Forest Road, Back Yamma Road and Troubalgie Road are local roads with sealed/unsealed pavement conditions.

It is recommended to assess the structural condition, as well as loading capacity of these local roads prior to commencement of construction works in consultation with the Forbes Shire Council in order to understand the capacity of infrastructure to carry over-size over-mass (OSOM) vehicle movements.

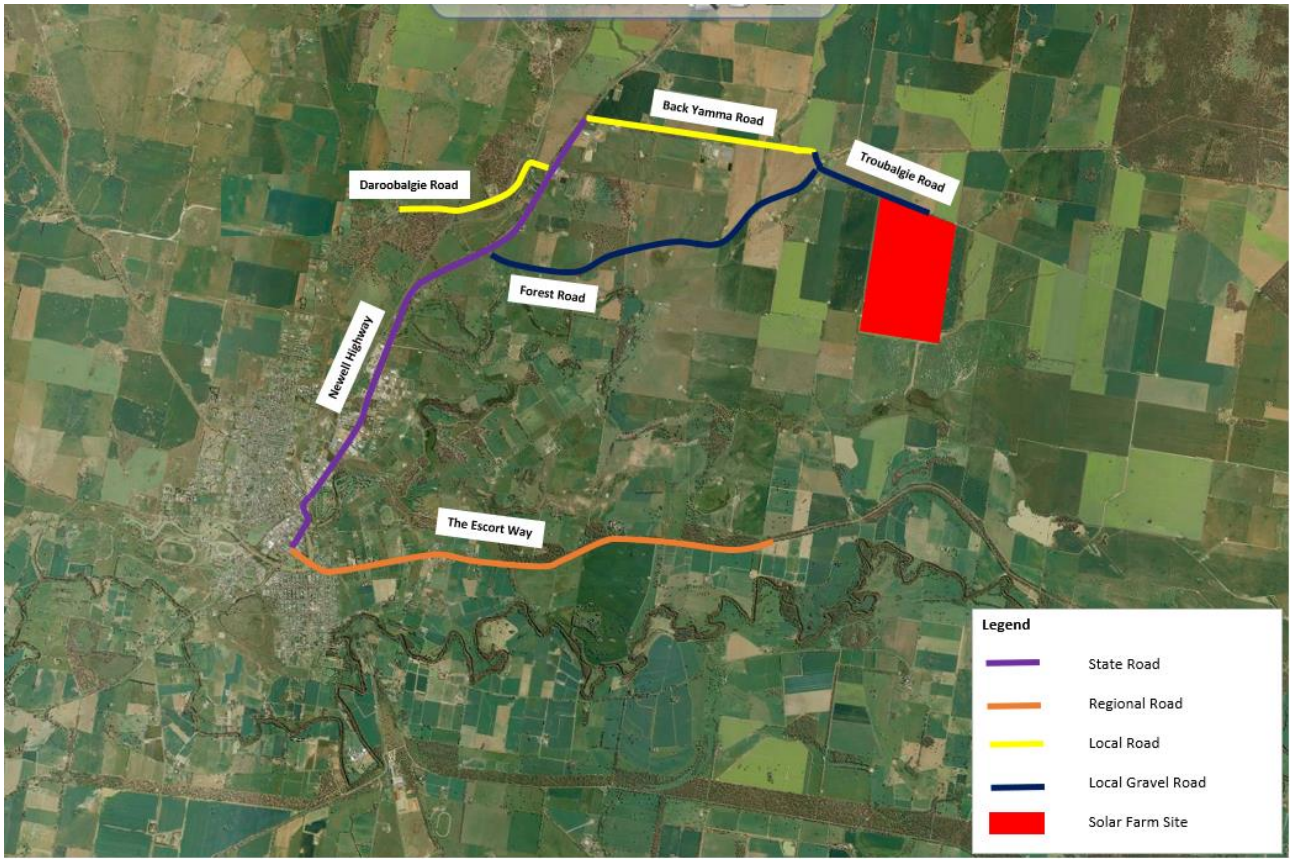


Figure 2-1 Surrounding Road Network (Image Source: SixMap)

2.1.1 Troubalgie Road

Troubalgie Road is a two-way unsealed road with a causeway near its intersection with Back Yamma Road. The road provides direct access to the site and is shown in Figure 2-2.

Figure 2-2 Existing Troubalgie Road

2.1.2 Forest Road

Forest Road intersects with Troubalgie Road at its eastern end and the Newell Highway at its western end and is a two-way unsealed road, which is shown in Figure 2-3. The posted speed limit ranges from 80 km/h to 100 km/h with several bends throughout the road segment. At its intersection with Newell Highway, there are no Channelised Right Turn, or Auxiliary Left Turn facilities.

Figure 2-3 Existing Forest Road

2.1.3 Back Yamma Road

Back Yamma Road is a two-way road with posted speed limit ranging from 80 km/h to 100 km/h with reduced speed zones throughout, as well as truck turning speed limit zones due to sharp bends. Large trucks currently use Back Yamma Road to access the Forbes Central West Livestock Exchange. The Newel Highway/ Back Yamma Road intersection already comprises left and right turn auxiliary lanes to accommodate existing heavy vehicle turning movements. Figure 2-4 to Figure 2-8 show Back Yamma Road leading to the Forbes Central West Livestock Exchange.

Figure 2-4 Existing Back Yamma Road

Figure 2-5 Back Yamma Road/ Newell Highway Intersection

Figure 2-6 Back Yamma Road/Livestock Exchange Access Road Intersection

Figure 2-7 Sharp Bend on Back Yamma Road East of the Livestock Exchange

Figure 2-8 Existing Culvert on Back Yamma Road

There is a sharp bend in the road immediately after the Back Yamma Road/Livestock Exchange Access Road intersection, as shown in Figure 2-7. There are also a number of culverts located on Back Yamma Road between the Livestock Exchange Access Road and Troubalgie Road, such as shown in Figure 2-8.

2.1.4 Newell Highway (A39)

The Newell Highway is a major national highway connecting Queensland, Victoria and NSW. The highway is single carriageway in the vicinity of the project and within Forbes varying from two to four lanes with speed limits ranging from 50 km/h (inside Forbes township) to 110 km/h. An at-grade rail crossing facility is located on the Newell Highway on the northern side of the Newell Highway/ Union Street intersection, as shown in Figure 2-9.

Figure 2-9 Existing At Grade Rail Crossing Facility on Newell Highway at Forbes

2.1.5 The Escort Way

The Escort Way is a single carriageway arterial road with two lanes running from the Mitchell Highway in Orange to the Lachlan Valley Way in Forbes. The posted speed limits on the road vary from 100 km/h outside of the Forbes Council area, 80 km/h on entry to the Forbes Council area and 50 km/h approaching the centre of the town.

2.2 Traffic Volumes

A permanent classified traffic counter site ID 6141 is located on the south side of Forbes some 190 m west of Green Road, which was used to determine annual traffic growth and is further discussed in Section 3.5.1. For purposes of this study, however, classified intersection turning counts were also required to enable performance assessment of relevant intersections. The classified intersection turning counts were also used to provide mid-block traffic count information on relevant roads, such as Newell Highway and The Escort Way, including percentage of heavy vehicles.

2.2.1 Traffic Count Survey Locations

Classified intersection turning count surveys were completed in March 2021 to understand and analyse existing traffic volumes and patterns within the study area. The traffic survey count locations are shown in Figure 2-10.

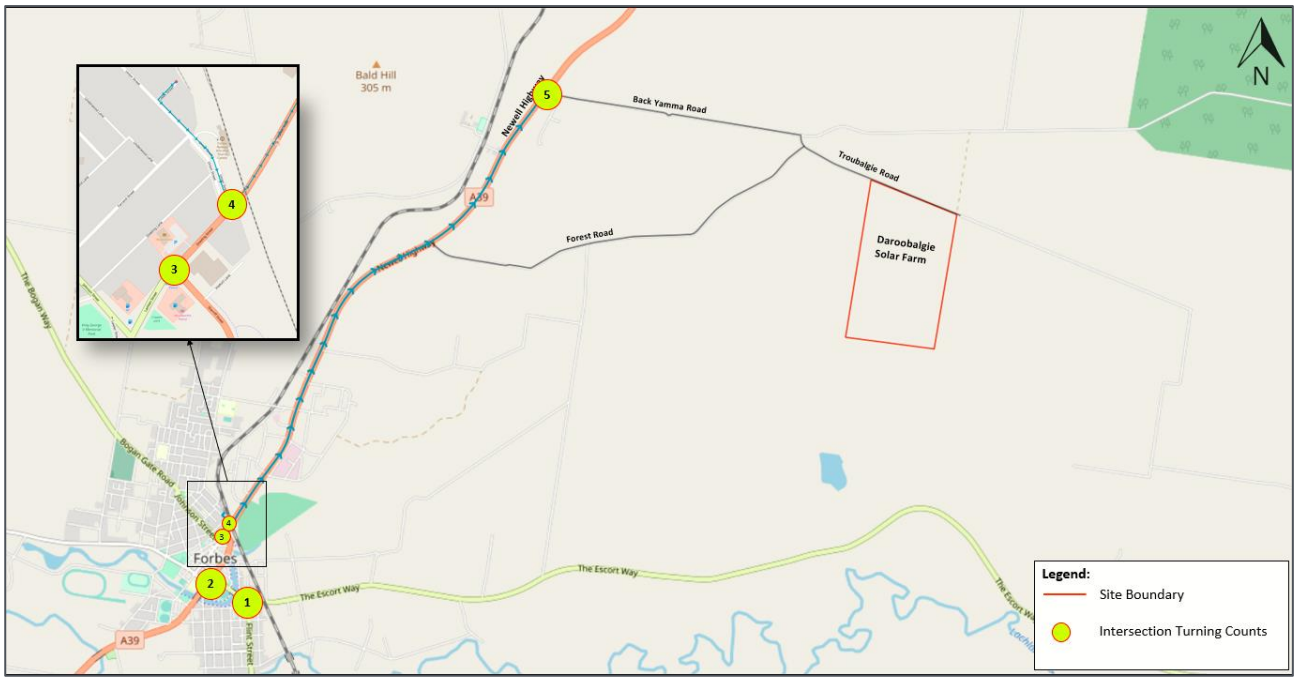


Figure 2-10 Intersection Turning Count Survey Locations

2.2.2 Intersection Turning Volumes and Patterns

Table 2-1 summarises details of the intersection turning count surveys, which were undertaken from 6:00 am to 7.00 pm on an average weekday at five locations in the study area.

The surveys were undertaken on a Central West Livestock Exchange sales day, thus capturing heavy traffic utilising the Newell Highway/ Back Yamma Road intersection and beyond.

No light, or heavy construction vehicles will utilise the Newell Highway/ Forest Road intersection to access the project site, hence this intersection was not surveyed. Measures will be included within the Construction Traffic Management Plan to restrict use of this intersection by construction traffic.

Table 2-1 Intersection Turning Count Locations – Summary

ID	Intersection	Control Type	Survey Period	Survey Date
1	The Escort Way/ Flint Street Intersection	Roundabout	6:00 am to 7:00 pm	Tuesday, 2nd March 2021
2	Newell Highway/Camp Street Intersection	Priority		
3	Newell Highway/Dowling Street Intersection	Signal		
4	Dowling Street/Union Street Intersection	Priority		
5	Newell Highway/Back Yamma Road Intersection	Priority		

Figure 2-11 to Figure 2-15 show intersection traffic volume profiles in 15 minute increments by vehicle type, including light and heavy vehicles, as well as total vehicle volumes. The surveys were used to identify AM and PM peak hour traffic volumes for each of the intersections, which were used for performance assessment purposes. Full details of peak hour traffic survey volumes for each of the intersections is included in Appendix A.

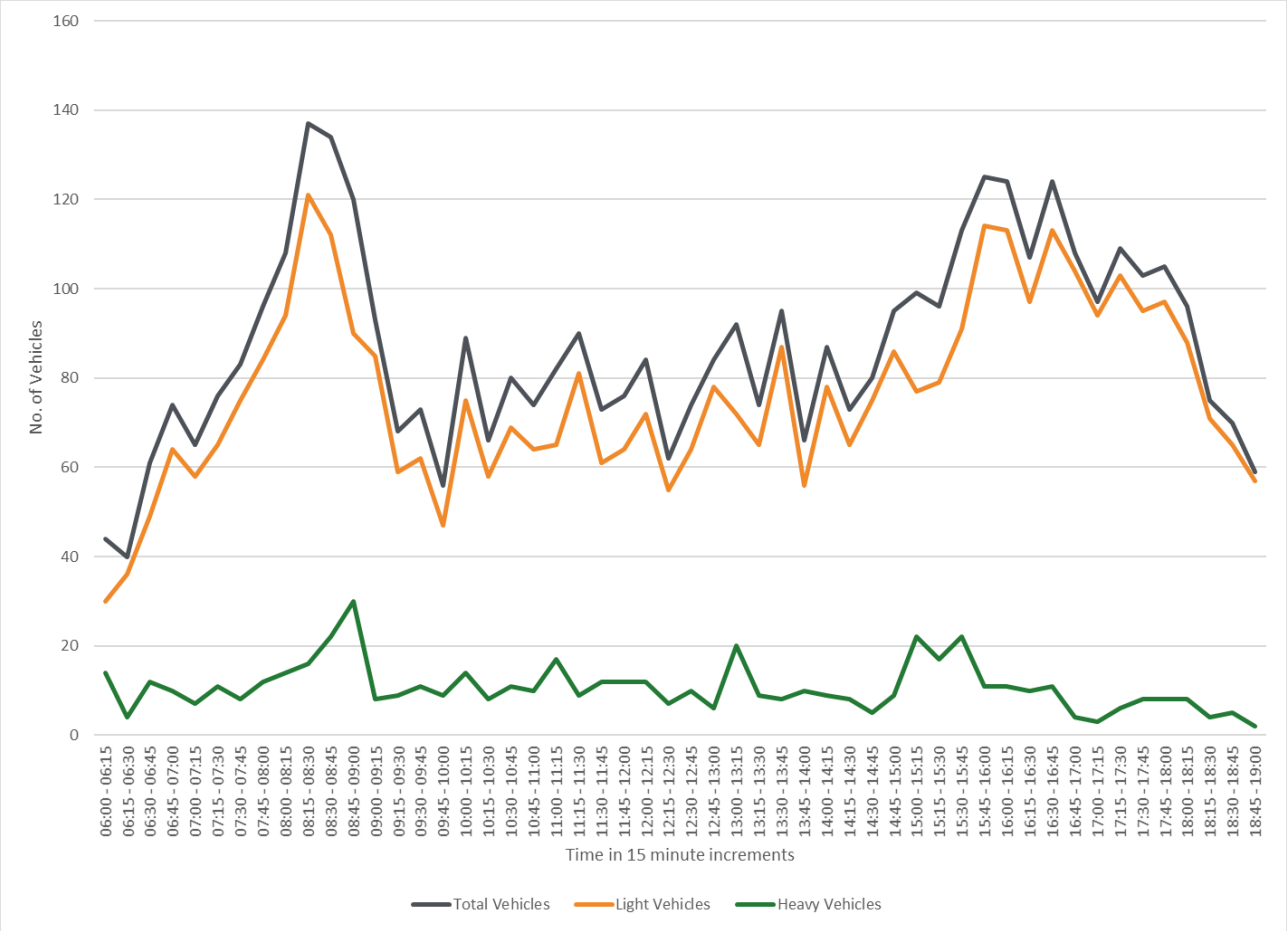


Figure 2-11 Intersection Turning Flows Profile by Vehicle Type at The Escort Way/ Flint Street Intersection

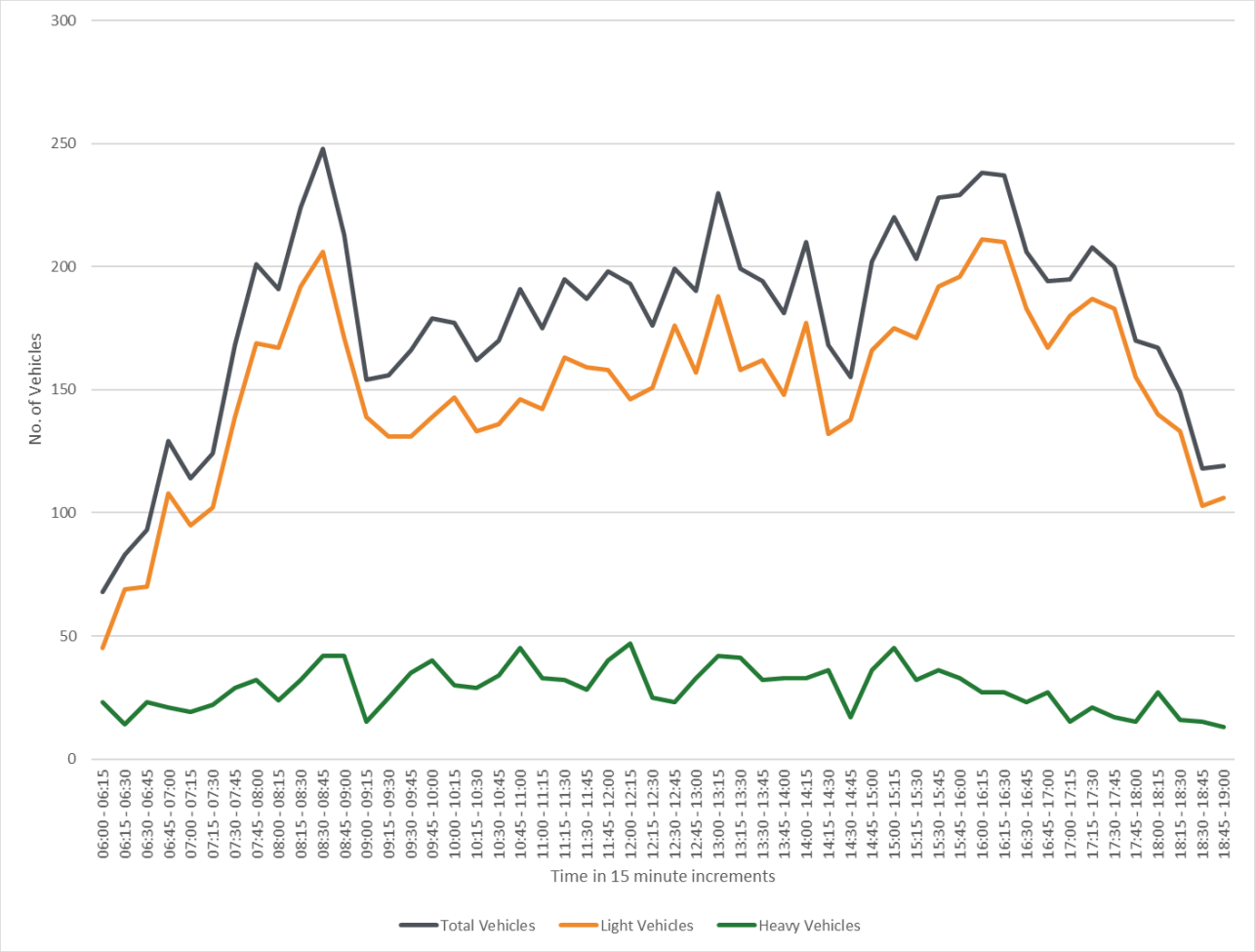


Figure 2-12 Intersection Turning Flows Profile by Vehicle Type at Newell Highway/Camp Street Intersection

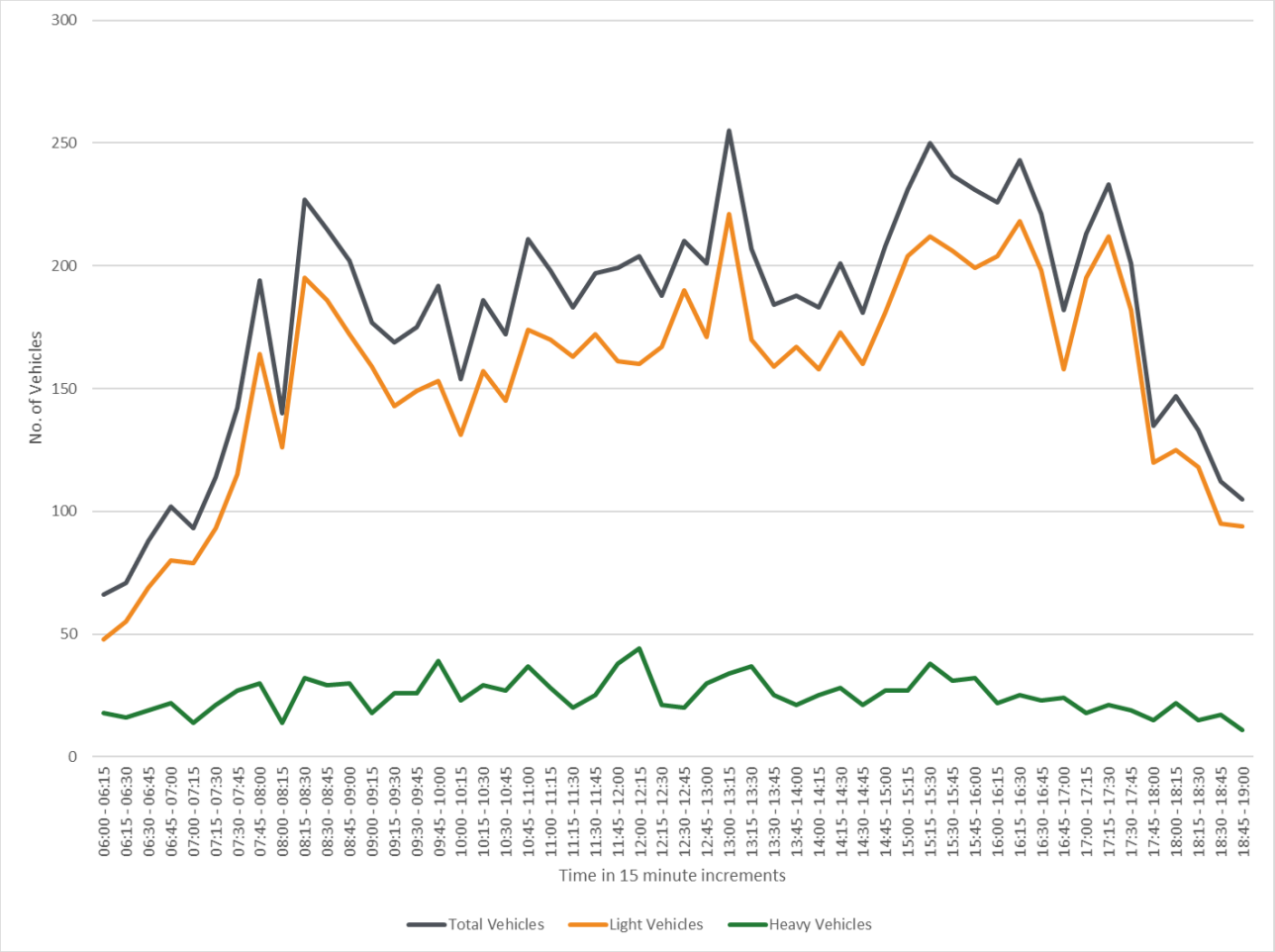


Figure 2-13 Intersection Turning Flows Profile by Vehicle Type at Newell Highway/Dowling Street Intersection

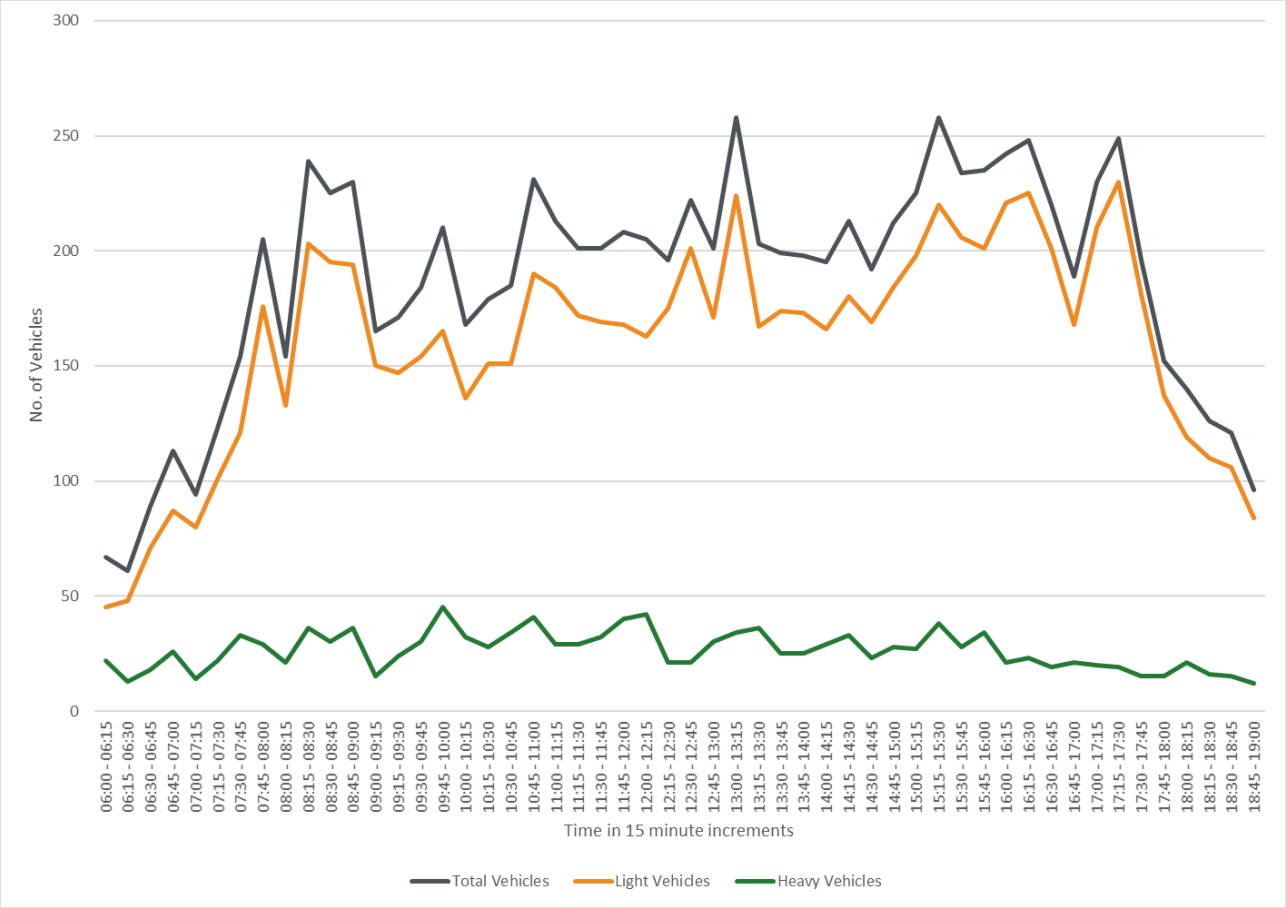


Figure 2-14 Intersection Turning Flows Profile by Vehicle Type at Union Street/Dowling Street Intersection

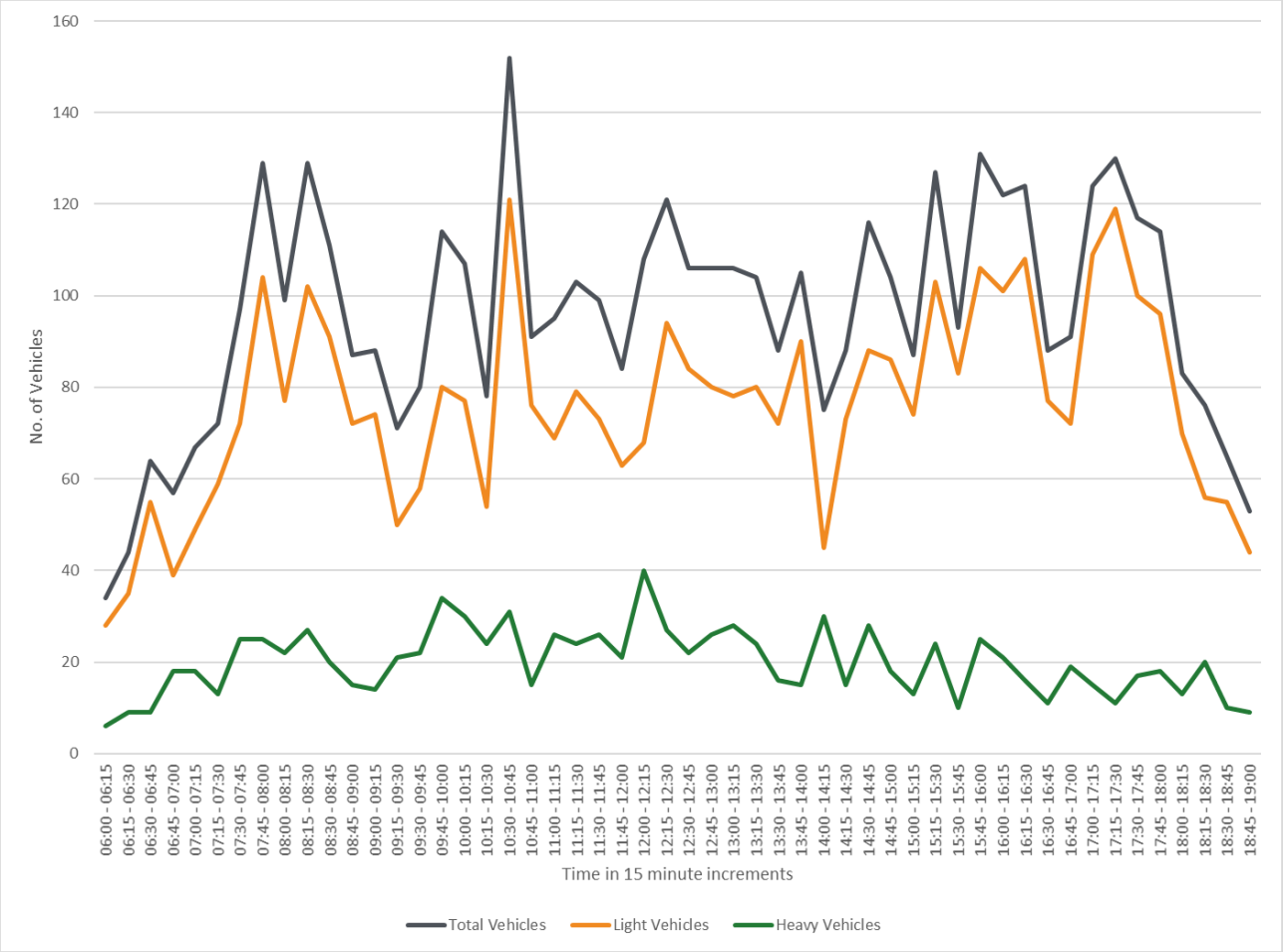


Figure 2-15 Intersection Turning Flows Profile by Vehicle Type at Newell Highway/Back Yamma Road Intersection

A review of traffic survey volume data enabled the AM and PM peak hours to be identified, which are summarised for each of the intersections in Table 2-2.

Table 2-2 AM and PM Intersection Peak Hours

Intersection	AM Peak	PM Peak
The Escort Way/ Flint Street	08:00 – 09:00	15:45 – 16:45
Newell Highway/Camp Street	08:00 – 09:00	15:30 – 16:30
Newell Highway/Dowling Street	08:15 – 09:15	15:00 – 16:00
Dowling Street/Union Street	08:15 – 09:15	15:15 – 16:15
Newell Highway/Back Yamma Road	07:45 – 08:45	17:00 – 18:00

In general, intersection turning volumes during the morning and afternoon peaks are similar. High heavy vehicle movements were recorded during both the AM and PM peak hours. Table 2-3 summarises weekday peak hourly traffic volumes and the heavy vehicle percentage along Newell Highway and The Escort Way.

Table 2-3 Hourly Traffic Flows and Heavy Vehicle Percentage at Newell Highway and The Escort Way

Name	Direction	Weekday AM peak (1 hour)		Weekday PM peak (1 hour)	
		Total	Heavy	Total	Heavy
Newell Highway (North of Union Street)	Northbound	353	43 (12%)	384	48 (13%)
	Southbound	333	52 (16%)	406	51 (13%)
	Two-way	**686**	**95 (14%)**	**790**	**99 (13%)**
The Escort Way (East of Flint Street)	Eastbound	77	15 (19%)	119	11 (7%)
	Westbound	145	18 (12%)	105	7 (10%)
	Two-way	**222**	**33 (15%)**	**224**	**18 (8%)**

It is evident from this information that peak hour traffic flows along these roads are low. As such, it is anticipated that these roads will have sufficient capacity to accommodate additional construction related traffic volumes during the construction of the proposed project.

2.3 Existing Intersection Performance

SIDRA Intersection software (version 9.0) has been used to assess intersection performance at key intersections. Roads and Maritime's *Traffic Modelling Guideline, Version 1, February 2013* (modelling guideline) was used as the main guideline for base year model development.

2.3.1 Level of Service Criteria

The performance of an intersection is measured by the intersection average delay per vehicle which corresponds to a Level of Service (LoS) measure for the intersection.

Performance of an intersection is measured in accordance with the *Austroads Guide to Traffic Management-Part 3: Traffic Studies and Analysis (2013).* The guideline recommends that for priority intersections, such as roundabouts and sign controlled intersections, the LoS value is determined by the critical movement with the highest delay, whereas for a signalised intersection LoS criteria are related to the average overall intersection delay measured in seconds per vehicle.

Intersection LoS were assessed using the standard Roads and Maritime Level of Service criteria for intersections, which are reproduced in Table 2-4 below.

Table 2-4 Level of Service Criteria for Intersections

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing

Source: RTA Guide to Traffic Generating Developments

2.3.2 Intersection Performance Analysis Results

Intersection performance was assessed for base year 2021 using intersection turning count data for the AM and PM peak hours identified. Table 2-5 and Table 2-6 summarise base case intersection performance results for the AM and PM peak hours respectively.

Table 2-5 Existing Base Case Intersection Modelling Results, AM Peak

Intersection	Avg. Delay	LoS	DoS	95th Back of Queue Length [m]
The Escort Way/ Flint Street	10	A	0.21	12 (Flint Street – S)
Newell Highway/Camp Street	27	B	0.57	31 (Camp Street – SE)
Newell Highway/Dowling Street	30	C	0.75	94 (Newell Highway – SE)
Dowling Street/Union Street	19	B	0.36	15 (Union Street – NW)
Newell Highway/Back Yamma Road	13	A	0.13	7 (Newell Highway – SW)

Table 2-6 Existing Base Case Intersection Modelling Results, PM Peak

Intersection	Avg. Delay	LoS	DoS	95th Back of Queue Length [m]
Flint Street/The Escort Way	10	A	0.20	12 (The Escort Way – W)
Newell Highway/Camp Street	29	C	0.61	29 (Camp Street – SE)
Newell Highway/Dowling Street	34	C	0.80	127 (Newell Highway – SE)
Dowling Street/Union Street	27	B	0.47	18 (Union Street – NW)
Newell Highway/Back Yamma Road	18	B	0.15	4 (Back Yamma Road – SE)

All intersections are performing with acceptable LoS during both AM and PM peak hours for the base case scenario. The analysis shows queues of 94m and 127m on the south-eastern approach of the Newell Highway/ Dowling Street intersection during both AM and PM peak hours respectively. This is due to high right turning movements from Newell Highway travelling northbound. Details of the SIDRA modelling outputs are provided in Appendix B.

2.4 Rail Infrastructure and Services

Rail services run through both Forbes and Parkes. An at grade rail crossing facility is available on the Newell Highway at Forbes north of the Newell Highway/ Union Street intersection, as shown in Figure 2-9. Parkes, which is approximately 25km north the solar farm site, is the crossroads of the Australian railway system, with access to all of the state capitals and major ports via the Defined Interstate Rail Network (DIRN), which is standard gauge.

To support the NSW State Government's target for increased rail modal share, the project will explore the use of rail for haulage of project components. Rail is a safe, efficient and ideal choice for transporting the many intermodal shipping containers that will be used to deliver solar panels and other components.

For purposes of this assessment, however, all components and materials have been assumed to travel by road. Upon further investigation, should a decision be taken for rail to be used to transport components, a Modification Application would be lodged, seeking the necessary approvals for this change to the proposal.

2.5 Coach Services

The Western NSW coach service runs through Forbes using The Escort Way from the east or Newell Highway from the south. It then travels to Parkes using the Newell Highway, as shown in Figure 2-16. The Western NSW coach service operates three time a day, including two services in the morning and one service in the afternoon.

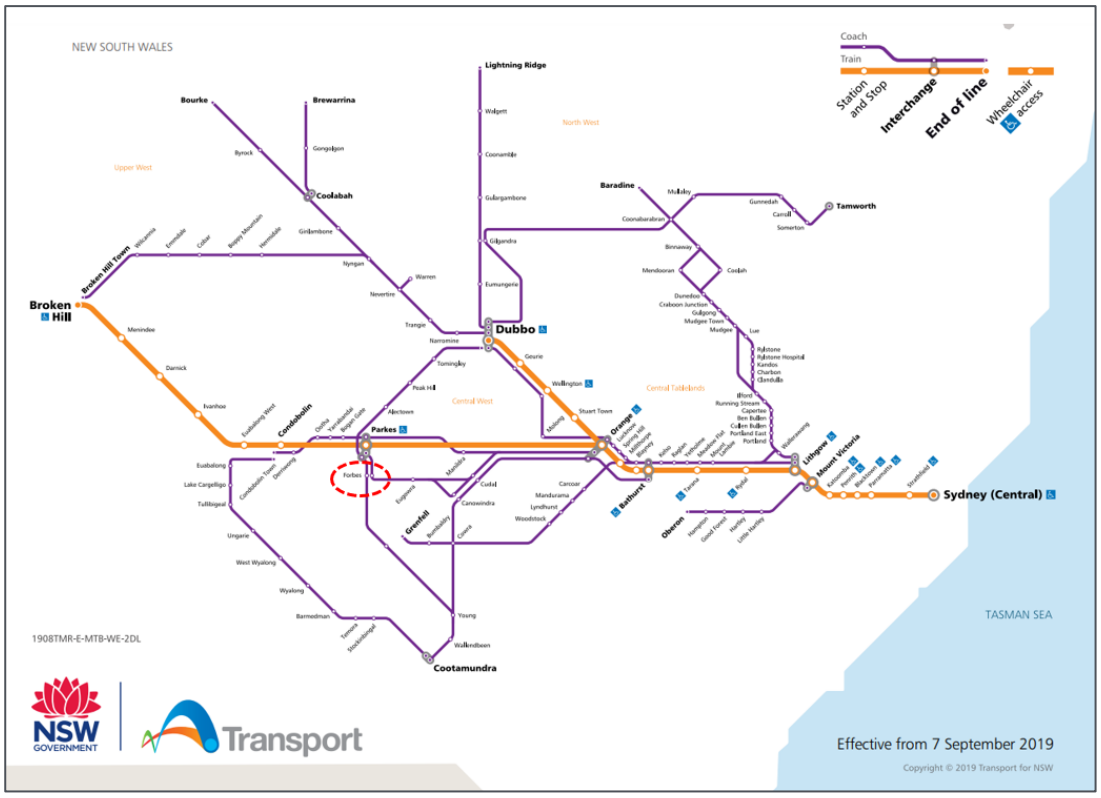


Figure 2-16 Existing Western NSW Coach Service Map (Source: TfNSW)

Currently coach services do not run through the local roads of Back Yamma, Forest Road and Troubalgie Road.

2.6 School Bus Services

Figure 2-17 shows existing school bus routes in the vicinity of the solar farm site. As shown, a designated school bus route uses Back Yamma Road, Daroobalgie Road and a small section of Newell Highway to provide school bus services to residents located along Back Yamma Road, Daroobalgie Road and in Forbes. There is also another school bus route that runs along the Newell Highway between Forbes and Parkes.

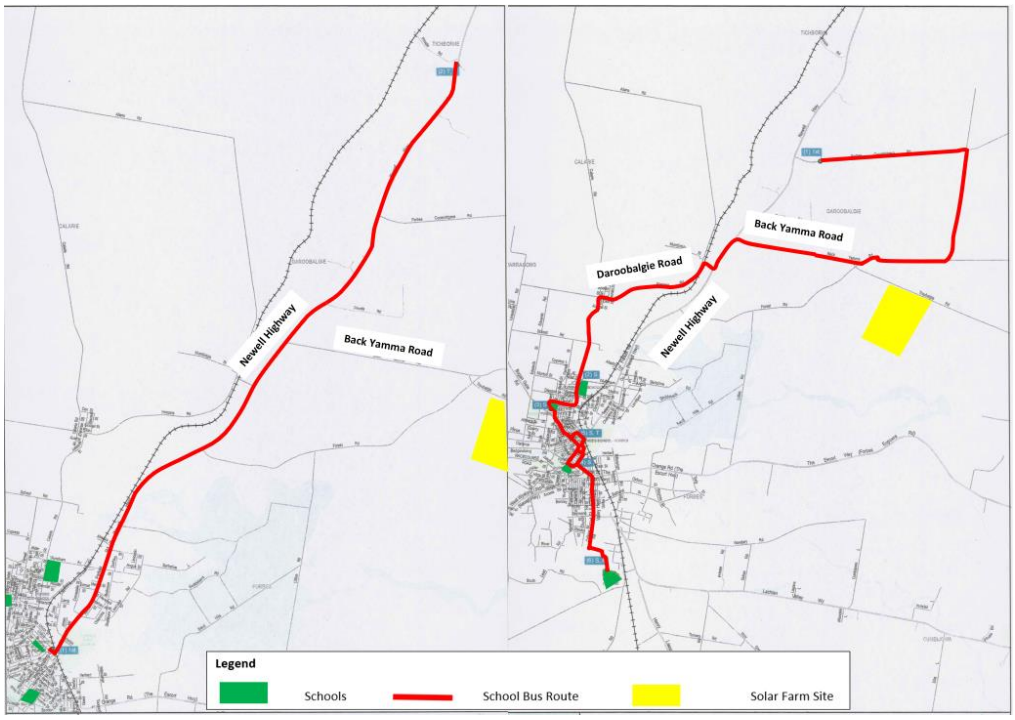


Figure 2-17 Existing Schools and School Bus Routes in the Vicinity of Solar Farm Site

2.7 Other Developments

2.7.1 Forbes Central West Livestock Exchange

The Forbes Central West Livestock Exchange, approximately 3 km west of the proposed solar farm site is owned by Forbes Shire Council. Key information about the Livestock Exchange (*Source: Pacific Hydro*), is summarised, as follows:

- Sale days - Mondays and Tuesdays (Mondays for cattle and Tuesdays for sheep)
- Capacity of the livestock exchange is up to 3,000 cattle, 50,000 sheep and 1,200 pigs
- 7 full time council staff. On sale days, there could be 300 people on site including agents, farmers and transport operators
- Typical work hours:
  - Monday 5 am to 9 pm
  - Tuesdays 3 am to 9 pm
  - Wednesday to Friday 7 am to 4 pm
  - Saturday 9 am to 3 pm
  - Sunday 3 pm to 11 pm
- Troubalgie Road, Back Yamma and Forest Road are used by transport operators to transport livestock to the livestock exchange for sale
- Occasionally cattle and sheep are brought to the livestock exchange by walk.

2.7.2 Other Solar Farms

There are several other solar farms in the area. The solar farms at Goonumbla, Jemalong and Parkes have already been constructed and are now operational. The assessment process of Quorn Park Solar Farm is on-going. These developments are sufficiently far apart from the proposed site, such that no traffic overlap is expected. A list of these solar farms is provided in Table 2-7 with locations presented in Figure 2-18.

Table 2-7 Nearby Solar Farms in the Vicinity of the Proposed Site

Solar Farm Development	Location	Status
Goonumbla Solar Farm	West of Parkes; access via Henry Parkes way	Operational
Jemalong Solar Farm	Southwest of Forbes; access via Lachlan Valley Way	Operational
Parkes Solar Farm	West of Parkes; access via Henry Parkes way	Operational
Quorn Park Solar Farm	West of Parkes; access via Henry Parkes way	Under assessment

Figure 2-18 Locations of Other Solar Farms in Area

3 Construction Impacts

The construction phase of the project will generate the largest volume of project-related traffic and consequently have the greatest impact on the road network. Assessment of project impacts on the surrounding road network were undertaken against the following criteria:

- Road and intersection capacity
- Pavement condition
- Average travel speed
- Property access
- Pedestrians and cyclists
- School bus route(s)
- Public transport
- Culverts
- Traffic safety
- Car parking and laydown areas.

3.1 Construction Programme

Construction start and end dates are not known at this time, however total duration of construction works is anticipated to be 56 weeks from commencing date. Table 3-1 summarises the duration of various tasks required for construction of the proposed solar farm.

Table 3-1 Duration of Tasks during Construction Stage

Task Name	Duration
Construction activities	**56 weeks**
Site mobilisation	4 weeks
Site set-up/access roads	8 weeks
HV trenching	12 weeks
PV plant installation	30 weeks
Substation/BESS and O&M construction	52 weeks
Transmission line	12 weeks
Switchyard construction	30 weeks
Commissioning (Energisation and commercial operation)	12 weeks

Source: Pacific Hydro

3.2 Traffic Generation

3.2.1 Construction

The construction phase is expected to generate the largest volume of traffic during the lifetime of the project.

Table 3-2 shows estimated construction related heavy vehicle movements (one-way) during various stages of construction.

Four over-dimensional truck movements are anticipated to occur during the substation construction stage to deliver transformers and electric rooms.

Table 3-2 Estimated Heavy Vehicle Movements (one-way) and Heavy Vehicle Types

Task Name	Purpose	Vehicle Type	No of one-way vehicle movements	Total No of one-way vehicle movements per task
Site mobilization and demobilisation	Portacabin delivery and removal	Low loader	20	24
	Water tank delivery and removal	Low loader	4	
Site set-up and access roads	Skip delivery and removal	Low loader	40	1360
	General deliveries	Semi-trailer	34	
	Crane mobilization and demob	Crane	4	
	Delivery of imported capping for road laydowns and crane hardstands	Truck and dog	400	
	Plant delivery and removal: excavators, compactors drill rig	Low loader	32	
	Fuel delivery	Fuel trucks	40	
	Water carts	Water cart	720	
	Concrete deliveries for maintenance container hardstands	Concrete agitators	90	
HV trenching	Cable delivery	Semi-trailer or B-double	184	1824
	Fuel deliveries	Fuel trucks	40	
	Backfill material delivery	Dump truck	1400	
	DC cabling trays and combiner boxes	Semi-trailer or B-double	200	
PV plant installation	Module deliveries	Semi-trailer	1286	2340
	Mounting structure and pile deliveries	Semi-trailer	1000	
	Inverter delivery	Low loader	26	
	Telescopic handler and excavator	Low loader	28	
Substation construction	Delivery of transformer units (4 OD vehicles) Crane (4 OD vehicles) Electrical building (1 OD vehicle)	OD vehicle	9	9
Electrical transmission line	Transmission towers	Semi-trailers	96	96
Switchyard	Concrete deliveries	Concrete agitators	100	120
	Infrastructure deliveries	Semi-trailers	20	
		Total one-way heavy vehicle movements		**5,773**

Source: Pacific Hydro, 2020

A number of key construction activities will overlap for a period of 10 weeks throughout the duration of the 56 week construction program (weeks 15-24 inclusive), including HV trenching, PV plant installation, substation construction, transmission line and switchyard construction. Details of overlapping construction activities, including task, duration, number of one-way heavy vehicle movements, as well as the number of one-way heavy vehicle movements per week for the duration of each task is provided in Table 3-3.

In summary, there would be a peak of 242 one-way heavy vehicle movements per week as a result of overlapping construction activities for a duration of no longer than 10 weeks.

Table 3-3 Key Overlapping Construction Activities and Estimated Heavy Vehicle Movements (one-way)

Task Name	Duration	No of one-way heavy vehicle movements	No of one-way heavy vehicle movements per week
HV trenching	12 weeks	1824	152
PV plant installation	30 weeks	2340	78
Substation construction	52 weeks	9	0
Transmission line	12 weeks	96	8
Switchyard construction	30 weeks	120	4
Total No. one-way vehicle movements per week			**242**

Assuming 5.5 working days a week and an average 10 working hours per day (assuming standard working hours - 6am to 7pm on weekday Monday to Friday and 8am to 1pm on Saturday), there would be 44 one-way heavy vehicle movements per day (around 4.4 one-way heavy vehicle movements per hour). For purposes of assessment, a worst case of 5 one-way heavy vehicle movements per hour has been assumed.

In addition, the average number of staff during the peak construction stage would be around 200 comprising trade assistants, sub-contractors and electricians. Assuming a vehicle occupancy of 1.2 persons per vehicle, this would generate 167 one-way light vehicle movements. For purposes of traffic assessment, it is assumed that all 167 vehicles would access the site during the AM peak hour and would leave the site during the PM peak hour.

3.2.2 Operation

Traffic generated during the operational phase is expected to be minimal in comparison to the construction phase. It is expected that operation will not generate significant traffic. The main activities that are involved in the operational phase are travel to and from the site for normal operational activities and routine maintenance.

3.2.3 Decommissioning

It is expected that decommissioning of the solar farm and its component components will be similar to that of the construction period.

3.3 Construction Vehicle Routes and Traffic Distribution

It is likely that either Port of Botany, Port of Newcastle or Port Kembla would be used to deliver construction related materials. For purposes of this assessment, all components and materials have been assumed to travel by road.

To support the NSW state government's target for increased rail modal share, the project will explore the use of rail for haulage of project components. Rail is a safe and efficient option for transporting the many intermodal shipping containers that will be used to deliver solar panels and other components.

The Stockinbingal-Parkes railway line is located close to the project site, which is managed by the Australian Rail Track Corporation (ARTC). Parkes, which is approximately 25km from the solar farm site, is the crossroads of the Australian railway system, with access to all of the state capitals and major ports via the Defined Interstate Rail Network (DIRN), which is standard gauge.

Upon further investigation, should the decision be taken for the rail option to be adopted, a Modification Application would be lodged, seeking the necessary approvals for this change to the proposal.

Locations where intermodal containers might be unloaded include sidings at Forbes (Mountain Industries intermodal terminal) and Parkes (several sidings) with extensive intermodal handling and transhipment capabilities. There are also several local trucking contractors who can handle the 'last miles' from the railhead to the project site.

There are two road options available to transport construction materials, namely from the north using Newell Highway (A39) and/or Henry Parkes Way via Parkes, or from the south using The Escort Way and Newell Highway via Forbes, as shown in Figure 3-1. All of these roads are designated heavy vehicle routes and would be able to accommodate additional heavy vehicle movements associated with the project. Both of these routes would require heavy vehicles to access the site from Newell Highway via Back Yamma Road and Troubalgie Road.

Whilst both heavy vehicle routes would be able to accommodate additional construction related heavy vehicles, the route from the south via The Escort Way through Forbes is considered for detailed assessment in this report, which aligns with the requirements of the SEARs. It is also to be noted that the intersection at Newell Highway and Back Yamma Road has spare capacity to accommodate vehicles coming from the north via Parkes.

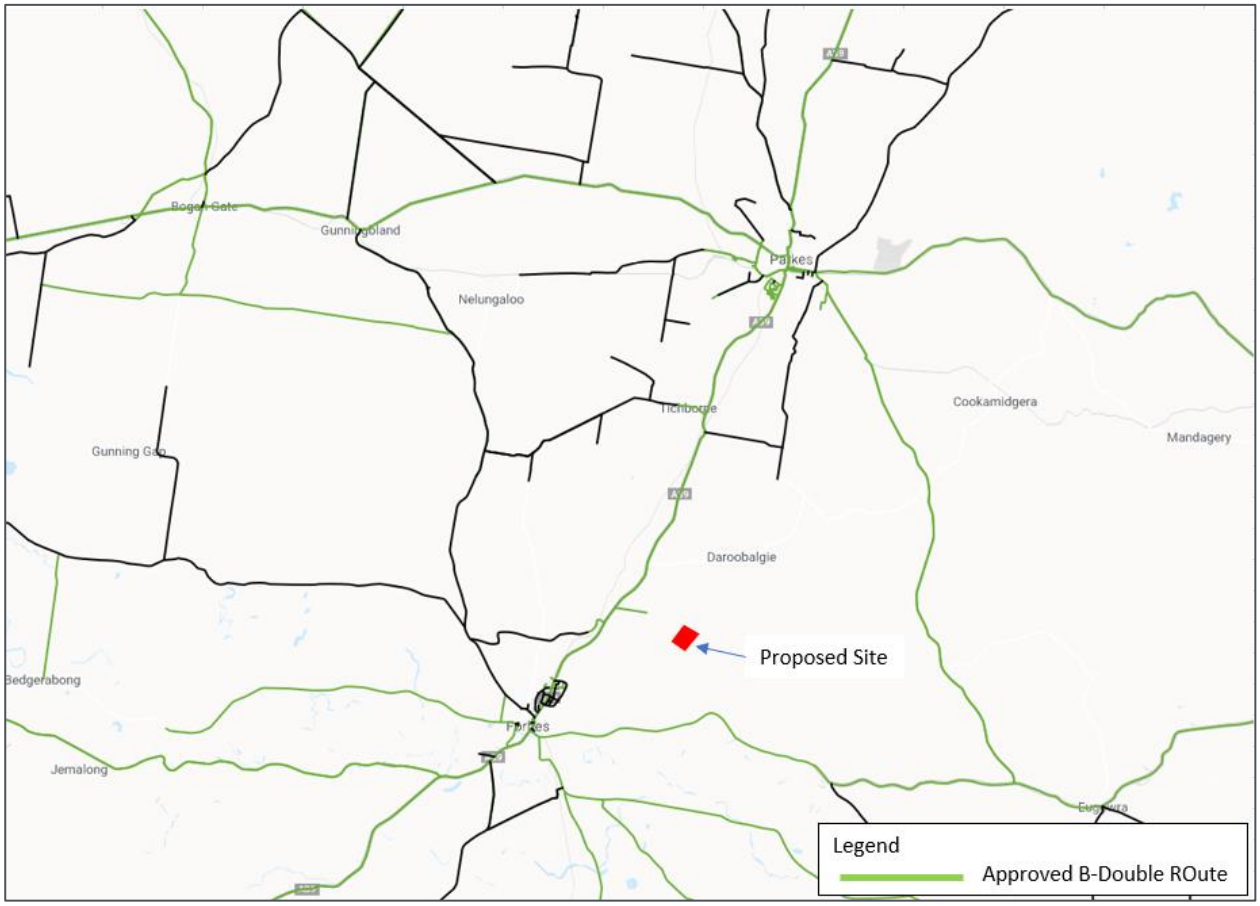


Figure 3-1 Approved B-Double Route (26 metre)

Figure 3-2 shows the proposed route for heavy construction related vehicles to the construction site from the south via Forbes using The Escort Way, Newell Highway, Back Yamma Road and Troubalgie Road.

Forest Road is generally not considered suitable for use by construction related vehicles for a number of reasons, including the Newell Highway/ Forest Road intersection, which does not have Channelised Right Turn, or Auxiliary Left Turn facilities, tight turning radius at the Forest Road/ Troubalgie Road intersection, as well as due to the general condition of the road and the fact that the road is unsealed making it unsuitable for heavy vehicles following rainfall.

The only heavy vehicle traffic that will be permitted access to Forest Road during construction will be the small number of vehicles required for the construction of the ETL, which will access Forest Road via Back Yamma Road and Troubalgie Road. No construction related vehicles will access Forest Road via the Newell Highway/ Forest Road intersection. A Construction Traffic Management Plan for the project, once developed, will detail mitigation, such as signage and a Driver Code of Conduct, to ensure that use of Forest Road is limited during construction and operation.

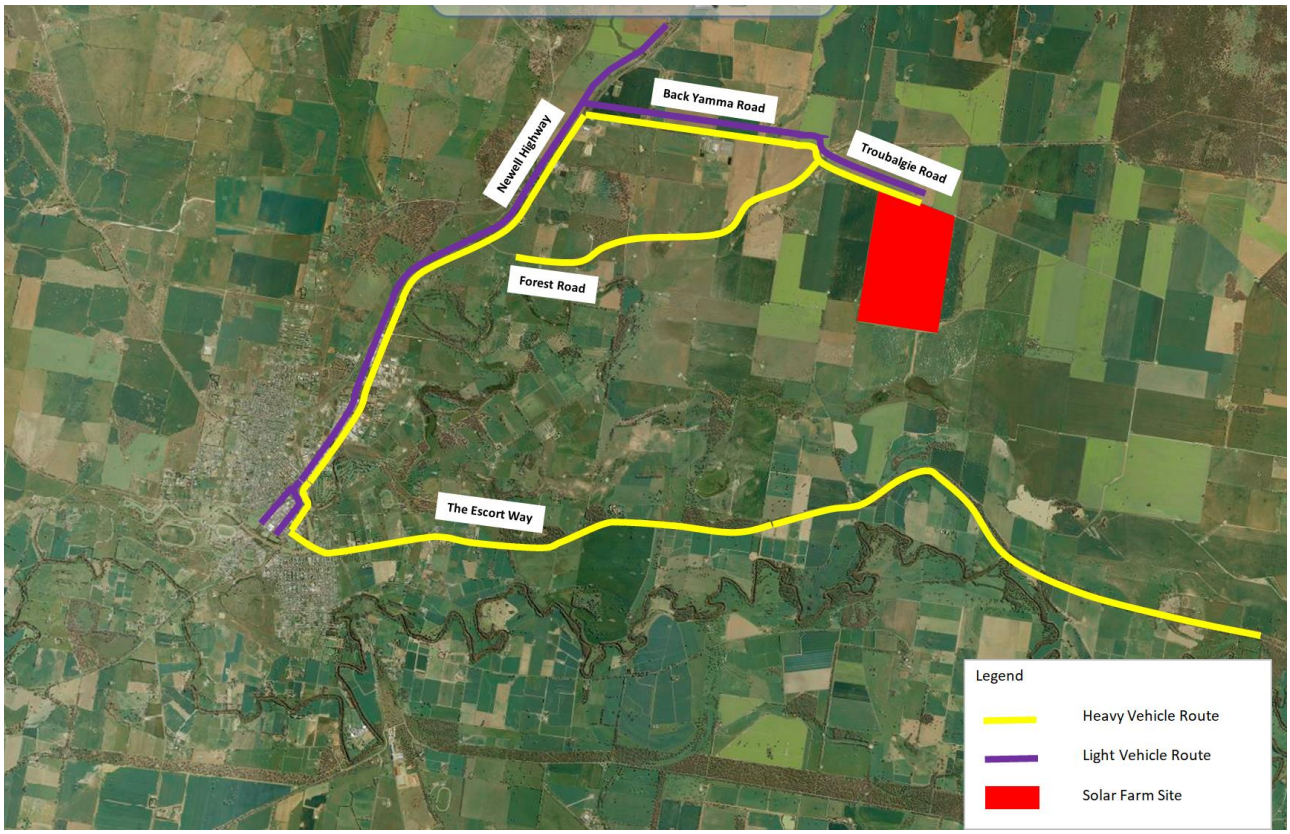


Figure 3-2 Proposed Route for Construction Related Vehicles (Light and Heavy)

For assessment purposes, it is anticipated that 100% of heavy vehicles would use the Escort Way, Newell Highway, Back Yamma Road and Troubalgie Road to access the site.

In regard to light vehicles, it is assumed that the majority of staff would stay at the nearby towns of Forbes and Parkes and would travel to the site via the Newell Highway, Back Yamma Road and Troubalgie Road. Two scenarios have been assessed, including 100% of staff travelling to the site from the south (from Forbes), as well as 100% of staff travelling to the site from the north (from Parkes).

The proposed distribution of light and heavy construction traffic is shown in Figure 3-3, while light and heavy construction traffic turning volumes at relevant intersections are provided in Appendix A. Total traffic volumes comprising existing background traffic, as well as construction related traffic volumes are also included in Appendix A.

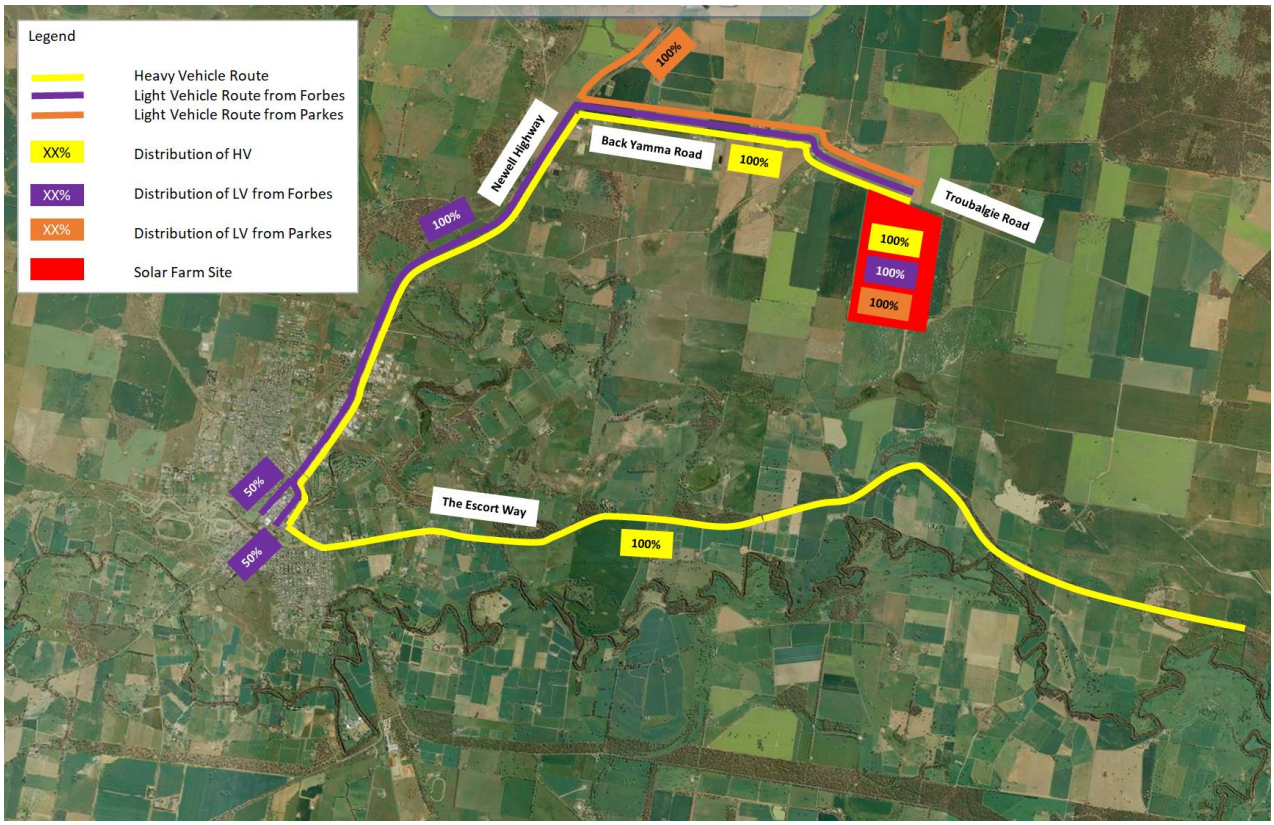


Figure 3-3 Distribution of Light and Heavy Construction Vehicles

With respect to access to the site by oversize-over mass (OSOM) vehicles, actual dimensions and mass of the transformer equipment are not yet resolved and will be further considered as the design work progresses. The main consideration will be definition of the haulage route from Port to site, and a detailed examination of this can only be done once the details of the transformer are known.

It is not envisaged that there will be any issues near the site for OSOM loads, as the design of Back Yamma Road and Troubalgie Road has already been established to allow access for 26m B doubles (without crossing the centreline). OSOM loads will be escorted by traffic control/police and can utilise the full road width if needed. However, consideration should be given to preparing a detailed report on OSOM transport to identify any issues of concern and treatments to address those issues (to transport the transformer equipment to site). This report should be subsequently prepared by a specialist Heavy Haulage contractor for consultation with relevant agencies and incorporate any specific requirements of those agencies.

3.4 Construction Impacts Assessment

The construction phase of the project will generate the largest volume of project-related traffic and consequently have the greatest impact on road network. Assessment of project impacts on the surrounding road network are discussed in the following sections.

3.5 Road and Intersection Capacity

Performance of the five key intersections was assessed for the development case scenario considering the additional light and heavy vehicles that will be generated during the construction stage. Commencement and end dates for construction are not currently known, however it is anticipated that construction will start between 2023 and 2026. For purposes of this traffic assessment and estimation of future year background traffic, it is assumed that construction would start in 2023 and run for a duration of 56 weeks.

3.5.1 Growth Rate Estimation

No historical traffic count data is available in the vicinity of the proposed site, however, a permanent traffic counter (Station ID: 6144) is located on the southern side of Forbes on the Newell Highway. Traffic volume data from this counter was used to estimate the annual growth rate of traffic in the area. Table 3-4 shows the historical traffic volume data on Newell Highway and associated annual traffic growth.

Table 3-4 Historical Daily Traffic Counts Data and Growth Rates (Station ID: 6144)

Movement	Year 2017	Year 2018	Year 2019	Year 2020	Year 2021
Eastbound	1329	1370	1336	1148	1283
Westbound	1278	1311	1280	1098	1279
Total	**2607**	**2681**	**2616**	**2246**	**2562**
Growth Rate (%)		***3%***	***-2%***	***-14%***	***14%***

Source: RMS Traffic Volume Viewer (Station ID: 6144)

As shown in Table 3-4, there is a negative trend of traffic growth between 2018 and 2020. Although positive growth is observed between 2020 and 2021, the daily total traffic volume in 2021 is still less than that of 2019. As such, no growth factor has been applied to existing traffic count survey data to estimate future base year intersection turning volumes.

3.5.2 Intersection Capacity

The performance of the five key intersections was assessed with additional light and heavy construction related traffic volumes. As discussed, two scenarios for light vehicles were considered, including 100% of staff travelling to the site from the south (from Forbes), as well as 100% of staff travelling to the site from the north (from Parkes).

Table 3-5 and

Table 3-6 show performance of key intersections with additional construction related traffic for the AM and PM peak hours respectively.

Table 3-5 Intersection Modelling Results with Construction Traffic, AM Peak

Intersection	100% LV from Forbes				100% LV from Parkes			
	Avg. Delay	LoS	DoS	95th Back of Queue Length [m]	Avg. Delay	LoS	DoS	95th Back of Queue Length [m]
The Escort Way/ Flint Street	10	A	0.21	12 Flint Street - S	10	A	0.21	12 Flint Street - S
Newell Highway/ Camp Street	41	C	0.73	45 Camp Street - SE	29	C	0.61	34 Camp Street - SE
Newell Highway/ Dowling Street	35	C	0.77	139 Newell Highway - SE	30	C	0.70	97 Newell Highway - SE
Dowling Street/ Union Street	29	C	0.53	23 Union Street - NW	19	B	0.37	16 Union Street - NW
Newell Highway/ Back Yamma Road	16	B	0.28	12 Newell Highway - SW	15	B	0.19	9 Newell Highway - SW

Table 3-6 Intersection Modelling Results with Construction Traffic, PM Peak

Intersection	100% LV from Forbes				100% LV from Parkes			
	Avg. Delay	LoS	DoS	95th Back of Queue Length [m]	Avg. Delay	LoS	DoS	95th Back of Queue Length [m]
The Escort Way/ Flint Street	10	A	0.20	12 The Escort Way - W	10	A	0.20	12 The Escort Way - W
Newell Highway/ Camp Street	48	D	0.79	46 Camp Street - SE	31	C	0.65	33 Camp Street - SE
Newell Highway/ Dowling Street	36	C	0.80	146 Newell Highway - SE	34	C	0.79	130 Newell Highway - SE
Dowling Street/ Union Street	54	D	0.73	32 Union Street - NW	29	B	0.48	18 Union Street - NW
Newell Highway /Back Yamma Road	17	B	0.30	10 Back Yamma Road - SE	16	B	0.48	22 Back Yamma Road - SE

Key findings from the intersection performance assessment are as follows:

- The Escort Way/ Flint Street intersection would continue to operate at LoS A in the AM and PM peaks in all scenarios;
- The Newell Highway/ Camp Street intersection would operate at LoS C during the AM peak for both light vehicle scenarios. In the PM peak, when light vehicles travel from Forbes, the intersection would operate at LoS D, however when light vehicles travel from Parkes, the intersection would operate at LoS C.
- The Newell Highway/ Dowling Street intersection would continue to operate with LoS C in the AM and PM peaks in all scenarios;
- The Dowling Street/ Union Street intersection would operate at Los B in the AM and PM peaks with and without project traffic when light vehicles travel to the site from Parkes, however when light vehicles travel from Forbes, the worst performing movement at the intersection would operate at LoS C and D in the AM and PM peaks respectively; and
- The Newell Highway/ Back Yamma Road intersection would operate well with acceptable delays and spare capacity in the AM and PM peaks for both light vehicle scenarios.

In summary, the assessment of construction related traffic on the future performance of key intersections has not identified any issues of concern. Details of SIDRA model outputs are provided in Appendix B.

3.6 Pavement Condition

The construction vehicle route via The Escort Way, Newell Highway and Back Yamma Road (between Newell Highway and Livestock Exchange Access Road) is a designated heavy vehicle route and the project is anticipated to have minor/no impacts on pavement condition due to additional construction vehicle movements. The nature of roads, including sealed, or unsealed is shown in Figure 3-4.

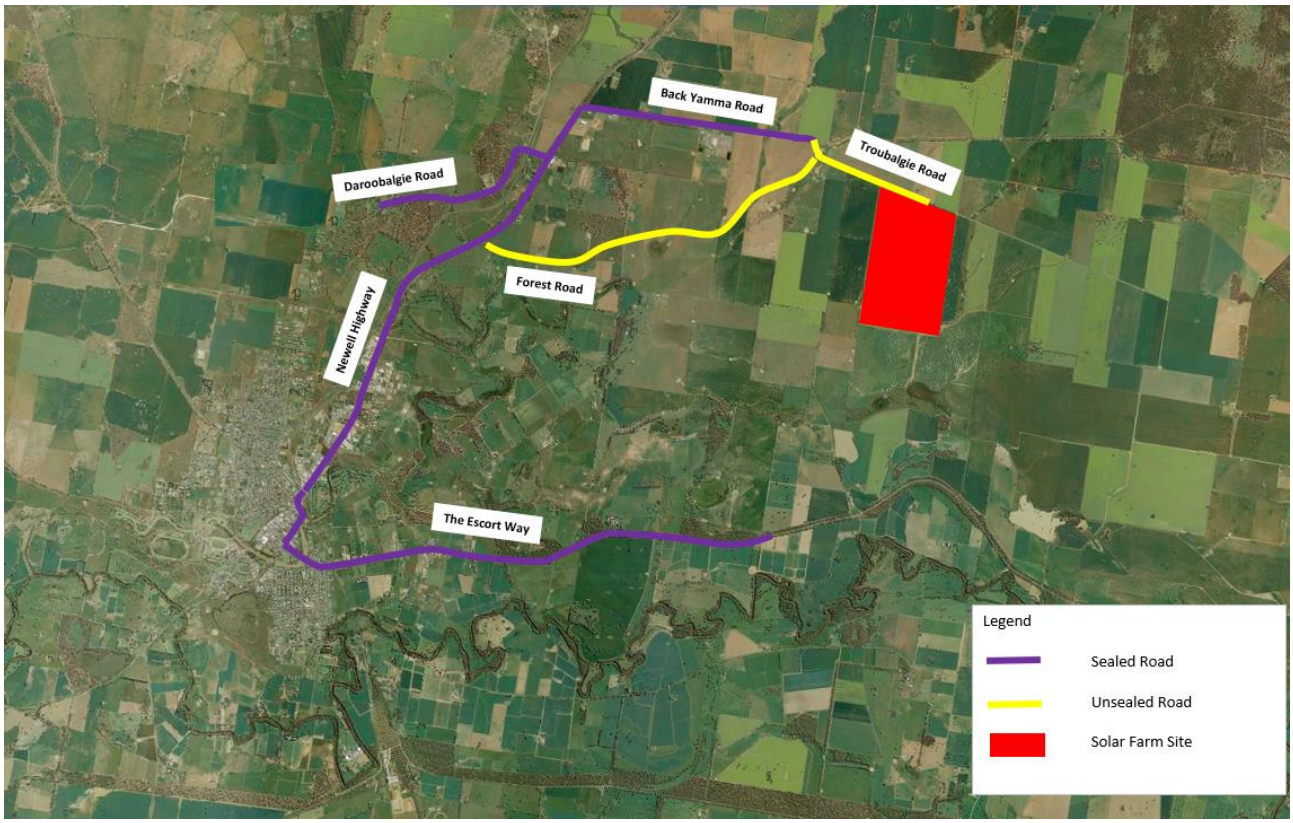


Figure 3-4 Location of Sealed and Unsealed Road

All heavy vehicles including over-dimensional vehicles would travel to the project site via Troubalgie Road. The unsealed road surfaces will likely deteriorate and potholes are likely to form under increased traffic loads, particularly during wet weather conditions when water ponds, or floods across the road. Dust would be generated on the road affecting visibility and resulting in the loss of pavement material. The impact of construction traffic on Troubalgie Road would be addressed through road upgrades and sealing prior to use by construction vehicles in consultation and agreement with the Council.

The only heavy vehicle traffic that will be permitted to access Forest Road will be the small number of vehicles required for the construction of the ETL. These vehicles will access Forest Road via Back Yamma Road and Troubalgie Road. No construction vehicles will access via the Newell Highway/ Forest Road intersection, which will be restricted for use through measures contained in the Construction Traffic Management Plan. Only minor impacts are therefore anticipated on the pavement condition of Forest Road.

3.7 Average Travel Speed

Over-dimensional vehicles, as well as heavy vehicles, are likely to travel at lower speeds than other vehicular traffic. The construction route via The Escort Way has one lane in each direction and likely to operate at lower speeds during the construction period. It is however noted that the Newell Highway from Forbes to Back Yamma Road has multiple lanes for travel in one direction and the impacts on average travel speed on this section of the route is anticipated to be minimal.

The Back Yamma Road from Newell Highway to Troubalgie Road is generally 6 to 8-metres wide. This may result in reduction of average travel speed and increase in travel time for other traffic accessing the Forbes Central West

Livestock Exchange, although this could be managed by implementation of a Traffic Management Plan through provision of passing opportunities, if required. It should also be noted that very little traffic currently uses these roads. The impacts of construction related traffic on average travel speed on Back Yamma Road and Troubalgie Road is therefore considered to be minor.

3.8 Property Access

There is one residential property access on the proposed construction route on Back Yamma Road. Existing property access will be maintained during the whole construction period and no impacts are anticipated due to construction vehicle movements, including over-dimensional vehicles during the construction period. Notwithstanding the above, there are potential temporary safety implications due to the movement of heavy construction vehicles, which would need to be further considered and addressed in the Construction Traffic Management Plan.

3.9 Pedestrian and Cyclists

Current onsite observation suggests that local roads proposed to be used by construction traffic currently experience little pedestrian and cyclist movements. As such, it is expected that the project would have minimal impact on pedestrians and cyclists along Back Yamma Road, Troubalgie Road and Forest Road.

The proposed construction route passes through the township of Forbes from Bridge Road to Union Street. Additional construction traffic is anticipated to have some impacts on pedestrian and cyclist movements along this section of Newell Highway. Site observation suggests that heavy trucks are frequently using this section of Newell Highway and that there are minimal active transport (pedestrians and cyclists) movements along this road. As such, the impacts on pedestrian and cyclist due to the additional construction related vehicles is anticipated to be minimal.

3.10 School Bus Route

There are a number of schools located on The Escort Way with designated school zones (being sections of roads which are signed to operate at 40 km/hr from 8:00-9:30 am and 2:30-4:00 pm weekdays).

Forbes Public High School and Forbes Red Bend Catholic College are located on Lachlan Street and College Road respectively in Forbes. Western Road Liners is the private school bus operator and collects students from Parkes, Forbes and Back Yamma. As shown in Figure 2-17, existing school buses currently run through Back Yamma Road, Daroobalgie Road, Newell Highway and other local roads within Forbes.

It is anticipated that construction vehicle movements during school bus operating hours would impact school bus movements along the above-mentioned roads. As such, the project would have some impact on existing school bus routes, however this impact can be mitigated as discussed in Sections 7 and 8.

3.11 Public Transport

As shown in Figure 2-16, the existing Western NSW coach service runs through The Escort Way and Newell Highway. However, this coach service operates three time a day. As such, it is anticipated that the impact of additional construction related traffic movement on the existing public bus services would be very low/minimal.

There are no existing public transport services available on the construction route from Newell Highway/Back Yamma Road to the project site. As such, there would be no impacts on public transport services on this section of the route due to the additional construction vehicle movements.

3.12 Culverts

There are a number of culverts located on Back Yamma Road and Troubalgie Road. The over-dimensional vehicles may exceed the parameters that the roads were originally designed to accommodate. As such, these vehicles represent greater risk in terms of both road safety and damage to road infrastructure compared to normal heavy vehicle movements, particularly on local roads leading to the project site. Use of roads by OSOM vehicles will need to be managed in consultation with roads authorities to ensure impacts are satisfactorily mitigated. This will include obtaining permits for use of relevant roads by OSOM vehicles, as required by roads authorities.

3.13 Traffic Safety

As construction traffic is expected to be relatively minor in comparison to local traffic within the town centre of Forbes, the impact on the overall roads within the town centre of Forbes is expected to be minimal.

Particular consideration must be given to existing and/ or proposed land uses that may be impacted along the local roads, namely Back Yamma Road, Forest Road and Troubalgie Road used to access the site off Newell Highway. There are no major developments on Forest Road and Troubalgie Road.

The Forbes Central West Livestock Exchange on Back Yamma Road may be impacted by construction vehicle use. The Forbes Central West Livestock Exchange operates between Sunday afternoon and Wednesday lunchtime. As such, a delivery management plan, as well as a Construction Traffic Management Plan should to be prepared prior to commencement of construction works to minimise/ avoid coinciding with the Livestock Exchange truck movements.

Appendix C contains a swept path analysis of the existing road geometry at the Back Yamma Road/ Troubalgie Road priority intersection to assess how B-Double (26m) trucks might be able to pass simultaneously turning to/ from Back Yamma Road and Troubalgie Road. This assessment demonstrates how a B-double can make the turn in both directions (right turn from Back Yamma Road and left turn from Troubalgie Road). However, there remains insufficient room for the turns to happen simultaneously.

Intersection upgrade measures would be required to accommodate such turning movements safely at this intersection. An alternative approach for potential consideration would be for B-Double movements at this intersection to be controlled by a traffic controller as part of other measures included in the Construction Traffic Management Plan, which would be subject to discussion and agreement with Forbes Shire Council.

3.14 Car Parking and Laydown Areas

It is anticipated that all car parking and a laydown area would be provided within the proposed site. As such, no impact is anticipated on car parking in the area.

3.15 Electricity Transmission Line (ETL) Route and Switchyard Site

As presented in Figure 1-3, the proposed ETL access points would be along Troubalgie Road, Forest Road, Newell Highway and Daroobalgie Road. Figure 3-5 shows proposed heavy vehicle routes for construction of the ETL and switchyard. The heavy vehicles would access the proposed construction route via Back Yamma Road and Troubalgie Road, then turn right to access Forest Road for construction of the ETL. Heavy vehicles would also turn left from Newell Highway into Daroobalgie Road to access the switchyard site and ETL.

Newell Highway and Daroobalgie Road are sealed roads and are both heavy vehicle routes. The average number of heavy vehicle movements during construction of the ETL and switchyard is as shown in Table 3-1 and Table 3-2 and would be approximately 12 vehicles per week. This small number of heavy vehicle movements is anticipated to have minimal impacts on the operation of Troubalgie Road, Forest Road, Newell Highway and Daroobalgie Road.

The Newell Highway/ Daroobalgie Road intersection has Channelised Right Turn and auxiliary left turn facilities and is currently used by heavy vehicles travelling to/ from the Forbes Recycling and Waste Depot. Daroobalgie Road is also used as a bypass for heavy vehicles travelling between The Bogan Way and Newell Highway north of Forbes and is therefore of an appropriate standard for use by the small number of heavy vehicles associated with construction activities relating to the ETL and switchyard.

To ensure safe access of construction vehicles, it is recommended that a safety review of proposed access points be undertaken at the detailed design stage. It is also recommended that this route and proposed access points be further considered in the development of a Construction Traffic Management Plan to be prepared and implemented in agreement with the Council and TfNSW.

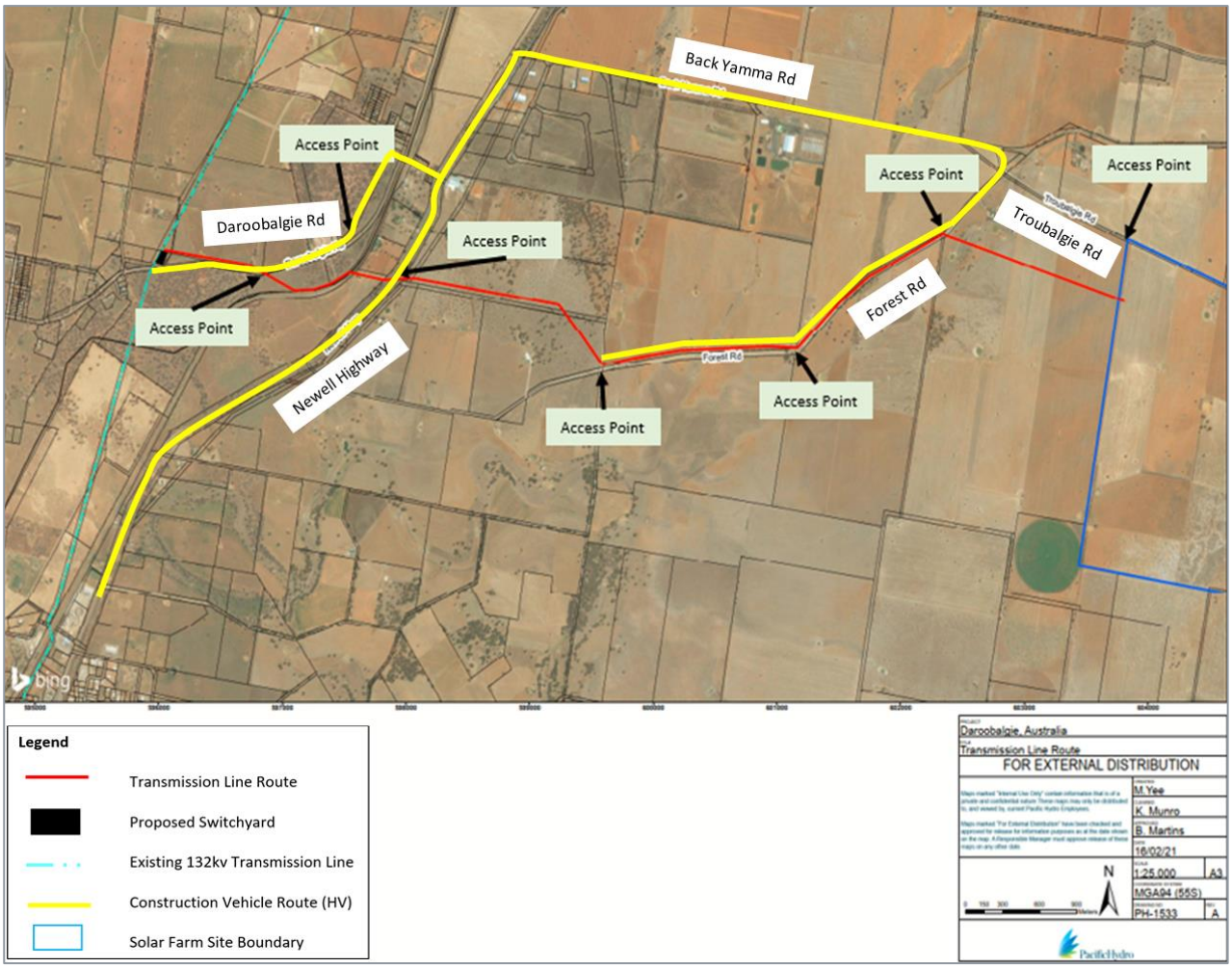


Figure 3-5 Proposed Construction Related Heavy Vehicle Routes for Construction of ETL and Switchyard

4 Operational Impacts

Following commissioning, the solar farm is expected to generate a minimal number of traffic movements per day. This traffic will be generated for operation and maintenance of the facility. Additional vehicle movement numbers associated with operation and maintenance activities are expected to be very low and will have negligible impacts on the existing road network.

5 Decommissioning Stage Impacts

Solar farm decommissioning is expected to take place after approximately 30 years of operation, generating traffic at a level less than or similar to the construction phase. Given the long duration between the present day and decommissioning, it is difficult to determine an accurate baseline for this assessment.

For purposes of a meaningful assessment, it is therefore proposed that the study relating to the decommissioning phase impacts is undertaken closer to the time of decommissioning. It is also recommended to prepare a specific Traffic Management Plan to address the impacts decommissioning stage traffic movements on the performance of surrounding road network.

6 Cumulative Impact Assessment

The traffic count surveys were undertaken on Tuesday 2nd of March 2021, one of the sales days of the nearby Livestock Exchange. As such, any traffic movements associated with the Livestock Exchange during the peak hours have already been captured in the traffic count survey data. This traffic is associated with an existing land use and is already accounted for in background traffic.

Whilst there are other solar farms in the area, vehicles associated with these developments are not anticipated to coincide with project related construction traffic. As such, there are no traffic related cumulative impacts expected to be associated with the project.

7 Summary of Impacts

A summary of the impacts associated with the construction and operation of the project is presented below.

7.1 Construction

Key findings relating to the impacts of construction traffic are summarised in Table 7-1 below.

Table 7-1 Impact assessment summary for the project

Impacts	Level	Assessment	Mitigation measures
Road operation and intersection capacity (The Escort Way, Newell Hwy, Back Yamma Road)	**Minor**	Project related traffic movements on the five assessed intersections are low and anticipated to have minor overall impacts on intersection performance.	No mitigation required
Intersection geometry (Back Yamma Road/ Troubalgie Road)	**Major**	The geometry of Back Yamma Road/ Troubalgie Road intersection is constrained and will not be able to accommodate two truck turning movements simultaneously (i.e. right in movement from Back Yamma Road to Troubalgie Road and left out movement from Troubalgie Road to Back Yamma Road).	Upgrade Back Yamma Road/ Troubalgie Road intersection to accommodate vehicle movements during the construction period, including OSOM vehicles in consultation with roads authorities. See road upgrade sketches included in Appendix D.
Pavement condition	**Major**	Use of the unsealed section of Troubalgie Road is anticipated to have major impacts on pavement condition due to heavy vehicle movements, including over-dimensional vehicles. Use of Forest Road (unsealed) by heavy vehicle traffic is anticipated to have major impacts on pavement condition	Upgrade Troubalgie Road between Back Yamma Road and the site access point to sealed road. See road upgrade sketches included in Appendix D. Widen Troubalgie Road between Back Yamma Road and the site access point, including Back Yamma Road/Troubalgie Road intersection to accommodate two-way heavy vehicle movements, including OSOM vehicles in consultation with roads authorities. See road upgrade sketches included in Appendix D. Prohibit heavy vehicle use of Forest Road (unless required for ETL construction) Restrict light vehicle use of Forest Road through signage, Driver Code of Conduct or other measures Consider establishing a transport pool for construction staff with common schedules, or use of a shuttle bus to reduce staff vehicle movements on Back Yamma Road during peak hours and to prevent use of Forest Road
Average travel speed	**Moderate**	Average travel speed on The Escort Way is anticipated to decrease due to slow moving heavy vehicles, including over-dimensional vehicle movements. This is considered to be a moderate impact on The Escort Way average travel speed. Potential reduction in average travel speed and increase in travel time for other traffic accessing the Forbes Central West Livestock Exchange	Minimise/ avoid construction vehicle movements during the hours of 8am- 9am and 4pm- 5pm Monday- Friday Avoid deliveries and minimise construction related traffic during peak operating times of the Forbes Central West Livestock Exchange

Impacts	Level	Assessment	Mitigation measures
Property access	**Minor**	Existing property access will be maintained during the whole construction phase and no impacts on property access is anticipated due to the movements of construction vehicles, including over-dimensional vehicles during the construction period. Notwithstanding the above, there are potential temporary safety implications for existing properties/businesses located on Back Yamma Road due to the movement of heavy construction vehicles on this road, which would need to be further considered and addressed in the Construction Traffic Management Plan	Temporary safety measures for existing properties/businesses located on Back Yamma Road due to the movement of heavy construction vehicles on this road be outlined in a Construction Traffic Management Plan
Pedestrian and cyclists	**Minor**	Due to the project being constructed in a rural area with minimal pedestrians and cyclists, the project would have minor impacts on pedestrians and cyclists	No additional measures required
School bus	**Moderate**	Construction traffic is anticipated to have moderate impacts on existing school bus routes along Newell Highway, Back Yamma Road and The Escort Way	Schedule construction material delivery and associated heavy vehicle movements including over-dimensional vehicle movements outside school bus operating hours
Public transport	**Minor**	It is anticipated that there will be minimal impact on the existing Western NSW coach service along The Escort Way and Newell Highway during construction of the solar farm. There are no existing public transport services available on the construction route from Back Yamma Road/ Newell Highway intersection to the project site. As such, there would be no impacts on the public transport services on this section of the route due to additional construction vehicle movements.	No additional measures required
Culverts	**Major**	Over-dimensional vehicles exceed the parameters that local roads, namely Back Yamma Road and Troubalgie Road were originally designed to accommodate, which could cause significant damage to existing culverts, particularly on local roads leading to the solar farm site.	Assessment of existing conditions and loading capacity of culverts and implementation of improvement measures as required to accommodate heavy construction vehicle movements, including over-dimensional vehicles
Traffic Safety	**Minor**	As construction related traffic is expected to be relatively minor in comparison to local traffic, the impact on the overall road safety within the town centre of Forbes is expected to be minimal.	Minimise/avoid construction vehicle movements during the peak hours of 8am-9am and 4pm- 5pm Monday- Friday Upgrade Back Yamma Road/ Troubalgie Road intersection to accommodate two-way heavy vehicle movements, including OSOM vehicles in consultation with road authorities

Impacts	Level	Assessment	Mitigation measures
		The geometry of Back Yamma Road/ Troubalgie Road intersection is not sufficient to safely accommodate two turning truck movements simultaneously.	
Car Parking and Laydown Areas	**Minor**	All car parking and laydown areas will be provided within the proposed site. No impact is envisaged for car parking in the area.	No additional measures required

7.2 Operation

Additional vehicle movement numbers associated with the operation of the proposed solar farm would be very low and would have negligible impacts on the performance of existing road network.

7.3 Decommissioning

Solar farm decommissioning typically takes place after approximately 25 to 30 years of operation, generating traffic at a level less than or similar to the construction phase. Given the long duration between the present day and decommissioning, it is difficult to determine an accurate baseline for this assessment. It is, however recommended to prepare a specific Traffic Management Plan to address the impacts decommissioning stage traffic movements on the surrounding road network.

8 Mitigation Measures

A number of measures have been identified to minimise the impacts of additional construction traffic movements on the existing road network, as follows:

- Engagement of a licensed haulage contractor with experience in operating over-dimensional vehicles and transporting similar loads to be responsible for obtaining all required approvals and permits from relevant roads authorities and Councils and for complying with conditions specified in the approvals.
- Preparation and implementation of a Construction Traffic Management Plan in conjunction with the haulage contractor and roads authorities. The Construction Traffic Management Plan will include, but will not be limited to the following:
  - Scheduling of deliveries. Minimise deliveries and heavy vehicle traffic to the solar farm site during peak operating hours of the Forbes Central West Livestock Exchange i.e. Sunday 3-7pm; Monday 5am – 9 pm and Tuesday 3am – 9pm
  - Managing timing of transport to avoid coinciding with the school bus operating hours along The Escort Way, Newell Highway and Back Yamma Road
  - Prohibiting construction vehicle traffic on Forest Road (except for the small number required for ETL construction)
  - Prohibiting use of the Newell Highway/ Forest Road intersection by all construction traffic
  - Providing updated information related to the haulage activities to the local community
  - Implementing temporary modifications to intersections and roadside furniture, including kerbside management, as required to accommodate over-dimensional vehicles
  - Ensuring ETL access points, including traffic control measures, allow for safe access of construction vehicles to the site
  - Managing the haulage process, including the erection of warning signs and/or advisory speed limits prior to isolated curves, crests, culverts and changes of road conditions along Back Yamma Road and Troubalgie Road
  - Placing of advisory speed limits on Back Yamma Road and Troubalgie Road used by construction traffic to enhance safety and manage maintenance costs
  - Producing a Driver Code of Conduct to be made available to all contractors and staff detailing construction vehicle routes, times when construction vehicle movements are restricted, namely 8am-9am and 4pm-5pm Monday- Friday, behavioural requirements, driver fatigue management, speed limits, as well as procedures to monitor and ensure compliance with the Driver Code of Conduct
  - Establishing procedures to monitor traffic impacts during construction and work methods required to be implemented to reduce impacts
  - Establishing a dedicated telephone contact(s) to enable any issues or concerns to be rapidly identified and addressed
  - Reinstating pre-existing conditions after temporary modifications to the roads and pavement along the route
- Consider establishing a transport pool for construction staff with common schedules, or use of a shuttle bus to reduce staff vehicle movements on Back Yamma Road during peak hours and to prevent use of Forest Road.
- Undertake safety review of proposed ETL access points at the detailed design stage to ensure safe access of construction vehicles
- Preparation of pre, mid and post construction road dilapidation reports addressing pavement and drainage structures in consultation with Council for the local roads, namely Back Yamma Road and Troubalgie Road prior to the commencement of construction, during peak construction activities and after construction is complete. Any damage resulting from construction traffic, except that resulting from normal wear and tear, would be repaired at the Proponent's cost. Alternatively, the Proponent may negotiate an alternative for local road damage with the relevant road authorities
- Identification of road improvement requirements, including the upgrade of the Back Yamma Road/ Troubalgie Road intersection to accommodate construction vehicles, including OSOM vehicle movements during the construction period. See road upgrade sketches included in Appendix D.

- Upgrade of Troubalgie Road between Back Yamma Road and the site access point to sealed road, as well as widening of Troubalgie Road to accommodate two-way heavy vehicle movements, including OSOM vehicles during construction of the proposed solar farm. See road upgrade sketches included in Appendix D.
- Preparation of a specific Construction Traffic Management Plan for the decommissioning phase reflecting changes in traffic volumes and work procedures.

9 Conclusion

The introduction of five heavy vehicle movements per hour and 167 light vehicle movements during the AM and PM peaks for the duration of the peak construction period is anticipated to have major impacts on existing pavement conditions and loading capacity of culverts along Back Yamma Road and Troubalgie Road.

Formal discussion has already been undertaken with Forbes Shire Council and it has been agreed to upgrade the Troubalgie Road between Back Yamma Road and the proposed site access point to a sealed road, as well as the widening of Troubalgie Road to accommodate two-way heavy vehicle movements prior to commencing construction of the solar farm. It was also agreed to upgrade the Back Yamma Road/ Troubalgie Road intersection to accommodate appropriate heavy vehicle movements. See road upgrade sketches included in Appendix D.

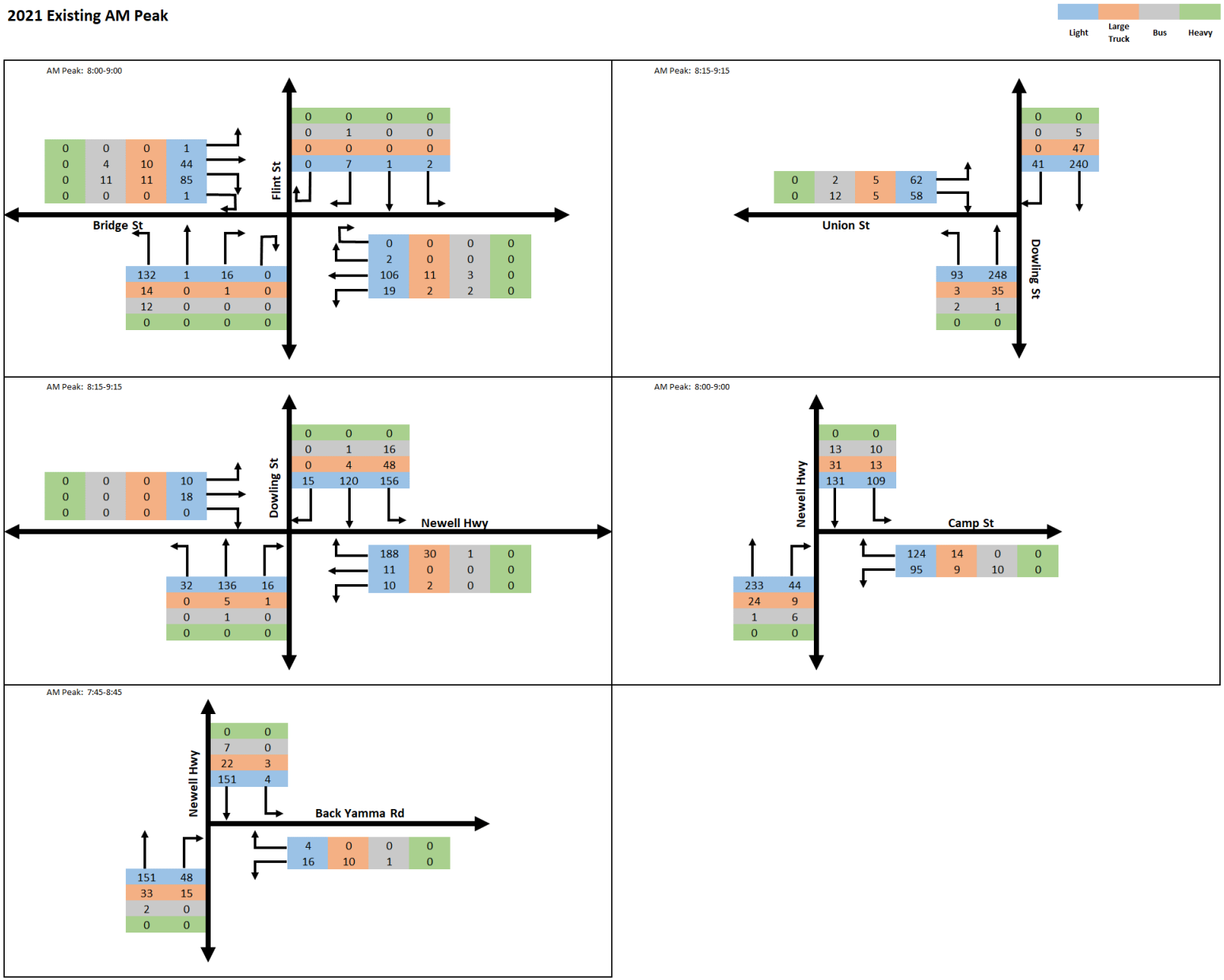
Management strategies required to address traffic impacts relating to the project are outlined in this report. These strategies should be incorporated into a Construction Traffic Management Plan and be implemented in consultation with relevant roads authorities, including Forbes Shire Council. Adoption of strategies for minimising traffic impacts will reduce community disruption, maintain roads to an appropriate standard throughout the construction program and maintain safety requirements.

A pre-and post-dilapidation survey for the construction route, namely Back Yamma Road and Troubalgie Road and for existing culverts should be conducted and loading capacity of these roads and infrastructures determined prior to commencement of construction. Road and infrastructure improvement works should also be identified based on dilapidation survey report findings.

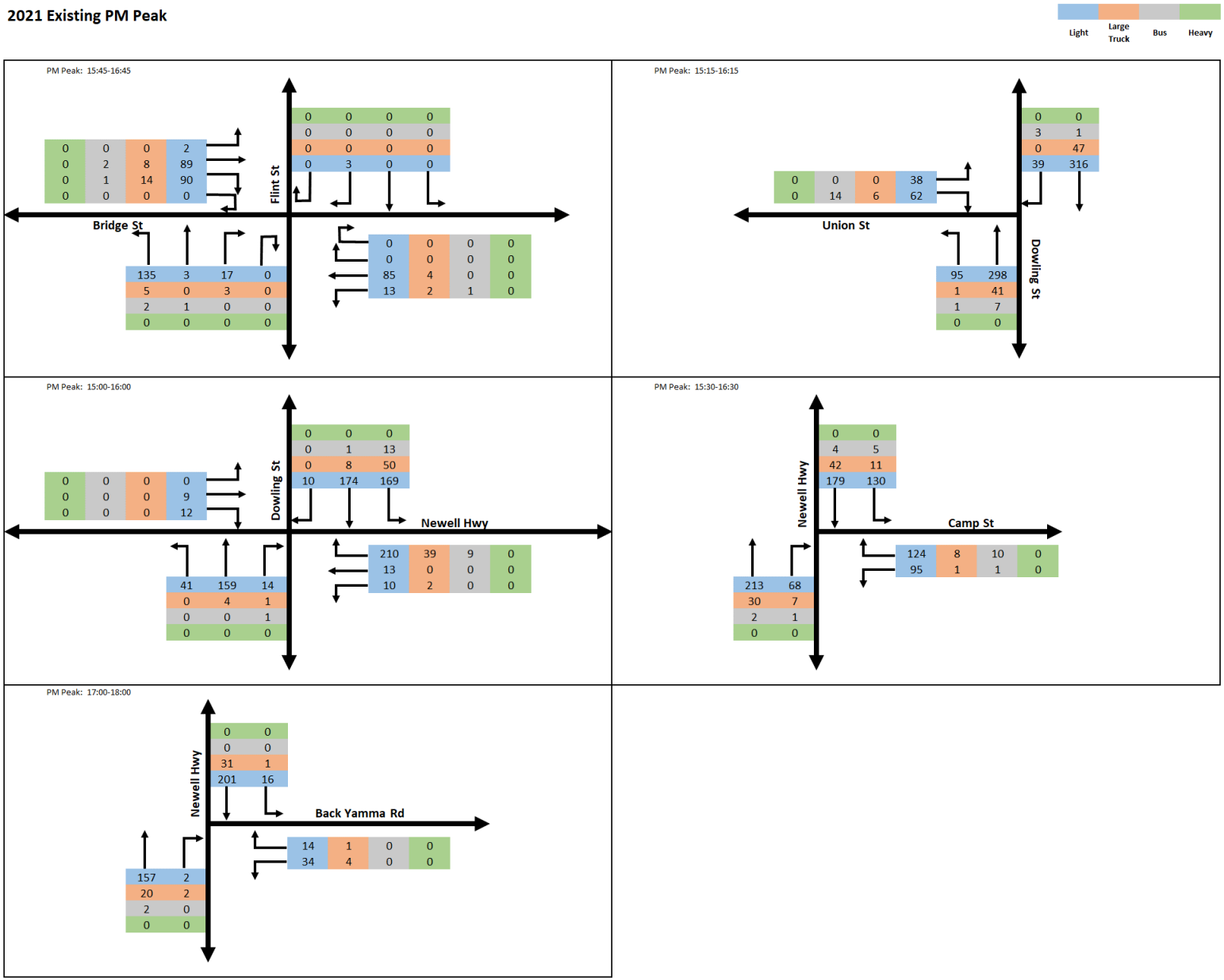
The impacts during the operational phase are considered to be minimal.

Appendix A Traffic Volumes

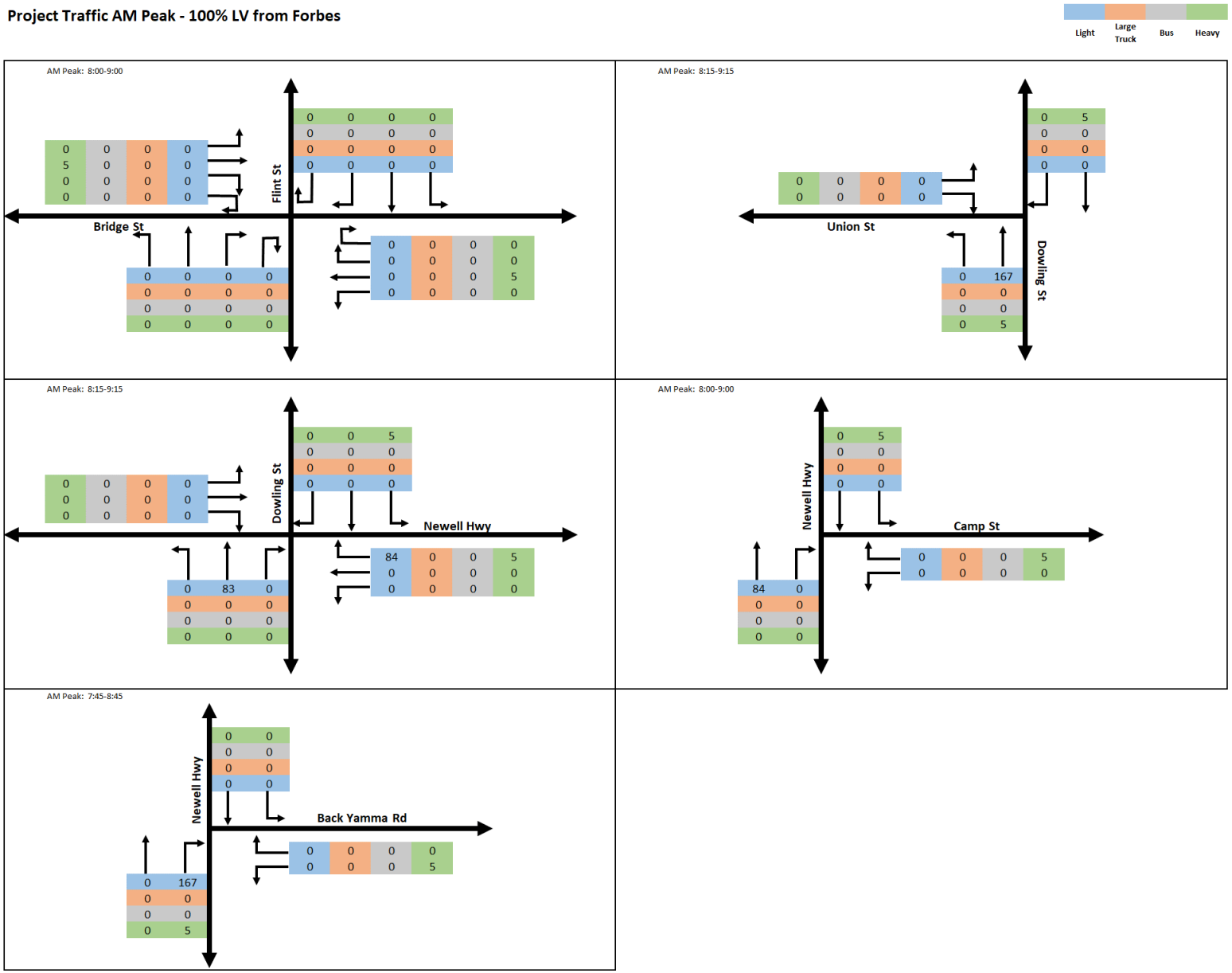
2021 Existing AM Peak



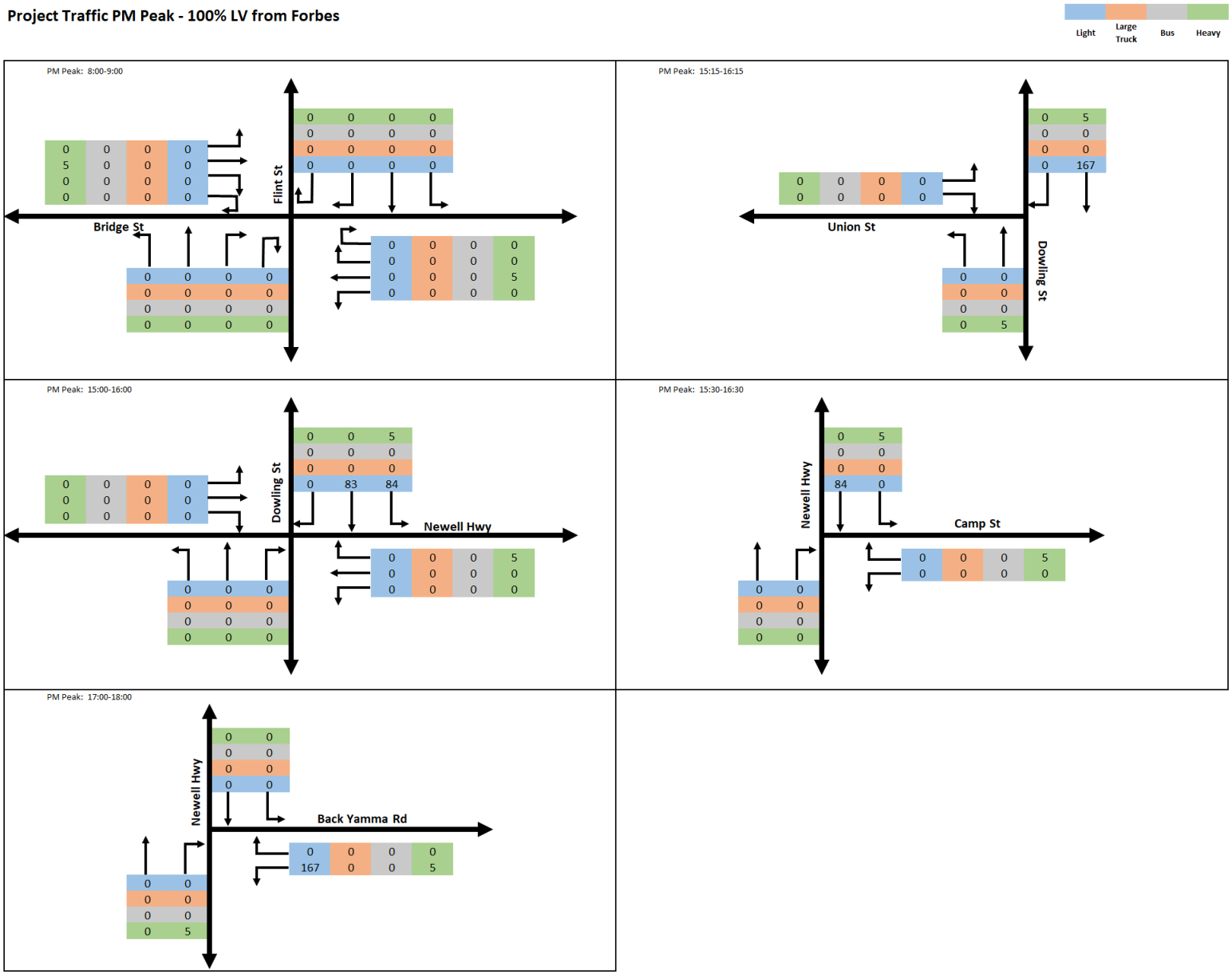
2021 Existing PM Peak



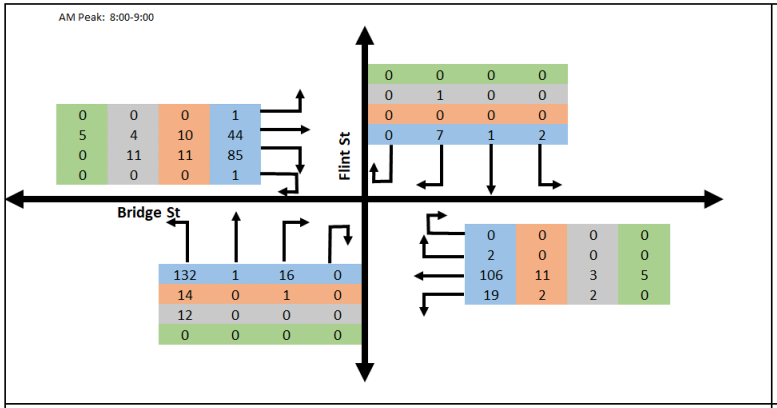
Project Traffic AM Peak - 100% LV from Forbes

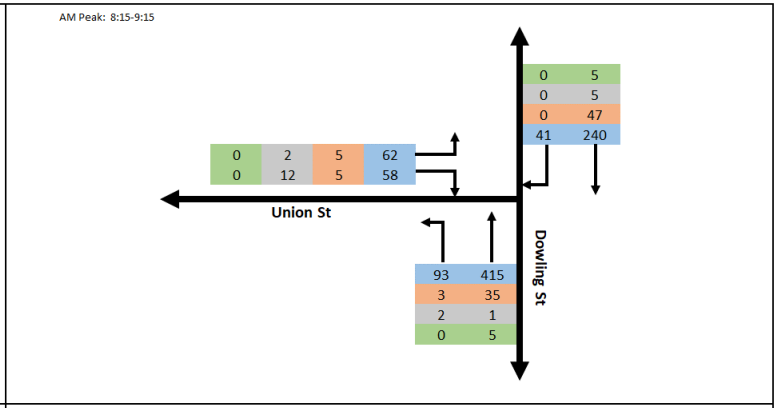


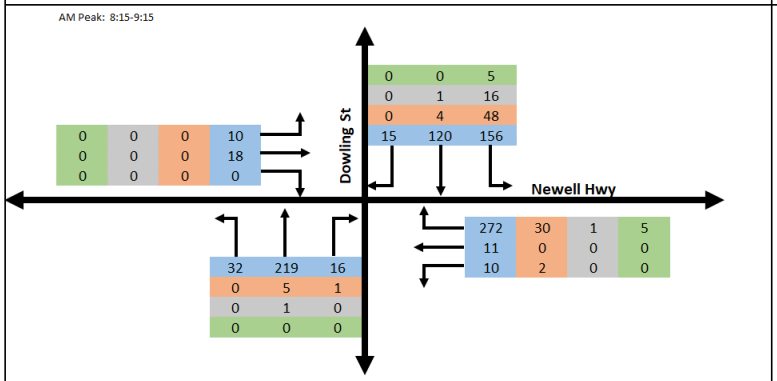
Project Traffic PM Peak - 100% LV from Forbes

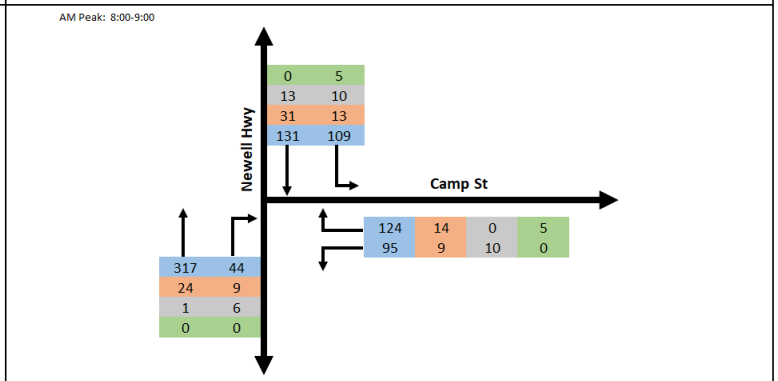


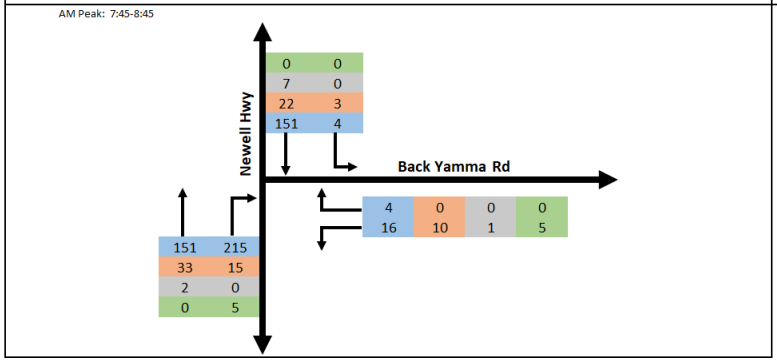
2021 Existing + Project Traffic AM Peak - 100% LV from Forbes



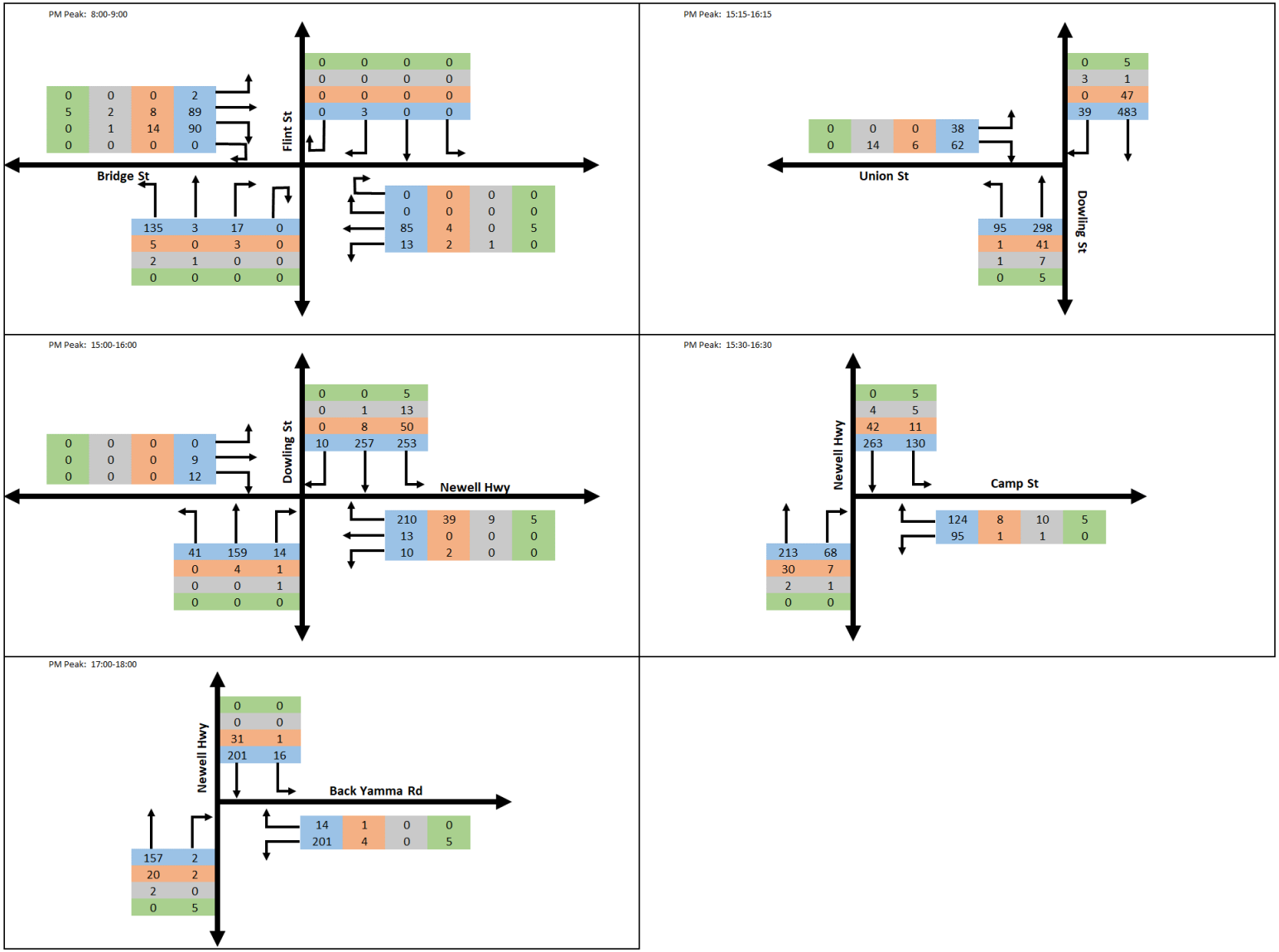




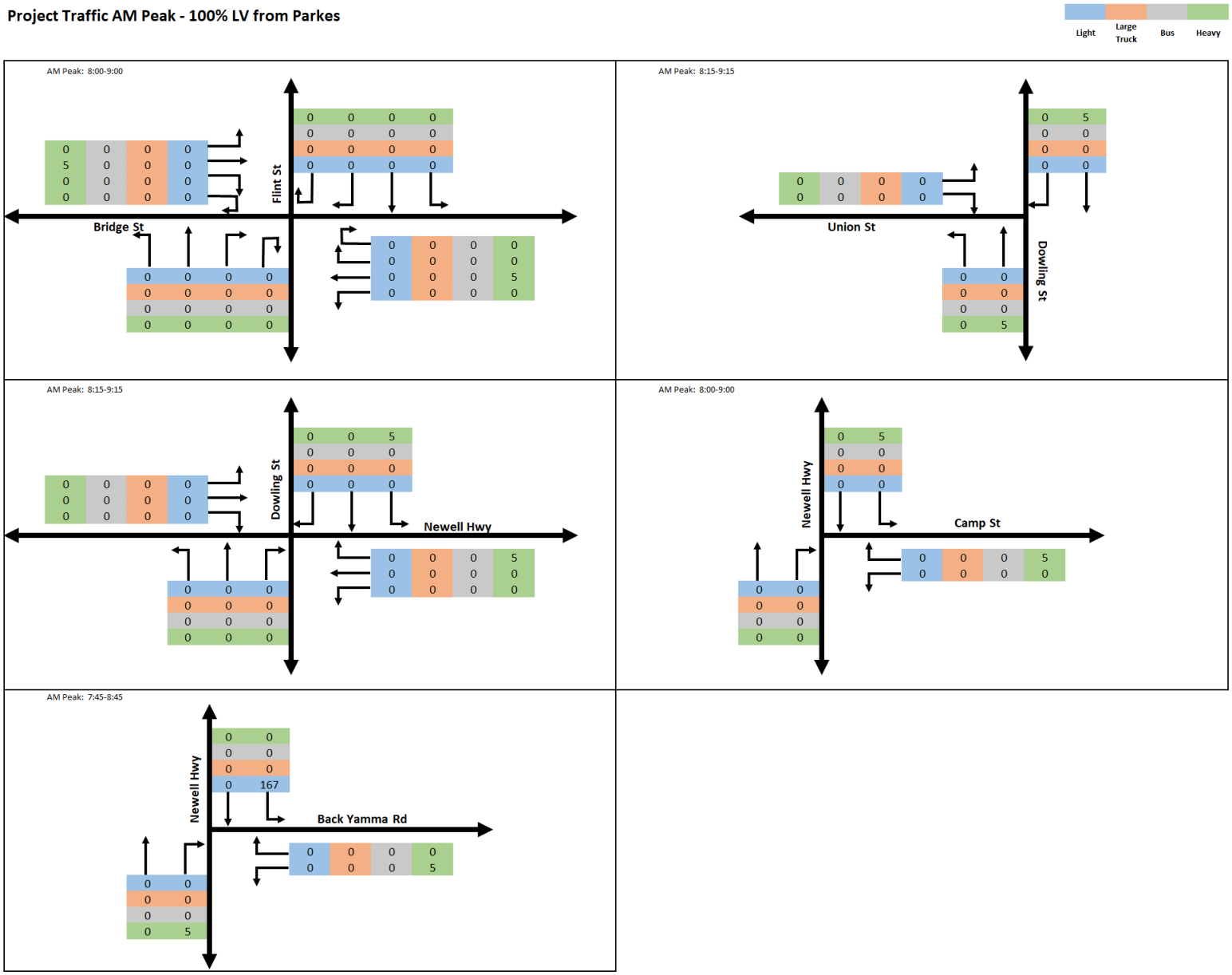




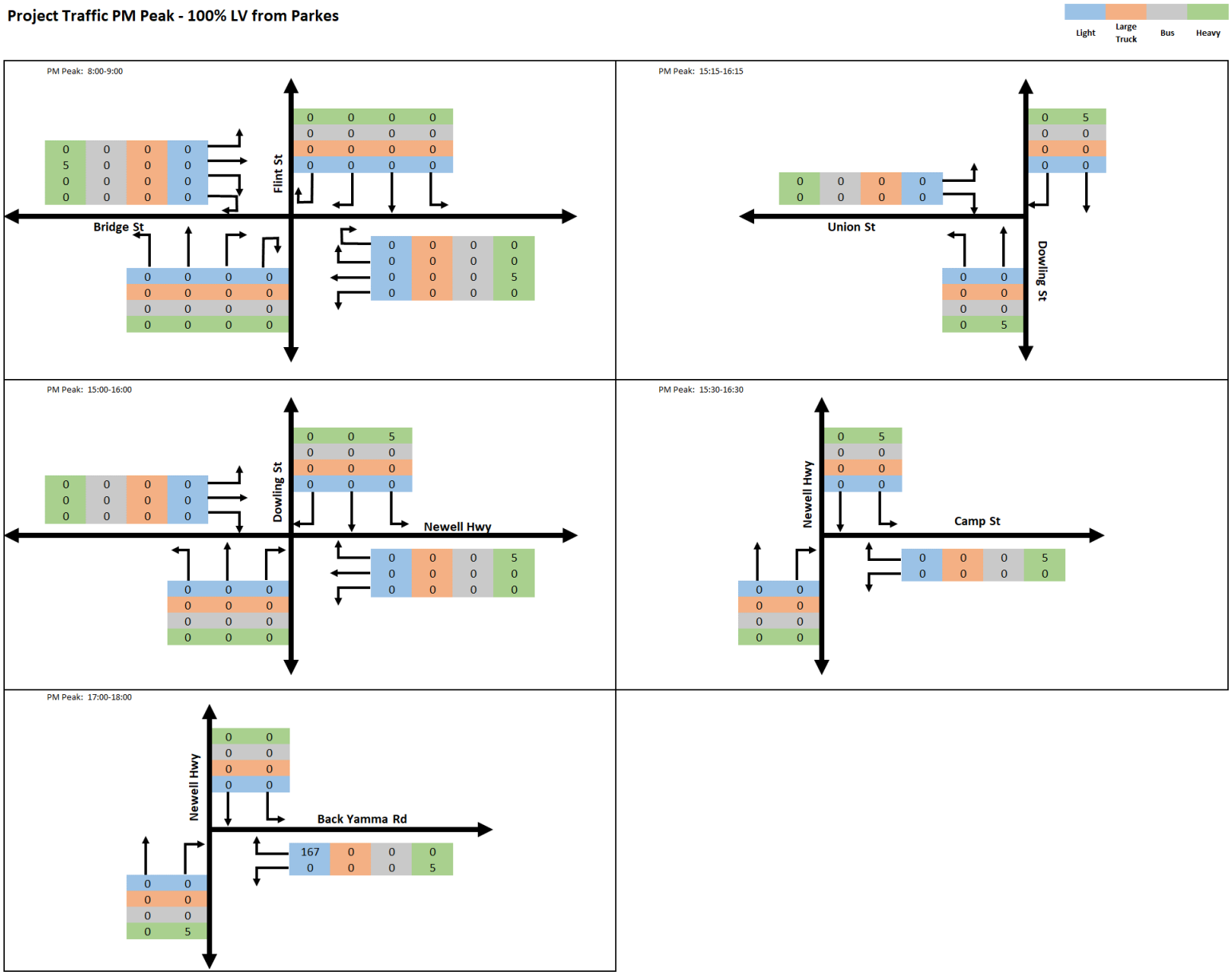
2021 Existing + Project Traffic PM Peak - 100% LV from Forbes



Project Traffic AM Peak - 100% LV from Parkes

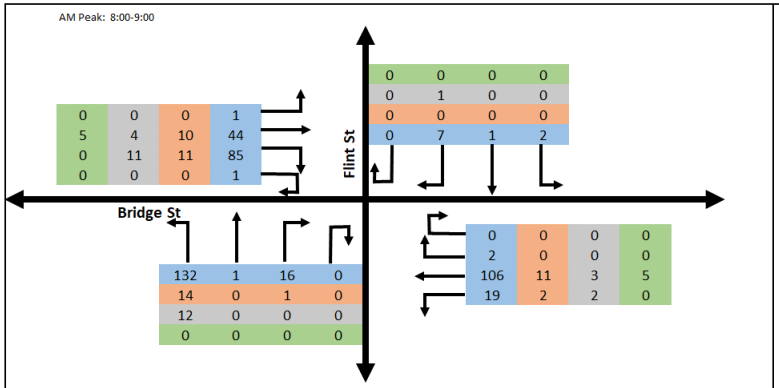


Project Traffic PM Peak - 100% LV from Parkes

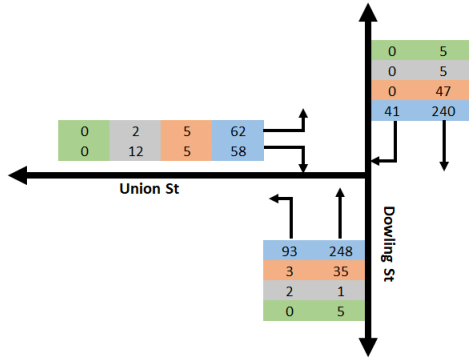


2021 Existing + Project Traffic AM Peak - 100% LV from Parkes

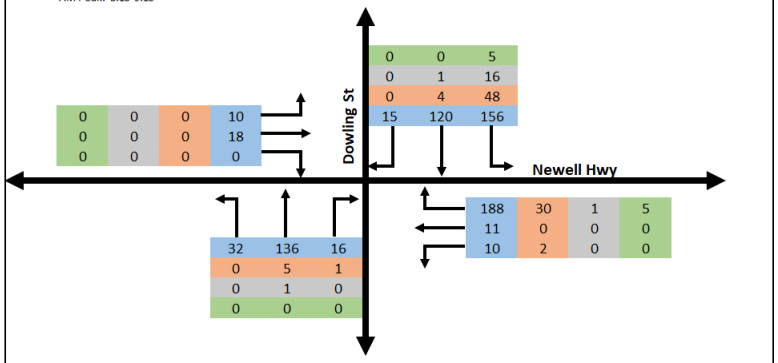
AM Peak: 8:00-9:00



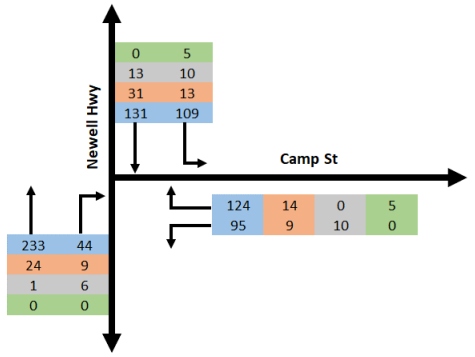
AM Peak: 8:15-9:15



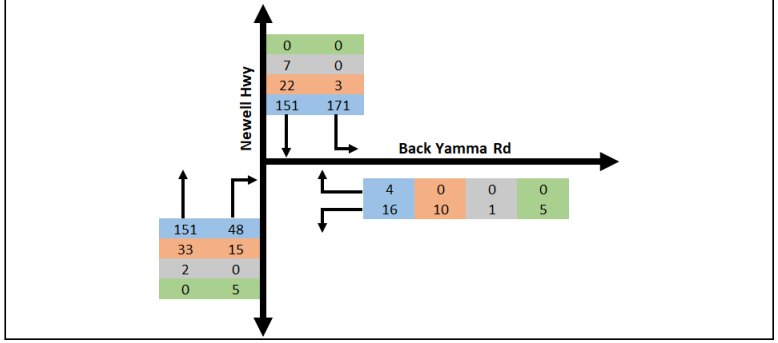
AM Peak: 8:15-9:15



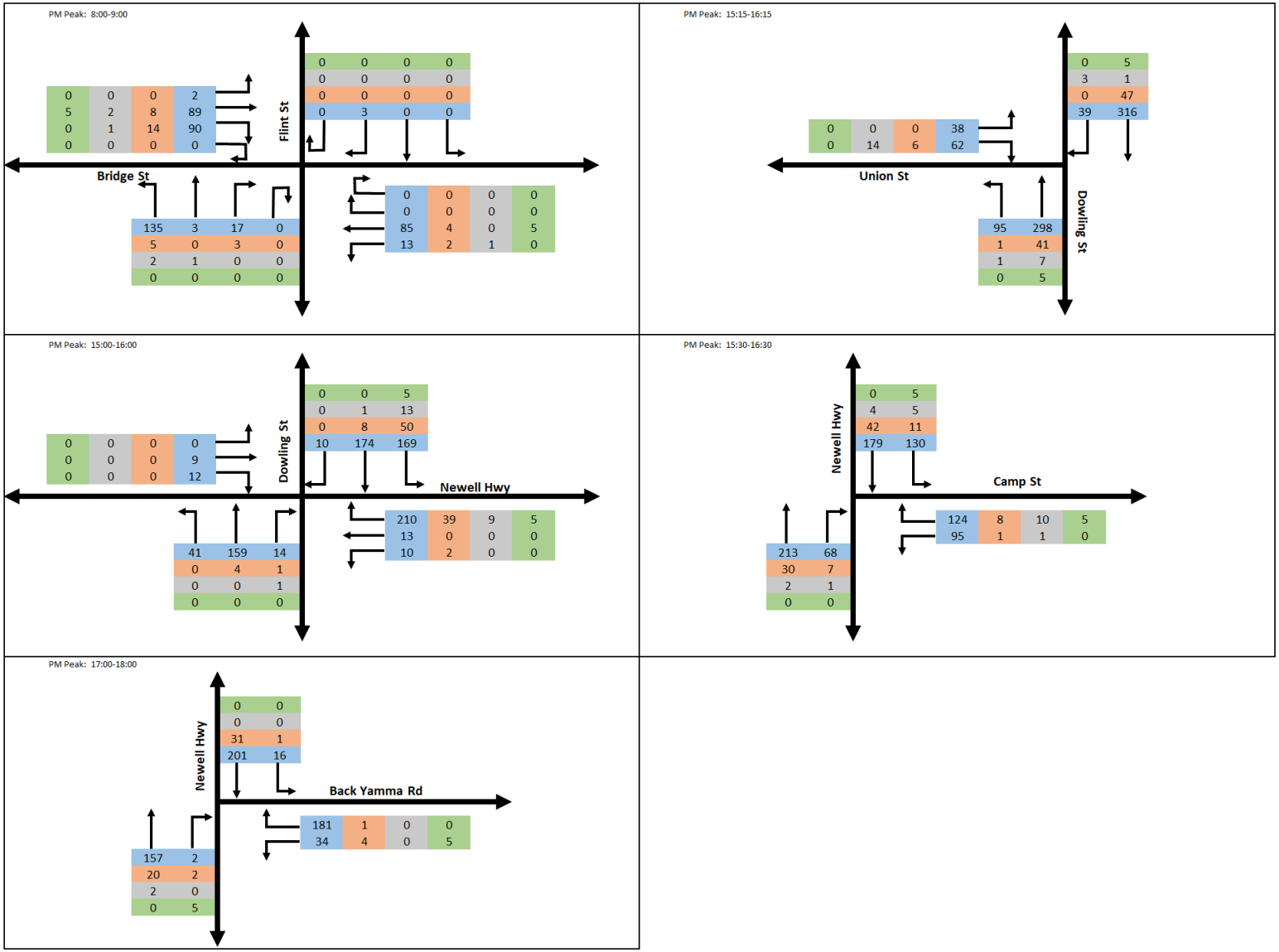
AM Peak: 8:00-9:00



AM Peak: 7:45-8:45



2021 Existing + Project Traffic PM Peak - 100% LV from Parkes



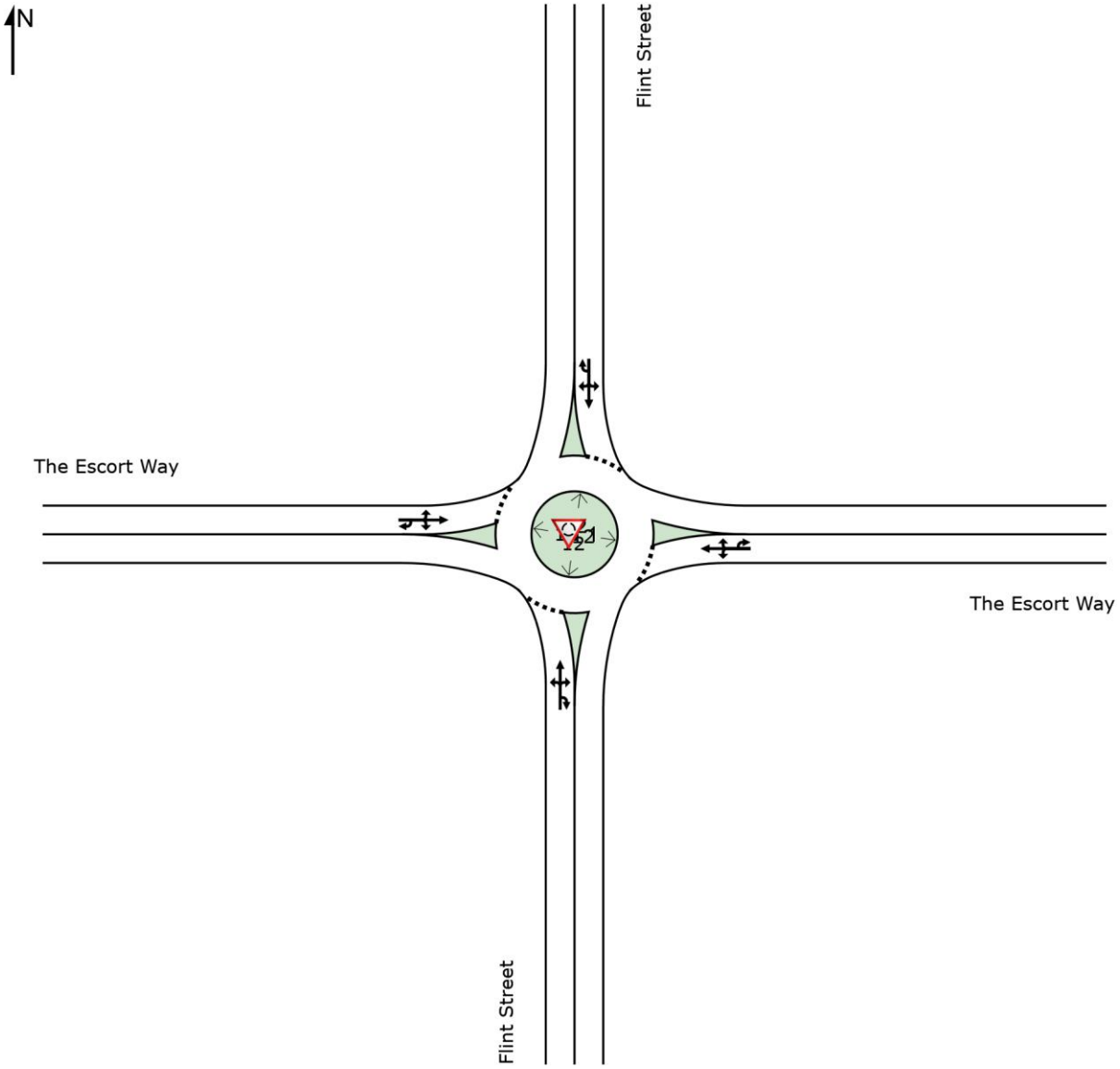
Appendix B SIDRA Model Outputs

SITE LAYOUT

Site: 1 [The Escort Way & Flint Street]

The Escort Way & Flint Street
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 1 [The Escort Way & Flint Street- AM Peak (Site Folder: 2021 Existing)]

The Escort Way & Flint Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Flint Street														
1	L2	158	26	166	16.5	0.209	4.8	LOS A	1.2	11.7	0.42	0.55	0.42	34.4
2	T1	1	0	1	0.0	0.209	4.2	LOS A	1.2	11.7	0.42	0.55	0.42	39.2
3	R2	17	1	18	5.9	0.209	8.3	LOS A	1.2	11.7	0.42	0.55	0.42	37.4
3u	U	1	0	1	0.0	0.209	9.6	LOS A	1.2	11.7	0.42	0.55	0.42	29.7
Approach		177	27	186	15.3	0.209	5.1	LOS A	1.2	11.7	0.42	0.55	0.42	34.6
East: The Escort Way														
4	L2	23	4	24	17.4	0.169	4.9	LOS A	0.9	8.7	0.38	0.49	0.38	33.8
5	T1	120	14	126	11.7	0.169	4.8	LOS A	0.9	8.7	0.38	0.49	0.38	39.6
6	R2	2	0	2	0.0	0.169	7.9	LOS A	0.9	8.7	0.38	0.49	0.38	40.6
6u	U	1	0	1	0.0	0.169	9.6	LOS A	0.9	8.7	0.38	0.49	0.38	36.5
Approach		146	18	154	12.3	0.169	4.9	LOS A	0.9	8.7	0.38	0.49	0.38	38.8
North: Flint Street														
7	L2	2	0	2	0.0	0.012	4.5	LOS A	0.1	0.4	0.40	0.57	0.40	35.5
8	T1	1	0	1	0.0	0.012	4.6	LOS A	0.1	0.4	0.40	0.57	0.40	32.8
9	R2	8	1	8	12.5	0.012	8.4	LOS A	0.1	0.4	0.40	0.57	0.40	37.9
9u	U	1	0	1	0.0	0.012	9.9	LOS A	0.1	0.4	0.40	0.57	0.40	39.5
Approach		12	1	13	8.3	0.012	7.6	LOS A	0.1	0.4	0.40	0.57	0.40	37.2
West: The Escort Way														
10	L2	1	0	1	0.0	0.165	3.5	LOS A	0.9	10.6	0.15	0.52	0.15	37.9
11	T1	58	14	61	24.1	0.165	3.9	LOS A	0.9	10.6	0.15	0.52	0.15	37.6
12	R2	107	22	113	20.6	0.165	7.5	LOS A	0.9	10.6	0.15	0.52	0.15	33.1
12u	U	1	0	1	0.0	0.165	8.9	LOS A	0.9	10.6	0.15	0.52	0.15	41.7
Approach		167	36	176	21.6	0.165	6.2	LOS A	0.9	10.6	0.15	0.52	0.15	34.8
All Vehicles		502	82	528	16.3	0.209	5.5	LOS A	1.2	11.7	0.32	0.52	0.32	36.0

MOVEMENT SUMMARY

Site: 1 [The Escort Way & Flint Street- PM Peak (Site Folder: 2021 Existing)]

The Escort Way & Flint Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Flint Street														
1	L2	142	7	149	4.9	0.161	3.9	LOS A	0.9	7.6	0.31	0.49	0.31	36.5
2	T1	4	1	4	25.0	0.161	4.0	LOS A	0.9	7.6	0.31	0.49	0.31	36.5
3	R2	20	3	21	15.0	0.161	8.1	LOS A	0.9	7.6	0.31	0.49	0.31	37.0
3u	U	1	0	1	0.0	0.161	9.3	LOS A	0.9	7.6	0.31	0.49	0.31	30.4
Approach		167	11	176	6.6	0.161	4.5	LOS A	0.9	7.6	0.31	0.49	0.31	36.5
East: The Escort Way														
4	L2	16	3	17	18.8	0.112	5.0	LOS A	0.6	5.0	0.35	0.46	0.35	34.1
5	T1	89	4	94	4.5	0.112	4.4	LOS A	0.6	5.0	0.35	0.46	0.35	40.8
6	R2	1	0	1	0.0	0.112	7.8	LOS A	0.6	5.0	0.35	0.46	0.35	40.9
6u	U	1	0	1	0.0	0.112	9.5	LOS A	0.6	5.0	0.35	0.46	0.35	36.8
Approach		107	7	113	6.5	0.112	4.6	LOS A	0.6	5.0	0.35	0.46	0.35	39.8
North: Flint Street														
7	L2	1	0	1	0.0	0.006	4.7	LOS A	0.0	0.2	0.43	0.55	0.43	35.5
8	T1	1	0	1	0.0	0.006	4.8	LOS A	0.0	0.2	0.43	0.55	0.43	32.9
9	R2	3	0	3	0.0	0.006	8.4	LOS A	0.0	0.2	0.43	0.55	0.43	38.0
9u	U	1	0	1	0.0	0.006	10.1	LOS A	0.0	0.2	0.43	0.55	0.43	39.5
Approach		6	0	6	0.0	0.006	7.5	LOS A	0.0	0.2	0.43	0.55	0.43	37.0
West: The Escort Way														
10	L2	2	0	2	0.0	0.195	3.6	LOS A	1.1	11.6	0.19	0.50	0.19	38.4
11	T1	99	10	104	10.1	0.195	3.8	LOS A	1.1	11.6	0.19	0.50	0.19	39.3
12	R2	105	15	111	14.3	0.195	7.6	LOS A	1.1	11.6	0.19	0.50	0.19	33.6
12u	U	1	0	1	0.0	0.195	8.9	LOS A	1.1	11.6	0.19	0.50	0.19	42.3
Approach		207	25	218	12.1	0.195	5.7	LOS A	1.1	11.6	0.19	0.50	0.19	36.5
All Vehicles		487	43	513	8.8	0.195	5.1	LOS A	1.1	11.6	0.27	0.49	0.27	37.2

MOVEMENT SUMMARY

Site: 1 [The Escort Way & Flint Street- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

The Escort Way & Flint Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Flint Street														
1	L2	158	26	166	16.5	0.211	4.8	LOS A	1.2	11.8	0.43	0.56	0.43	34.3
2	T1	1	0	1	0.0	0.211	4.3	LOS A	1.2	11.8	0.43	0.56	0.43	39.1
3	R2	17	1	18	5.9	0.211	8.3	LOS A	1.2	11.8	0.43	0.56	0.43	37.3
3u	U	1	0	1	0.0	0.211	9.7	LOS A	1.2	11.8	0.43	0.56	0.43	29.6
Approach		177	27	186	15.3	0.211	5.2	LOS A	1.2	11.8	0.43	0.56	0.43	34.6
East: The Escort Way														
4	L2	23	4	24	17.4	0.176	4.9	LOS A	0.9	9.2	0.38	0.49	0.38	33.8
5	T1	125	19	132	15.2	0.176	4.9	LOS A	0.9	9.2	0.38	0.49	0.38	39.1
6	R2	2	0	2	0.0	0.176	7.9	LOS A	0.9	9.2	0.38	0.49	0.38	40.6
6u	U	1	0	1	0.0	0.176	9.6	LOS A	0.9	9.2	0.38	0.49	0.38	36.5
Approach		151	23	159	15.2	0.176	5.0	LOS A	0.9	9.2	0.38	0.49	0.38	38.4
North: Flint Street														
7	L2	2	0	2	0.0	0.012	4.6	LOS A	0.1	0.4	0.40	0.57	0.40	35.5
8	T1	1	0	1	0.0	0.012	4.6	LOS A	0.1	0.4	0.40	0.57	0.40	32.8
9	R2	8	1	8	12.5	0.012	8.5	LOS A	0.1	0.4	0.40	0.57	0.40	37.9
9u	U	1	0	1	0.0	0.012	9.9	LOS A	0.1	0.4	0.40	0.57	0.40	39.4
Approach		12	1	13	8.3	0.012	7.6	LOS A	0.1	0.4	0.40	0.57	0.40	37.2
West: The Escort Way														
10	L2	1	0	1	0.0	0.170	3.5	LOS A	1.0	11.1	0.15	0.52	0.15	37.9
11	T1	63	19	66	30.2	0.170	3.9	LOS A	1.0	11.1	0.15	0.52	0.15	37.1
12	R2	107	22	113	20.6	0.170	7.5	LOS A	1.0	11.1	0.15	0.52	0.15	33.1
12u	U	1	0	1	0.0	0.170	8.9	LOS A	1.0	11.1	0.15	0.52	0.15	41.7
Approach		172	41	181	23.8	0.170	6.2	LOS A	1.0	11.1	0.15	0.52	0.15	34.7
All Vehicles		512	92	539	18.0	0.211	5.5	LOS A	1.2	11.8	0.32	0.52	0.32	35.8

MOVEMENT SUMMARY

Site: 1 [The Escort Way & Flint Street- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

The Escort Way & Flint Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Flint Street														
1	L2	142	7	149	4.9	0.163	4.0	LOS A	0.9	7.7	0.32	0.50	0.32	36.4
2	T1	4	1	4	25.0	0.163	4.1	LOS A	0.9	7.7	0.32	0.50	0.32	36.5
3	R2	20	3	21	15.0	0.163	8.2	LOS A	0.9	7.7	0.32	0.50	0.32	36.9
3u	U	1	0	1	0.0	0.163	9.3	LOS A	0.9	7.7	0.32	0.50	0.32	30.3
Approach		167	11	176	6.6	0.163	4.5	LOS A	0.9	7.7	0.32	0.50	0.32	36.4
East: The Escort Way														
4	L2	16	3	17	18.8	0.119	5.0	LOS A	0.6	5.4	0.35	0.46	0.35	34.1
5	T1	94	9	99	9.6	0.119	4.5	LOS A	0.6	5.4	0.35	0.46	0.35	40.1
6	R2	1	0	1	0.0	0.119	7.9	LOS A	0.6	5.4	0.35	0.46	0.35	40.9
6u	U	1	0	1	0.0	0.119	9.5	LOS A	0.6	5.4	0.35	0.46	0.35	36.8
Approach		112	12	118	10.7	0.119	4.6	LOS A	0.6	5.4	0.35	0.46	0.35	39.3
North: Flint Street														
7	L2	1	0	1	0.0	0.006	4.8	LOS A	0.0	0.2	0.43	0.56	0.43	35.5
8	T1	1	0	1	0.0	0.006	4.8	LOS A	0.0	0.2	0.43	0.56	0.43	32.8
9	R2	3	0	3	0.0	0.006	8.4	LOS A	0.0	0.2	0.43	0.56	0.43	38.0
9u	U	1	0	1	0.0	0.006	10.1	LOS A	0.0	0.2	0.43	0.56	0.43	39.4
Approach		6	0	6	0.0	0.006	7.5	LOS A	0.0	0.2	0.43	0.56	0.43	37.0
West: The Escort Way														
10	L2	2	0	2	0.0	0.200	3.6	LOS A	1.1	12.1	0.19	0.50	0.19	38.4
11	T1	104	15	109	14.4	0.200	3.8	LOS A	1.1	12.1	0.19	0.50	0.19	38.9
12	R2	105	15	111	14.3	0.200	7.6	LOS A	1.1	12.1	0.19	0.50	0.19	33.6
12u	U	1	0	1	0.0	0.200	8.9	LOS A	1.1	12.1	0.19	0.50	0.19	42.3
Approach		212	30	223	14.2	0.200	5.7	LOS A	1.1	12.1	0.19	0.50	0.19	36.4
All Vehicles		497	53	523	10.7	0.200	5.1	LOS A	1.1	12.1	0.27	0.49	0.27	37.1

MOVEMENT SUMMARY

Site: 1 [The Escort Way & Flint Street- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

The Escort Way & Flint Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Flint Street														
1	L2	158	26	166	16.5	0.211	4.8	LOS A	1.2	11.8	0.43	0.56	0.43	34.3
2	T1	1	0	1	0.0	0.211	4.3	LOS A	1.2	11.8	0.43	0.56	0.43	39.1
3	R2	17	1	18	5.9	0.211	8.3	LOS A	1.2	11.8	0.43	0.56	0.43	37.3
3u	U	1	0	1	0.0	0.211	9.7	LOS A	1.2	11.8	0.43	0.56	0.43	29.6
Approach		177	27	186	15.3	0.211	5.2	LOS A	1.2	11.8	0.43	0.56	0.43	34.6
East: The Escort Way														
4	L2	23	4	24	17.4	0.176	4.9	LOS A	0.9	9.2	0.38	0.49	0.38	33.8
5	T1	125	19	132	15.2	0.176	4.9	LOS A	0.9	9.2	0.38	0.49	0.38	39.1
6	R2	2	0	2	0.0	0.176	7.9	LOS A	0.9	9.2	0.38	0.49	0.38	40.6
6u	U	1	0	1	0.0	0.176	9.6	LOS A	0.9	9.2	0.38	0.49	0.38	36.5
Approach		151	23	159	15.2	0.176	5.0	LOS A	0.9	9.2	0.38	0.49	0.38	38.4
North: Flint Street														
7	L2	2	0	2	0.0	0.012	4.6	LOS A	0.1	0.4	0.40	0.57	0.40	35.5
8	T1	1	0	1	0.0	0.012	4.6	LOS A	0.1	0.4	0.40	0.57	0.40	32.8
9	R2	8	1	8	12.5	0.012	8.5	LOS A	0.1	0.4	0.40	0.57	0.40	37.9
9u	U	1	0	1	0.0	0.012	9.9	LOS A	0.1	0.4	0.40	0.57	0.40	39.4
Approach		12	1	13	8.3	0.012	7.6	LOS A	0.1	0.4	0.40	0.57	0.40	37.2
West: The Escort Way														
10	L2	1	0	1	0.0	0.170	3.5	LOS A	1.0	11.1	0.15	0.52	0.15	37.9
11	T1	63	19	66	30.2	0.170	3.9	LOS A	1.0	11.1	0.15	0.52	0.15	37.1
12	R2	107	22	113	20.6	0.170	7.5	LOS A	1.0	11.1	0.15	0.52	0.15	33.1
12u	U	1	0	1	0.0	0.170	8.9	LOS A	1.0	11.1	0.15	0.52	0.15	41.7
Approach		172	41	181	23.8	0.170	6.2	LOS A	1.0	11.1	0.15	0.52	0.15	34.7
All Vehicles		512	92	539	18.0	0.211	5.5	LOS A	1.2	11.8	0.32	0.52	0.32	35.8

MOVEMENT SUMMARY

Site: 1 [The Escort Way & Flint Street- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

The Escort Way & Flint Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

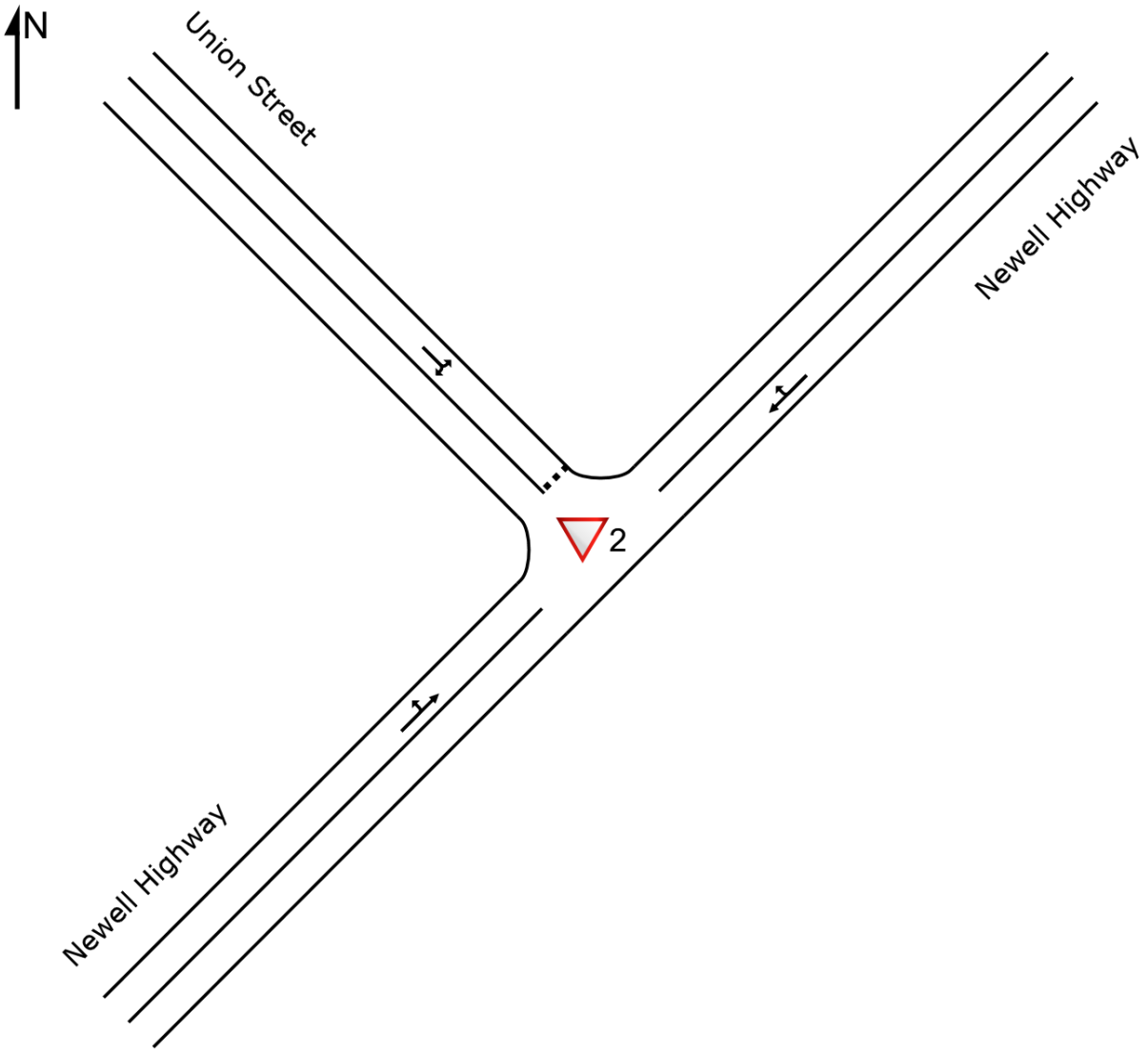
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Flint Street														
1	L2	142	7	149	4.9	0.163	4.0	LOS A	0.9	7.7	0.32	0.50	0.32	36.4
2	T1	4	1	4	25.0	0.163	4.1	LOS A	0.9	7.7	0.32	0.50	0.32	36.5
3	R2	20	3	21	15.0	0.163	8.2	LOS A	0.9	7.7	0.32	0.50	0.32	36.9
3u	U	1	0	1	0.0	0.163	9.3	LOS A	0.9	7.7	0.32	0.50	0.32	30.3
Approach		167	11	176	6.6	0.163	4.5	LOS A	0.9	7.7	0.32	0.50	0.32	36.4
East: The Escort Way														
4	L2	16	3	17	18.8	0.119	5.0	LOS A	0.6	5.4	0.35	0.46	0.35	34.1
5	T1	94	9	99	9.6	0.119	4.5	LOS A	0.6	5.4	0.35	0.46	0.35	40.1
6	R2	1	0	1	0.0	0.119	7.9	LOS A	0.6	5.4	0.35	0.46	0.35	40.9
6u	U	1	0	1	0.0	0.119	9.5	LOS A	0.6	5.4	0.35	0.46	0.35	36.8
Approach		112	12	118	10.7	0.119	4.6	LOS A	0.6	5.4	0.35	0.46	0.35	39.3
North: Flint Street														
7	L2	1	0	1	0.0	0.006	4.8	LOS A	0.0	0.2	0.43	0.56	0.43	35.5
8	T1	1	0	1	0.0	0.006	4.8	LOS A	0.0	0.2	0.43	0.56	0.43	32.8
9	R2	3	0	3	0.0	0.006	8.4	LOS A	0.0	0.2	0.43	0.56	0.43	38.0
9u	U	1	0	1	0.0	0.006	10.1	LOS A	0.0	0.2	0.43	0.56	0.43	39.4
Approach		6	0	6	0.0	0.006	7.5	LOS A	0.0	0.2	0.43	0.56	0.43	37.0
West: The Escort Way														
10	L2	2	0	2	0.0	0.200	3.6	LOS A	1.1	12.1	0.19	0.50	0.19	38.4
11	T1	104	15	109	14.4	0.200	3.8	LOS A	1.1	12.1	0.19	0.50	0.19	38.9
12	R2	105	15	111	14.3	0.200	7.6	LOS A	1.1	12.1	0.19	0.50	0.19	33.6
12u	U	1	0	1	0.0	0.200	8.9	LOS A	1.1	12.1	0.19	0.50	0.19	42.3
Approach		212	30	223	14.2	0.200	5.7	LOS A	1.1	12.1	0.19	0.50	0.19	36.4
All Vehicles		497	53	523	10.7	0.200	5.1	LOS A	1.1	12.1	0.27	0.49	0.27	37.1

SITE LAYOUT

Site: 2 [Union Street & Dowling Street]

Union Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 2 [Union Street & Dowling Street- AM Peak (Site Folder: 2021 Existing)]

Union Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Newell Highway														
5	T1	292	52	307	17.8	0.234	0.5	LOS A	0.5	5.5	0.17	0.08	0.17	47.8
6	R2	41	0	43	0.0	0.234	7.2	LOS A	0.5	5.5	0.17	0.08	0.17	45.8
Approach		333	52	351	15.6	0.234	1.3	NA	0.5	5.5	0.17	0.08	0.17	47.6
NorthWest: Union Street														
7	L2	69	7	73	10.1	0.364	8.5	LOS A	1.5	15.1	0.66	0.90	0.86	34.2
9	R2	75	17	79	22.7	0.364	18.6	LOS B	1.5	15.1	0.66	0.90	0.86	25.7
Approach		144	24	152	16.7	0.364	13.8	LOS A	1.5	15.1	0.66	0.90	0.86	30.4
SouthWest: Newell Highway														
10	L2	98	5	103	5.1	0.241	4.6	LOS A	0.0	0.0	0.00	0.14	0.00	44.0
11	T1	284	36	299	12.7	0.241	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	48.0
Approach		382	41	402	10.7	0.241	1.2	NA	0.0	0.0	0.00	0.14	0.00	47.3
All Vehicles		859	117	904	13.6	0.364	3.4	NA	1.5	15.1	0.18	0.24	0.21	43.9

MOVEMENT SUMMARY

Site: 2 [Union Street & Dowling Street- PM Peak (Site Folder: 2021 Existing)]

Union Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Newell Highway														
5	T1	364	48	383	13.2	0.282	0.7	LOS A	0.7	7.3	0.18	0.07	0.20	47.7
6	R2	42	3	44	7.1	0.282	8.5	LOS A	0.7	7.3	0.18	0.07	0.20	44.9
Approach		406	51	427	12.6	0.282	1.5	NA	0.7	7.3	0.18	0.07	0.20	47.4
NorthWest: Union Street														
7	L2	38	0	40	0.0	0.468	10.5	LOS A	1.9	17.7	0.81	1.03	1.16	29.3
9	R2	82	20	86	24.4	0.468	26.9	LOS B	1.9	17.7	0.81	1.03	1.16	20.9
Approach		120	20	126	16.7	0.468	21.7	LOS B	1.9	17.7	0.81	1.03	1.16	24.0
SouthWest: Newell Highway														
10	L2	97	2	102	2.1	0.279	4.6	LOS A	0.0	0.0	0.00	0.12	0.00	44.8
11	T1	346	48	364	13.9	0.279	0.0	LOS A	0.0	0.0	0.00	0.12	0.00	48.2
Approach		443	50	466	11.3	0.279	1.0	NA	0.0	0.0	0.00	0.12	0.00	47.7
All Vehicles		969	121	1020	12.5	0.468	3.8	NA	1.9	17.7	0.18	0.21	0.23	43.5

MOVEMENT SUMMARY

Site: 2 [Union Street & Dowling Street- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

Union Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Newell Highway														
5	T1	297	57	313	19.2	0.250	0.9	LOS A	0.7	7.6	0.22	0.09	0.23	47.0
6	R2	41	0	43	0.0	0.250	8.9	LOS A	0.7	7.6	0.22	0.09	0.23	45.0
Approach		338	57	356	16.9	0.250	1.9	NA	0.7	7.6	0.22	0.09	0.23	46.7
NorthWest: Union Street														
7	L2	69	7	73	10.1	0.526	13.7	LOS A	2.3	22.8	0.82	1.09	1.27	29.1
9	R2	75	17	79	22.7	0.526	29.3	LOS C	2.3	22.8	0.82	1.09	1.27	20.8
Approach		144	24	152	16.7	0.526	21.8	LOS B	2.3	22.8	0.82	1.09	1.27	25.3
SouthWest: Newell Highway														
10	L2	98	5	103	5.1	0.336	4.6	LOS A	0.0	0.0	0.00	0.10	0.00	44.9
11	T1	456	41	480	9.0	0.336	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	48.5
Approach		554	46	583	8.3	0.336	0.8	NA	0.0	0.0	0.00	0.10	0.00	48.1
All Vehicles		1036	127	1091	12.3	0.526	4.1	NA	2.3	22.8	0.18	0.23	0.25	43.2

MOVEMENT SUMMARY

Site: 2 [Union Street & Dowling Street- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

Union Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Newell Highway														
5	T1	536	53	564	9.9	0.378	0.7	LOS A	0.9	8.8	0.15	0.05	0.19	48.0
6	R2	42	3	44	7.1	0.378	9.2	LOS A	0.9	8.8	0.15	0.05	0.19	45.2
Approach		578	56	608	9.7	0.378	1.3	NA	0.9	8.8	0.15	0.05	0.19	47.8
NorthWest: Union Street														
7	L2	38	0	40	0.0	0.728	25.5	LOS B	3.4	31.8	0.90	1.27	1.78	20.4
9	R2	82	20	86	24.4	0.728	54.2	LOS D	3.4	31.8	0.90	1.27	1.78	13.4
Approach		120	20	126	16.7	0.728	45.1	LOS D	3.4	31.8	0.90	1.27	1.78	15.9
SouthWest: Newell Highway														
10	L2	97	2	102	2.1	0.283	4.6	LOS A	0.0	0.0	0.00	0.12	0.00	44.8
11	T1	351	53	369	15.1	0.283	0.0	LOS A	0.0	0.0	0.00	0.12	0.00	48.2
Approach		448	55	472	12.3	0.283	1.0	NA	0.0	0.0	0.00	0.12	0.00	47.7
All Vehicles		1146	131	1206	11.4	0.728	5.8	NA	3.4	31.8	0.17	0.20	0.28	41.2

MOVEMENT SUMMARY

Site: 2 [Union Street & Dowling Street- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

Union Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Newell Highway														
5	T1	297	57	313	19.2	0.239	0.5	LOS A	0.5	5.6	0.17	0.08	0.17	47.8
6	R2	41	0	43	0.0	0.239	7.3	LOS A	0.5	5.6	0.17	0.08	0.17	45.8
Approach		338	57	356	16.9	0.239	1.3	NA	0.5	5.6	0.17	0.08	0.17	47.6
NorthWest: Union Street														
7	L2	69	7	73	10.1	0.373	8.7	LOS A	1.6	15.5	0.67	0.91	0.88	33.9
9	R2	75	17	79	22.7	0.373	19.2	LOS B	1.6	15.5	0.67	0.91	0.88	25.5
Approach		144	24	152	16.7	0.373	14.2	LOS A	1.6	15.5	0.67	0.91	0.88	30.1
SouthWest: Newell Highway														
10	L2	98	5	103	5.1	0.246	4.6	LOS A	0.0	0.0	0.00	0.14	0.00	44.0
11	T1	289	41	304	14.2	0.246	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	48.0
Approach		387	46	407	11.9	0.246	1.2	NA	0.0	0.0	0.00	0.14	0.00	47.3
All Vehicles		869	127	915	14.6	0.373	3.4	NA	1.6	15.5	0.18	0.24	0.21	43.9

MOVEMENT SUMMARY

Site: 2 [Union Street & Dowling Street- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

Union Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

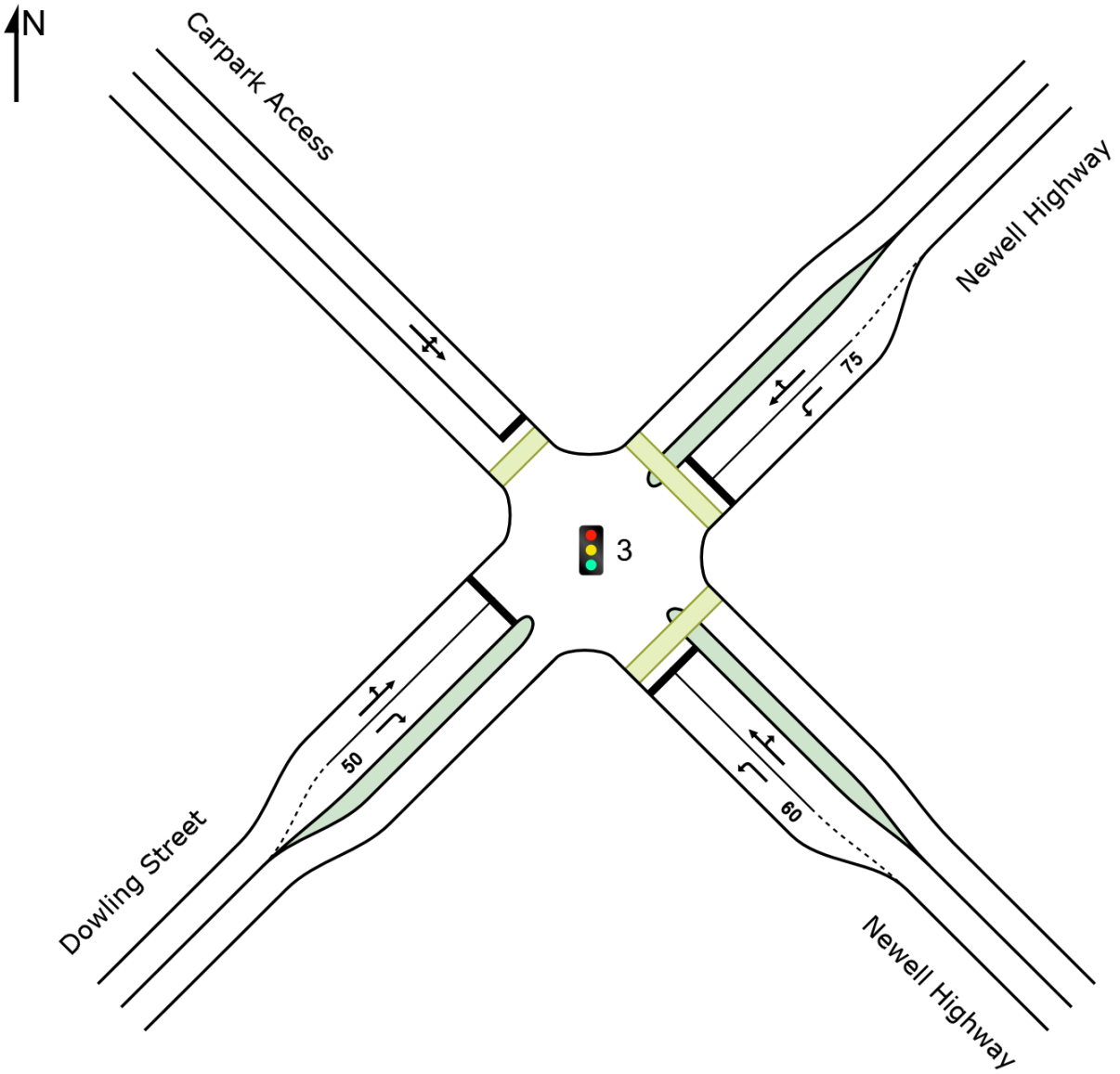
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Newell Highway														
5	T1	369	53	388	14.4	0.287	0.7	LOS A	0.7	7.5	0.18	0.07	0.20	47.6
6	R2	42	3	44	7.1	0.287	8.6	LOS A	0.7	7.5	0.18	0.07	0.20	44.9
Approach		411	56	433	13.6	0.287	1.5	NA	0.7	7.5	0.18	0.07	0.20	47.3
NorthWest: Union Street														
7	L2	38	0	40	0.0	0.482	10.9	LOS A	2.0	18.3	0.81	1.04	1.19	28.8
9	R2	82	20	86	24.4	0.482	28.0	LOS B	2.0	18.3	0.81	1.04	1.19	20.4
Approach		120	20	126	16.7	0.482	22.6	LOS B	2.0	18.3	0.81	1.04	1.19	23.6
SouthWest: Newell Highway														
10	L2	97	2	102	2.1	0.283	4.6	LOS A	0.0	0.0	0.00	0.12	0.00	44.8
11	T1	351	53	369	15.1	0.283	0.0	LOS A	0.0	0.0	0.00	0.12	0.00	48.2
Approach		448	55	472	12.3	0.283	1.0	NA	0.0	0.0	0.00	0.12	0.00	47.7
All Vehicles		979	131	1031	13.4	0.482	3.9	NA	2.0	18.3	0.18	0.21	0.23	43.4

SITE LAYOUT

Site: 3 [Dowling Street & Newell Highway]

Dowling Street & Newell Highway
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 3 [Dowling Street & Newell Highway- AM Peak (Site Folder: 2021 Existing)]

Dowling Street & Newell Highway
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 71 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Newell Highway														
1	L2	12	2	13	16.7	0.024	13.1	LOS A	0.2	1.9	0.67	0.64	0.67	35.3
22	T1	11	0	12	0.0	* 0.699	37.4	LOS C	8.4	93.8	0.97	0.87	1.07	19.4
3	R2	219	31	231	14.2	0.699	34.7	LOS C	8.4	93.8	0.97	0.87	1.07	24.7
Approach		242	33	255	13.6	0.699	33.7	LOS C	8.4	93.8	0.96	0.86	1.05	24.8
NorthEast: Newell Highway														
4	L2	220	64	232	29.1	0.430	20.9	LOS B	5.8	83.7	0.75	0.77	0.75	30.9
5	T1	125	5	132	4.0	0.514	31.1	LOS C	4.9	39.2	0.96	0.78	0.96	17.2
26	R2	15	0	16	0.0	0.514	37.8	LOS C	4.9	39.2	0.96	0.78	0.96	10.8
Approach		360	69	379	19.2	0.514	25.1	LOS B	5.8	83.7	0.83	0.77	0.83	25.8
NorthWest: Carpark Access														
27	L2	10	0	11	0.0	* 0.120	16.5	LOS B	0.6	3.9	0.90	0.64	0.90	12.9
28	T1	18	0	19	0.0	0.120	16.5	LOS B	0.6	3.9	0.90	0.64	0.90	22.9
29	R2	1	0	1	0.0	0.120	16.5	LOS B	0.6	3.9	0.90	0.64	0.90	12.4
Approach		29	0	31	0.0	0.120	16.5	LOS B	0.6	3.9	0.90	0.64	0.90	19.8
SouthWest: Dowling Street														
30	L2	32	0	34	0.0	0.746	43.8	LOS D	6.8	53.9	1.00	0.92	1.20	9.5
11	T1	142	6	149	4.2	* 0.746	35.7	LOS C	6.8	53.9	1.00	0.92	1.20	15.6
12	R2	17	1	18	5.9	0.083	35.4	LOS C	0.6	5.1	0.91	0.69	0.91	24.5
Approach		191	7	201	3.7	0.746	37.0	LOS C	6.8	53.9	0.99	0.90	1.18	15.4
All Vehicles		822	109	865	13.3	0.746	30.1	LOS C	8.4	93.8	0.91	0.82	0.98	23.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		ped	m			sec	m	m/sec
SouthEast: Newell Highway												
P1	Full	1	1	29.8	LOS C	0.0	0.0	0.92	0.92	194.3	213.9	1.10
NorthEast: Newell Highway												
P2	Full	1	1	29.8	LOS C	0.0	0.0	0.92	0.92	194.3	213.9	1.10
NorthWest: Carpark Access												
P7	Full	1	1	29.8	LOS C	0.0	0.0	0.92	0.92	190.2	208.6	1.10
All Pedestrians		3	3	29.8	LOS C	0.0	0.0	0.92	0.92	192.9	212.1	1.10

MOVEMENT SUMMARY

Site: 3 [Dowling Street & Newell Highway- PM Peak (Site Folder: 2021 Existing)]

Dowling Street & Newell Highway
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 77 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Newell Highway														
1	L2	12	2	13	16.7	0.033	27.9	LOS B	0.4	4.4	0.77	0.66	0.77	27.3
22	T1	13	0	14	0.0	* 0.743	39.1	LOS C	10.8	127.4	0.97	0.90	1.10	19.0
3	R2	258	48	272	18.6	0.743	36.5	LOS C	10.8	127.4	0.97	0.90	1.10	24.0
Approach		283	50	298	17.7	0.743	36.2	LOS C	10.8	127.4	0.96	0.89	1.09	23.9
NorthEast: Newell Highway														
4	L2	232	63	244	27.2	0.428	21.1	LOS B	6.4	91.6	0.73	0.77	0.73	30.8
5	T1	183	9	193	4.9	0.779	39.1	LOS C	8.2	68.7	1.00	0.95	1.23	14.9
26	R2	10	0	11	0.0	0.779	45.7	LOS D	8.2	68.7	1.00	0.95	1.23	9.6
Approach		425	72	447	16.9	0.779	29.4	LOS C	8.2	91.6	0.85	0.85	0.96	23.6
NorthWest: Carpark Access														
27	L2	1	0	1	0.0	* 0.088	31.1	LOS C	0.7	4.8	0.90	0.72	0.90	10.0
28	T1	9	0	9	0.0	0.088	31.1	LOS C	0.7	4.8	0.90	0.72	0.90	18.9
29	R2	12	0	13	0.0	0.088	31.1	LOS C	0.7	4.8	0.90	0.72	0.90	9.5
Approach		22	0	23	0.0	0.088	31.1	LOS C	0.7	4.8	0.90	0.72	0.90	14.0
SouthWest: Dowling Street														
30	L2	41	0	43	0.0	0.768	46.1	LOS D	8.6	65.5	1.00	0.94	1.20	9.2
11	T1	163	4	172	2.5	* 0.768	38.0	LOS C	8.6	65.5	1.00	0.94	1.20	14.9
12	R2	16	2	17	12.5	0.073	36.5	LOS C	0.6	5.3	0.89	0.69	0.89	24.1
Approach		220	6	232	2.7	0.768	39.4	LOS C	8.6	65.5	0.99	0.92	1.18	14.5
All Vehicles		950	128	1000	13.5	0.779	33.8	LOS C	10.8	127.4	0.92	0.87	1.04	21.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		ped	m			sec	m	m/sec
SouthEast: Newell Highway												
P1	Full	1	1	32.7	LOS D	0.0	0.0	0.92	0.92	197.3	213.9	1.08
NorthEast: Newell Highway												
P2	Full	1	1	32.7	LOS D	0.0	0.0	0.92	0.92	197.3	213.9	1.08
NorthWest: Carpark Access												
P7	Full	1	1	32.7	LOS D	0.0	0.0	0.92	0.92	193.2	208.6	1.08
All Pedestrians		3	3	32.7	LOS D	0.0	0.0	0.92	0.92	195.9	212.1	1.08

MOVEMENT SUMMARY

Site: 3 [Dowling Street & Newell Highway- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

Dowling Street & Newell Highway
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 87 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Newell Highway														
1	L2	12	2	13	16.7	0.018	11.4	LOS A	0.1	1.8	0.55	0.62	0.55	36.5
22	T1	11	0	12	0.0	* 0.737	40.2	LOS C	13.7	139.0	0.96	0.88	1.04	18.8
3	R2	308	36	324	11.7	0.737	37.4	LOS C	13.7	139.0	0.96	0.88	1.04	23.9
Approach		331	38	348	11.5	0.737	36.6	LOS C	13.7	139.0	0.95	0.87	1.02	24.0
NorthEast: Newell Highway														
4	L2	225	69	237	30.7	0.413	22.6	LOS B	6.9	99.2	0.72	0.76	0.72	30.0
5	T1	125	5	132	4.0	0.629	41.2	LOS C	6.3	50.1	1.00	0.83	1.05	14.3
26	R2	15	0	16	0.0	0.629	47.8	LOS D	6.3	50.1	1.00	0.83	1.05	9.3
Approach		365	74	384	20.3	0.629	30.0	LOS C	6.9	99.2	0.83	0.79	0.85	23.8
NorthWest: Carpark Access														
27	L2	10	0	11	0.0	* 0.148	21.5	LOS B	0.7	4.9	0.93	0.66	0.93	11.8
28	T1	18	0	19	0.0	0.148	21.5	LOS B	0.7	4.9	0.93	0.66	0.93	21.3
29	R2	1	0	1	0.0	0.148	21.5	LOS B	0.7	4.9	0.93	0.66	0.93	11.2
Approach		29	0	31	0.0	0.148	21.5	LOS B	0.7	4.9	0.93	0.66	0.93	18.3
SouthWest: Dowling Street														
30	L2	32	0	34	0.0	0.770	47.9	LOS D	11.9	90.8	1.00	0.94	1.15	9.0
11	T1	225	6	237	2.7	* 0.770	39.7	LOS C	11.9	90.8	1.00	0.94	1.15	14.6
12	R2	17	1	18	5.9	0.057	36.6	LOS C	0.6	5.6	0.85	0.69	0.85	24.1
Approach		274	7	288	2.6	0.770	40.5	LOS C	11.9	90.8	0.99	0.92	1.13	14.6
All Vehicles		999	119	1052	11.9	0.770	34.8	LOS C	13.7	139.0	0.91	0.85	0.98	21.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		ped	m			sec	m	m/sec
SouthEast: Newell Highway												
P1	Full	1	1	37.7	LOS D	0.0	0.0	0.93	0.93	202.2	213.9	1.06
NorthEast: Newell Highway												
P2	Full	1	1	37.7	LOS D	0.0	0.0	0.93	0.93	202.2	213.9	1.06
NorthWest: Carpark Access												
P7	Full	1	1	37.7	LOS D	0.0	0.0	0.93	0.93	198.2	208.6	1.05
All Pedestrians		3	3	37.7	LOS D	0.0	0.0	0.93	0.93	200.9	212.1	1.06

MOVEMENT SUMMARY

Site: 3 [Dowling Street & Newell Highway- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

Dowling Street & Newell Highway
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 87 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Newell Highway														
1	L2	12	2	13	16.7	0.033	30.4	LOS C	0.4	4.9	0.77	0.67	0.77	26.2
22	T1	13	0	14	0.0	* 0.752	42.8	LOS D	12.3	145.8	0.97	0.90	1.09	18.2
3	R2	263	53	277	20.2	0.752	40.1	LOS C	12.3	145.8	0.97	0.90	1.09	22.9
Approach		288	55	303	19.1	0.752	39.8	LOS C	12.3	145.8	0.97	0.89	1.08	22.8
NorthEast: Newell Highway														
4	L2	321	68	338	21.2	0.491	21.4	LOS B	9.8	120.8	0.73	0.78	0.73	30.8
5	T1	266	9	280	3.4	* 0.799	40.9	LOS C	13.0	103.5	1.00	0.97	1.18	14.5
26	R2	10	0	11	0.0	0.799	47.6	LOS D	13.0	103.5	1.00	0.97	1.18	9.4
Approach		597	77	628	12.9	0.799	30.5	LOS C	13.0	120.8	0.85	0.87	0.94	23.2
NorthWest: Carpark Access														
27	L2	1	0	1	0.0	* 0.099	36.0	LOS C	0.8	5.7	0.91	0.72	0.91	9.3
28	T1	9	0	9	0.0	0.099	36.0	LOS C	0.8	5.7	0.91	0.72	0.91	17.8
29	R2	12	0	13	0.0	0.099	36.0	LOS C	0.8	5.7	0.91	0.72	0.91	8.8
Approach		22	0	23	0.0	0.099	36.0	LOS C	0.8	5.7	0.91	0.72	0.91	13.1
SouthWest: Dowling Street														
30	L2	41	0	43	0.0	0.798	52.2	LOS D	9.8	74.9	1.00	0.96	1.23	8.4
11	T1	163	4	172	2.5	* 0.798	44.0	LOS D	9.8	74.9	1.00	0.96	1.23	13.5
12	R2	16	2	17	12.5	0.075	40.9	LOS C	0.6	6.0	0.90	0.69	0.90	22.7
Approach		220	6	232	2.7	0.798	45.3	LOS D	9.8	74.9	0.99	0.94	1.20	13.2
All Vehicles		1127	138	1186	12.2	0.799	35.9	LOS C	13.0	145.8	0.91	0.88	1.02	20.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		ped	m			sec	m	m/sec
SouthEast: Newell Highway												
P1	Full	1	1	37.7	LOS D	0.0	0.0	0.93	0.93	202.2	213.9	1.06
NorthEast: Newell Highway												
P2	Full	1	1	37.7	LOS D	0.0	0.0	0.93	0.93	202.2	213.9	1.06
NorthWest: Carpark Access												
P7	Full	1	1	37.7	LOS D	0.0	0.0	0.93	0.93	198.2	208.6	1.05
All Pedestrians		3	3	37.7	LOS D	0.0	0.0	0.93	0.93	200.9	212.1	1.06

MOVEMENT SUMMARY

Site: 3 [Dowling Street & Newell Highway- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

Dowling Street & Newell Highway
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 74 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Newell Highway														
1	L2	12	2	13	16.7	0.023	12.8	LOS A	0.1	1.8	0.65	0.64	0.65	35.6
22	T1	11	0	12	0.0	* 0.668	36.6	LOS C	8.6	96.5	0.96	0.85	1.01	19.6
3	R2	224	36	236	16.1	0.668	33.9	LOS C	8.6	96.5	0.96	0.85	1.01	24.9
Approach		247	38	260	15.4	0.668	33.0	LOS C	8.6	96.5	0.94	0.84	1.00	25.0
NorthEast: Newell Highway														
4	L2	225	69	237	30.7	0.431	21.0	LOS B	6.1	87.8	0.74	0.77	0.74	30.8
5	T1	125	5	132	4.0	0.535	32.9	LOS C	5.2	41.1	0.97	0.78	0.97	16.6
26	R2	15	0	16	0.0	0.535	39.6	LOS C	5.2	41.1	0.97	0.78	0.97	10.5
Approach		365	74	384	20.3	0.535	25.9	LOS B	6.1	87.8	0.83	0.77	0.83	25.5
NorthWest: Carpark Access														
27	L2	10	0	11	0.0	* 0.126	17.5	LOS B	0.6	4.1	0.91	0.65	0.91	12.7
28	T1	18	0	19	0.0	0.126	17.5	LOS B	0.6	4.1	0.91	0.65	0.91	22.5
29	R2	1	0	1	0.0	0.126	17.5	LOS B	0.6	4.1	0.91	0.65	0.91	12.1
Approach		29	0	31	0.0	0.126	17.5	LOS B	0.6	4.1	0.91	0.65	0.91	19.5
SouthWest: Dowling Street														
30	L2	32	0	34	0.0	0.703	43.6	LOS D	6.9	54.5	1.00	0.89	1.13	9.6
11	T1	142	6	149	4.2	* 0.703	35.4	LOS C	6.9	54.5	1.00	0.89	1.13	15.6
12	R2	17	1	18	5.9	0.078	35.9	LOS C	0.6	5.2	0.90	0.69	0.90	24.3
Approach		191	7	201	3.7	0.703	36.8	LOS C	6.9	54.5	0.99	0.87	1.11	15.5
All Vehicles		832	119	876	14.3	0.703	30.2	LOS C	8.6	96.5	0.90	0.81	0.95	23.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		ped	m			sec	m	m/sec
SouthEast: Newell Highway												
P1	Full	1	1	31.2	LOS D	0.0	0.0	0.92	0.92	195.8	213.9	1.09
NorthEast: Newell Highway												
P2	Full	1	1	31.2	LOS D	0.0	0.0	0.92	0.92	195.8	213.9	1.09
NorthWest: Carpark Access												
P7	Full	1	1	31.2	LOS D	0.0	0.0	0.92	0.92	191.7	208.6	1.09
All Pedestrians		3	3	31.2	LOS D	0.0	0.0	0.92	0.92	194.4	212.1	1.09

MOVEMENT SUMMARY

Site: 3 [Dowling Street & Newell Highway- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

Dowling Street & Newell Highway
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 78 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Newell Highway														
1	L2	12	2	13	16.7	0.032	27.6	LOS B	0.4	4.4	0.76	0.66	0.76	27.4
22	T1	13	0	14	0.0	* 0.735	38.6	LOS C	11.0	129.9	0.97	0.89	1.08	19.1
3	R2	263	53	277	20.2	0.735	36.0	LOS C	11.0	129.9	0.97	0.89	1.08	24.1
Approach		288	55	303	19.1	0.735	35.8	LOS C	11.0	129.9	0.96	0.88	1.07	24.0
NorthEast: Newell Highway														
4	L2	237	68	249	28.7	0.432	21.0	LOS B	6.6	93.9	0.73	0.77	0.73	30.9
5	T1	183	9	193	4.9	0.789	40.0	LOS C	8.4	70.0	1.00	0.96	1.24	14.7
26	R2	10	0	11	0.0	0.789	46.7	LOS D	8.4	70.0	1.00	0.96	1.24	9.5
Approach		430	77	453	17.9	0.789	29.7	LOS C	8.4	93.9	0.85	0.85	0.96	23.5
NorthWest: Carpark Access														
27	L2	1	0	1	0.0	* 0.089	31.5	LOS C	0.7	4.9	0.90	0.72	0.90	9.9
28	T1	9	0	9	0.0	0.089	31.5	LOS C	0.7	4.9	0.90	0.72	0.90	18.8
29	R2	12	0	13	0.0	0.089	31.5	LOS C	0.7	4.9	0.90	0.72	0.90	9.5
Approach		22	0	23	0.0	0.089	31.5	LOS C	0.7	4.9	0.90	0.72	0.90	13.9
SouthWest: Dowling Street														
30	L2	41	0	43	0.0	0.778	47.1	LOS D	8.7	66.7	1.00	0.95	1.21	9.0
11	T1	163	4	172	2.5	* 0.778	38.9	LOS C	8.7	66.7	1.00	0.95	1.21	14.7
12	R2	16	2	17	12.5	0.074	37.1	LOS C	0.6	5.4	0.90	0.69	0.90	23.9
Approach		220	6	232	2.7	0.778	40.3	LOS C	8.7	66.7	0.99	0.93	1.19	14.3
All Vehicles		960	138	1011	14.4	0.789	34.0	LOS C	11.0	129.9	0.92	0.88	1.04	21.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

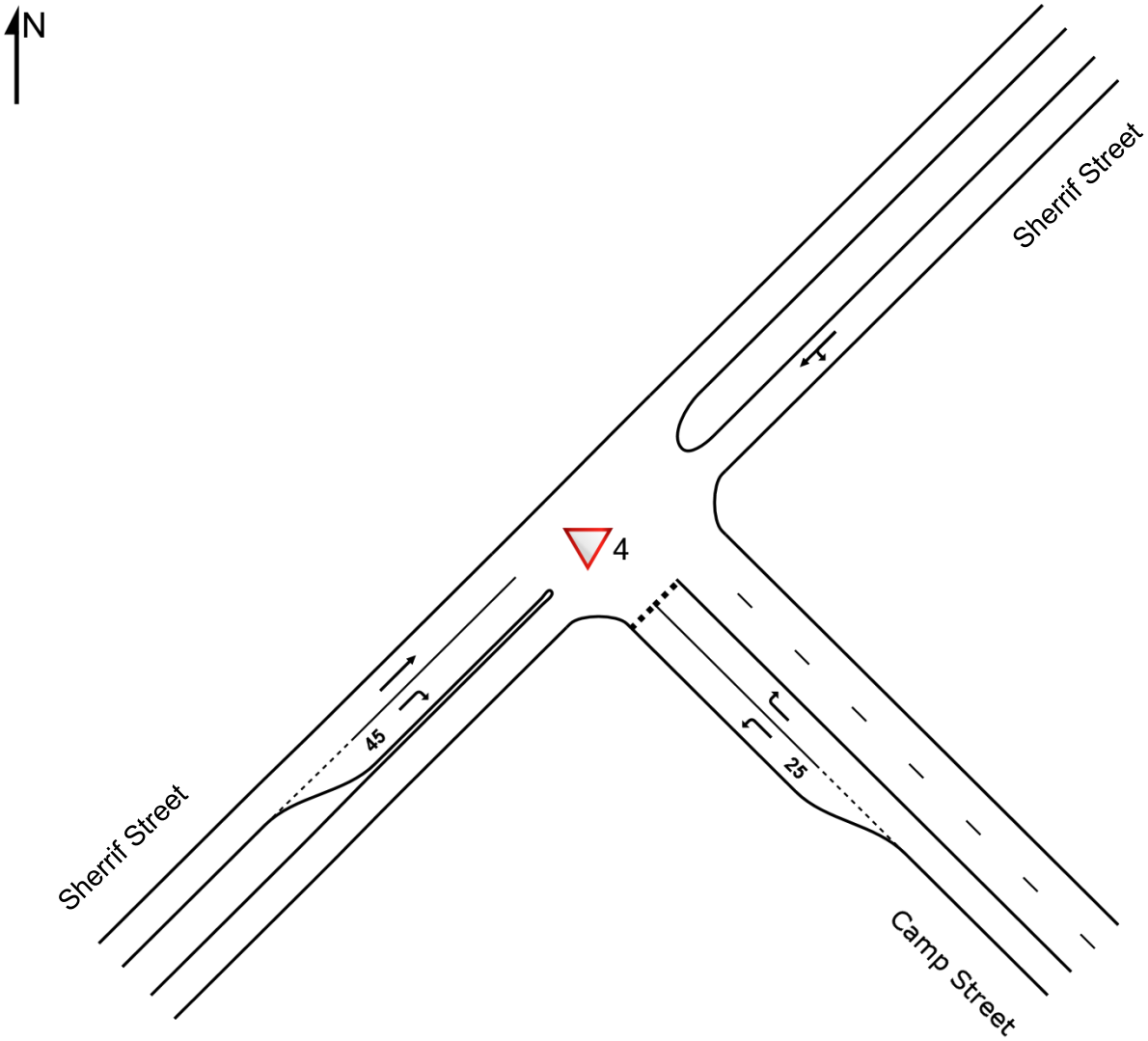
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		ped	m			sec	m	m/sec
SouthEast: Newell Highway												
P1	Full	1	1	33.2	LOS D	0.0	0.0	0.92	0.92	197.8	213.9	1.08
NorthEast: Newell Highway												
P2	Full	1	1	33.2	LOS D	0.0	0.0	0.92	0.92	197.8	213.9	1.08
NorthWest: Carpark Access												
P7	Full	1	1	33.2	LOS D	0.0	0.0	0.92	0.92	193.7	208.6	1.08
All Pedestrians		3	3	33.2	LOS D	0.0	0.0	0.92	0.92	196.4	212.1	1.08

SITE LAYOUT

Site: 4 [Camp Street & Sherrif Street]

Camp Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 4 [Camp Street & Sherrif Street- AM Peak (Site Folder: 2021 Existing)]

Camp Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Camp Street														
1	L2	114	19	120	16.7	0.127	6.3	LOS A	0.5	5.2	0.41	0.61	0.41	37.3
3	R2	138	14	145	10.1	0.574	27.0	LOS B	3.0	30.8	0.86	1.14	1.42	19.5
Approach		252	33	265	13.1	0.574	17.7	LOS B	3.0	30.8	0.66	0.90	0.96	25.9
NorthEast: Sherrif Road														
4	L2	132	23	139	17.4	0.215	3.9	LOS A	0.0	0.0	0.00	0.22	0.00	43.1
5	T1	175	44	184	25.1	0.215	0.0	LOS A	0.0	0.0	0.00	0.22	0.00	44.1
Approach		307	67	323	21.8	0.215	1.7	NA	0.0	0.0	0.00	0.22	0.00	43.6
SouthWest: Sherrif Road														
11	T1	258	25	272	9.7	0.160	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	59	15	62	25.4	0.101	9.2	LOS A	0.4	5.2	0.58	0.74	0.58	34.4
Approach		317	40	334	12.6	0.160	1.7	NA	0.4	5.2	0.11	0.14	0.11	44.2
All Vehicles		876	140	922	16.0	0.574	6.3	NA	3.0	30.8	0.23	0.39	0.32	35.2

MOVEMENT SUMMARY

Site: 4 [Camp Street & Sherrif Street PM Peak (Site Folder: 2021 Existing)]

Camp Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Camp Street														
1	L2	97	2	102	2.1	0.091	6.0	LOS A	0.4	2.7	0.41	0.61	0.41	38.5
3	R2	142	18	149	12.7	0.607	28.9	LOS C	3.2	29.2	0.89	1.16	1.50	18.8
Approach		239	20	252	8.4	0.607	19.6	LOS B	3.2	29.2	0.70	0.94	1.06	24.7
NorthEast: Sherrif Road														
4	L2	146	16	154	11.0	0.252	3.9	LOS A	0.0	0.0	0.00	0.21	0.00	43.6
5	T1	225	46	237	20.4	0.252	0.0	LOS A	0.0	0.0	0.00	0.21	0.00	44.5
Approach		371	62	391	16.7	0.252	1.5	NA	0.0	0.0	0.00	0.21	0.00	44.1
SouthWest: Sherrif Road														
11	T1	245	32	258	13.1	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	76	8	80	10.5	0.115	8.7	LOS A	0.5	4.8	0.59	0.76	0.59	35.1
Approach		321	40	338	12.5	0.158	2.1	NA	0.5	4.8	0.14	0.18	0.14	43.5
All Vehicles		931	122	980	13.1	0.607	6.3	NA	3.2	29.2	0.23	0.39	0.32	35.2

MOVEMENT SUMMARY

Site: 4 [Camp Street & Sherrif Street- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

Camp Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Camp Street														
1	L2	114	19	120	16.7	0.127	6.3	LOS A	0.5	5.2	0.41	0.61	0.41	37.3
3	R2	143	19	151	13.3	0.733	41.0	LOS C	4.3	44.9	0.93	1.32	1.91	15.1
Approach		257	38	271	14.8	0.733	25.6	LOS B	4.3	44.9	0.70	1.00	1.25	21.6
NorthEast: Sherrif Road														
4	L2	137	28	144	20.4	0.220	3.9	LOS A	0.0	0.0	0.00	0.23	0.00	42.9
5	T1	175	44	184	25.1	0.220	0.0	LOS A	0.0	0.0	0.00	0.23	0.00	44.1
Approach		312	72	328	23.1	0.220	1.7	NA	0.0	0.0	0.00	0.23	0.00	43.5
SouthWest: Sherrif Road														
11	T1	342	25	360	7.3	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	59	15	62	25.4	0.102	9.3	LOS A	0.4	5.3	0.58	0.75	0.58	34.3
Approach		401	40	422	10.0	0.205	1.4	NA	0.4	5.3	0.09	0.11	0.09	45.1
All Vehicles		970	150	1021	15.5	0.733	7.9	NA	4.3	44.9	0.22	0.39	0.37	32.9

MOVEMENT SUMMARY

Site: 4 [Camp Street & Sherrif Street- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

Camp Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Camp Street														
1	L2	97	2	102	2.1	0.101	6.5	LOS A	0.4	2.9	0.47	0.66	0.47	38.2
3	R2	147	23	155	15.6	0.789	47.9	LOS D	4.9	45.8	0.95	1.39	2.16	13.6
Approach		244	25	257	10.2	0.789	31.4	LOS C	4.9	45.8	0.76	1.10	1.49	19.3
NorthEast: Sherrif Road														
4	L2	151	21	159	13.9	0.302	3.9	LOS A	0.0	0.0	0.00	0.17	0.00	44.1
5	T1	309	46	325	14.9	0.302	0.0	LOS A	0.0	0.0	0.00	0.17	0.00	45.5
Approach		460	67	484	14.6	0.302	1.3	NA	0.0	0.0	0.00	0.17	0.00	44.9
SouthWest: Sherrif Road														
11	T1	245	32	258	13.1	0.159	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	76	8	80	10.5	0.137	10.0	LOS A	0.5	5.5	0.63	0.83	0.63	33.8
Approach		321	40	338	12.5	0.159	2.4	NA	0.5	5.5	0.15	0.20	0.15	42.7
All Vehicles		1025	132	1079	12.9	0.789	8.8	NA	4.9	45.8	0.23	0.40	0.40	31.9

MOVEMENT SUMMARY

Site: 4 [Camp Street & Sherrif Street- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

Camp Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Camp Street														
1	L2	114	19	120	16.7	0.127	6.3	LOS A	0.5	5.2	0.41	0.61	0.41	37.3
3	R2	143	19	151	13.3	0.609	28.8	LOS C	3.3	34.1	0.88	1.18	1.51	18.8
Approach		257	38	271	14.8	0.609	18.8	LOS B	3.3	34.1	0.67	0.93	1.02	25.1
NorthEast: Sherrif Road														
4	L2	137	28	144	20.4	0.220	3.9	LOS A	0.0	0.0	0.00	0.23	0.00	42.9
5	T1	175	44	184	25.1	0.220	0.0	LOS A	0.0	0.0	0.00	0.23	0.00	44.1
Approach		312	72	328	23.1	0.220	1.7	NA	0.0	0.0	0.00	0.23	0.00	43.5
SouthWest: Sherrif Road														
11	T1	258	25	272	9.7	0.160	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	59	15	62	25.4	0.102	9.3	LOS A	0.4	5.3	0.58	0.75	0.58	34.3
Approach		317	40	334	12.6	0.160	1.7	NA	0.4	5.3	0.11	0.14	0.11	44.1
All Vehicles		886	150	933	16.9	0.609	6.7	NA	3.3	34.1	0.23	0.40	0.33	34.7

MOVEMENT SUMMARY

Site: 4 [Camp Street & Sherrif Street- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

Camp Street & Newell Highway
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

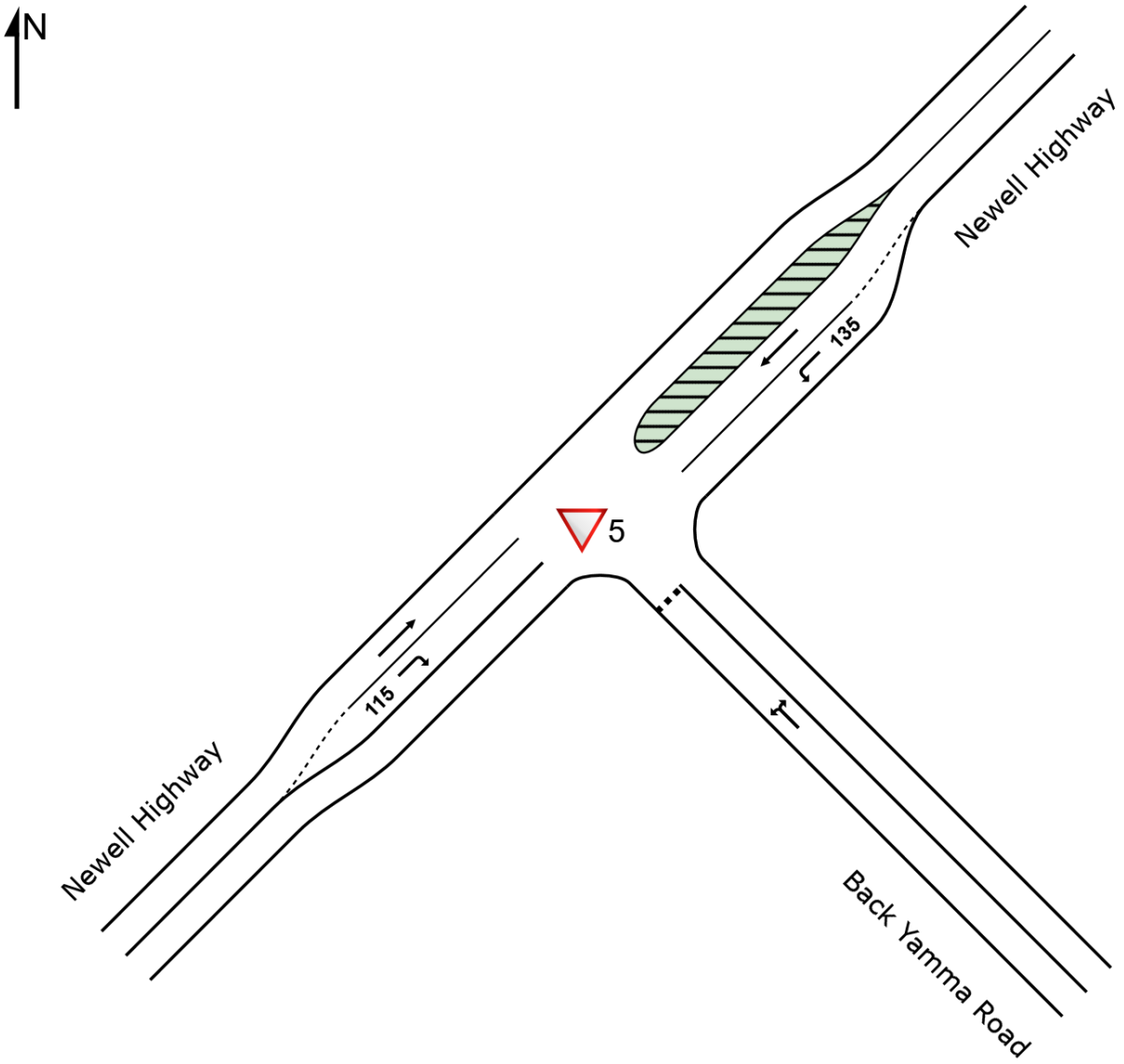
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Camp Street														
1	L2	97	2	102	2.1	0.091	6.0	LOS A	0.4	2.7	0.41	0.61	0.41	38.5
3	R2	147	23	155	15.6	0.648	31.3	LOS C	3.5	32.9	0.90	1.20	1.62	17.9
Approach		244	25	257	10.2	0.648	21.3	LOS B	3.5	32.9	0.71	0.97	1.14	23.7
NorthEast: Sherrif Road														
4	L2	151	21	159	13.9	0.256	3.9	LOS A	0.0	0.0	0.00	0.21	0.00	43.4
5	T1	225	46	237	20.4	0.256	0.0	LOS A	0.0	0.0	0.00	0.21	0.00	44.5
Approach		376	67	396	17.8	0.256	1.6	NA	0.0	0.0	0.00	0.21	0.00	43.9
SouthWest: Sherrif Road														
11	T1	245	32	258	13.1	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
12	R2	76	8	80	10.5	0.117	8.8	LOS A	0.5	4.8	0.60	0.77	0.60	35.0
Approach		321	40	338	12.5	0.158	2.1	NA	0.5	4.8	0.14	0.18	0.14	43.4
All Vehicles		941	132	991	14.0	0.648	6.8	NA	3.5	32.9	0.23	0.40	0.34	34.5

SITE LAYOUT

Site: 5 [Newell Highway & Back Yamma Road]

Newell Highway & Back Yamma Road
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 5 [Newell Highway & Back Yamma Road- AM Peak (Site Folder: 2021 Existing)]

Newell Highway & Back Yamma Road
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Back Yamma Road														
1	L2	27	11	28	40.7	0.079	12.2	LOS A	0.3	4.9	0.48	0.74	0.48	42.1
3	R2	4	0	4	0.0	0.079	13.1	LOS A	0.3	4.9	0.48	0.74	0.48	53.9
Approach		31	11	33	35.5	0.079	12.4	LOS A	0.3	4.9	0.48	0.74	0.48	43.4
NorthEast: Newell Highway														
4	L2	7	3	7	42.9	0.007	8.0	LOS A	0.0	0.0	0.00	0.63	0.00	54.3
5	T1	180	29	189	16.1	0.117	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		187	32	197	17.1	0.117	0.3	NA	0.0	0.0	0.00	0.02	0.00	78.9
SouthWest: Newell Highway														
11	T1	186	35	196	18.8	0.128	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	63	15	66	23.8	0.116	10.6	LOS A	0.5	6.7	0.47	0.73	0.47	52.4
Approach		249	50	262	20.1	0.128	2.7	NA	0.5	6.7	0.12	0.18	0.12	72.6
All Vehicles		467	93	492	19.9	0.128	2.4	NA	0.5	6.7	0.10	0.16	0.10	72.7

MOVEMENT SUMMARY

Site: 5 [Newell Highway & Back Yamma Road- PM Peak (Site Folder: 2021 Existing)]

Newell Highway & Back Yamma Road
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Back Yamma Road														
1	L2	38	4	40	10.5	0.102	9.6	LOS A	0.4	3.7	0.50	0.75	0.50	51.2
3	R2	15	1	16	6.7	0.102	15.3	LOS B	0.4	3.7	0.50	0.75	0.50	52.3
Approach		53	5	56	9.4	0.102	11.2	LOS A	0.4	3.7	0.50	0.75	0.50	51.5
NorthEast: Newell Highway														
4	L2	17	1	18	5.9	0.011	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	59.6
5	T1	232	31	244	13.4	0.150	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		249	32	262	12.9	0.150	0.5	NA	0.0	0.0	0.00	0.04	0.00	78.6
SouthWest: Newell Highway														
11	T1	179	22	188	12.3	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	4	2	4	50.0	0.016	17.7	LOS B	0.1	1.3	0.58	0.75	0.58	43.6
Approach		183	24	193	13.1	0.114	0.4	NA	0.1	1.3	0.01	0.02	0.01	78.9
All Vehicles		485	61	511	12.6	0.150	1.6	NA	0.4	3.7	0.06	0.11	0.06	75.5

MOVEMENT SUMMARY

Site: 5 [Newell Highway & Back Yamma Road- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

Newell Highway & Back Yamma Road
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Back Yamma Road														
1	L2	32	16	34	50.0	0.090	12.0	LOS A	0.3	5.4	0.48	0.74	0.48	40.3
3	R2	4	0	4	0.0	0.090	16.2	LOS B	0.3	5.4	0.48	0.74	0.48	53.9
Approach		36	16	38	44.4	0.090	12.5	LOS A	0.3	5.4	0.48	0.74	0.48	41.5
NorthEast: Newell Highway														
4	L2	7	3	7	42.9	0.007	8.0	LOS A	0.0	0.0	0.00	0.63	0.00	54.3
5	T1	180	29	189	16.1	0.117	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		187	32	197	17.1	0.117	0.3	NA	0.0	0.0	0.00	0.02	0.00	78.9
SouthWest: Newell Highway														
11	T1	186	35	196	18.8	0.129	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	235	20	247	8.5	0.277	8.8	LOS A	1.3	11.6	0.46	0.71	0.46	56.2
Approach		421	55	443	13.1	0.277	4.9	NA	1.3	11.6	0.26	0.40	0.26	66.8
All Vehicles		644	103	678	16.0	0.277	4.0	NA	1.3	11.6	0.19	0.31	0.19	68.4

MOVEMENT SUMMARY

Site: 5 [Newell Highway & Back Yamma Road- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Forbes)]

Newell Highway & Back Yamma Road
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Back Yamma Road														
1	L2	210	9	221	4.3	0.295	9.1	LOS A	1.2	9.8	0.49	0.75	0.50	55.2
3	R2	15	1	16	6.7	0.295	17.4	LOS B	1.2	9.8	0.49	0.75	0.50	54.1
Approach		225	10	237	4.4	0.295	9.7	LOS A	1.2	9.8	0.49	0.75	0.50	55.1
NorthEast: Newell Highway														
4	L2	17	1	18	5.9	0.011	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	59.6
5	T1	232	31	244	13.4	0.150	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		249	32	262	12.9	0.150	0.5	NA	0.0	0.0	0.00	0.04	0.00	78.6
SouthWest: Newell Highway														
11	T1	179	22	188	12.3	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	9	7	9	77.8	0.024	14.2	LOS A	0.1	1.5	0.54	0.73	0.54	44.5
Approach		188	29	198	15.4	0.114	0.7	NA	0.1	1.5	0.03	0.04	0.03	77.8
All Vehicles		662	71	697	10.7	0.295	3.7	NA	1.2	9.8	0.17	0.28	0.18	70.4

MOVEMENT SUMMARY

Site: 5 [Newell Highway & Back Yamma Road- AM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

Newell Highway & Back Yamma Road
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Back Yamma Road														
1	L2	32	16	34	50.0	0.089	12.0	LOS A	0.3	5.3	0.48	0.74	0.48	40.4
3	R2	4	0	4	0.0	0.089	14.8	LOS B	0.3	5.3	0.48	0.74	0.48	54.1
Approach		36	16	38	44.4	0.089	12.3	LOS A	0.3	5.3	0.48	0.74	0.48	41.6
NorthEast: Newell Highway														
4	L2	174	3	183	1.7	0.101	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	60.2
5	T1	180	29	189	16.1	0.117	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		354	32	373	9.0	0.117	3.5	NA	0.0	0.0	0.00	0.31	0.00	70.6
SouthWest: Newell Highway														
11	T1	186	35	196	18.8	0.129	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	68	20	72	29.4	0.168	13.9	LOS A	0.7	9.4	0.59	0.85	0.59	48.5
Approach		254	55	267	21.7	0.168	3.7	NA	0.7	9.4	0.16	0.23	0.16	70.7
All Vehicles		644	103	678	16.0	0.168	4.1	NA	0.7	9.4	0.09	0.30	0.09	68.5

MOVEMENT SUMMARY

Site: 5 [Newell Highway & Back Yamma Road- PM Peak (Site Folder: 2021 Existing + Project- 100% LV from Parkes)]

Newell Highway & Back Yamma Road
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Back Yamma Road														
1	L2	43	9	45	20.9	0.475	12.6	LOS A	2.8	21.7	0.67	0.97	1.01	44.3
3	R2	182	1	192	0.5	0.475	16.3	LOS B	2.8	21.7	0.67	0.97	1.01	49.8
Approach		225	10	237	4.4	0.475	15.6	LOS B	2.8	21.7	0.67	0.97	1.01	48.7
NorthEast: Newell Highway														
4	L2	17	1	18	5.9	0.011	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	59.6
5	T1	232	31	244	13.4	0.150	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		249	32	262	12.9	0.150	0.5	NA	0.0	0.0	0.00	0.04	0.00	78.6
SouthWest: Newell Highway														
11	T1	179	22	188	12.3	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	9	7	9	77.8	0.024	14.2	LOS A	0.1	1.5	0.54	0.73	0.54	44.5
Approach		188	29	198	15.4	0.114	0.7	NA	0.1	1.5	0.03	0.04	0.03	77.8
All Vehicles		662	71	697	10.7	0.475	5.7	NA	2.8	21.7	0.24	0.35	0.35	67.3

Appendix C Road Geometry Technical Memo

Member of the Surbana Jurong Group

Technical Memorandum

Memo No.	1	**Date of Issue**	28 January 2022
Subject	Road Geometry Assessment	**Discipline**	Roads & Highways
Project Title	Daroobalgie	**Project No.**	30012765
Document No.	1	**Revision**	1
Author	Graeme Allen, Designer		
Reviewed by	Andrew Brown	**Approved by**	Jessica Miller
Prepared for	Pacific Hydro	**Attention to**	Kate Munro
Attachments	NA		

1. Introduction

Swept path analysis of the existing road geometry at the Back Yamma Road/ Troubalgie Road priority intersection has been undertaken to determine the ability of B-Double (26m) trucks to pass simultaneously turning to/ from Back Yamma Road and Troubalgie Road.

1.1 Existing conditions

As shown in Figure 1-1, the current road geometry allows for a B-double to make the turn in both directions (Right turn from Back Yamma Road and Left turn from Troubalgie Road), however there is insufficient room for the turns to happen simultaneously. The yellow circle in the figure shows the vehicle conflict point.

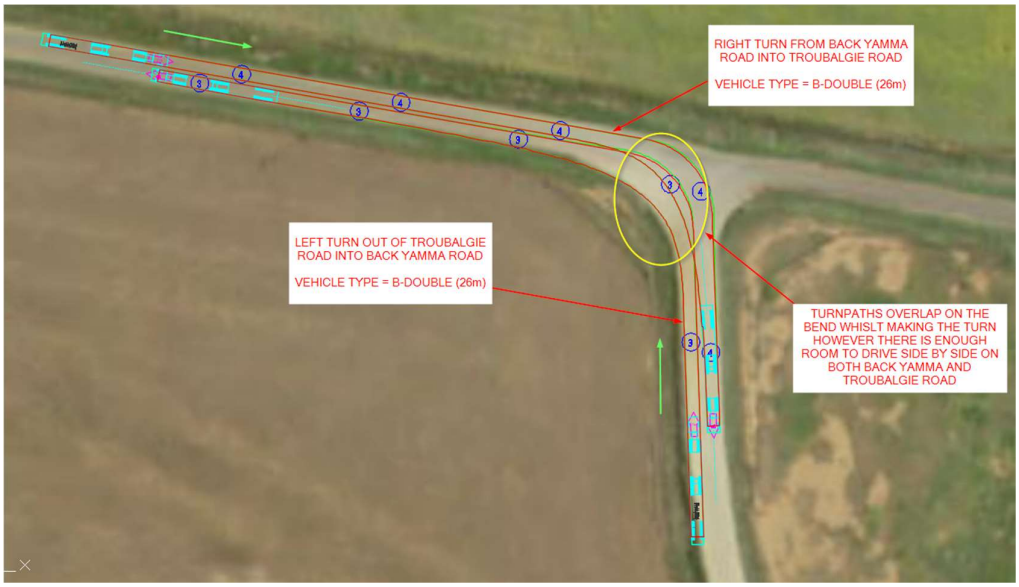


Figure 1-1 Swept path analysis - Back Yamma Road/ Troubalgie Road existing priority intersection

1.2 Potential options for mitigation

1.2.1 Option 1 – Intersection widening

Figure 1-2 highlights widening needed on the left turn of Troubalgie Road to allow B-Double vehicles to pass simultaneously. The current radius of this turn is 30m and would need to be increased to 50m to avoid vehicle collision. This would require an additional pavement area of around 207m², as shown in Figure 1-3.

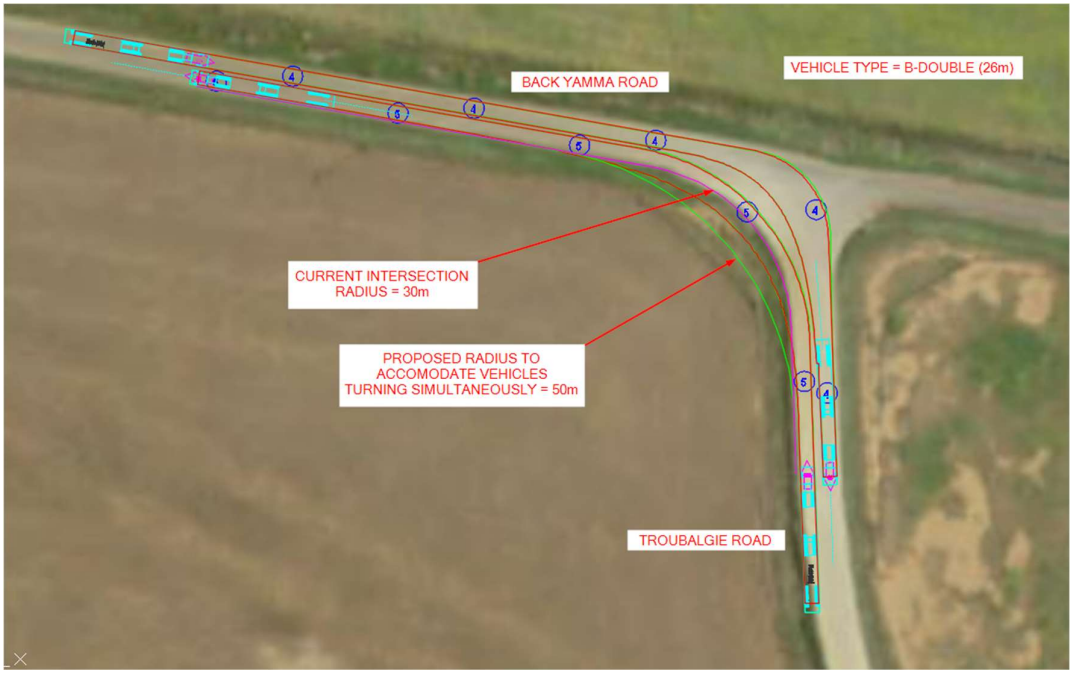


Figure 1-2 Swept path analysis - Back Yamma Road/ Troubalgie Road priority intersection widening

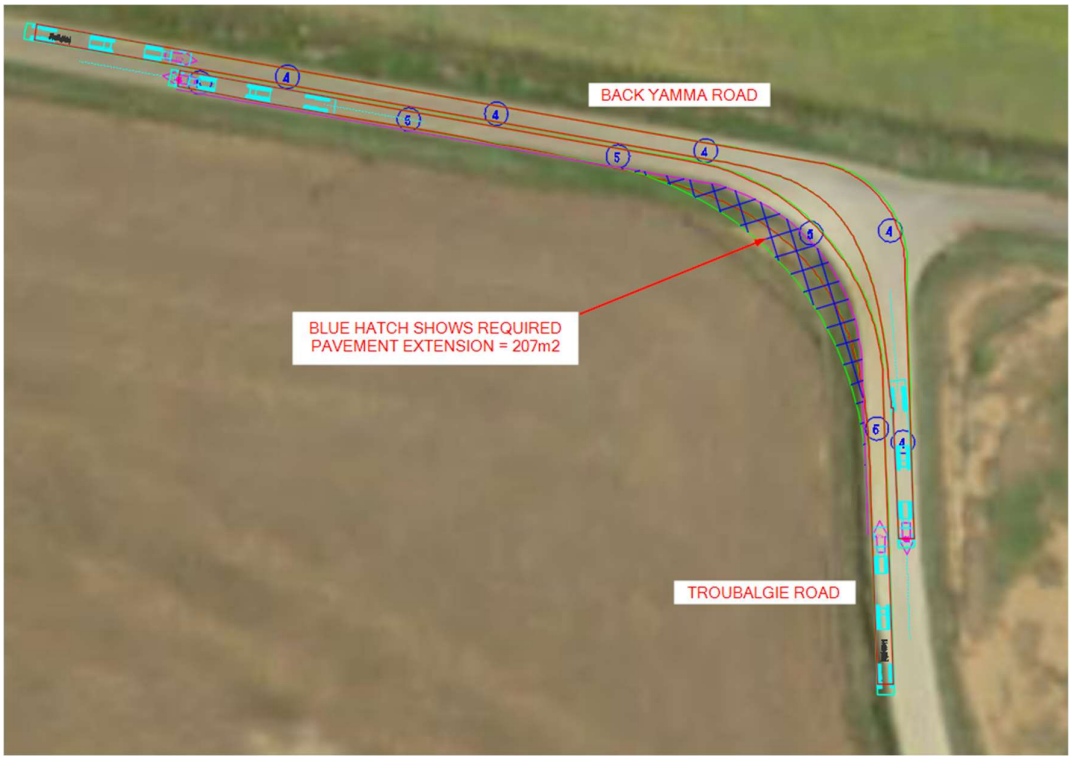


Figure 1-3 Swept path analysis - Back Yamma Road/ Troubalgie Road priority intersection pavement extension requirements

1.2.2 Construction Traffic Management Plan (CTMP)

An alternative approach for potential consideration would be for B-Double movements at this intersection to be controlled by a traffic controller as part of other measures included in the CTMP, which would be subject to discussion an agreement with Council.

Appendix D Road Upgrade Sketches Technical Memo

Member of the Surbana Jurong Group

Memorandum

To	Kate Munro, Pacific Hydro	**Date**	13 July 2022
From	Lance Vickery, Senior Project Manager	**No. of pages**	1 of 2
Reference	30012765		
Subject	**Daroobalgie Solar Farm - Upgrades to Back Yamma and Troubalgie Roads**		

SMEC Australia Pty Ltd has been requested to prepare road upgrade sketches and this technical memo to clarify the scope of road works agreed with Forbes Shire Council. These road works will support the construction and operation of the Daroobalgie Solar Farm.

The site is accessed initially from the Newell Highway (HW17) at the intersection of Back Yamma Road, 9 km north of Forbes. The existing intersection is well developed with both CHR (Channelised Right Turn) and AUL (Auxilliary Left Turn) facilities. This intersection serves as the access to several industrial lots including the Forbes Central West Livestock Exchange and local traffic on the network in that area. No road works are identified at this location and the performance of the intersection will not be adversely impacted by the Solar Farm proposal.

Between the Newell Highway and the intersection with Troubalgie Road, Back Yamma Road has been widened in recent years and provides a two-lane sealed pavement with approximately 0.5 m of shoulder sealing. The alignment is generally straight and level.

At the access to the Forbes Central West Livestock Exchange the interscetion has been constructed to favour heavy vehicle movements in/out of that facility. Given the size and configuration of vehicles at the site this is reasonable. It does however raise a concern for longer heavy vehicles travelling further to the east. A check of swept paths demonstrates that minor widening would be required to accommodate a 26m B Double movement.

One caution with such work is that there is evidence at the site that motorists are demonstrating poor lane discipline and attempting to flatten any deflection intended in the current design. Given the relatively remote location and the ample sight distance at this site, this is not surprising. Further widening is likely to enhance opportunities for such behaviour and increase speeds along Back Yamma Road at the location.

It is **recommended** that serious consideration be given to minimising any new widening work, provided that longer vehicles can be accommodated within the existing sealed pavement.

At the existing intersections of:

1. Back Yamma Road/ Troubalgie Road; and
2. Troubalgie Road/ Solar Farm site access

It is proposed that each intersection will be reconstructed to provide:

- A BAR (Basic Right Turn) 100 km/h design speed in accordance with Austroads guide to road design part 4A, Figure 7.6
- A BAL (Basic Left Turn) 100 km/h design speed in accordance with Austroads guide to road design part 4A, Figure 8.2.

Between the intersection of Back Yamma Road and the Solar Farm access, Troubalgie Road is to be widened and sealed such that it provides two sealed lanes of 3.5m and sealed shoulders 0.5m wide (overall width of seal is 8.0m).

Attached are layouts marked up to reflect the above scope of work, as well as alternative layouts showing potential swept paths where the vehicle remains on the existing paved surface of Back Yamma Road.

Yours sincerely,

Lance Vickery
Senior Project Manager

NOT FOR CONSTRUCTION

SCALE 1:5000 25 0 50 100
AT A3 SIZE DRAWING

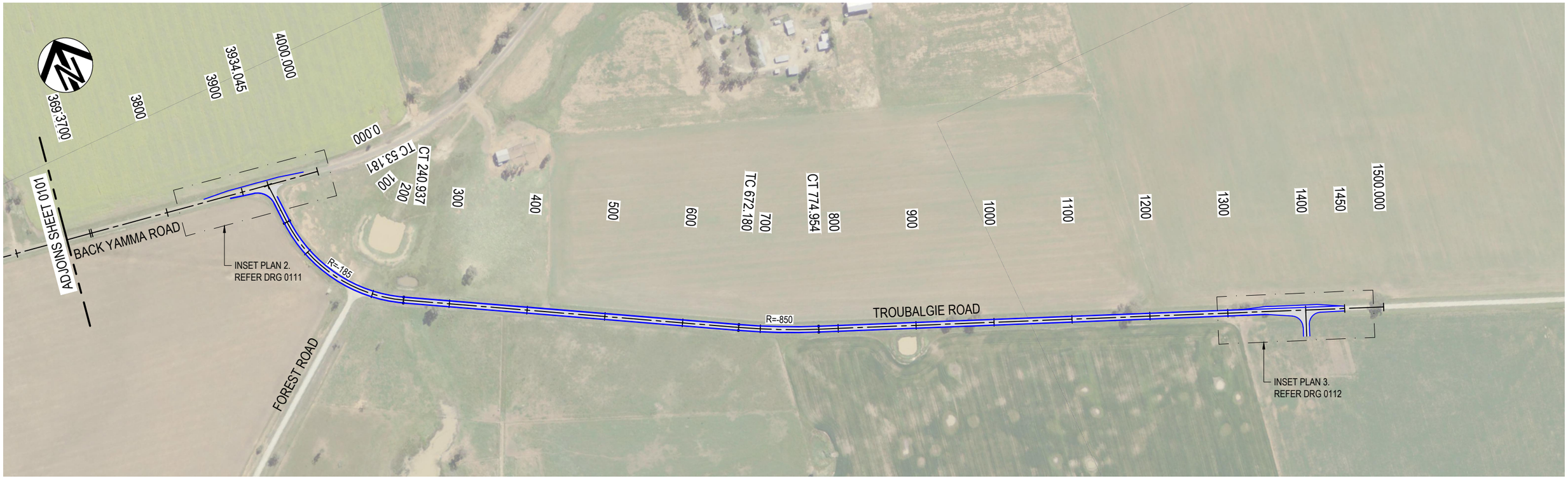
DRAWING FILE LOCATION / NAME
V:_Vault\Opportunities\1043887\110_CADD\CAD\Info_Docs\Civil\220708_Solar_Access_Road\1043887-220708-PLAN-0101-DK_[ID].dwg

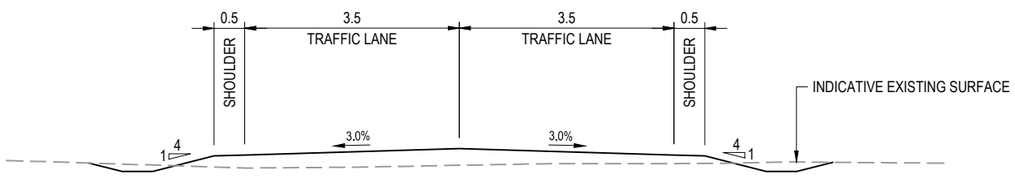
DAROOBALGIE SOLAR ROAD DESIGN
GENERAL ARRANGEMENT
SHEET 1

INFORMATION DOCUMENT

1043887-220708-PLAN-0101-DK_[ID]

SMEC
Member of the Surbana Jurong Group
© ABN 47 065 475 149
52 VICTORIA STREET
GRAFTON NSW, 2460





TYPICAL CROSS SECTION
TROUBALGIE ROAD
SCALE 1:100

NOT FOR CONSTRUCTION

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AT A3 SIZE DRAWING

DRAWING FILE LOCATION / NAME
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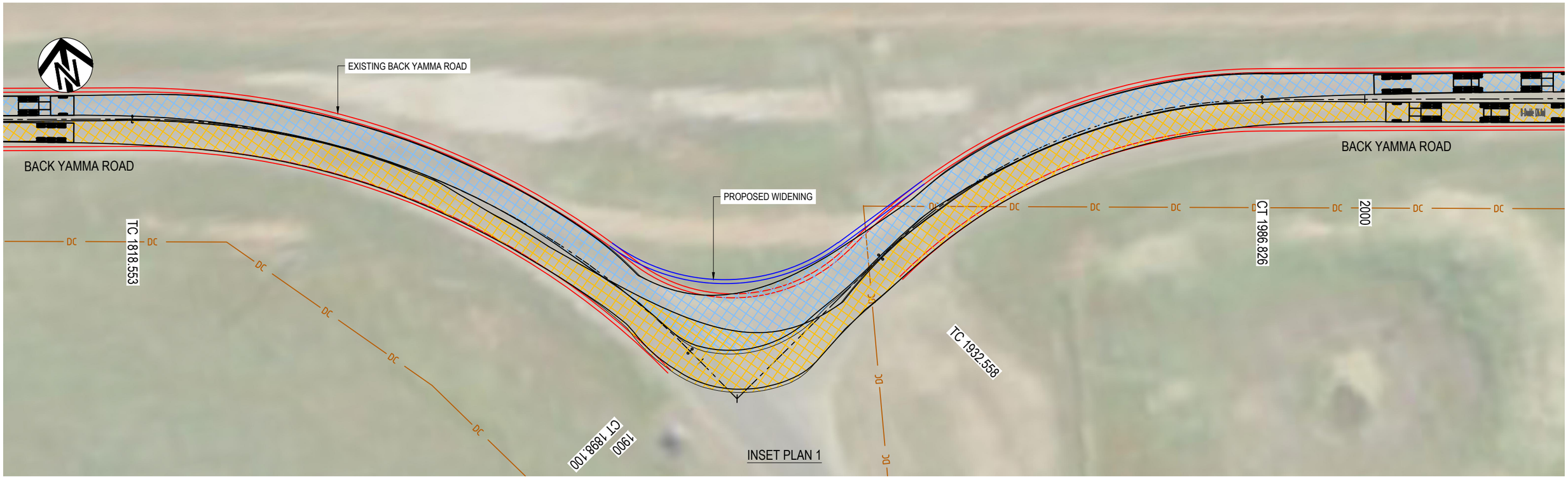
DAROOBALGIE SOLAR ROAD DESIGN
GENERAL ARRANGEMENT
SHEET 2

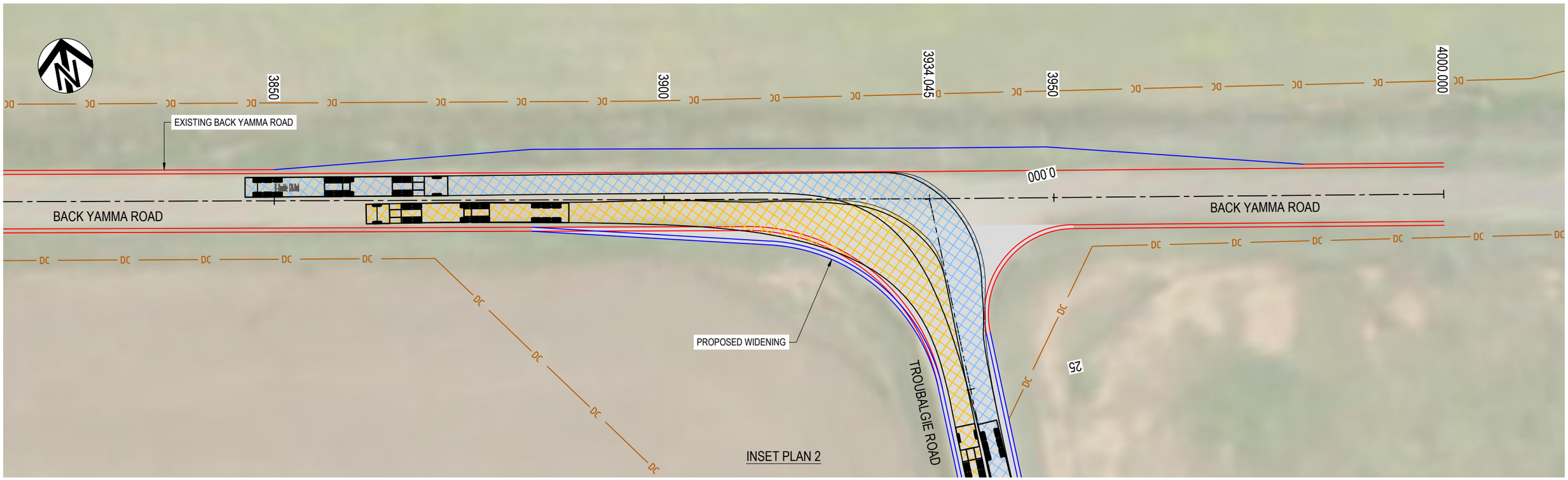
INFORMATION DOCUMENT

1043887-220708-PLAN-0102-DK_[ID]

SMEC
Member of the Surbana Jurong Group

52 VICTORIA STREET
GRAFTON NSW, 2460





NOT FOR CONSTRUCTION

AT A3 SIZE DRAWING

DRAWING FILE LOCATION / NAME

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DAROOBALGIE SOLAR ROAD DESIGN
INTERSECTION LAYOUT AND TURNPATHS - SHEET 1

INFORMATION DOCUMENT

1043887-220708-PLAN-0111-DK_[ID]

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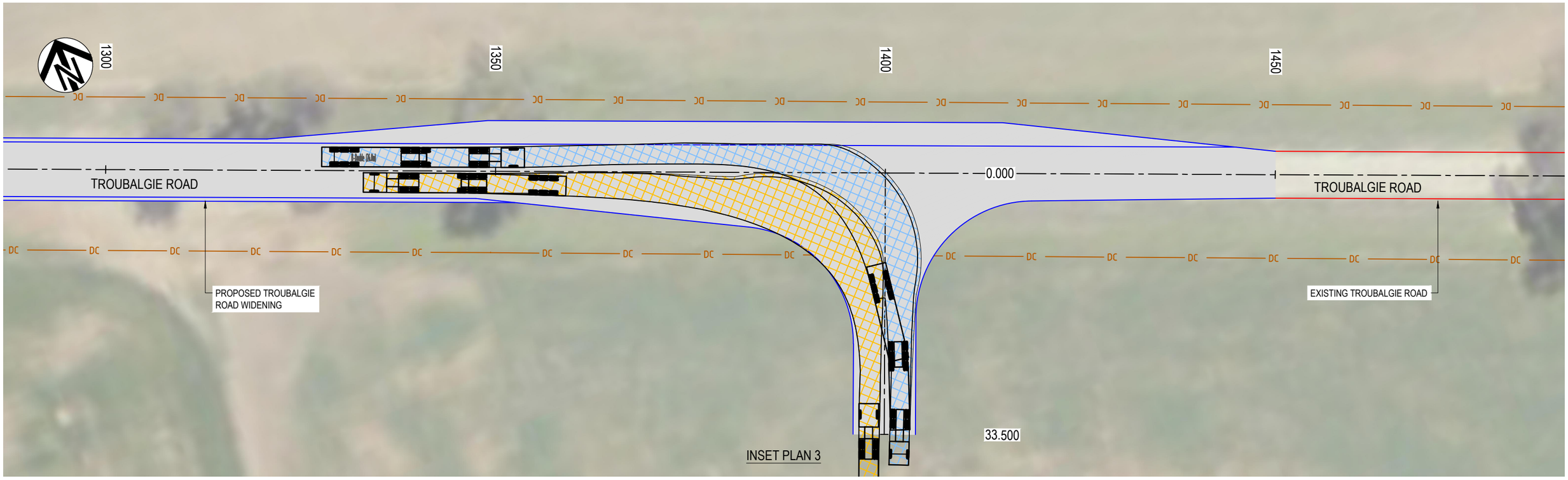

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DAROOBALGIE SOLAR ROAD DESIGN
INTERSECTION LAYOUT AND TURNPATHS - SHEET 2

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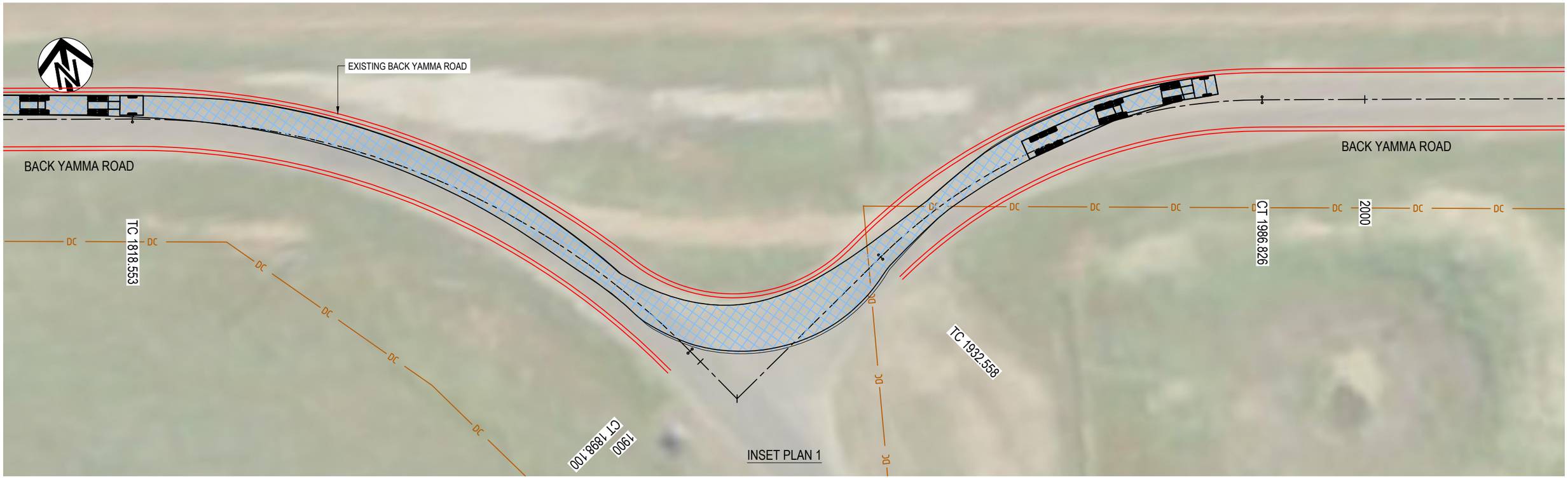

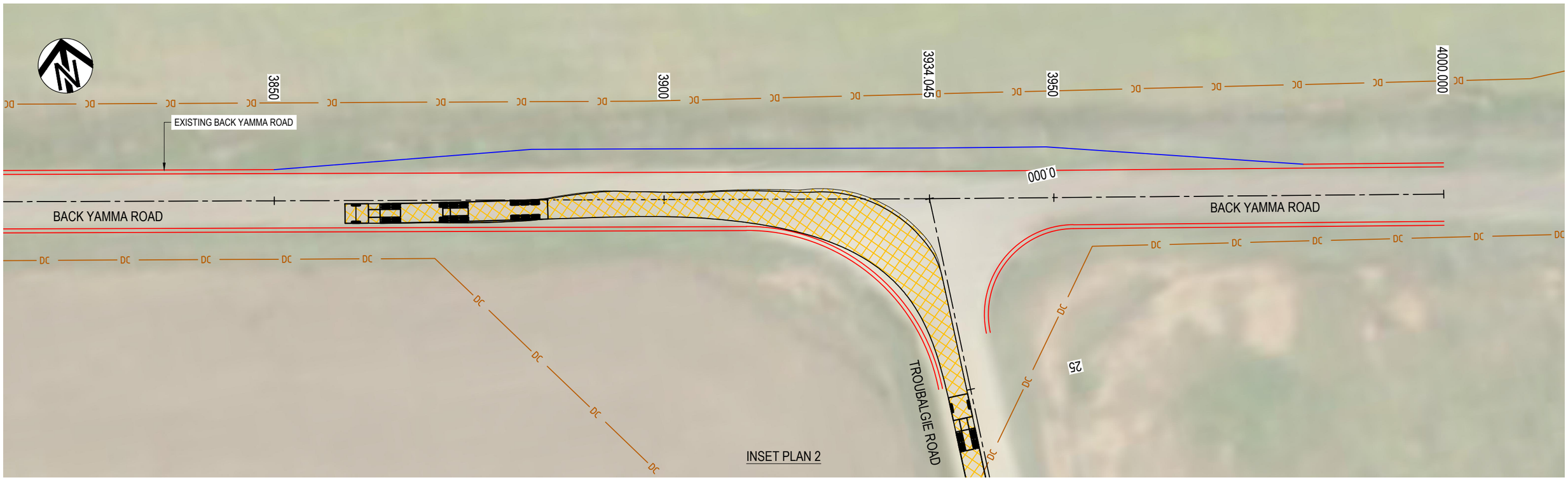

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DAROOBALGIE SOLAR ROAD DESIGN
INTERSECTION LAYOUT AND
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