TERRAIN SOLAR

Marulan Solar Farm

Traffic Impact Assessment

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1 INTRODUCTION

1.1 PURPOSE

Terrain Solar is proposing to develop a 150 megawatt (MW) solar farm on land approximately 23 kilometres (km) east of Goulburn NSW and 7 km west of the village of Marulan, referred to as the Marulan Solar Farm (MSF). The project is State Significant Development (SSD- 13137914).

As part of the consolidated agency advice issued for the project, a Traffic Impact Assessment (TIA) Report will be required to meet the Secretary's Environmental Assessment Requirements (SEARs). This Report addresses the requirements for traffic impact outlined in the SEARS issued on 19 February 2021.

This Traffic Impact Assessment assesses the potential traffic impacts of the proposed development and has been prepared in accordance with:

- *the Secretary's Environmental Assessment Requirements (SEARs) dated 19 February 2021; and*
- *The Roads and Traffic Authority (RTA), now Roads and Maritime Services (RMS) Guide to Traffic Generating Developments (2002), which is the relevant guidance for traffic impact assessments in NSW.*

Premise Australia Pty Ltd (Premise) has been engaged to provide a TIA for the proposed development to assess potential impacts associated with construction and operation of the proposed MSF.

The basis and scope of this Traffic Impact Assessment is detailed in **Section 1.4** of this report.

1.2 THE SITE

The site is located approximately 7 km west of the NSW town of Marulan, NSW on land at 740 Carrick Road (Lot 55 DP1141136). It is located within the Goulburn Mulwaree Local Government Area (LGA) and is zoned RU1 – Primary Production via the *Goulburn Mulwaree Local Environmental Plan (LEP) 2009*.

The site has an irregular shape with a total area of 1650 hectares and frontages as follows:

- Eastern frontages (adjoining land zoned for RU1- Primary Production): 2.76 kilometres
- Southern frontages (adjoining land zoned for RU2-Primary Production and E3-Environmental Management): 7.14 kilometres
- Western frontages (adjoining land zoned E3 Environmental management and to the north-west, Carrick Road): 2.45 kilometres
- Northern frontage (adjoining land zoned for primary production purposes, the Main Southern Railway and to the north-west Carrick Road): 7.26 kilometres.
- The site has a narrow, 27 metre-wide frontage to Munro Road to the south.

The site is currently accessed from Carrick Road via the landowners driveway and internal farm tracks and the indicative extent of the solar farm is approximately 375.5 ha.

A number of potential access routes have been considered for construction and operation purposes for the solar farm, including:

- Carrick Road, to the south of the intersection of Carrick Road and the Main Southern Railway Line;
- Rampion Hills Road;
- Munro Road;
- Brayton Road; and
- Jerrara Road.

The preferred and proposed access is via Munro Road in the south, which in turn links to the Hume Highway. The Hume Highway links Sydney in the north with Melbourne to the south.

The road network in the surrounding locality in depicted in **Figure 1**.

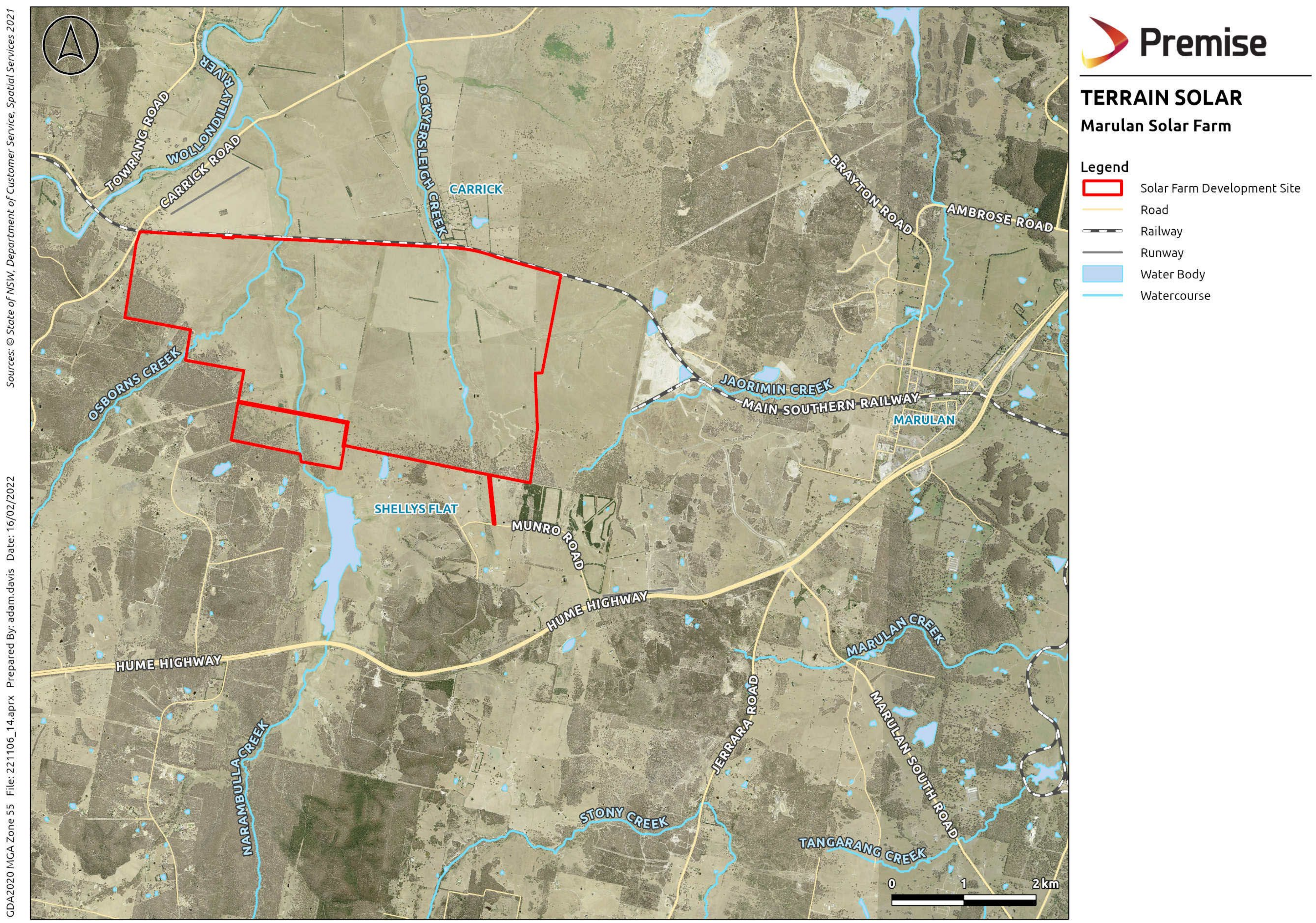
1.3 ACCESS

The site has a 27 metre-wide access corridor between 3 Graham Lane and Lot 54/DP1141136 linking to Munro Road. Munro Road is a local road with a speed limit of 100 kilometres per hour in both directions, connecting to the Hume Highway to the south. There is no existing driveway at the beginning of or within the access corridor. The construction of both a driveway crossover from Munro Road and driveway/access track within the access corridor will be necessary to enable vehicular access to the site. As Munro Road is a local road, Goulburn Mulwaree Council (GMC) is the roads authority and approval under Section 138 of the *Roads Act 1993* will be required from GMC for the opening of the new access.

However, it is acknowledged that the project will impact unconstructed Crown Roads in two areas. A small section of Crown Road is impacted by the internal access road and a longer section of Crown Road in the south-western extent of the site is impacted by proposed solar infrastructure construction. In both scenarios, these roads are unconstructed, are subject to a pending road closure request and purchase application by the land owner and are subject to a pending licence application to enable impacts whilst the road closure process progresses. Crown Lands landowner consent has been received for the lodgement of the development application.

At the Hume Highway/Munro Road intersection, an approximately 135 metre-long channelised left turn into Munro Road is provided for north/east-bound traffic from the Hume Highway and an approximately 155 metre-long channelised right turn into Munro Road is provided for south/west-bound traffic from the Hume Highway. Acceleration lanes for vehicles exiting Munro Road are not available in either direction, requiring vehicles exiting Munro Road to wait for adequate gaps in traffic along the Hume Highway to accelerate in the mainstream lanes to the 110 kilometre per hour speed limit applying in both directions.

Figure 1 – Development Site and Local Road Network



1.4 SCOPE

Schedule 3 of *State Environmental Planning Policy (Transport and Infrastructure) 2021* classifies developments based upon the potential to generate additional traffic onto the surrounding road network.

Developments listed in Schedule 3 of SEPP (Transport and Infrastructure) require referral to Transport for NSW (TfNSW) by the consent authority. The consent authority is required to take into consideration any submission that TfNSW provides in response to the notice of the development.

In addition, the consent authority must consider, pursuant to Clause 2.121 of SEPP (Transport and Infrastructure), the accessibility of the site and any potential traffic safety, road congestion or parking implications of the proposed development.

The road that will be used for access to the solar farm will be Munro Road.

The proposed access arrangements from Munro Road are situated greater than 90 metres from the Hume Highway (M31), therefore Column 2 of Schedule 3 of the ISEPP applies. However, the proposed development would not generate 200 or more motor vehicles per hour and less than 200 car parking spaces are proposed.

While the development is not classified as a traffic generating development via Schedule 3 of the ISEPP, this Traffic Impact Assessment Report has been prepared to examine potential traffic impacts of the project and to satisfy the Secretary's Environmental Assessment Requirements (SEARs).

The SEARs state the following with regards to Transport:

> *An assessment of the peak and average traffic generation including over-dimensional vehicles and construction worker transportation*
>
> *An assessment of the likely transport impacts to the site access route (Including Carrick Road, Rampion Hills Road, Munro Road, Brayton Road, Stoney Creek Road, Jerrara Road and Hume Highway, Site access point(s), any Crown land, particularly in relation to the capacity and condition of the roads, road safety and intersection performance*
>
> *A cumulative impact assessment of traffic from nearby developments; and*
>
> *Provide Details of measures to mitigate and/ or manage potential impacts including a schedule of all required road upgrades (Including resulting from heavy vehicle and over mass / over dimensional traffic haulage routes), road maintenance contributions, and any other traffic control measures developed in consultation with the relevant road authority.*

In accordance with provisions outlined in the SEARs, this Traffic Impact Assessment (TIA) Report has been prepared to address the following:

- Existing traffic and roadway conditions, including details of proposed access arrangements.
- Impact of construction activities, including proposed transport routes and access to and from the site.
- Impacts of proposed operating conditions, including impacts on the efficiency and safety of the surrounding road network.
- Mitigation measures to minimise impacts of the proposed development.

2 EXISTING TRAFFIC CONDITIONS

2.1 ROAD NETWORK HIERARCHY

The NSW Roads and Traffic Authority's (RTA) *Guide to Traffic Generating Developments* proposes four basic road classes as the basis for the functional hierarchy of a road network.

A functional classification considers the relative balance of the traffic mobility function and amenity/access functions of streets and roads and defines the purpose of a road within the context of a road network.

The four road classes are arterial, sub-arterial, collector and local roads and are defined in **Table 1**.

Table 1 – Road Classes and Functions

Road Class	Road Function
Arterial roads	Roads whose main function is to carry through traffic from one region to another forming the principal means of communication for major traffic movements.
Sub-Arterial roads	Those roads which supplement the arterial roads in providing for through traffic movement to an individually determined limit that is sensitive to both roadway characteristics and adjoining land uses.
Collector roads	Roads that distribute traffic between the arterial roads and the local street system and provide access to adjoining property.
Local roads	Subdivisional roads whose main traffic function is to provide access to adjoining property.

The main transport route and the supply of construction materials will be via the Hume Highway, however, an assessment of the classification of the roads leading to and surrounding the development site is provided in **Table 2**.

Table 2 – Existing Road Classification

Road	Classification
Carrick Road	Collector
Rampion Hills Road	Local
Munro Road	Local
Brayton Road	Collector Road
Stoney Creek Road	Local
Jerrara Road	Collector
Hume Highway	Arterial Road

2.2 EXISTING ROADWAY CONDITIONS

The existing roadway configuration, conditions and intersection facilities of the surrounding road network and transport routes to the site are outlined in the following sections of the report.

2.2.1 Carrick Road

Carrick Road is a local collector road that extends northeast from a connection with the Hume Highway to Brayton Road.

Carrick Road is a two-way rural road with a carriageway that varies along its length. Portions of the roadway near the Hume Highway and Brayton Road are bitumen sealed, with double centrelines and edge line markings. The majority of the roadway, however, is unmarked and features several segments of dirt road.

Carrick Road is speed limited at 100 km/hr

The roadway crosses the Main Southern Railway Line as it passes the north-western corner of the development. The railway crossing features road markings, cattle guards and has flashing lights signal and boom gate control.

Give way signage is provided at intersections to the south and north providing right of way for vehicles travelling along the Hume Highway and Brayton Road respectively.

Signage is provided at intersections with Hume Highway and Brayton Road to ensure that divers are aware of school bus operation.

2.2.2 Rampion Hills Road

Rampion Hills Road is a local road that extends north from a connection with the Hume Highway providing access to Narambulla Lake Road and several private roadways/tracks associated with properties to the south- and west of the development

Rampion Hills is a two-way bitumen sealed rural roadway situated to the west of Narambulla Creek. The majority of the roadway is unmarked, with the exception of a portion to the south at the intersection with the Hume Highway with double centreline and edge line markings. The roadway terminates with a cul-de-sac, surrounded by gated access for nearby properties, approximately 2.6km north of an intersection with the Hume Highway.

Rampion Hills Road is speed limited at 100 km/hr.

A left-hand turning lane for vehicles travelling east along the Hume Highway assists access to Rampion Hills Road. Give way signage providing right of way for vehicles travelling along the Hume Highway is situated at the southern end of Rampion Hills Road.

Rampion Hills Road is situated opposite of a median opening along the Hume Highway. The median opening provides access to Rampion Hills Road for vehicles travelling west along the Hume Highway. Give way Signage is provided as appropriate providing right of way for vehicles travelling east and west along the Hume Highway.

2.2.3 Munro Road

Munro Road is a local road that extends north from a connection with the Hume Highway providing access to Graham Lane and several private roadways/tracks associated with properties to the south-of the development

Munro Road is a two-way bitumen sealed rural roadway situated to the east of Narambulla Creek. The majority of the roadway is unmarked, with the exception of a portion to the south at the intersection with the

Hume Highway with double centreline and edge line markings. The roadway terminates at an intersection with Graham Lane, approximately 2.1km north-west of an intersection with the Hume Highway.

Munro Road is speed limited at 100 km/hr.

A left-hand turning lane for vehicles travelling east along the Hume Highway assists access to Munro Road. Give way signage providing right of way for vehicles travelling along the Hume Highway is situated at the southern end of Munro Road

Munro Road is situated opposite of a median opening along the Hume Highway. The median opening provides access to Munro Road for vehicles travelling west along the Hume Highway. Give Way signage providing right of way for vehicles traveling east along the Hume Highway is provided.

2.2.4 Brayton Road

Brayton Road is a collector roadway that extends west from a connection with the Hume Highway. It travels through town of Marulan passing an intersection with Stoney Creek Road and Maclura Drive before extending northwards towards Brayton. The roadway continues after Brayton crossing the Tarlo River before terminating in the locality of Bannaby, approximately 29.5 km north of Marulan, at an intersection with Bannaby Road and Hanworth Road.

Brayton Road is a two-way bitumen sealed rural roadway. The majority of the roadway is unmarked with single and double centre lines provided as appropriate where sight distance is limited and at intersections with surrounding roadways. The roadway passes a number of residential dwellings and commercial businesses situated in the township of Marulan and crosses a number of watercourses as it extends north towards Bannaby including: Jaormin Creek, The Wollondilly River, Junction Creek and The Tarlo River.

The eastern portion of Brayton Road connects to roadways that merge onto the Hume Highway. A single lane roadway extends north, merging onto the Hume Highway (northbound). A two-way, two-lane underpass extends eastwards, connecting southbound traffic to Marulan and merging onto the Hume Highway (southbound).

Brayton Road is speed limited at 50 km/hr as it extends west and north through Marulan. North of Jaormin Creek Brayton Road is speed limited at 100km/hr

Give way signage providing right of way to vehicles travelling along George Street is situated towards the eastern end of Brayton Road.

Give way signage is additionally provided towards the west at the intersection with Maclura Drive and Stoney Creek Road, providing right of way for vehicles travelling north along Stoney Creek Road and Brayton Road.

2.2.5 Stoney Creek Road

Stoney Creek Road is a local road that extends south from a connection with Maclura Drive and Brayton Road before travelling west across, Jaormin Creek, towards the eastern boundary of the development site. The roadway connects to several private roadways and tracks associated with Holcim Lynwood Quarry.

Stoney Creek Road is a two-way bitumen sealed unmarked rural roadway. The roadway terminates approximately 3.2 km west of an intersection with Brayton Road within the Holcim Lynwood Quarry, north of the Main Southern Railway Line. A gate preventing unauthorised access is provided approximately1 km south-west of this intersection.

Stoney Creek Road is speed limited at 50 km/hr

2.2.6 Jerrara Road

Jerrara Road is a local collector road that extends south from a roundabout connection with Marulan South Road and Hume Highway Overpass to connect to Mountain Ash Road the township of Bungonia approximately 14.27 km to the south. The roadway is situated to the south-west of Marulan and south-east of the development site.

Jerrara Road is a two-way, two-lane bitumen sealed rural roadway with a 3.5m wide carriageway in each direction. The roadway is centreline and edge line marked with variable width bitumen sealed shoulders. Single and double centre lines are provided as appropriate where sight distance is limited due to variations in the lateral and vertical alignment of the road.

The northern portion of Jerrara Road provides a roadway that merges onto the Hume Highway. This single lane is situated 60m south-west of a connection with Marulan South Road and extends for approximately 600m before merging onto the Hume Highway (westbound).

Concrete causeways are provided where the roadway crosses Stony Creek, Sawyers Creek, an unnamed 3rd Strahler order tributary of Jerrara Creek and Spring Ponds Creek.

A bridge is provided over Jerrara Creek.

Jerrara Road is speed limited at 80 km/hr

2.2.7 Hume Highway

The Hume Highway is a Classified Arterial State Road (M31) that extends north towards Sydney and south to the Victorian Border near Albury and on to Melbourne. It is situated to the south of the Development Site and runs between Goulburn and Marulan.

The roadway is a two-way, four lane bitumen sealed road with 2 lanes in each direction. The roadway possesses a vegetated median strip separating traffic traveling in different directions and is edge line marked with variable width shoulders. Median openings, turning lanes and exits are provided as appropriate to enable access to surrounding roadways

The Hume Highway is speed Limited at 110 km/hr

2.2.8 Intersection the Hume Highway and Munro Road

The Hume Highway and Munro Road intersection has an approximately 135 metre-long deceleration channelised left turn into Munro Road provided for north/east-bound traffic from the Hume Highway and an approximately 155 metre-long channelised right turn into Munro Road is provided for south/west-bound traffic from the Hume Highway. Acceleration lanes for vehicles exiting Munro Road are not available in either direction, requiring vehicles exiting Munro Road to wait for adequate gaps in traffic along the Hume Highway to accelerate in the mainstream lanes to the 110 kilometre per hour speed limit applying in both directions.

Access onto the Hume Highway from Munro Road is controlled by Give Way signs.

2.2.9 Intersection of Munro Road and Graham Lane

The intersection of Munro Road and Graham Lane is a standard T-Intersection with the Graham Lane traffic having the priority.

2.2.10 Intersection Of Jerrara Road And Marulan South Road

The intersection of Jerrara Road and Marulan South Road forms a four way roundabout as part of a grade separated intersection with the Hume Highway.

2.2.11 Intersection Of The Hume Highway And Carrick Road

The intersection of the Hume Highway and Carrick Road forms a major channelised intersection with a protected deceleration and right turn lane and a deceleration and left turn lane into Carrick Road. The intersection also incorporates a seagull island for right turning vehicles from Carrick Road onto the Hume Highway.

Photographs of the various roads and intersections described in the previous Sections are included in the **Plates** Section of this Report.

2.3 EXISTING ROADWAY CAPACITY

The provision of roads within an urban area provides four main functions:

- to cater for moving vehicles;
- to cater for parked vehicles;
- to cater for pedestrians and bicycle traffic; and
- to allow for development and to provide access to adjoining property.

In carrying out the above functions, a road must also be capable of handling the traffic demands placed on it. Roads have varying capacities dependent on the function they are performing. *AUSTROADS Guide to Traffic Engineering Practice* defines capacity as follows:

> *"Capacity is the maximum number of vehicles which has a reasonable expectation of passing over a given section of a lane or roadway in one direction (or in both directions for a two-lane or three- lane highway) during a given time period under prevailing roadway and traffic conditions."*

The physical characteristics of a roadway such as lane width, alignment and frequency of intersections make up the prevailing roadway conditions.

The road's capacity and a driver's expectations of the operational characteristics of a traffic stream defines a qualitative measure denoted as the Level of Service (LOS) of a road.

Level of service definitions combine such factors as speed, travel time, safety, convenience and traffic interruptions and fall into six levels of service categories ranging from A down to F.

The categories are graduated from Level of Service A down through six levels to Level of Service F that is a zone of forced flow.

Based on the physical configurations of the surrounding road network, observations of traffic movements and the methodology outlined in Part 2 *Roadway Capacity of AUSTROADS Guide to Traffic Engineering Practice*, the capacity and LOS of the surrounding roads can be determined, as outlined in **Table 3**.

Table 3 – Roadway Capacity and Level of Service

Road	Level of Service	Two way hourly capacity (vehicles per hour)
Carrick Road	Level of Service B	600 vph
Rampion Hills Road	Level of Service B	600 vph
Munro Road	Level of Service B	600 vph
Brayton Road	Level of Service B	1200 vph

Road	Level of Service	Two way hourly capacity (vehicles per hour)
Stoney Creek Road	Level of Service B	600 vph
Jerrara Road	Level of Service B	1200 vph
Hume Highway	Level of Service B	3600 vph

The AUSTROADS *Guide to Traffic Engineering Practice* describes Level of Service B as:

> *"A condition of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is a little less than with Level of Service A"*

2.4 EXISTING TRAFFIC VOLUMES

2.4.1 Traffic volume and count data

Traffic Volume Data was obtained from the TfNSW Traffic Volume Viewer for the Hume Highway, from historical records collected by Goulburn Mulwaree Council and, in the case of Munro Road, from analysis of predicted movements/day based on the number of properties along the property with a dwelling entitlement.

TfNSW Traffic Volume Data identifies the number, direction and a general percentage indication of passenger and heavy vehicles.

Traffic Count data provided by Goulburn Mulwaree Council identifies the number, class and speed of vehicles travelling on the surrounding network.

Recorded traffic data is available for the following Roads and Periods:

- Hume Highway 650m east of George Street (Station Id: T0274-PR), TfNSW Traffic Volume Viewer, 2021
- Jerrara Road, 14km south from Marulan South Road, 2019
- Jerrara Road, 380m south of Marulan South Road, 2019
- Jerrara Road, 300m south of Marulan South Road, 2021
- Jerra Road, 300m north of Mountain Ash Road, 2021
- Carrick Road, 150m from the Hume Highway, 2017
- Carrick Road, 100 south of Brayton Road intersection 2017
- Brayton Road 4km west of George Street, 2019

The Traffic volume data provided by Goulburn Mulwaree Council is attached in **Appendix A** of this Report.

Analysis of the traffic data can determine parameters such Average Annual Daily Traffic (AADT), peak hour traffic by volume and time occurrence and vehicle speed statistics.

As no specific provisions for calculating traffic volumes are made within the *Goulburn Mulwaree Council DCP* 2009, data for the remaining roads have been determined by reference to *RTA's Guide to Traffic Generating Development* (2002), surrounding major projects and existing developments situated along the roadways.

Calculations for remaining roadways are outlined in **Table 4** rely on the assumption of:

- 9 Trips per day and 0.85 Weekday Peak Hour Vehicle Trips for dwellings (RTA 2002).
- A restriction of 5 truck trips per hour and 50 truck movements per day entering and exiting Marulan Quarry (Marulan Quarry SEARS, Transport for NSW, Attachment 2, April 2020)

- 34 truckloads (68 vehicle movements) on an average week day, and up to 58 truckloads (116 vehicle movements) on a worst case day along Marulan South Road for Marulan South limestone Mine. This equates to 3 one-way trips in an average hour on an average day and up to five one-way trips in a worst-case hour on a worst case day. (Marulan South limestone Mine Continued Operations, Environmental Impact Statement, Boral Cement Limited, March 2019,).
- 400 light vehicles and 75 heavy vehicle movements per day during peak construction and 10 additional light vehicle movements per day during operation for a State Significant Solar Farm of similar scale. (Springdale Solar Farm (100MW) Environmental Impact Statement, AECOM 29 June 2018)

Table 4 – Calculated Traffic Movements

Road	Developments	Daily Vehicle Trips (RTA 2002)	Weekday Peak Hour Vehicle Trips	Total Daily Vehicle Trips / Traffic Movements	Total Weekday Peak Hour Vehicle Trips
Rampion Hills Road	9 Dwellings	9 trips per day	0.85 per dwelling	81	7.65
Munro Road (including 3 dwellings from Graham Lane)	6 Dwellings	9 trips per day	0.85 per dwelling	54	5.1
Stoney Creek Road	27 Dwellings	9 trips per day	0.85 per dwelling	243	22.95

2.4.2 Average Daily Traffic

Average Daily Traffic (ADT) is defined as the average number of vehicles that travel through a specific point of a road over a short duration time period. Estimates of ADT are calculated by dividing the total daily volumes during a specified time period by the number of days in the period.

Estimates of ADT on the surrounding road network, collected by Goulburn Mulwaree Council, are summarised in **Table 5**.

Total Vehicles (per day) was calculated by dividing Total vehicles by the record period (hours) and multiplying by 24 to convert to a daily measurement.

Table 5 – ADT on Surrounding Road Network

Road	Record Year	Record Period	Total Vehicles	ADT	Heavy vehicles class 3-12 (%)
Jerrara Road (14km south from Marulan South Road)	2019	14:08 20/09/2019 to, 9:37 10/10/2019	13438	672	17.7
Jerrara Road (380m south from Marulan South Road)	2019	14:27 20/09/2019 to, 10:14 10/10/2019	20214	1011	16.5
Jerrara Road (300m south from Marulan Road)	2021	14:37 21/07/21 to, 15:20 04/08/21	9607	686	22.3

Road	Record Year	Record Period	Total Vehicles	ADT	Heavy vehicles class 3-12 (%)
Jerrara Road (300m north of Mountain Ash Road)	2021	15:17 21/07/21 to,15:01 04/08/21	5138	367	26.2
Carrick Road (150m from the Hume Highway)	2017	16:10 24/08/17 to, 12/09/17	4015	217	20.3
Carrick Road (100m south of Brayton Road intersection)	2017	16:45 24/08/17 to, 12/09/17	1519	82	19.6
Brayton Road (4km west of George St)	2019	11:12 16/09/2019 to, 11:38 30/09/2019	8762	626	36.5

2.4.3 Average Annual Daily Traffic

Annual Average Daily Traffic (AADT) is defined as the total volume of traffic passing a roadside observation point over a period of a year divided by the number of days in the year.

TfNSW has a traffic recording station located on the M31 Hume Highway, 650m East of George Street in Marulan (T0274-PR). In 2022 there were 20,727 vehicles movements recorded in which 10.0% were heavy vehicles.

AADT directional traffic data collected by TfNSW for the Hume Highway is summarised in **Table 6** below.

Table 6 – Hume Highway M31 AADT

Road/Direction	Recorded Year	Vehicles per day	Heavy vehicles class 3-12 (%)
Hume Highway-(Northbound)	2022	10,472	10.03
Hume Highway-(Southbound)	2022	10,255	10.00

2.4.4 Peak hour traffic volumes

Various data (including Peak Hour Traffic Volumes) available from the RMS recording station T0274-PR for 2022 is summarised in **Table 7** below.

Table 7 – Hume Highway M31 (T0274-PR) Traffic Volume Data (2022)

Road/Direction	Timeframe	Light vehicles	Heavy Vehicles	Total Vehicles (per day)	Peak Volumes (per hour)
Hume Highway (Northbound)	All Days	9,422	1,050	10,472	
	Weekdays	7,810	1,073	8,883	
	Weekends	11,965	1,066	13,031	
	Nominal AM Peak	1,162	236	--	1,398
	Nominal PM Peak	2,580	304	--	2,884

Road/Direction	Timeframe	Light vehicles	Heavy Vehicles	Total Vehicles (per day)	Peak Volumes (per hour)
Hume Highway (Southbound)	All Days	9,230	1,025	10,255	
	Weekdays	8,246	1,086	9,332	
	Weekends	10,981	884	11,865	
	Nominal AM Peak	1,978	349	--	2,237
	Nominal PM Peak	2,043	209	--	2,252

The traffic counts collected by Goulburn-Mulwaree Council provides information on the traffic volumes and vehicle classifications on the subject roads as outlined in **Table 5**.

The ADT data determined can be used to estimate the peak hour traffic data. An accepted TfNSW practice is to estimate the peak hour traffic volume as 15% of the AADT or ADT traffic volume on a given road. As the traffic data was collected at different times, the available traffic data will be extrapolated to estimate the Year 2022 traffic data by the application of a growth factor to take into account the natural growth in traffic that occurs over time on roads. The natural growth factor will be assumed to inflate traffic volumes on the roads by 1%.

An assessment of council recorded ADT on the subject roads and the corresponding estimates of 2022 peak hour volumes are summarised in **Table 8** below.

Table 8 – Estimated 2022 Peak Hour Traffic Volumes

Road	ADT (Year Recorded)	2022 Peak volume (Vehicles per hour)
Jerrara Road (14km south from Marulan South Road)	672 (2019)	104 vph
Jerrara Road (380m south from Marulan South Road)	1011 (2019)	156 vph
Jerrara Road (300m south from Marulan Road)	686 (2021)	104 vph
Jerrara Road (300m north of Mountain Ash Road)	367 (2021)	56 vph
Carrick Road (150m from the Hume Highway)	217 (2017)	34 vph
Carrick Road (100m south of Brayton Road intersection)	82 (2017)	13 vph
Brayton Road (4km west of George St)	626 (2019)	97 vph

3 TRAFFIC IMPACT ASSESSMENT

3.1 PROPOSED DEVELOPMENT

The following Section outlines the operating conditions proposed via the development as they relate to vehicle movements. The anticipated construction period for the solar farm is approximately 18 months or approximately 72 weeks.

3.1.1 Haulage routes

Solar panels and specialist electrical equipment (i.e., inverters, substation etc) are expected to arrive in the Port Botany and be transported to the site by road transport along the Hume Highway. Heavy vehicles will only be permitted to turn left from the Hume Highway into Munro Road to access the solar farm site and then turn left from Munro Road onto the Hume Highway on departure from the development site.

The haulage route from Sydney to the Marulan Solar Farm is indicated on **Drawing TS01** and **TS02** in the Drawings Section of this Report.

3.1.2 Vehicle movements

Section 3 of RTA's *Guide to Traffic Generating Development* (2002) sets out calculations of Traffic Generation relating to proposed land use.

Traffic Generated by the proposed development is anticipated to be restricted to the construction phase of the project with additional movements generated by material deliveries, trade persons and staff.

The level of traffic generated during the future operational phase of the project is expected to be minimal, restricted to occasional site maintenance activities.

Although the proposed development is not classified as traffic generating works via Schedule 3 of the ISEPP, anticipated heavy vehicle movements have been calculated from information provided by the proponent.

It should be noted that a single vehicle arriving and departing the site is considered as two separate vehicle trips.

Information provided by the proponent has estimated that there will be approximately 2,162 heavy vehicle trips during the construction phase of the development for deliveries/site operations such as:

- The 132kV switching station
- Sub Station
- Electricity transmission lines/cables
- Solar Arrays

The proponent has also provided details for the expected delivery to site of the approximately 360,000 solar panels required for the project. Based on using semitrailers with a loading of capacity of 420 panels per truck, approximately 857 truck deliveries will be required, equating to 1,714 trips.

If B-Doubles are used with a loading capacity of 700 panels per truck, then approximately 514 truck deliveries will be required, equating to 1,028 trips.

In addition, there will be approximately 400 containers of panel related materials delivered to site for racking, posts, steel etc for the installation of the solar panels. This will generate an additional 800 trips using semitrailers for delivery.

Therefore, the total heavy vehicle trips generated by the construction of the solar farm is:

2,162 trips + 1,714 trips + 800 trips = 4,676 heavy vehicle trips

Approximately 300 staff will be required to construct the solar farm. It is expected that staff will be transported to and from site either in private or fleet passenger vehicles and by shuttle buses.

For the proportional split between transport modes, it will be assumed that 100 staff arrive/depart in light passenger vehicles with 2 people per each vehicle. This will generate 100 trips per day or approximately 36,000 trips over the construction period of the solar farm.

The remaining 200 staff will arrive/depart on shuttle buses with an average of 20 passengers per shuttle bus. The shuttle buses will deliver workers to site and then leave and return to collect workers at the end of the day. Therefore, the operation of the shuttle buses will generate 40 trips per day or approximately 14,400 trips over the construction period of the solar farm.

Based on the delivery of the solar panels to site using semitrailers, the estimated vehicle movements generated by the proposed development are outlined in **Table 9.**

Table 9 – Estimated Total Traffic Generation

Phase	Component	Anticipated Vehicle Trips
Construction	Heavy Vehicles (Materials Delivery)	2,162
	Heavy Vehicles (Solar Panel Delivery)	1,714
	Heavy Vehicles (Containers)	800
	Light Vehicles (Staff)	36,000
	Shuttle Buses (Staff)	14,400
	Total	**55,076 trips**
Operation	Light Vehicles (Staff)	10
	Total	**10**

Whilst the transport of staff to and from the solar farm development during the 18 month construction period accounts for approximately 92% of the total trips, the heavy vehicle movements totalling 4,676 trips are likely to have the greater impact on the surrounding road network.

3.1.3 Construction scheduling

The anticipated scheduling of the construction of the solar farm over the 18 month period with the associated heavy vehicle trips is set out in **Table 10**.

Table 10 – Estimated Construction Scheduling Heavy Vehicle Trips

Construction Timeframe	Site Activities	Heavy Vehicle Trips
Month 1	Site Establishment	200
Month 2 to Month 4	Site Clearing Bulk Earthworks	440
Month 5 to Month 8	Bulk Earthworks Solar Farm Grid Connection	1,480
Month 9 to Month 12	Solar Farm Grid Connection Infrastructure Installation	802
Month 13 to Month 15	Infrastructure Installation Panel Installation	1,714
Month 16 to Month 18	Commissioning Demobilisation	40
Total Heavy Vehicle Trips		**4,676 trips**

3.1.4 Distribution of traffic movements

Anticipated work hours during the construction phase of the project are expected to be restricted between 7:00am to 6:00pm Monday to Friday, and 8:00am to 1:00pm on Saturdays. No construction work is anticipated to occur on Sunday. With the exception of emergencies, any work required outside of this timeframe will be subject to approval from relevant authorities.

The distribution of the traffic generation has been determined on the assumption that vehicle movements along the Hume Highway (predominantly heavy vehicle movements) will approach from the north ie. travelling southbound on the Hume Highway and continue on to Goulburn. At the major roundabout entry to Goulburn, heavy vehicles will then return northbound on the Hume Highway allowing a left turn into Munro Road from the deceleration/left turn lane and then accessing the solar farm site.

Departing vehicles will also turn left from Munro Road onto the Hume Highway to continue travelling northbound.

The haulage route is indicated on **Drawing TS01** and **TS02** in the Drawings Section of this Report.

3.1.5 Cumulative Traffic Impacts

A number of other approved developments are located on roads off the Hume Highway including:

- Marulan South Limestone Quarry and Peppertree Quarry both located off Marulan South Road;
- Gunlake Quarry located off Brayton Road;
- Holcim Lynwood Quarry located off Stoney Creek Road; and
- Marulan Quarry located off Winfarthing Road.

All of the existing developments access the Hume Highway at intersection locations east and to the west of Munro Road. The access to the Marulan Solar Farm off Munro Road is independent and does not impact on the operations of the other developments.

Recent traffic counts available for the Hume Highway would include traffic generated by the existing developments and therefore there are no cumulative impacts from traffic generated by the construction of the solar farm.

3.2 IMPACT OF THE GENERATED TRAFFIC

3.2.1 Traffic generation

Based on the estimated total traffic generation for the solar farm outlined in **Table 9** and the construction scheduling for heavy vehicles outlined in **Table 10**, estimates of the average and peak vehicle trip generation have been assessed and are summarised in **Table 11**.

Table 11 – Estimates of Average and Peak Vehicle Trip Generation

Vehicle Type	Average Vehicle Trips		Peak Vehicle Trips	
	Daily (vpd)	Peak Hour (vph)	Daily (vpd)	Peak Hour (vph)
Light Passenger Vehicle (car/SUV)	100	20	160	35
Worker Shuttle Buses	40	5	50	8
Heavy Vehicles	13	6	28	12
Totals	**153**	**31**	**238**	**55**

3.2.2 Traffic volume on the Hume Highway

A comparison can be made between the current daily and peak hour traffic volumes on the Hume Highway and the proposed peak vehicle trip generation from the construction of the solar farm indicated in **Table 11.**

The construction traffic volumes distributed to the Hume Highway relies on the following assumptions:

- Heavy Vehicles delivering materials and supplies to the site would be travelling southbound along the Hume Highway to Goulburn and then northbound to turn left only into Munro Road.
- Heavy Vehicles departing the site would turn left from Munro Road and would be travelling northbound along the Hume Highway
- Light Vehicle movements for workers and staff attending site would predominately travel from Goulburn and be northbound along the Hume Highway and then turn left into Munro Road.
- Light Vehicle movements departing the site would turn left from Munro Road onto the Hume Highway, travel northbound to Marulan to turn around then then return to Goulburn.

A summary of the peak daily and peak hour vehicle trips generated by the construction of the solar farm and distributed northbound and southbound on the Hume Highway in accordance with the travel criteria outlined is presented in **Table 12**.

Table 12 – Peak Vehicle Trips Generated During Construction

Road		Light Vehicles		Heavy Vehicles		All Vehicles	
		Peak Daily	Peak Hour	Peak Daily	Peak Hour	Peak Daily	Peak Hour
Hume Highway (Northbound)	Generated Trips	210	44	28	12	238	56
Hume Highway (Southbound)	Generated Trips	105	22	28	12	133	34

A comparison of the existing 2022 AADT and peak hour traffic volumes on the Hume Highway with the maximum net increase in trips generated by the proposed development is provided in **Table 13**. It should be noted that the peak hour trips from **Table 12** are distributed to both the AM and PM existing traffic volumes on the Hume Highway to determine which peak hour has the greatest potential impact.

Table 13 – Comparison of Hume Highway Traffic Volumes and Net Increase in Trips During Construction

Road		Exiting Traffic Volume	Traffic Volume Generated	Construction Phase Traffic Volume	Net increase %
Hume Highway (Northbound)	AADT	10,472 veh/day	238 veh/day	10,710 veh/day	2.27%
	AM peak	1,398 veh/hour	56 veh/hour	1,454 veh/hour	4.00%
	PM peak	2,884 veh/hour	56 veh/hour	2,940 veh/hour	1.94%
Hume Highway (Southbound)	AADT	10,255 veh/day	133 veh/day	10,388 veh/day	1.29%
	AM peak	2,237 veh/hour	34 veh/hour	2,271 veh/hour	1.52%
	PM peak	2,252 veh/hour	34 veh/hour	2,286 veh/hour	1.51%

The construction of the solar farm would result in a percentage increase in traffic volumes on the Hume Highway ranging from 1.51% (PM Peak on the Hume Highway southbound) to 4.00% (AM Peak on the Hume Highway northbound).

The percentage increases in traffic volume for AADT and peak hour on the Hume Highway are not significant.

The increase in daily traffic volume and peak hour volume generated by the construction of the solar farm would be easily absorbed into the surrounding road network with minimal impact on the capacity of the existing traffic streams using the road system.

3.2.3 Traffic volume on Munro Road

The existing ADT on Munro Road is estimated as 54 vpd and the peak hour volume is estimated as 5 vph.

The heavy vehicle and light vehicle construction traffic will access the development site via Munro Road.

Based on the information presented in **Table 11**, the peak daily trip generation is 238 trips per day and the peak hourly trip generation is 55 trips per hour.

The percentage increases for the peak daily and peak hour trips are set out below:

Daily Vehicle Trip Increase: 238 trips/54 trips x 100 = 440.7%

Peak Hour Trip Increase: 55 trips/5 trips x 100 = 1,100.0%

Whilst the percentage increase in trip generation compared to existing traffic volumes appear very significant, there are two (2) factors to account for this:

1. The extremely low traffic volumes currently using Munro Road; and

2. The Operational Capacity of the roadway to cater for vehicles using the roadway during the construction phase.

The Operational Capacity is the percentage of actual volume capacity that the road is functioning at.

Based on the roadway capacities determined in **Section 2.3** of this Report, a comparison of the construction phase peak hour traffic volume and the actual road capacity for Munro Road is indicated below:

Construction Phase peak hour trips:	5 + 55 =	60 trips per hour
Capacity of Munro Road at a Level of Service B:		600 vehicles per hour
Operational Capacity of Munro Road:		10%

Munro Road is operating at just 10% of its Operational Capacity at a Level of Service B and the impact of the additional traffic generated by the construction of the solar farm is not significant in terms of the volume of construction phase traffic using Munro Road.

However, the generation of 4,676 heavy vehicle trips onto Munro Road during the construction phase of the solar farm will require works to be carried out to improve the width of the roadway to accommodate the simultaneous operation (passing) of heavy vehicles along the roadway.

Details of the proposed works on Munro Road are outlined in **Section 3.6**.

3.3 HUME HIGHWAY INTERSECTION ASSESSMENT

The intersection of the Hume Highway and Munro Road will be assessed using the SIDRA computer modelling software.

The results of the SIDRA modelling to be carried out will assess the operational characteristics of the intersection for each turning movement such as:

- Delay
- Level of Service
- Queue Length
- Degree of Saturation

<u>Pre Development AM Peak Hour Intersection Operation</u>

The Pre Development AM Peak Hour operation of the intersection of the Hume Highway and Munro Road has been carried out and a summary of the SIDRA modelling for the operation of the intersection is indicated in **Table 14**. The SIDRA modelling results for the assessment of the intersection are included in **Appendix B**.

It should be noted that the eastbound and southbound descriptors are only for modelling purposes and don’t correlate to actual directions on the subject roads.

Table 14 – Pre Development AM Hume Highway and Munro Road Intersection Operating Parameters

Scenario	Vehicles on Movement	Average Delay (seconds)	95% Queue Length (metres)	Overall Level of Service (LOS)
Pre Development AM Peak Hour				
Hume Highway Eastbound				
Left Turn into Munro Road	3	8.2	0.0	LOS A
Straight through Eastbound	1398	0.1	0.0	LOS A
Munro Road Southbound				
Left Turn onto the Hume Highway	3	11.3	0.0	LOS B

The Pre Development AM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.0 for Munro Road southbound and 0.39 for the Hume Highway east bound and therefore the Degree of Saturation for the overall operation of the intersection is 0.39.

Pre Development PM Peak Hour Intersection Operation

The Pre Development PM Peak Hour operation of the intersection of the Hume Highway and Munro Road has been carried out and a summary of the SIDRA modelling for the operation of the intersection is indicated in **Table 15**. The SIDRA modelling results for the assessment of the intersection are included in **Appendix B**.

Table 15 – Pre Development PM Hume Highway and Munro Road Intersection Operating Parameters

Scenario	Vehicles on Movement	Average Delay (seconds)	95% Queue Length (metres)	Overall Level of Service (LOS)
Pre Development PM Peak Hour				
Hume Highway Eastbound				
Left Turn into Munro Road	3	8.2	0.0	LOS A
Straight through Eastbound	2884	0.3	0.0	LOS A
Munro Road Southbound				
Left Turn onto the Hume Highway	3	38.9	1.0	LOS E

The Pre Development PM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.03 for Munro Road southbound and 0.78 for the Hume Highway east bound and therefore the Degree of Saturation for the overall operation of the intersection is 0.78.

Construction Phase AM Peak Hour Intersection Operation

The Construction Phase AM Peak Hour operation of the intersection of the Hume Highway and Munro Road has been carried out and a summary of the SIDRA modelling for the operation of the intersection is indicated in **Table 16**.

The SIDRA modelling results for the assessment of the intersection are included in **Appendix C**.

Table 16 – Construction Phase AM Hume Highway and Munro Road Intersection Operating Parameters

Scenario	Vehicles on Movement	Average Delay (seconds)	95% Queue Length (metres)	Overall Level of Service (LOS)
Construction Phase AM Peak Hour				
Hume Highway Eastbound				
Left Turn into Munro Road	32	8.3	0.0	LOS A
Straight through Eastbound	1398	0.1	0.0	LOS A
Munro Road Southbound				
Left Turn onto the Hume Highway	17	12.8	1.0	LOS B

The Construction Phase AM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.03 for Munro Road southbound and 0.39 for the Hume Highway east bound and therefore the Degree of Saturation for the overall operation of the intersection is 0.39.

A comparison of the Pre Development AM Peak Hour intersection operation (Table 14) and the Construction Phase AM Peak Hour operation (Table 16) indicates that there is very little change in the operational parameters of the intersection. For the left turn from Munro Road onto the Hume Highway, the Average Delay increases from 11.3 seconds to 12.8 seconds whilst the Level of Service remains the same at LOS B.

Construction Phase PM Peak Hour Intersection Operation

The Construction Phase PM Peak Hour operation of the intersection of the Hume Highway and Munro Road has been carried out and a summary of the SIDRA modelling for the operation of the intersection is indicated in **Table 17**. The SIDRA modelling results for the assessment of the intersection are included in **Appendix C**.

Table 17 – Construction Phase PM Hume Highway and Munro Road Intersection Operating Parameters

Scenario	Vehicles on Movement	Average Delay (seconds)	95% Queue Length (metres)	Overall Level of Service (LOS)
Construction Phase PM Peak Hour				
Hume Highway Eastbound				
Left Turn into Munro Road	17	8.3	0.0	LOS A
Straight through Eastbound	2884	0.3	0.0	LOS A
Munro Road Southbound				
Left Turn onto the Hume Highway	32	62.5	9.0	LOS F

The Construction Phase PM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.39 for Munro Road southbound and 0.78 for the Hume Highway east bound and therefore the Degree of Saturation for the overall operation of the intersection is 0.78.

A comparison of the Pre Development PM Peak Hour intersection operation (Table 15) and the Construction Phase PM Peak Hour operation (Table 17) indicates that there is significant change in the operational parameters of the intersection. For the left turn from Munro Road onto the Hume Highway, the Average

Delay increases from 38.9 seconds to 52.5 seconds whilst the Level of Service has changed from LOS E to a LOS F.

The cause of change in the operational parameters of the intersection is the volume of through traffic on the Hume Highway limiting the left turn opportunities from Munro Road onto the Hume Highway.

Construction Phase Operation of the Intersection with Heavy Vehicles Only

In order to mitigate the operation of the intersection for traffic generated by the construction of the solar farm, the operation of the intersection of the Hume Highway and Munro Road has been carried out for the operation of heavy vehicles only on Munro Road and off peak to the PM Peak Hour traffic volume on the Hume Highway. A summary of the SIDRA modelling for the operation of the intersection is indicated in **Table 18**.

The SIDRA modelling results for the assessment of the intersection are included in **Appendix C**.

Table 18 – Construction Phase Peak Hour Heavy Vehicles only Hume Highway and Munro Road Intersection Operating Parameters

Scenario	Vehicles on Movement	Average Delay (seconds)	95% Queue Length (metres)	Overall Level of Service (LOS)
Construction Phase Peak Hour Heavy Vehicles Only				
Hume Highway Eastbound				
Left Turn into Munro Road	9	8.2	0.0	LOS A
Straight through Eastbound	1398	0.1	0.0	LOS A
Munro Road Southbound				
Left Turn onto the Hume Highway	9	33.4	4.0	LOS D

The Construction Phase Peak Hour with Heavy Vehicles Only Degree of Saturation for each leg of the intersection ranges from 0.07 for Munro Road southbound and 0.39 for the Hume Highway east bound and therefore the Degree of Saturation for the overall operation of the intersection is 0.39.

A comparison of the Pre Development PM Peak Hour intersection operation (Table 15) and the Construction Phase Peak Hour with Heavy Vehicles only operation (Table 18) indicates that there is an improvement in the operational parameters of the intersection. For the left turn from Munro Road onto the Hume Highway, the Average Delay decreases from 38.9 seconds to 33.4 seconds whilst the Level of Service has changed from LOS E to a LOS D.

On this basis, the scheduling for the arrival, and more importantly, the departure of heavy vehicles from the development site should generally occur as far as practical off peak to the PM Peak Hour on the Hume Highway.

3.3.1 Hume Highway Turn Warrant Assessment

A turn warrant assessment has been carried out for the intersection of the Hume Highway and Munro Road for the left turn of vehicles from the Highway into Munro Road.

The turn warrant assessment has been carried out based on Figure 3.25 *Warrants for turn treatments on major roads at unsignalised intersections* from the AUSTROADS *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossing Management.* The assessment has been completed for both the AM and PM Construction Phase peak hour traffic movements.

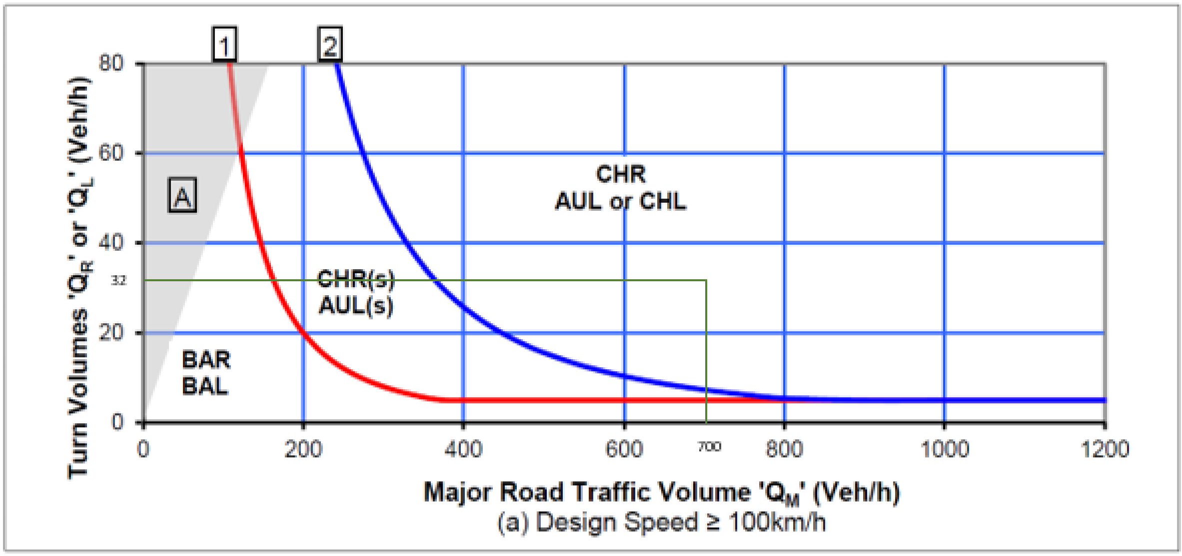
From **Table 16**, the Construction Phase AM turning movements at the intersection are:

Left turn into Munro Road: 32 vehicles per hour

Hume Highway straight through (2 Lanes): 1,398 vehicles per hour

Assuming an equal lane distribution of the Hume Highway traffic, Q_L = 32 Veh/hr and Q_M = 700 Veh/hr have been plotted on Figure 3.25 below:

Figure 3.25: Warrants for turn treatments on major roads at unsignalised intersections



The turn treatment indicated for the Construction Phase AM traffic volumes is an AUL or Auxiliary Left Turn treatment for the left turn from the Hume Highway into Munro Road.

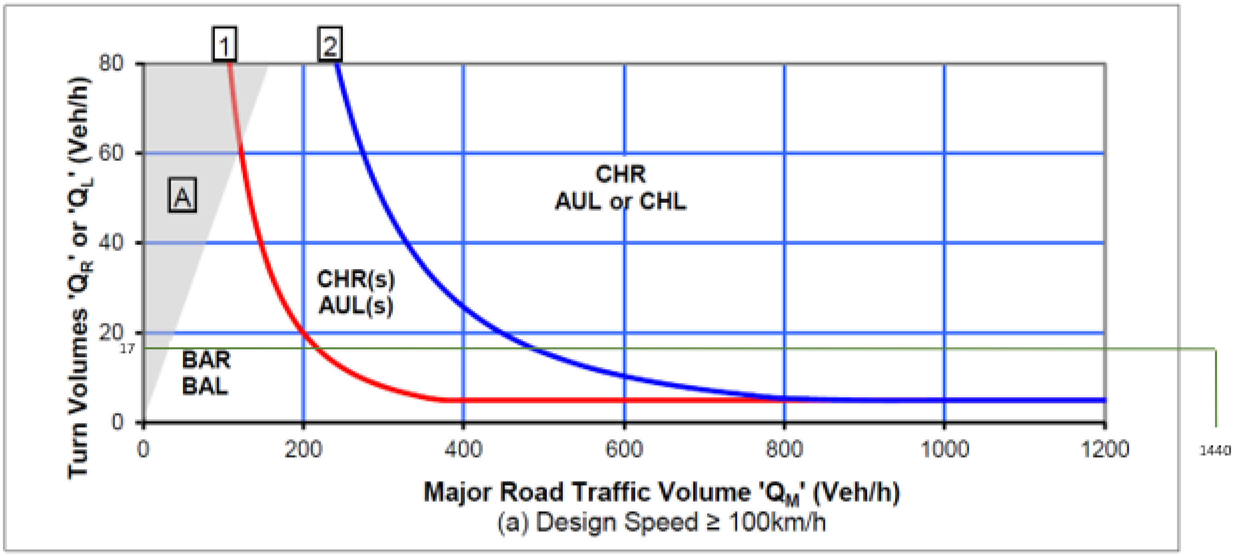
From **Table 17**, the Construction Phase PM turning movements at the intersection are:

Left turn into Munro Road: 17 vehicles per hour

Hume Highway straight through (2 Lanes): 2,884 vehicles per hour

Assuming an equal lane distribution of the Hume Highway traffic, Q_L = 17 Veh/hr and Q_M = 1,440 Veh/hr have been plotted on Figure 3.25 on the following page:

Figure 3.25: Warrants for turn treatments on major roads at unsignalised intersections



Whilst the Q_M volume is to the right of the scale, the turn treatment indicated for the Construction Phase PM traffic volumes is also an AUL or Auxiliary Left Turn treatment for the left turn from the Hume Highway into Munro Road.

The criteria for an AUL deceleration and turning lane from the Hume Highway into Munro Road shall be determined from the AUSTROADS *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (AGRD Part 4A).

The AUL left turn treatment for rural situations is indicated in Figure 8.4 of the AGRD Part 4A.

The diverge/deceleration length (D) and the taper length (T) are determined from Table 5.2 of the Guide (length D) and by using a formula to calculate T.

The following parameters can be determined for the AUL deceleration turn lane at the design speed:

D = 180m
T = 35m

It should be noted that the taper length T is included in the overall diverge/deceleration length D.

The existing AUL diverge/deceleration left turn lane currently provided from the Hume Highway into Munro Road is 135m with a taper length of 35m.

Whilst the existing AUL facility on the Hume Highway is shorter than the requirement specified in Figure 8.4 from AGRD Part 4A by a distance of 45m, a comparison will be made with the rural AUL(s) treatment that incorporates a shorter left turn lane.

The AUL(s) left turn treatment for rural situations is indicated in Figure 8.3 of the AGRD Part 4A.

From Table 8.2 of the AGRD and for 120km/hr, the diverge/deceleration length is 100m with a taper length of 35m.

The existing AUL diverge/deceleration left turn lane currently provided from the Hume Highway into Munro Road exceeds the requirement for an AUL(s) specified in Figure 8.3 from AGRD Part 4A by a distance of 35m.

As the construction period for the solar farm is 18 months and the predominant vehicle usage is by light passenger vehicles, SUV's and shuttle buses for construction workers, the existing deceleration and left turning lane from the Hume Highway into Munro Road will operate satisfactorily for the construction of the solar farm.

3.4 MUNRO ROAD AND SITE ACCESS ROAD INTERSECTION ASSESSMENT

Construction Phase AM Peak Hour Intersection Operation

The Construction Phase AM Peak Hour operation of the intersection of Munro Road and the Site Access Road has been carried out and a summary of the SIDRA modelling for the operation of the intersection is indicated in **Table 19**.

The SIDRA modelling results for the assessment of the intersection are included in **Appendix D**.

Table 19 – Construction Phase AM Munro Road and Site Access Road Intersection Operating Parameters

Scenario	Vehicles on Movement	Average Delay (seconds)	95% Queue Length (metres)	Overall Level of Service (LOS)
Construction Phase AM Peak Hour				
Munro Road Westbound				
Right Turn into the Site Access Road	29	5.6	1.0	LOS A
Straight through Westbound	3	0.0	1.0	LOS A
Munro Road Eastbound				
Straight through Eastbound	3	0.0	0.0	LOS A
Site Access Road Southbound				
Left Turn into Munro Road	14	5.8	0.0	LOS A

The Construction Phase AM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.00 for Munro Road eastbound and 0.02 for Munro Road westbound and therefore the Degree of Saturation for the overall operation of the intersection is 0.02.

All movements at the intersection operate at a Level of Service A and therefore the access to the solar farm will operate efficiently during the construction phase of the project.

Construction Phase PM Peak Hour Intersection Operation

The Construction Phase PM Peak Hour operation of the intersection of Munro Road and the Site Access Road has been carried out and a summary of the SIDRA modelling for the operation of the intersection is indicated in **Table 20**.

The SIDRA modelling results for the assessment of the intersection are included in **Appendix D**.

Table 20 – Construction Phase PM Munro Road and Site Access Road Intersection Operating Parameters

Scenario	Vehicles on Movement	Average Delay (seconds)	95% Queue Length (metres)	Overall Level of Service (LOS)
Construction Phase PM Peak Hour				
Munro Road Westbound				
Right Turn into the Site Access Road	14	5.8	0.0	LOS A
Straight through Westbound	3	0.0	0.0	LOS A

Scenario	Vehicles on Movement	Average Delay (seconds)	95% Queue Length (metres)	Overall Level of Service (LOS)
Munro Road Eastbound				
Straight through Eastbound	3	0.0	0.0	LOS A
Site Access Road Southbound				
Left Turn into Munro Road	29	5.7	1.0	LOS A

The Construction Phase PM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.00 for Munro Road eastbound and 0.02 for the Site Access Road southbound and therefore the Degree of Saturation for the overall operation of the intersection is 0.02.

All movements at the intersection operate at a Level of Service A and therefore the access to the solar farm will operate efficiently during the construction phase of the project.

<u>Construction Phase Operation of the Intersection with Heavy Vehicles Only</u>

To correlate with the operation of the intersection of the Hume Highway and Munro Road for heavy vehicles only, a similar assessment of the intersection of Munro Road and the Site Access Road has been carried out and the SIDRA results are summarised in **Table 21**.

The SIDRA modelling results for the assessment of the intersection are included in **Appendix D**.

Table 21 – Construction Phase Munro Road and Site Access Road Intersection Heavy Vehicle Operating Parameters

Scenario	Vehicles on Movement	Average Delay (seconds)	95% Queue Length (metres)	Overall Level of Service (LOS)
Construction Phase Peak Hour				
Munro Road Westbound				
Right Turn into the Site Access Road	6	6.3	1.0	LOS A
Straight through Westbound	3	0.0	1.0	LOS A
Munro Road Eastbound				
Straight through Eastbound	3	0.0	0.0	LOS A
Site Access Road Southbound				
Left Turn into Munro Road	6	6.4	1.0	LOS A

The Construction Phase Peak Hour Degree of Saturation with heavy vehicles only for each leg of the intersection ranges from 0.00 for Munro Road eastbound and 0.01 for the Site Access Road southbound and therefore the Degree of Saturation for the overall operation of the intersection is 0.01.

Whilst there has been a slight increase in the operation parameters for average delay, all movements at the intersection operate at a Level of Service A and therefore the access to the solar farm will operate efficiently during the construction phase of the project.

3.4.1 Turning Paths for the Hume Highway and the access off Munro Road

Intersection turning path plans have been produced for:

- The intersection of the Hume Highway and Munro Road; and
- The intersection of Munro Road and the Site Access Road.

The intersection turning path plans are included in the **Drawings** Section of the Report (Premise Reference 211106_02 C001 to C003).

The turning paths indicate the operation of a B-Double at each intersection as a worst case scenario, however, the operation of semitrailers will easily be accommodated at the intersections.

The intersection turning path plans indicate the following procedures are to be implemented to improve the operation of the intersections:

1. The arrival of B-Doubles turning left from the Hume Highway into Munro Road shall be managed by the operation of an accredited Traffic Controller to allow the heavy vehicle to turn into Munro Road within the bitumen sealed area at the intersection. The Traffic Controller shall hold vehicles in Munro Road a sufficient distance back from the Hume Highway intersection for the left turn from the Highway to be completed and allowing the B-Double to return to the correct side of the roadway.
2. The turning path at the intersection of Munro Road and the Site Access Road is to be used in the design process to set the criteria for the design and construction of the site access intersection.

3.5 POST DEVELOPMENT + 10 YEARS SCENARIO

The general requirement by TfNSW is to carry out an assessment to determine if there are any traffic impacts from proposed developments for a post development + 10 years scenario.

Whilst the traffic volumes on the surrounding roads, and in particular the Hume Highway, will increase over time, the traffic associated with the solar farm development will be restricted to the construction phase with minimal impacts during site operation.

Once the development is constructed over the anticipated 18 month period, there will be no further heavy vehicle movements to and from the site. Also, light vehicle movements would decrease and would be restricted to staff movements associated with occasional site maintenance activities.

Therefore, the assessment of the potential impacts of the post development + 10 years scenario is not warranted for the Marulan Solar Farm.

3.6 MITIGATION MEASURES

3.6.1 Traffic Management

The surrounding road network is well regulated and includes the provision of the following features as appropriate:

- Dual carriageway in each direction on the Hume Highway
- Give Way signs
- Stop Signs
- Deceleration and turning lanes at intersections
- Median Openings

However, the following mitigation measures are proposed to improve traffic management on the road network:

Munro Road Upgrading

Whilst the majority of Munro Road has a bitumen sealed width of 7.0m, the non-compliant sections of the road should be upgraded to achieve the following criteria:

- Minimum 3.0m wide travel lane in each direction.
- 1.0m wide gravel shoulder in each direction with 0.5m of the shoulder bitumen sealed.

The area where Munro Road does not meet the stated criteria is a section approximately 80m in length located approximately 50m from the intersection with the Hum Highway.

As the road currently has no line markings, the following recommendations also apply:

- Centreline and edgeline marking along Munro Road between the Hume Highway intersection and the site access.
- Double barrier lines where minimum sight distances are not achieved.

Hume Highway and Munro Road Intersection

Based on the turning path assessment, the arrival of B-Doubles turning left from the Hume Highway into Munro Road shall be managed by the operation of an accredited Traffic Controller to allow the heavy vehicle to turn into Munro Road within the bitumen sealed area at the intersection.

Appropriate "Trucks Crossing or Entering" warning signage (W5-22) should be installed on the Hume Highway on the northbound approach to the intersection with Munro Road. It is recommended that such signage is to be in place on a temporary basis whilst the construction of the solar farm is being carried out.

3.6.2 Driver Code of Conduct

A Driver Code of Conduct should be implemented for the operation of vehicles delivering plant and materials to the solar farm and may include the following provisions:

- The transport route on the Hume Highway must be identified to all heavy vehicle operators to ensure all deliveries to the site arriving from Sydney must proceed to Goulburn to turn around and then return to Munro Road to turn left from the Highway.
- Drivers must not use the crossover from the southbound lanes of the Hume Highway to access Munro Road and crossing the northbound lanes of the Highway.
- The scheduling for the arrival, and more importantly, the departure of heavy vehicles from the development site should occur, as reasonably as practical, off peak to the PM Peak Hour on the Hume Highway.
- Set up an induction process for all drivers to ensure that safety objectives are being met.
- Drivers are to obey all speed limits and other restrictions on the transport routes, particularly with regards to residential areas and school zones.
- Drivers are to demonstrate courteous behaviour to all road users and are to be aware to take additional care when travelling the transport routes between the hours of 8.00am to 9.15am and 3.00pm to 4.15pm when school buses may be operating and picking up or dropping off children.
- Ensure that all loads are covered.
- Ensure that loads do not exceed the legal limits.
- Ensure that vehicles are maintained and are equipped with all required safety measures.
- Implement a public complaints registration system to ensure effective resolution of complaints received and to take disciplinary action if necessary.

3.6.3 Traffic Management Plan

A Traffic Management Plan (TMP) will be developed in consultation with Goulburn Mulwaree Council and TfNSW prior to the commencement of construction of the solar farm. The TMP will identify and provide management strategies to mitigate the impacts of project related traffic including:

- Haulage of materials to site.
- The safe transportation of construction workers to site and return. In this regard, TfNSW will require specific details on how the proponent will ensure the identified management measures employed to ensure the safety of staff travelling to and from the site each day will be controlled and enforced.

In general terms, the TMP would include details on the following:

- Construction timeframe and staging of the works.
- Measures to consult with other road users to minimise impacts (e.g., liaison with school bus operators).
- Confirmation of anticipated additional traffic volumes generated by the solar farm.
- Confirmation of final heavy vehicle and OSOM vehicle haulage routes to be used for all delivery vehicles accessing the site.
- A process to review haulage route road conditions prior to the commencement of works on the solar farm.
- A process to carry out pre and post construction road dilapidation surveys to ensure that Munro Road is reinstated to pre-construction conditions.
- Requirements for any additional TMP(s) required for a specific work stage/construction process (e.g., delivery of oversize components).
- Qualify and identify any relevant mechanisms for OSOM vehicle permits and traffic management requirements.

A major component of the TMP will be for the control of the arrival and departure of heavy vehicles and construction workers vehicles through the intersection of the Hume Highway and Munro Road. All vehicles arriving at the solar farm construction site are to turn left into Munro Road from the Hume Highway and on departure will turn left from Munro Road back onto the Hume Highway.

Preliminary discussions have been held with TfNSW representatives to discuss the operation of the TMP.

Vehicles associated with the construction of the solar farm (with the exception of an expected three (3) OSOM vehicles outlined below) will <u>not</u> be permitted to use the median break separating the northbound and southbound carriageways of the Hume Highway.

The arrival of B-Doubles turning left from the Hume Highway into Munro Road shall be managed by the operation of an accredited Traffic Controller to allow the heavy vehicle to turn into Munro Road within the bitumen sealed area at the intersection. The Traffic Controller shall hold vehicles in Munro Road a sufficient distance back from the Hume Highway intersection for the left turn from the Highway to be completed and allowing the B-Double to return to the correct side of the roadway.

The Traffic Controller will be responsible to ensure that vehicles departing the construction site of the solar farm can only turn left from Munro Road onto the Hume Highway. Any breaches of this policy will be reported to the proponent of the solar farm to enable disciplinary action to be taken.

The proponent has advised that it is anticipated that up to three (3) OSOM vehicles may be required for the delivery of oversized components to the solar farm such as the main power transformers and the control building for the substation. The OSOM vehicles would be under the control of accredited escort vehicles and would make the right turn from the Hume Highway into Munro Road.

The operation of up to three (3) OSOM vehicles turning right into Munro Road would involve the co-operation and involvement of a number of stakeholders such as TfNSW, the NSW Police, accredited traffic controllers and the local Council.

4 CONCLUSION

The impact of the traffic generated by the construction and operation of the Marulan Solar Farm on the surrounding road network has been assessed in terms of:

i) Traffic Volume;

ii) Site Access;

iii) Intersection Operation; and

iv) Road Safety.

The estimated traffic generated during the anticipated 18 month construction period of the solar farm is 55,076 trips comprising 4,676 heavy vehicle trips delivering supplies and materials and 50,400 light passenger and shuttle bus trips transporting workers to and from site.

The estimated peak daily trips and peak hour trips are 238 trips per day and 55 trips per hour respectively.

The construction of the solar farm would result in a percentage increase in traffic volumes on the Hume Highway ranging from 1.51% (PM Peak on the Hume Highway southbound) to 4.00% (AM Peak on the Hume Highway northbound).

The percentage increases in traffic volume for AADT and peak hour on the Hume Highway are not significant.

The increase in daily traffic volume and peak hour volume generated by the construction of the solar farm would be easily absorbed into the surrounding road network with minimal impact on the capacity of the existing traffic streams using the road system.

Munro Road is operating at just 10% of its Operational Capacity at a Level of Service B and the impact of the additional traffic generated by the construction of the solar farm is not significant in terms of the volume of construction phase traffic using Munro Road.

SIDRA modelling has been carried out to assess the operation of the intersection of the Hume Highway and Munro Road and Munro Road and the solar farm access road. The SIDRA modelling has determined:

Hume Highway and Munro Road Intersection

- The Construction Phase AM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.03 for Munro Road southbound and 0.39 for the Hume Highway east bound and therefore the Degree of Saturation for the overall operation of the intersection is 0.39.

  The Hume Highway left turn into Munro Road and straight through operate at a LOS A whilst the left turn out of Munro Road operates at a LOS B.

- The Construction Phase PM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.39 for Munro Road southbound and 0.78 for the Hume Highway east bound and therefore the Degree of Saturation for the overall operation of the intersection is 0.78.

  A comparison of the Pre Development PM Peak Hour intersection operation and the Construction Phase PM Peak Hour operation indicates that there is significant change in the operational parameters of the intersection. For the left turn from Munro Road onto the Hume Highway, the Average Delay increases from 38.9 seconds to 52.5 seconds whilst the Level of Service has changed from LOS E to a LOS F.

The cause of change in the operational parameters of the intersection is the volume of through traffic on the Hume Highway limiting the left turn opportunities from Munro Road onto the Hume Highway.

- The Construction Phase Peak Hour with Heavy Vehicles Only Degree of Saturation for each leg of the intersection ranges from 0.07 for Munro Road southbound and 0.39 for the Hume Highway east bound and therefore the Degree of Saturation for the overall operation of the intersection is 0.39.

  A comparison of the Pre Development PM Peak Hour intersection operation and the Construction Phase Peak Hour with Heavy Vehicles only operation indicates that there is an improvement in the operational parameters of the intersection. For the left turn from Munro Road onto the Hume Highway, the Average Delay decreases from 38.9 seconds to 33.4 seconds whilst the Level of Service has changed from LOS E to a LOS D.

  On this basis, the scheduling for the arrival, and more importantly, the departure of heavy vehicles from the development site should occur, as reasonably as practical, off peak to the PM Peak Hour on the Hume Highway.

<u>Munro Road and Site Access Road Intersection</u>

- The Construction Phase AM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.00 for Munro Road eastbound and 0.02 for Munro Road westbound and therefore the Degree of Saturation for the overall operation of the intersection is 0.02.
- The Construction Phase PM Peak Hour Degree of Saturation for each leg of the intersection ranges from 0.00 for Munro Road eastbound and 0.02 for the Site Access Road southbound and therefore the Degree of Saturation for the overall operation of the intersection is 0.02.
- The Construction Phase Peak Hour Degree of Saturation for each leg of the intersection for heavy vehicles only ranges from 0.00 for Munro Road eastbound and 0.01 for the Site Access Road southbound and therefore the Degree of Saturation for the overall operation of the intersection is 0.01.
- All movements at the intersection operate at a Level of Service A and therefore the access to the solar farm will operate efficiently during the construction phase of the project.

The assessment of the traffic generated by the proposed construction of the solar farm has concluded the following:

- The increase in the traffic volumes on the surrounding road network will not change the classifications of the roads under the functional road hierarchy.
- The increase in traffic volumes generated by the proposed development would be easily absorbed into the surrounding Hume Highway road network with minimal impact on the capacity of the existing traffic streams using the road system.
- Mitigation measures are proposed to improve traffic management on the road network including:

  The arrival of B-Doubles turning left from the Hume Highway into Munro Road shall be managed by the operation of an accredited Traffic Controller to allow the heavy vehicle to turn into Munro Road within the bitumen sealed area at the intersection. The Traffic Controller shall hold vehicles in Munro Road a sufficient distance back from the Hume Highway intersection for the left turn from the Highway to be completed and allowing the B-Double to return to the correct side of the roadway

  Installation of appropriate “Trucks Crossing or Entering” warning signage (W5-22) should be installed on the Hume Highway on the northbound approach to the intersection with Munro Road.

In completing the assessment of the impact of the traffic generated by the construction of the Marulan Solar Farm, the following recommendations are made:

- Munro Road should be upgraded in accordance with the criteria outlined in **Section 3.6.1**.
- The operation of the intersection of Munro Road and the Hume Highway is to be managed in accordance with the requirements set out in **Section 3.6.1.**
- A Driver Code of Conduct should be implemented generally in accordance with **Section 3.6.2**.
- A Traffic Management Plan shall be developed and implemented in accordance with **Section 3.6.3**.
- The scheduling for the arrival, and more importantly, the departure of heavy vehicles from the development site should occur, as reasonably as practical, off peak to the PM Peak Hour on the Hume Highway.
- The existing deceleration and left turning lane from the Hume Highway into Munro Road will operate satisfactorily for the construction of the solar farm.
- The design and construction of all recommended traffic facilities are to be carried out in accordance with the appropriate Australian Standards, codes and the requirements and policies of TFNSW and Goulburn Mulwaree Council.

The implementation of the recommendations of this Traffic Impact Assessment during the approval and construction of the Marulan Solar Farm will see the operation of the construction phase of the development with the integration of the generated traffic into the surrounding road network.

5 REFERENCES

Roadway Capacity of AUSTROADS Guide to Traffic Engineering Practice

RTA Guide to Traffic Generating Developments (2002)

AUSTROADS Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management

AUSTROADS Guide to Road Design Part 4A; Unsignalised and Signalised Intersections

PLATES

Plate 1 – Hume Highway, connection to Munro Road, looking east View 1

Plate 2 – Hume Highway, connection to Munro Road, looking east View 2

Plate 3 – Munro Road, looking north from the Hume Highway Intersection

Plate 4 – Munro Road, looking north

Plate 5 – Munro Road, looking north towards site along access corridor

Plate 6 – Munro Road, looking east

Plate 7 – Munro Road, T Intersection, looking west

Plate 8 – Munro Road, T-Intersection. looking south

Plate 9 – Munro Road, T-Intersection. looking north

Plate 10 – Munro Road, T Intersection, looking east

Plate 11 – Munro Road, connection to Hume Highway, Looking South

Plate 12 – Munro Road and Hume Highway Intersection, looking south

Plate 13 – Munro Road and Hume Highway Intersection, looking east

Plate 14 – Munro Road and Hume Highway Intersection, looking west

Plate 15 –Hume Highway -southeast of development, looking east towards Jerrara Road/Marulan South Road turn off

Plate 16 – Carrick Road, north of the site, looking west towards Lockyersleigh Creek View 1

Plate 17 – Carrick Road, north of the site, looking west towards Lockyersleigh Creek View 2

Plate 18 – Carrick Road Railway Crossing, looking north-east

Plate 19 – Carrick Road Railway Crossing, looking north

Plate 20 – Carrick Road railway crossing, looking east

Plate 21 – Carrick Road south of railway, looking north-east, towards site

Plate 22 – Carrick Road south of railway, looking south-west

DRAWINGS

ISSUED FOR REVIEW

DATE	REV	DESCRIPTION	REC	APP
08/07/2022	A	ISSUED FOR REVIEW	RB	SJH

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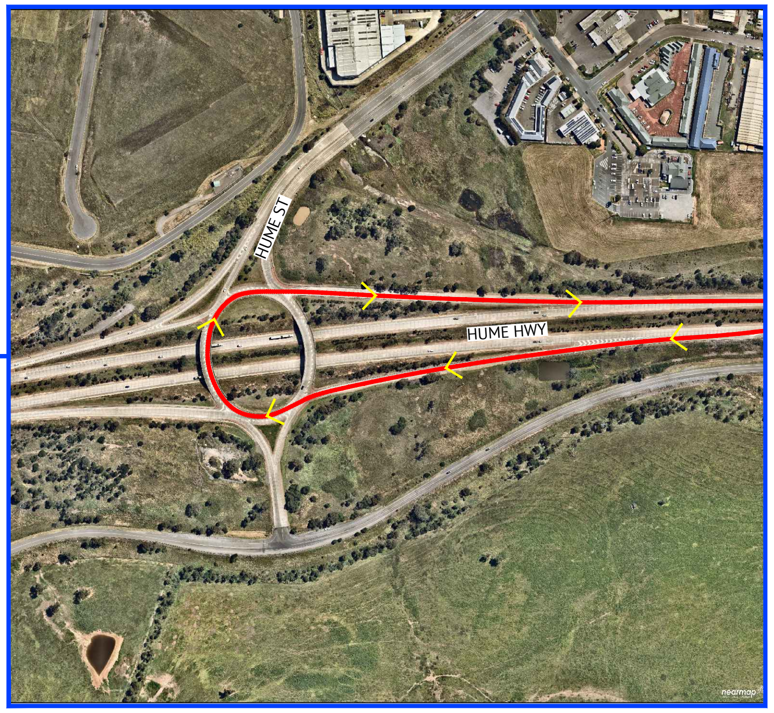
CHECKED SJH
PROJECT MANAGER SJH
ENGINEERING CERTIFICATION

SCALE NTS
ORIGINAL SHEET SIZE A1

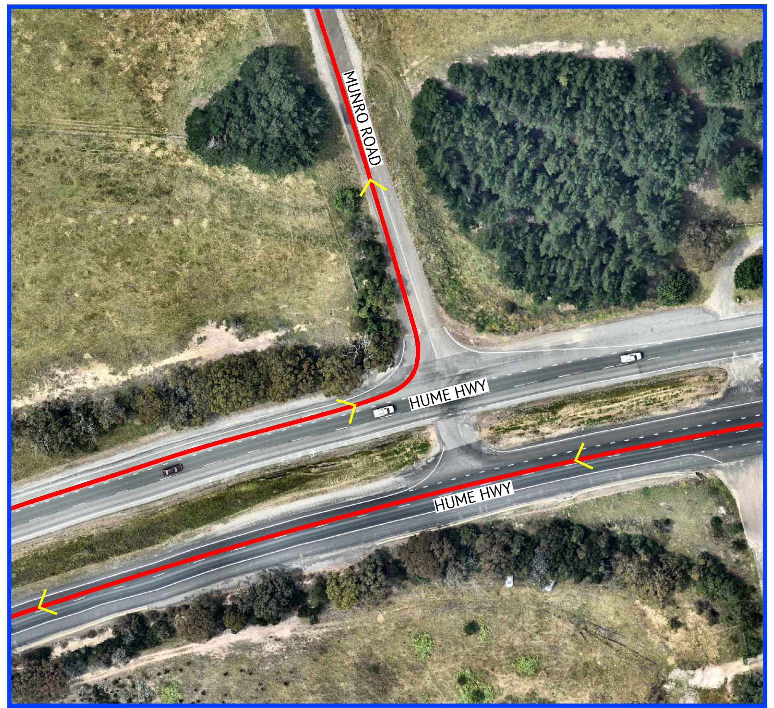
CLIENT TERRAIN SOLAR
PROJECT MARULAN SOLAR FARM
LOCATION 154 MUNRO ROAD / 740 CARRICK ROAD, MARULAN, 2580
SHEET TITLE PORT BOTANY TO SITE TRUCK ROUTE

JOB CODE 221106_03
SHEET NUMBER TS01
REV A



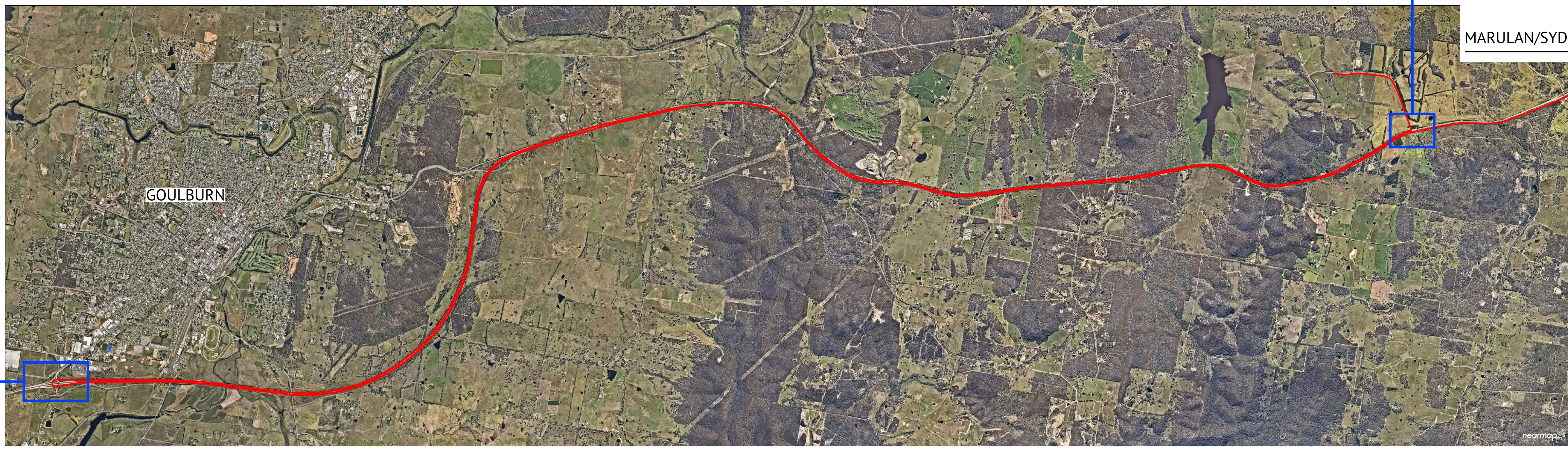
HUME ST GOULBURN ROUNDABOUT

NTS



MUNRO ROAD INTERSECTION

NTS



MARULAN/SYDNEY

OVERALL HUME HWY ROUTE

NTS

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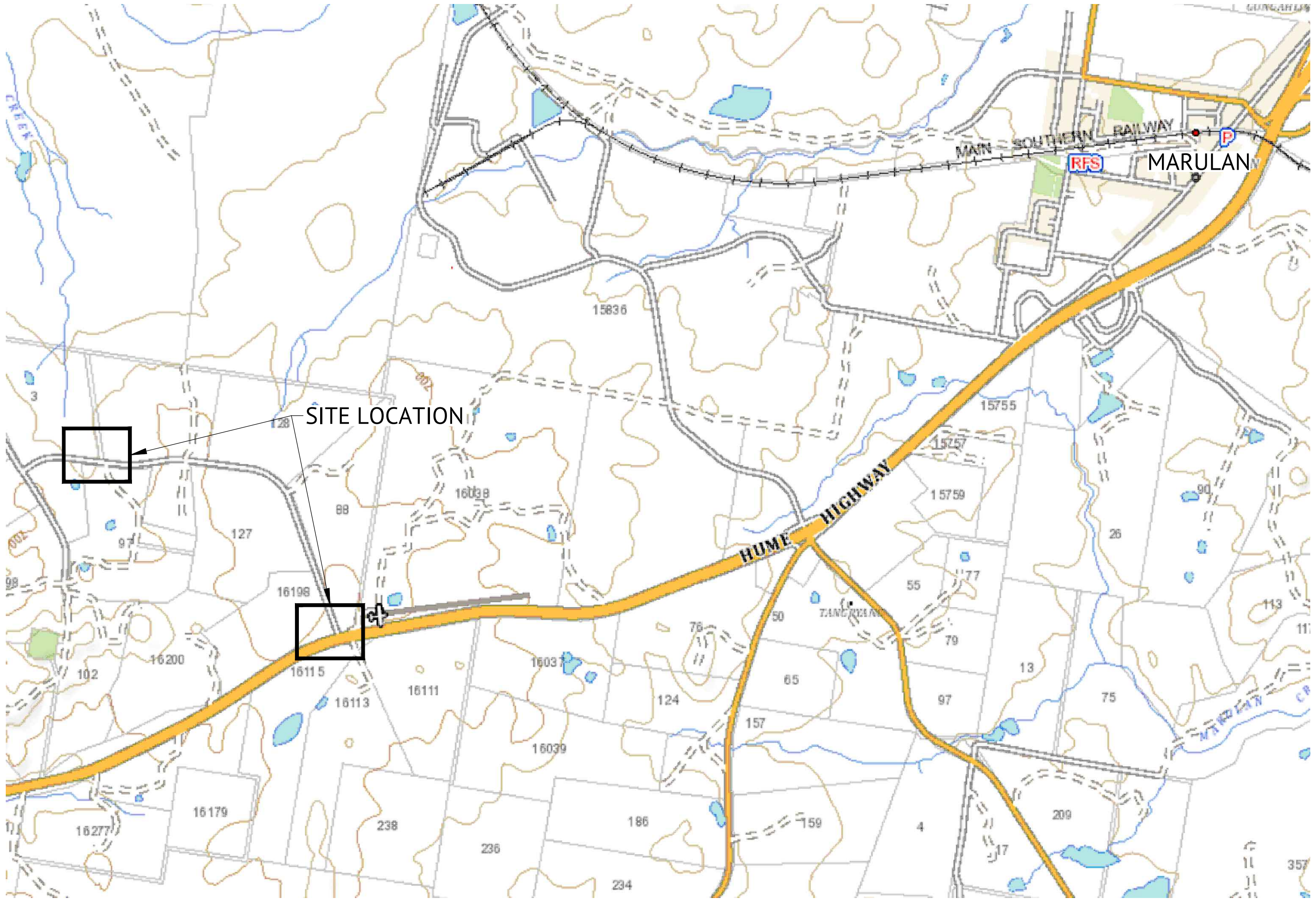
SCALE	NTS
ORIGINAL SHEET SIZE	A1

CLIENT	TERRAIN SOLAR
PROJECT	MARULAN SOLAR FARM
LOCATION	154 MUNRO ROAD / 740 CARRICK ROAD, MARULAN, 2580
SHEET TITLE	MARULAN TO SITE TRUCK ROUTE
JOB CODE	221106_03
SHEET NUMBER	TS02
REV	A

MARULAN SOLAR FARM
154 MUNRO ROAD / 740 CARRICK ROAD, MARULAN 2580
TERRAIN SOLAR
INTERSECTION SWEPT PATH PLANS



LOCALITY PLAN

Sheet List Table	
Sheet Number	Sheet Title
C001	TITLESHEET & SITE LOCALITY
C002	SITE ACCESS TURNING PATH PLAN
C003	HUME HIGHWAY TURNING PATH PLAN

ISSUED FOR REPORT

DATE	REV	DESCRIPTION	REC	APP
18/05/2022	E	ISSUED FOR REPORT	RB	SJH
11/05/2022	D	ISSUED FOR REPORT - HUME LEFT TURN CHANGE	RB	PPO
05/05/2022	C	ISSUED FOR REPORT	RB	PPO
27/04/2022	B	ISSUED FOR REPORT	RB	PPO
11/04/2022	A	ISSUED FOR REVIEW	RB	PPO

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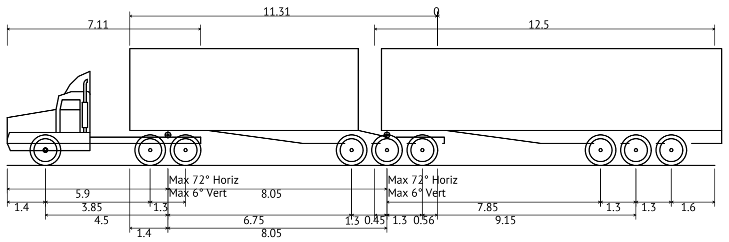
PROJECT MANAGER PPO
ENGINEERING CERTIFICATION
SCALE
ORIGINAL SHEET SIZE A1

CLIENT TERRAIN SOLAR
PROJECT MARULAN SOLAR FARM
LOCATION 154 MUNRO ROAD / 740 CARRICK ROAD, MARULAN 2580
SHEET TITLE TITLESHEET & SITE LOCALITY
JOB CODE 221106_02
SHEET NUMBER C001
REV E



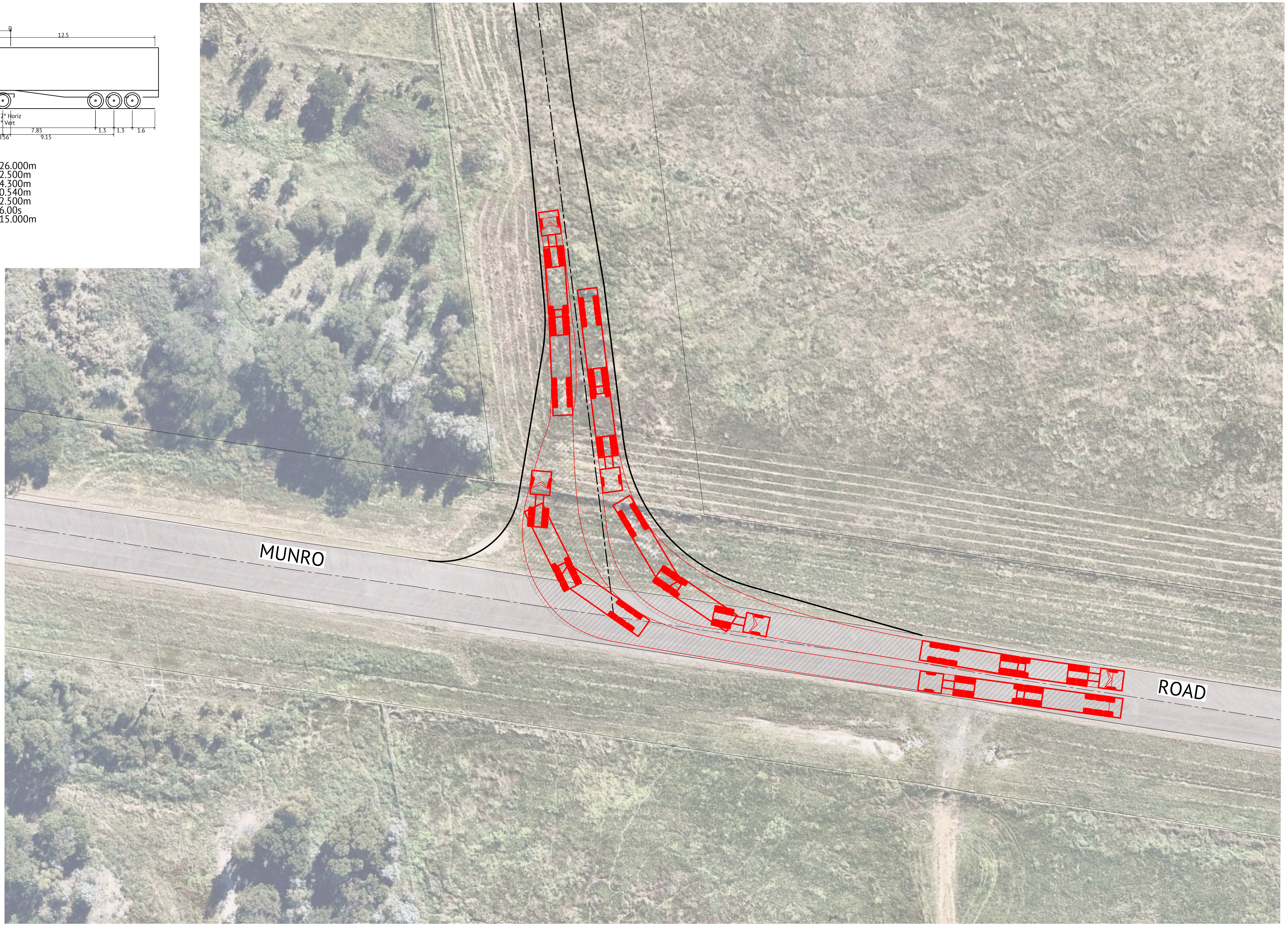
B-Double (26.0m)

Overall Length	26.000m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.540m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	15.000m

AUSTROADS B-DOUBLE (26.0)m TYPICAL DETAIL

NTS

TURN SPEED 10Km/h



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DATE	REV	DESCRIPTION	REC	APP
18/05/2022	E	ISSUED FOR REPORT	RB	SJH
11/05/2022	D	ISSUED FOR REPORT - HUME LEFT TURN CHANGE	RB	PPO
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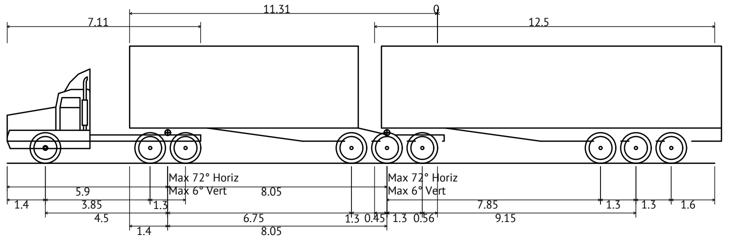
PROJECT MANAGER: PPO
ENGINEERING CERTIFICATION

SCALE: 0 5 10 15m
SCALE 1:250 (A1)
ORIGINAL SHEET SIZE A1

CLIENT: TERRAIN SOLAR
PROJECT: MARULAN SOLAR FARM
LOCATION: 154 MUNRO ROAD / 740 CARRICK ROAD, MARULAN 2580
SHEET TITLE: SITE ACCESS TURNING PATH PLAN

JOB CODE: 221106_02
SHEET NUMBER: C002
REV: E



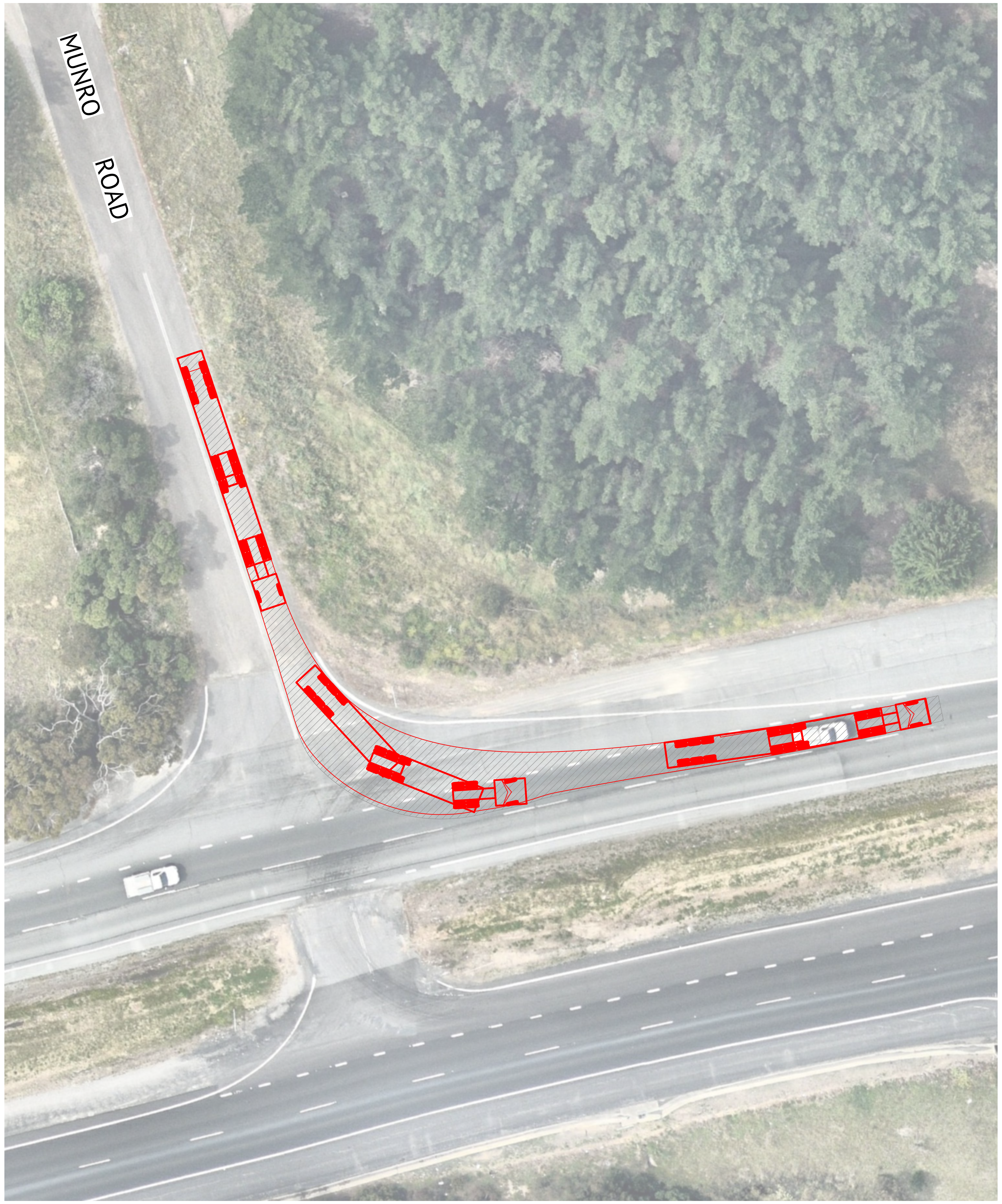
B-Double (26.0m)

Overall Length	26.000m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.540m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	15.000m

AUSTROADS B-DOUBLE
(26.0)m TYPICAL DETAIL
NTS

TURN SPEED 10Km/h

THE ARRIVAL OF B-DOUBLES TURNING LEFT FROM THE HUME HIGHWAY INTO MUNRO ROAD SHALL BE MANAGED BY THE OPERATION OF AN ACCREDITED TRAFFIC CONTROLLER TO ALLOW THE HEAVY VEHICLE TO TURN INTO MUNRO ROAD WITHIN THE BITUMEN SEALED AREA AT THE INTERSECTION. THE TRAFFIC CONTROLLER SHALL HOLD VEHICLES IN MUNRO ROAD A SUFFICIENT DISTANCE BACK FROM THE HUME HIGHWAY INTERSECTION FOR THE LEFT TURN FROM THE HIGHWAY TO BE COMPLETED AND ALLOWING THE B-DOUBLE TO RETURN TO THE CORRECT SIDE OF THE ROADWAY.



ISSUED FOR REPORT

DATE	REV	DESCRIPTION	REC	APP
18/05/2022	E	ISSUED FOR REPORT	RB	SJH
11/05/2022	D	ISSUED FOR REPORT - HUME LEFT TURN CHANGE	RB	PPO
05/05/2022	C	ISSUED FOR REPORT	RB	PPO
27/04/2022	B	ISSUED FOR REPORT	RB	PPO
11/04/2022	A	ISSUED FOR REVIEW	RB	PPO

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CHECKED: PPO
PROJECT MANAGER: PPO
ENGINEERING CERTIFICATION

SCALE
0 5 10 15m
SCALE 1:250 (A1)
ORIGINAL SHEET SIZE A1

CLIENT: TERRAIN SOLAR
PROJECT: MARULAN SOLAR FARM
LOCATION: 154 MUNRO ROAD / 740 CARRICK ROAD, MARULAN 2580
SHEET TITLE: HUME HIGHWAY TURNING PATH PLAN

JOB CODE: 221106_02
SHEET NUMBER: C003
REV: E

APPENDIX A

TRAFFIC DATA FOR SURROUNDING ROADS

Provided by Goulburn Mulwaree Council

MetroCount Traffic Executive
Class Speed Matrix

ClassMatrix-219 -- English (ENA)

Datasets:

Site:	**[RD26-1412] Jerrara Road 14km south from Marulan South Road**
Attribute:	Jerrara Rd
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 0
Survey Duration:	14:07 Friday, 20 September 2019 => 9:37 Thursday, 10 October 2019,
Zone:	
File:	RD26-1412 0 2019-10-10 0942.EC0 (Plus)
Identifier:	PK242AF3 MC5900-X13 (c)MetroCount 09Nov16
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**14:08 Friday, 20 September 2019 => 9:37 Thursday, 10 October 2019 (19.8123)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 13438 / 13441 (99.98%)

Class Speed Matrix

ClassMatrix-219
Site: RD26-1412.0.1NS
Description: **Jerrara Road 14km south from Marulan South Road**
Filter time: **14:08 Friday, 20 September 2019 => 9:37 Thursday, 10 October 2019**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Class													
	SV	SVT	TB2	TB3	T4	ART3	ART4	ART5	ART6	BD	DRT	TRT	Total	
km/h	1	2	3	4	5	6	7	8	9	10	11	12		
10- 20	2	.	2	.	.	.	.	.	.	.	.	.	4	0.0%
20- 30	6	1	.	.	.	.	.	.	.	.	.	.	7	0.1%
30- 40	15	.	2	.	.	.	.	.	.	1	.	.	18	0.1%
40- 50	33	2	4	10	.	1	.	3	18	3	19	.	93	0.7%
50- 60	170	35	20	9	29	3	4	15	49	197	21	.	552	4.1%
60- 70	617	126	125	11	13	8	11	26	23	19	16	.	995	7.4%
70- 80	2603	417	346	19	33	19	46	22	180	40	18	.	3743	27.9%
80- 90	3866	503	401	16	31	36	42	5	77	16	5	.	4998	37.2%
90-100	1847	157	250	1	2	19	7	.	2	6	.	.	2291	17.0%
100-110	488	23	62	.	1	2	.	.	.	.	.	.	576	4.3%
110-120	112	3	7	.	.	1	.	.	.	.	.	.	123	0.9%
120-130	23	.	.	.	.	.	.	.	.	.	.	.	23	0.2%
130-140	12	.	.	.	.	.	.	.	.	.	.	.	12	0.1%
140-150	3	.	.	.	.	.	.	.	.	.	.	.	3	0.0%
150-160	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
Total	**9797**	**1267**	**1219**	**66**	**109**	**89**	**110**	**71**	**349**	**282**	**79**	**0**	**13438**	
	72.9%	**9.4%**	**9.1%**	**0.5%**	**0.8%**	**0.7%**	**0.8%**	**0.5%**	**2.6%**	**2.1%**	**0.6%**	**0.0%**		
													ADT 672	

MetroCount Traffic Executive
Class Speed Matrix

ClassMatrix-220 -- English (ENA)

Datasets:

Site:	**[RD26-38] Jerrara Road 380m south of Marulan South Rd**
Attribute:	Jerrara Rd
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	14:47 Friday, 20 September 2019 => 10:14 Thursday, 10 October 2019,
Zone:	
File:	RD26-38 0 2019-10-10 1010.EC0 (Plus)
Identifier:	PK34MRW0 MC5900-X13 (c)MetroCount 09Nov16
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**14:48 Friday, 20 September 2019 => 10:14 Thursday, 10 October 2019 (19.8098)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 20214 / 20223 (99.96%)

Class Speed Matrix

ClassMatrix-220
Site: RD26-38.0.1SN
Description: **Jerrara Road 380m south of Marulan South Rd**
Filter time: **14:48 Friday, 20 September 2019 => 10:14 Thursday, 10 October 2019**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

km/h	SV 1	SVT 2	TB2 3	TB3 4	T4 5	ART3 6	ART4 7	ART5 8	ART6 9	BD 10	DRT 11	TRT 12	Total	
10- 20	6	.	.	1	.	.	.	.	.	.	.	.	7	0.0%
20- 30	30	1	5	3	1	.	.	.	1	.	.	.	41	0.2%
30- 40	59	5	13	1	1	.	.	5	1	1	.	.	86	0.4%
40- 50	205	35	37	2	4	2	4	12	13	6	.	.	320	1.6%
50- 60	954	119	98	10	15	8	11	17	56	28	8	.	1324	6.5%
60- 70	2844	350	357	39	43	26	41	30	143	82	43	.	3998	19.8%
70- 80	5391	610	632	39	56	36	75	17	178	170	25	.	7229	35.8%
80- 90	3985	374	481	12	6	32	41	3	26	28	5	.	4993	24.7%
90-100	1374	79	182	3	1	8	9	.	7	8	.	.	1671	8.3%
100-110	347	10	64	.	.	.	.	.	.	.	.	.	421	2.1%
110-120	76	1	16	.	.	.	.	.	.	.	.	.	93	0.5%
120-130	16	.	8	.	.	.	.	.	.	.	.	.	24	0.1%
130-140	4	.	1	.	.	.	.	.	.	.	.	.	5	0.0%
140-150	1	.	.	.	.	.	.	.	.	.	.	.	1	0.0%
150-160	1	.	.	.	.	.	.	.	.	.	.	.	1	0.0%
Total	15293	1584	1894	110	127	112	181	84	425	323	81	0	20214	
	75.7%	7.8%	9.4%	0.5%	0.6%	0.6%	0.9%	0.4%	2.1%	1.6%	0.4%	0.0%	ADT 1011	

MetroCount Traffic Executive
Class Speed Matrix

ClassMatrix-320 -- English (ENA)

Datasets:

Site:	**[RD26-30] Jerrara Road 300 south of Marulan South Rd**
Attribute:	Jerrara Rd
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	14:37 Wednesday, 21 July 2021 => 15:20 Wednesday, 4 August 2021,
Zone:	
File:	RD26-30 0 2021-08-04 1504.EC0 (Plus)
Identifier:	PK286HYB MC5900-X13 (c)MetroCount 09Nov16
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**14:38 Wednesday, 21 July 2021 => 15:20 Wednesday, 4 August 2021 (14.0297)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = North, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 9607 / 9610 (99.97%)

Class Speed Matrix

ClassMatrix-320
Site: RD26-30.0.1SN
Description: **Jerrara Road 300 south of Marulan South Rd**
Filter time: **14:38 Wednesday, 21 July 2021 => 15:20 Wednesday, 4 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Class													
	SV	SVT	TB2	TB3	T4	ART3	ART4	ART5	ART6	BD	DRT	TRT	Total	
km/h	1	2	3	4	5	6	7	8	9	10	11	12		
10- 20	2	.	1	.	.	.	.	.	.	.	.	.	3	0.0%
20- 30	6	1	.	.	.	.	.	.	1	.	.	.	8	0.1%
30- 40	17	2	9	.	.	.	.	.	.	1	.	.	29	0.3%
40- 50	102	7	28	3	3	.	1	.	4	12	2	.	162	1.7%
50- 60	836	53	161	17	10	3	9	4	49	90	17	.	1249	13.0%
60- 70	2115	168	427	30	26	11	31	5	95	233	45	.	3186	33.2%
70- 80	2279	146	395	22	5	18	17	2	22	47	7	.	2960	30.8%
80- 90	1171	86	191	2	2	5	6	2	4	3	.	.	1472	15.3%
90-100	364	12	40	2	.	.	1	.	.	1	.	.	420	4.4%
100-110	73	3	16	.	.	.	.	.	.	.	.	.	92	1.0%
110-120	20	1	2	.	.	.	.	.	.	.	.	.	23	0.2%
120-130	1	.	.	.	.	.	.	.	.	.	.	.	1	0.0%
130-140	1	.	.	.	.	.	.	.	.	.	.	.	1	0.0%
140-150	1	.	.	.	.	.	.	.	.	.	.	.	1	0.0%
150-160	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
Total	6988	479	1270	76	46	37	65	13	175	387	71	0	9607	
	72.7%	5.0%	13.2%	0.8%	0.5%	0.4%	0.7%	0.1%	1.8%	4.0%	0.7%	0.0%		
													ADT 686	

MetroCount Traffic Executive
Class Speed Matrix

ClassMatrix-319 -- English (ENA)

Datasets:
Site: **[RD26-1419] Jerrara Road 300m north of Mountain Ash Rd**
Attribute: Jerrara Rd
Direction: 5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration: 15:17 Wednesday, 21 July 2021 => 15:01 Wednesday, 4 August 2021,
Zone:
File: RD26-1419 0 2021-08-04 1450.EC0 (Plus)
Identifier: PK34MRW0 MC5900-X13 (c)MetroCount 09Nov16
Algorithm: Factory default axle (v5.02)
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:
Filter time: **15:18 Wednesday, 21 July 2021 => 15:01 Wednesday, 4 August 2021 (13.9886)**
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range: 10 - 160 km/h.
Direction: North, East, South, West (bound), P = North, Lane = 0-16
Separation: Headway > 0 sec, Span 0 - 100 metre
Name: Default Profile
Scheme: Vehicle classification (AustRoads94)
Units: Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile: Vehicles = 5138 / 5140 (99.96%)

Class Speed Matrix

ClassMatrix-319
Site: RD26-1419.0.1SN
Description: **Jerrara Road 300m north of Mountain Ash Rd**
Filter time: **15:18 Wednesday, 21 July 2021 => 15:01 Wednesday, 4 August 2021**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Class													
	SV	SVT	TB2	TB3	T4	ART3	ART4	ART5	ART6	BD	DRT	TRT	Total	
km/h	1	2	3	4	5	6	7	8	9	10	11	12		
10- 20	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
20- 30	2	.	1	.	.	.	.	.	.	.	.	.	3	0.1%
30- 40	9	.	2	.	.	.	.	.	.	.	1	.	12	0.2%
40- 50	25	.	5	.	.	.	1	1	1	8	27	.	68	1.3%
50- 60	175	9	35	5	1	1	4	.	23	88	14	.	355	6.9%
60- 70	636	66	137	20	4	4	11	4	42	56	24	.	1004	19.5%
70- 80	906	103	256	15	5	4	15	5	25	34	5	.	1373	26.7%
80- 90	1091	80	245	12	2	12	16	.	5	8	.	.	1471	28.6%
90-100	504	20	106	.	.	2	3	.	1	2	.	.	638	12.4%
100-110	136	6	36	.	.	1	1	1	.	.	.	.	181	3.5%
110-120	22	.	5	.	.	.	1	.	.	.	.	.	28	0.5%
120-130	4	.	.	.	.	.	.	.	.	.	.	.	4	0.1%
130-140	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
140-150	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
150-160	1	.	.	.	.	.	.	.	.	.	.	.	1	0.0%
Total	**3511**	**284**	**828**	**52**	**12**	**24**	**52**	**11**	**97**	**196**	**71**	**0**	**5138**	
	68.3%	**5.5%**	**16.1%**	**1.0%**	**0.2%**	**0.5%**	**1.0%**	**0.2%**	**1.9%**	**3.8%**	**1.4%**	**0.0%**		
													ADT 367	

Goulburn Mulwaree Council
Class Speed Matrix

ClassMatrix-543 -- English (ENA)

Datasets:
Site: **[RD48-15] Carrick Road 150m from Hume Hwy**
Direction: 5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration: 16:10 Thursday, 24 August 2017 => 7:21 Tuesday, 12 September 2017
Zone:
File: RD48-15 0 2017-09-12 0722.EC0 (Plus)
Identifier: EA8146A7 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm: Factory default (v3.21 - 15275)
Data type: Axle sensors - Paired (Class/Speed/Count)

Profile:
Filter time: **16:11 Thursday, 24 August 2017 => 7:21 Tuesday, 12 September 2017**
Included classes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range: 10 - 160 km/h.
Direction: North, East, South, West (bound)
Separation: All - (Headway)
Name: Default Profile
Scheme: Vehicle classification (AustRoads94)
Units: Metric (meter, kilometer, m/s, km/h, kg, tonne)
In profile: Vehicles = 4015 / 4023 (99.80%)

Class Speed Matrix

ClassMatrix-543
Site: RD48-15.0.0SN
Description: **Carrick Road 150m from Hume Hwy**
Filter time: **16:11 Thursday, 24 August 2017 => 7:21 Tuesday, 12 September 2017**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

Speed (km/h)	Class 1	2	3	4	5	6	7	8	9	10	11	12	Speed Totals	
10 - 20	34	.	2	.	.	.	.	.	.	.	.	.	36	0.9%
20 - 30	25	1	3	5	.	.	2	.	.	.	.	.	36	0.9%
30 - 40	74	1	14	2	1	1	4	1	.	.	.	.	98	2.4%
40 - 50	156	14	52	5	14	4	1	2	1	.	.	.	249	6.2%
50 - 60	603	51	150	9	18	11	12	5	2	.	.	.	861	21.4%
60 - 70	1109	38	187	5	7	12	17	3	1	.	.	.	1379	34.3%
70 - 80	777	19	147	.	5	6	16	2	.	.	.	.	972	24.2%
80 - 90	249	1	70	.	.	5	1	.	.	.	.	.	326	8.1%
90 - 100	39	.	10	.	.	.	.	.	.	.	.	.	49	1.2%
100 - 110	8	.	.	.	.	.	.	.	.	.	.	.	8	0.2%
110 - 120	1	.	.	.	.	.	.	.	.	.	.	.	1	0.0%
120 - 130	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
130 - 140	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
140 - 150	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
150 - 160	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
Class Totals	**3075**	**125**	**635**	**26**	**45**	**39**	**53**	**13**	**4**	**0**	**0**	**0**	**4015**	
	76.6%	**3.1%**	**15.8%**	**0.6%**	**1.1%**	**1.0%**	**1.3%**	**0.3%**	**0.1%**	**0.0%**	**0.0%**	**0.0%**	AADT 217	

Goulburn Mulwaree Council
Class Speed Matrix

ClassMatrix-542 -- English (ENA)

Datasets:

Site:	**[RD48-1691] Carrick Road 100m south of Brayton Road intersection**
Direction:	5 - South bound A>B, North bound B>A. **Lane:** 0
Survey Duration:	16:45 Thursday, 24 August 2017 => 7:45 Tuesday, 12 September 2017
Zone:	
File:	RD48-1691 0 2017-09-12 0746.EC0 (Plus)
Identifier:	EC41F131 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default (v3.21 - 15275)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**16:46 Thursday, 24 August 2017 => 7:45 Tuesday, 12 September 2017**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound)
Separation:	All - (Headway)
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (meter, kilometer, m/s, km/h, kg, tonne)
In profile:	Vehicles = 1519 / 1523 (99.74%)

Class Speed Matrix

ClassMatrix-542
Site: RD48-1691.0.0SN
Description: **Carrick Road 100m south of Brayton Road intersection**
Filter time: **16:46 Thursday, 24 August 2017 => 7:45 Tuesday, 12 September 2017**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0)

Speed (km/h)	Class 1	2	3	4	5	6	7	8	9	10	11	12	Speed Totals	
10 - 20	13	1	1	1	.	.	.	.	.	.	.	.	16	1.1%
20 - 30	31	6	4	4	2	4	.	5	1	.	.	.	57	3.8%
30 - 40	134	17	56	5	.	7	2	3	.	.	.	.	224	14.7%
40 - 50	428	33	81	3	3	2	.	3	.	.	.	.	553	36.4%
50 - 60	409	13	62	.	1	7	5	.	.	.	.	.	497	32.7%
60 - 70	127	.	35	.	.	1	.	.	.	.	.	.	163	10.7%
70 - 80	8	.	.	.	.	.	.	.	.	.	.	.	8	0.5%
80 - 90	1	.	.	.	.	.	.	.	.	.	.	.	1	0.1%
90 - 100	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
100 - 110	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
110 - 120	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
120 - 130	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
130 - 140	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
140 - 150	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
150 - 160	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
Class Totals	1151	70	239	13	6	21	7	11	1	0	0	0	1519	
	75.8%	4.6%	15.7%	0.9%	0.4%	1.4%	0.5%	0.7%	0.1%	0.0%	0.0%	0.0%	AADT 82	

MetroCount Traffic Executive
Class Speed Matrix

ClassMatrix-213 -- English (ENA)

Datasets:

Site:	**[RD75-415] Brayton Road 4km west of George St**
Attribute:	Brayton Rd
Direction:	6 - West bound A>B, East bound B>A. **Lane:** 0
Survey Duration:	11:11 Monday, 16 September 2019 => 11:38 Monday, 30 September 2019,
Zone:	
File:	RD75-415 0 2019-09-30 0315.EC0 (Plus)
Identifier:	DJ145M9A MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**11:12 Monday, 16 September 2019 => 11:38 Monday, 30 September 2019 (14.0182)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = East, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 8762 / 8762 (100.00%)

Class Speed Matrix

ClassMatrix-213
Site: RD75-415.0.1WE
Description: **Brayton Road 4km west of George St**
Filter time: **11:12 Monday, 16 September 2019 => 11:38 Monday, 30 September 2019**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Class												
	SV	SVT	TB2	TB3	T4	ART3	ART4	ART5	ART6	BD	DRT	TRT	Total	
km/h	1	2	3	4	5	6	7	8	9	10	11	12		
10- 20	7	.	1	.	.	.	.	.	.	.	.	.	8	0.1%
20- 30	12	.	1	1	.	.	.	.	.	.	.	.	14	0.2%
30- 40	12	.	1	.	.	.	.	.	.	1	.	.	14	0.2%
40- 50	8	.	.	1	.	.	.	.	.	.	.	.	9	0.1%
50- 60	27	5	2	.	.	.	.	.	1	2	1	.	38	0.4%
60- 70	124	14	20	2	1	.	3	.	4	8	.	.	176	2.0%
70- 80	439	37	83	15	12	3	9	2	31	88	4	.	723	8.3%
80- 90	1073	68	223	63	44	5	11	24	81	432	56	.	2080	23.7%
90-100	1666	82	350	42	51	9	14	33	163	484	72	.	2966	33.9%
100-110	1210	50	256	17	6	4	13	5	54	169	16	.	1800	20.5%
110-120	531	13	130	1	.	.	2	.	.	1	.	.	678	7.7%
120-130	139	3	42	.	.	1	.	.	.	.	.	.	185	2.1%
130-140	32	.	18	.	.	.	.	.	.	.	.	.	50	0.6%
140-150	10	.	7	.	.	1	.	.	.	.	.	.	18	0.2%
150-160	1	.	2	.	.	.	.	.	.	.	.	.	3	0.0%
Total	5291	272	1136	142	114	23	52	64	334	1185	149	0	8762	
	60.4%	3.1%	13.0%	1.6%	1.3%	0.3%	0.6%	0.7%	3.8%	13.5%	1.7%	0.0%		
													ADT 626	

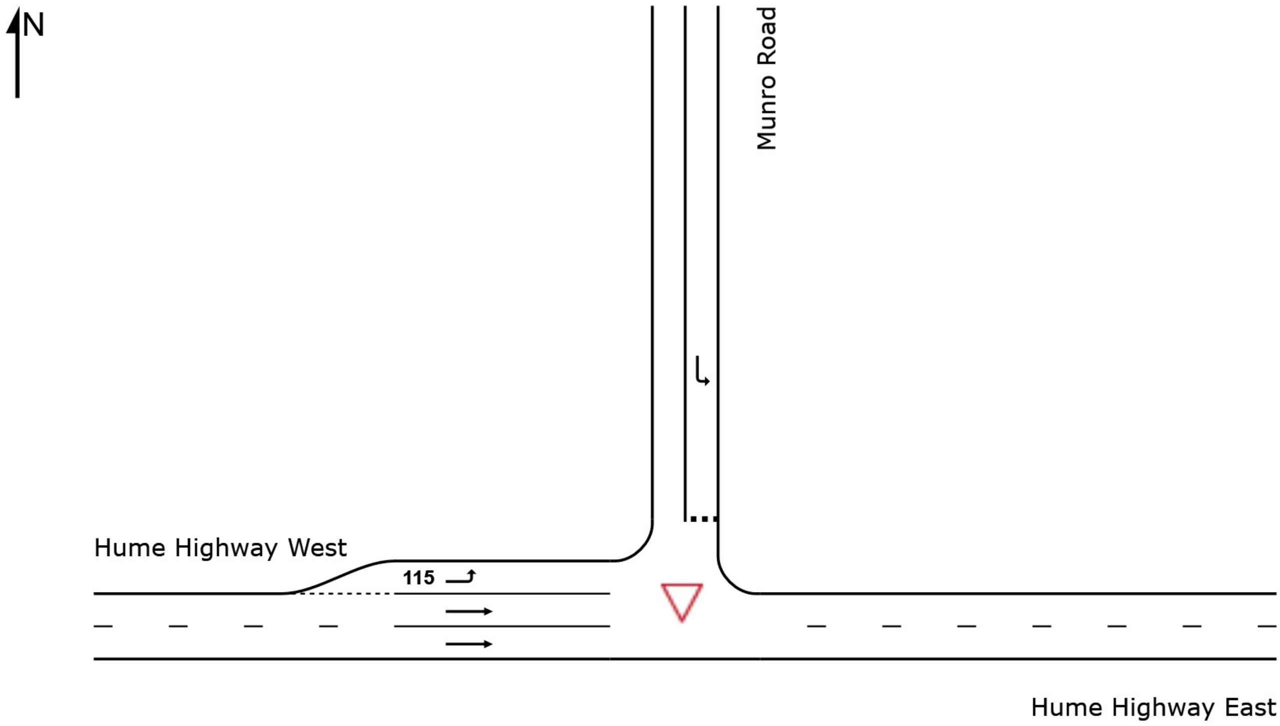
APPENDIX B

SIDRA MODELLING RESULTS FOR PRE DEVELOPMENT TRAFFIC VOLUMES ON THE HUME HIGHWAY

SITE LAYOUT

▽ Site: [Hume Hwy Munro Rd - Pre Development]

Site Category: (None)
Giveway / Yield (Two-Way)



SIDRA INTERSECTION 8.0 | Copyright © 2000-2019 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: GEOLYSE PTY LTD | Created: Thursday, 14 April 2022 2:03:23 PM
Project: C:\Users\peter.oste\OneDrive - Premise\Documents\MARULAN SITES.sip8

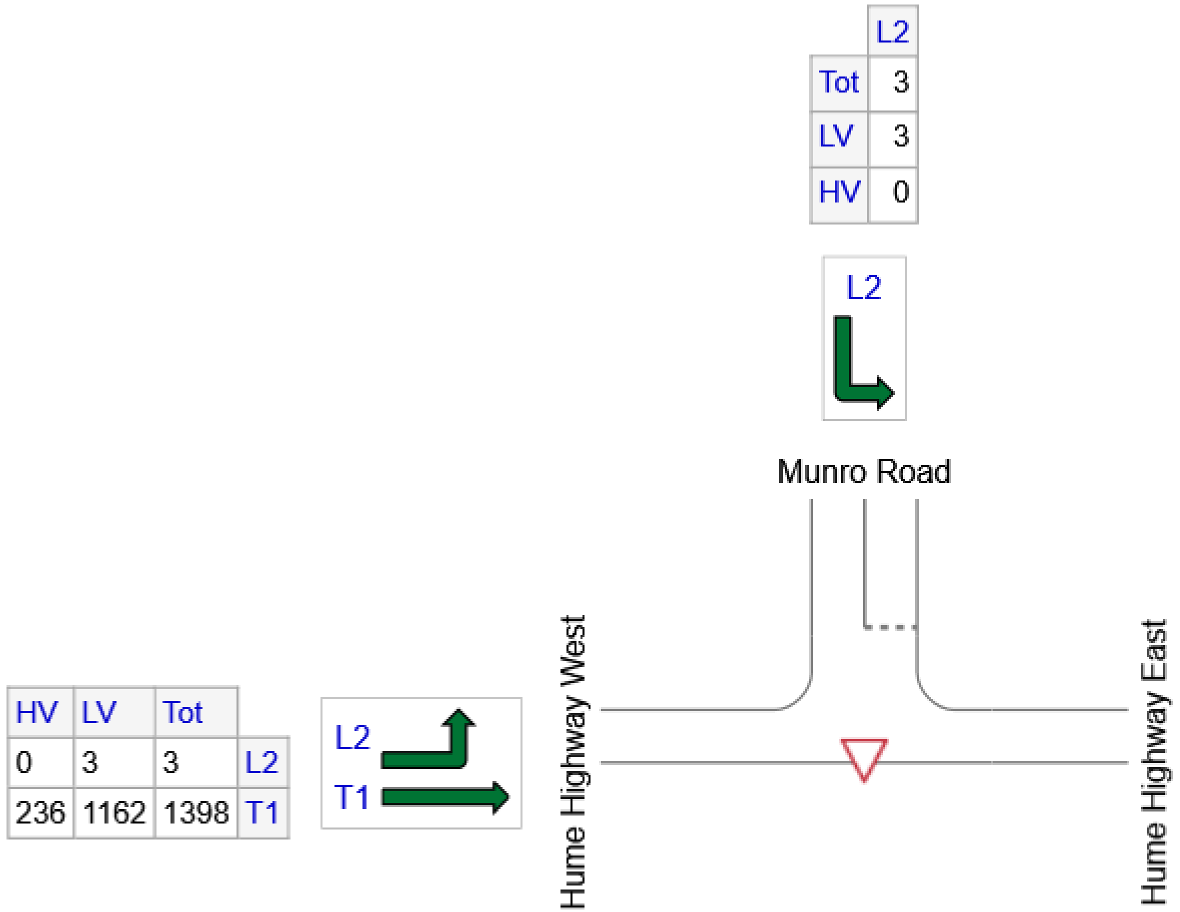
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

▽ Site: [Hume Hwy Munro Rd - Pre Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

Volume Display Method: Separate



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
N: Munro Road	3	3	0
W: Hume Highway West	1401	1165	236
Total	1404	1168	236

DELAY (CONTROL)

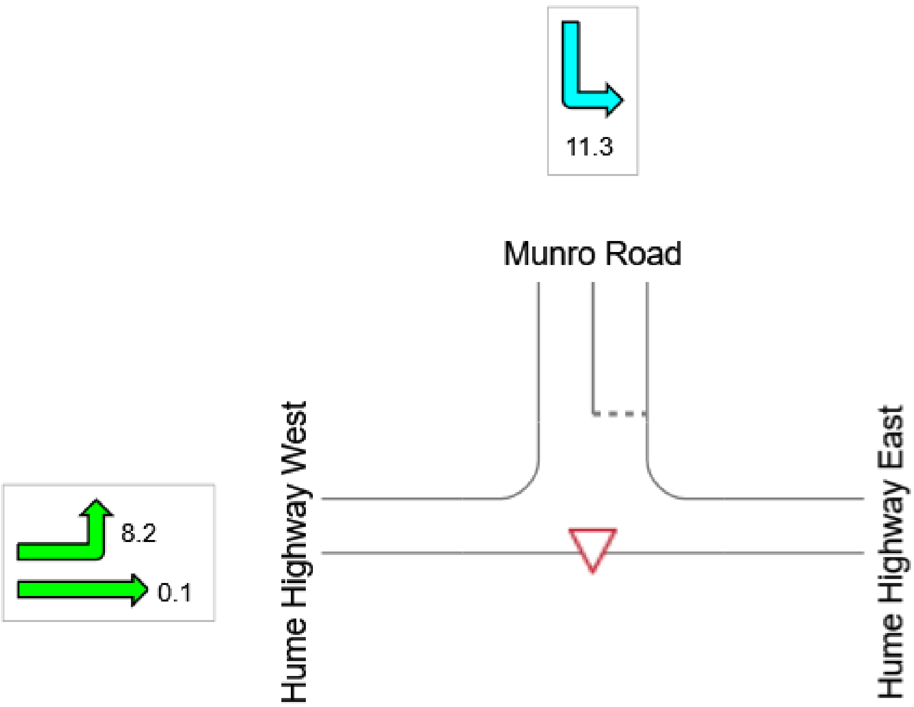
Average control delay per vehicle, or average pedestrian delay (seconds)

▽ Site: [Hume Hwy Munro Rd - Pre Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Delay (Control)	11.3	0.1	0.1
LOS	B	NA	NA



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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QUEUE DISTANCE (%ILE)

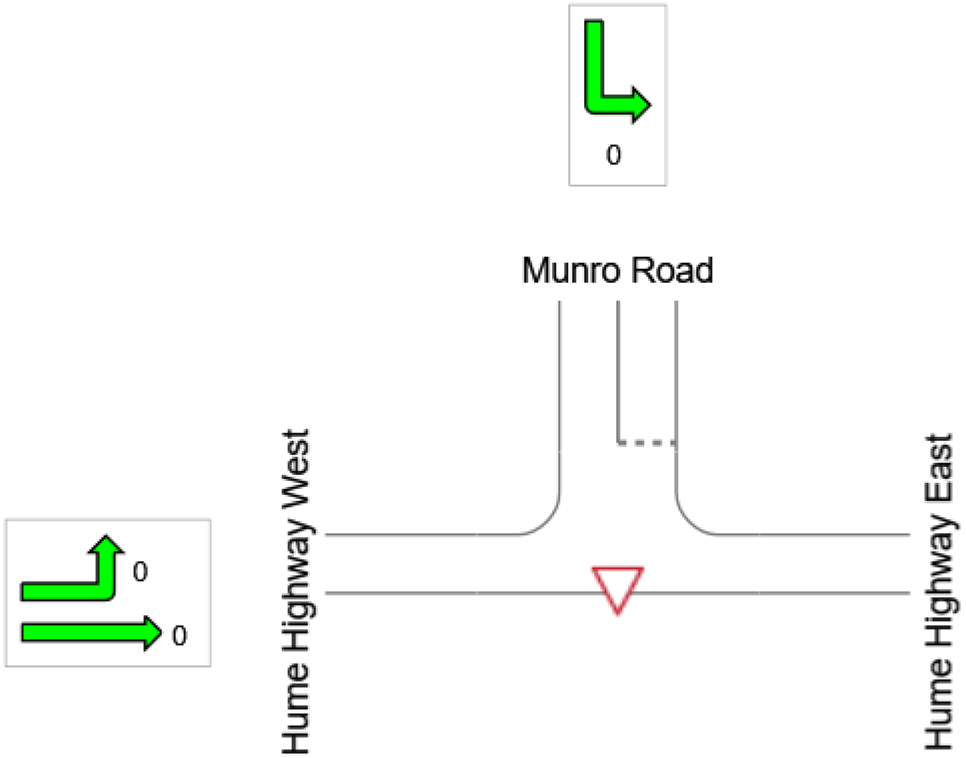
Largest 95% Back of Queue Distance for any lane used by vehicle movement (metres)

▽ Site: [Hume Hwy Munro Rd - Pre Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Vehicle Queue (%ile)	0	0	0



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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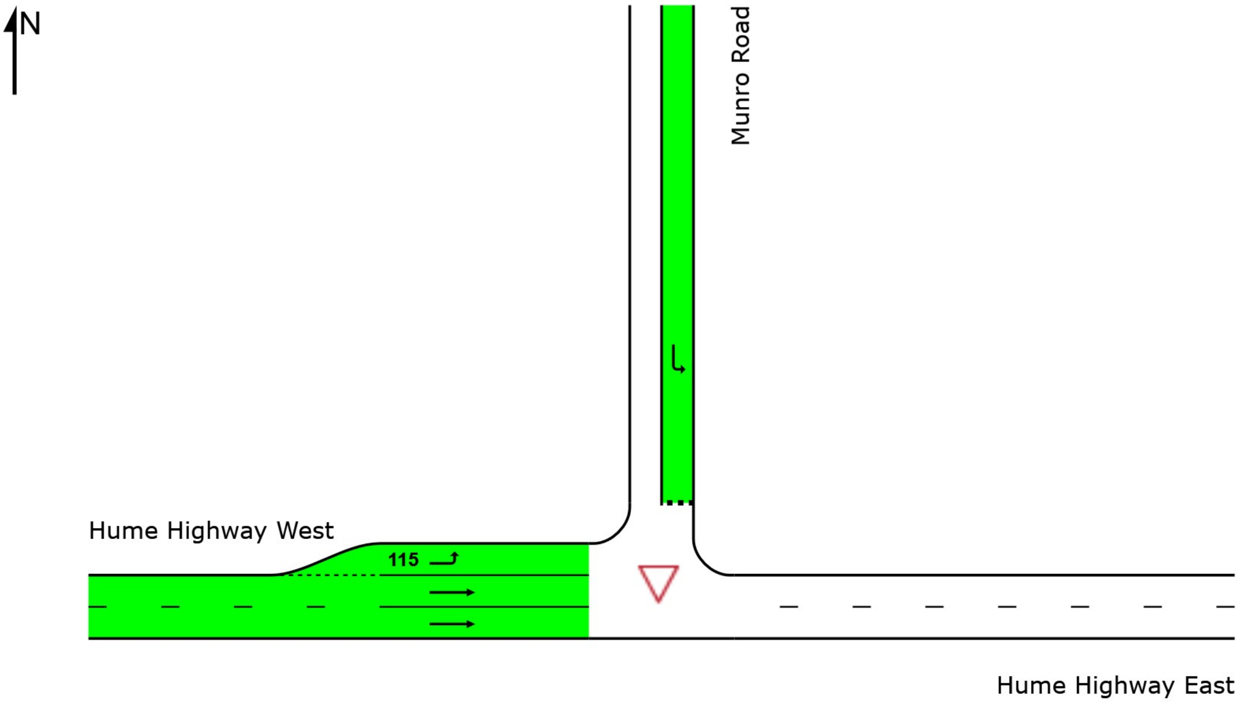
DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

▽ Site: [Hume Hwy Munro Rd - Pre Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

	Approaches		Intersection
	North	West	
Degree of Saturation	0.00	0.39	0.39



Colour code based on Degree of Saturation

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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LEVEL OF SERVICE

Movement Level of Service

Site: [Hume Hwy Munro Rd - Pre Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
LOS	B	NA	NA

Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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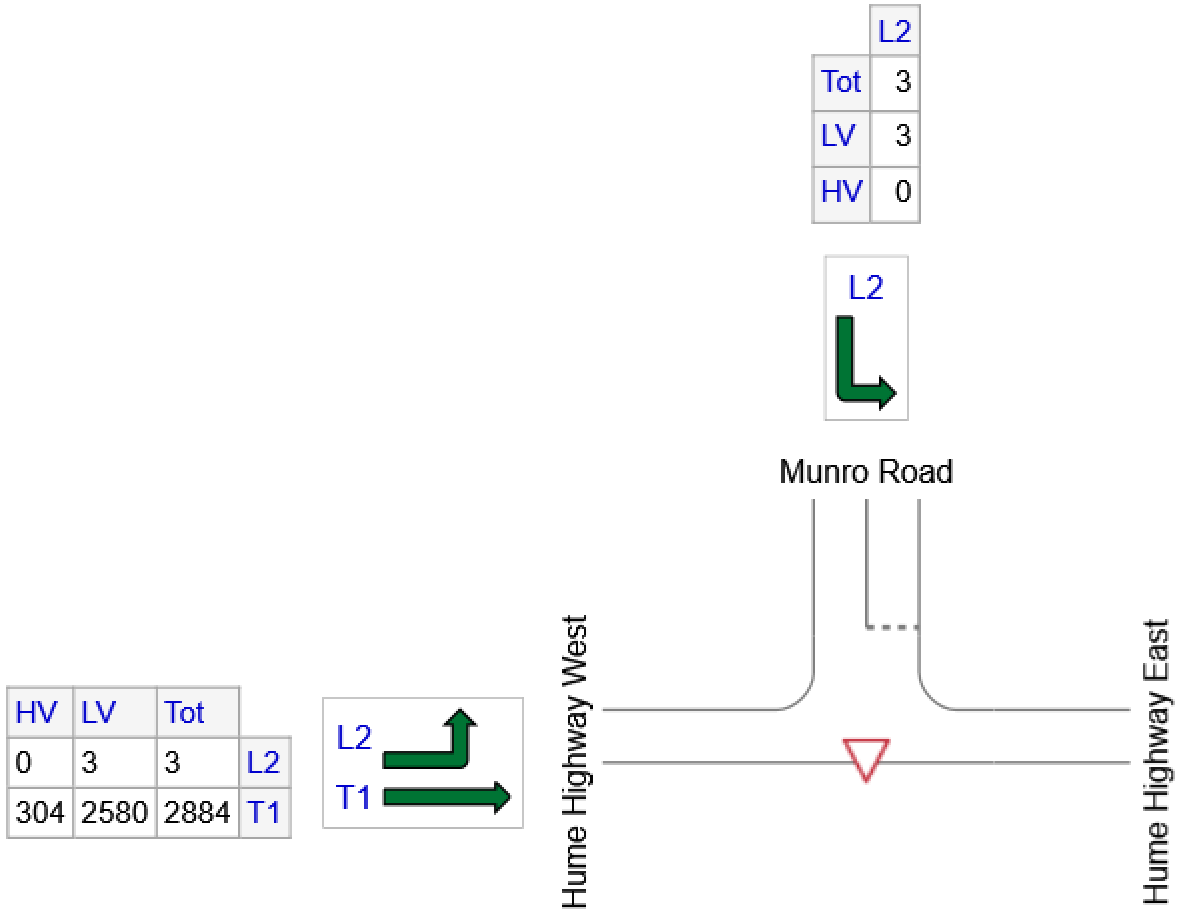
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

▽ Site: [Hume Hwy Munro Rd - Pre Development PM]

Site Category: (None)
Giveway / Yield (Two-Way)

Volume Display Method: Separate



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
N: Munro Road	3	3	0
W: Hume Highway West	2887	2583	304
Total	2890	2586	304

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DELAY (CONTROL)

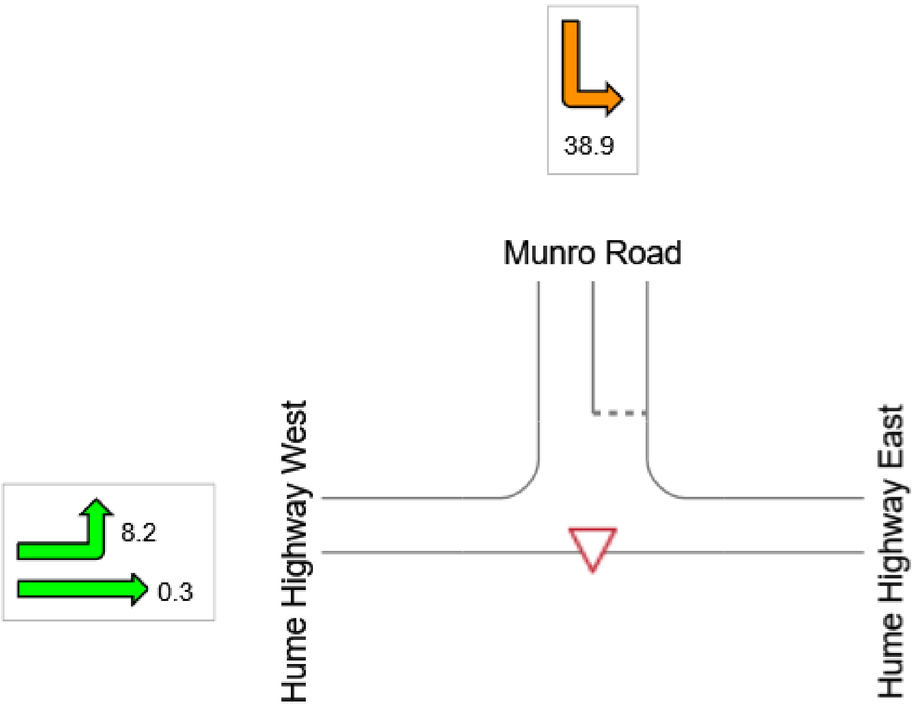
Average control delay per vehicle, or average pedestrian delay (seconds)

▽ Site: [Hume Hwy Munro Rd - Pre Development PM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Delay (Control)	38.9	0.3	0.4
LOS	E	NA	NA



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

QUEUE DISTANCE (%ILE)

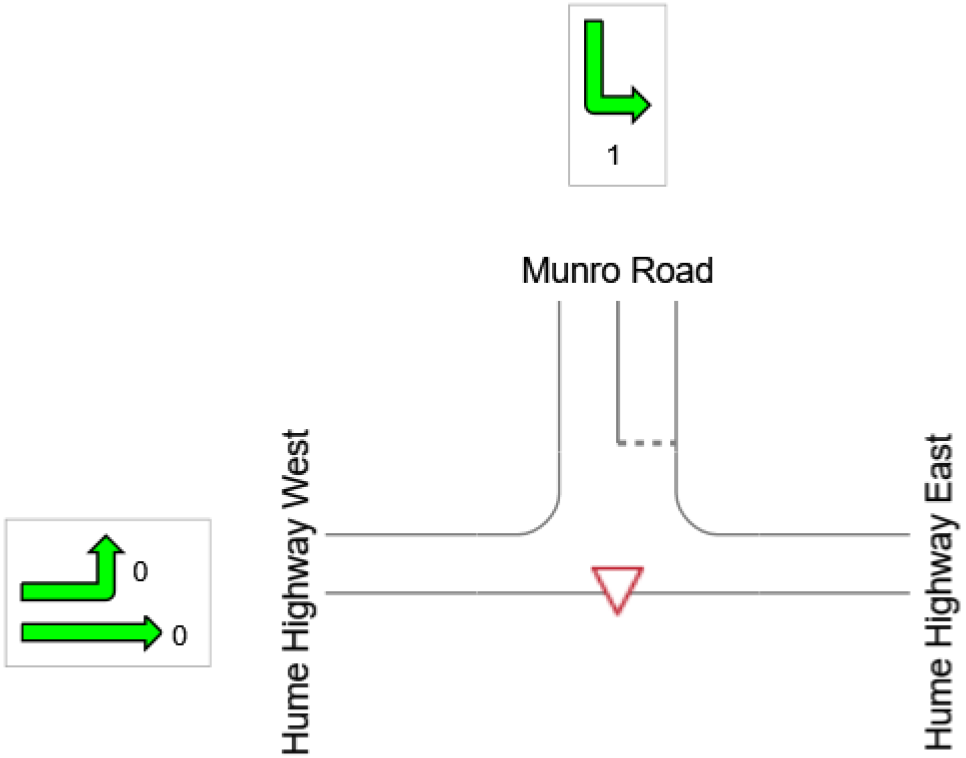
Largest 95% Back of Queue Distance for any lane used by vehicle movement (metres)

▽ Site: [Hume Hwy Munro Rd - Pre Development PM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Vehicle Queue (%ile)	1	0	1



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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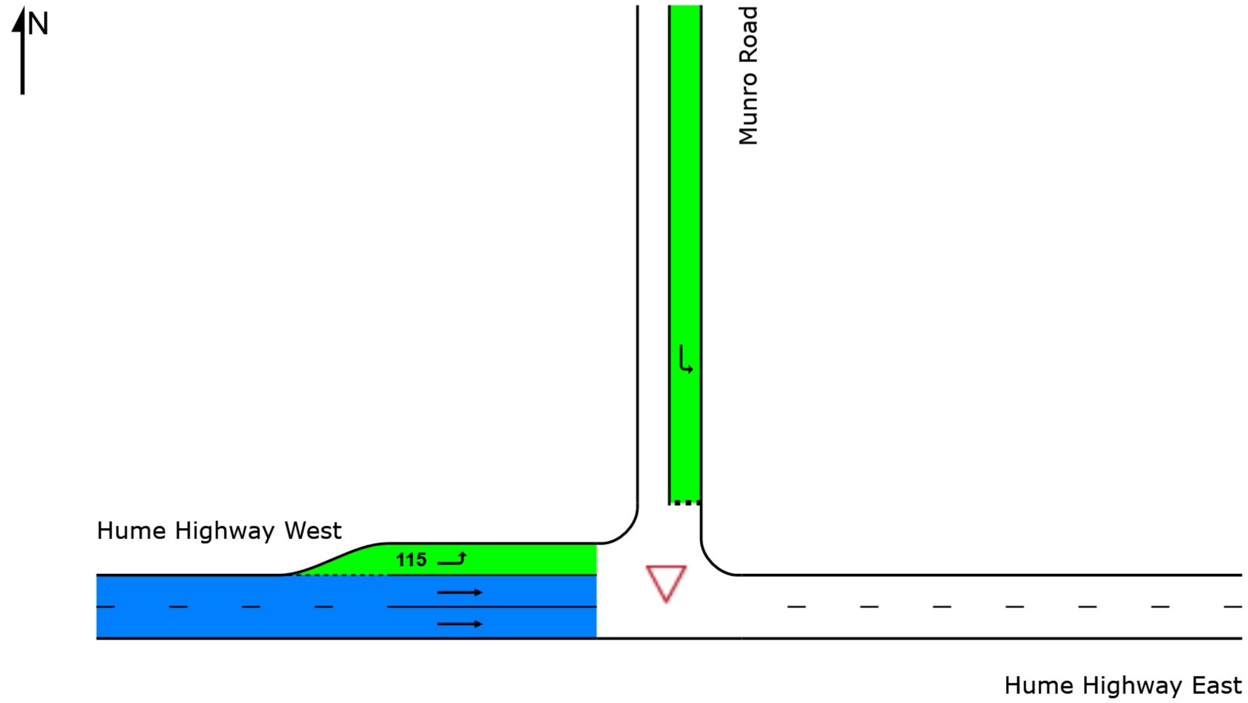
DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

▽ Site: [Hume Hwy Munro Rd - Pre Development PM]

Site Category: (None)
Giveway / Yield (Two-Way)

	Approaches		Intersection
	North	West	
Degree of Saturation	0.03	0.78	0.78



Colour code based on Degree of Saturation

[< 0.6]   [0.6 – 0.7]   [0.7 – 0.8]   [0.8 – 0.9]   [0.9 – 1.0]   [> 1.0]

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LEVEL OF SERVICE

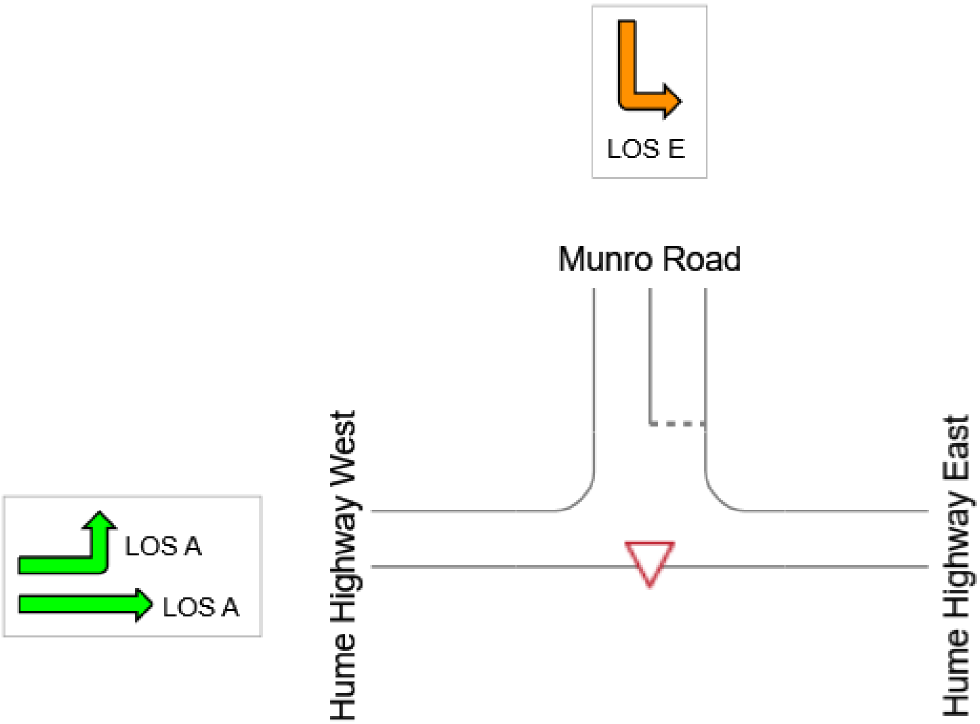
Movement Level of Service

Site: [Hume Hwy Munro Rd - Pre Development PM]

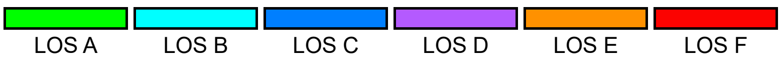
Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
LOS	E	NA	NA



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

APPENDIX C

SIDRA MODELLING RESULTS FOR CONSTRUCTION PHASE TRAFFIC ON THE HUME HIGHWAY

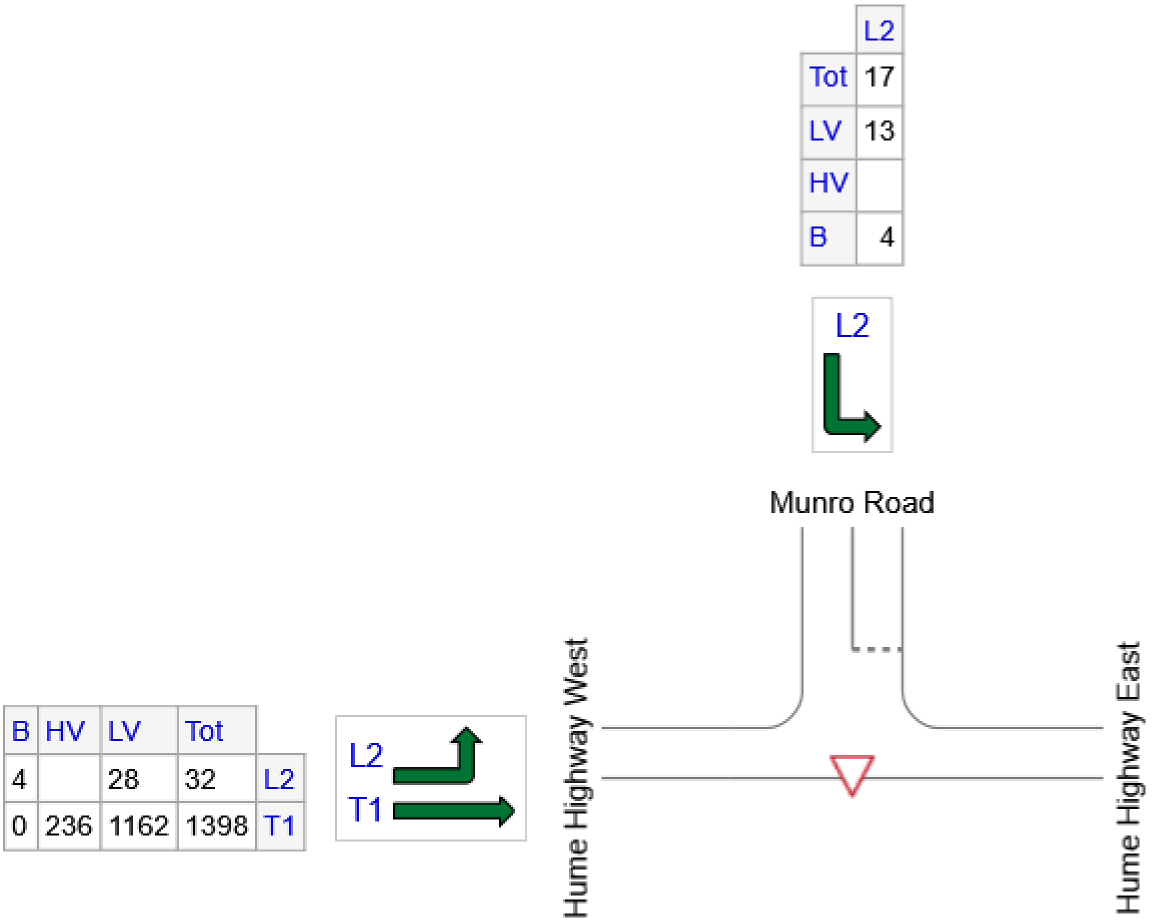
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: [Hume Hwy Munro Rd - Post Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

Volume Display Method: Separate



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Buses (B)
N: Munro Road	17	13	-	4
W: Hume Highway West	1430	1190	236	4
Total	1447	1203	236	8

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DELAY (CONTROL)

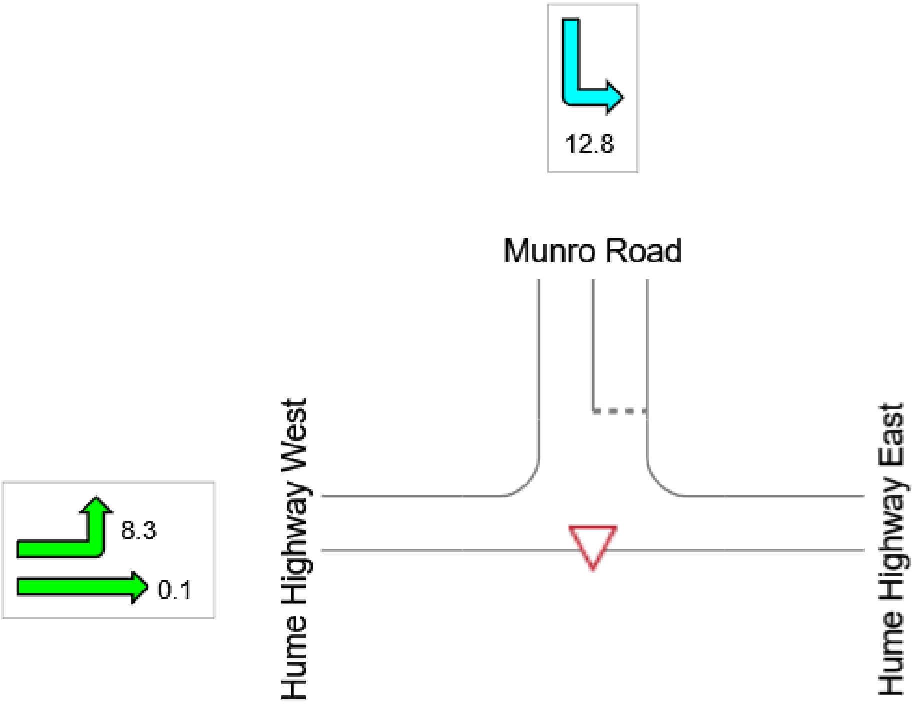
Average control delay per vehicle, or average pedestrian delay (seconds)

▽ Site: [Hume Hwy Munro Rd - Post Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Delay (Control)	12.8	0.2	0.4
LOS	B	NA	NA



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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QUEUE DISTANCE (%ILE)

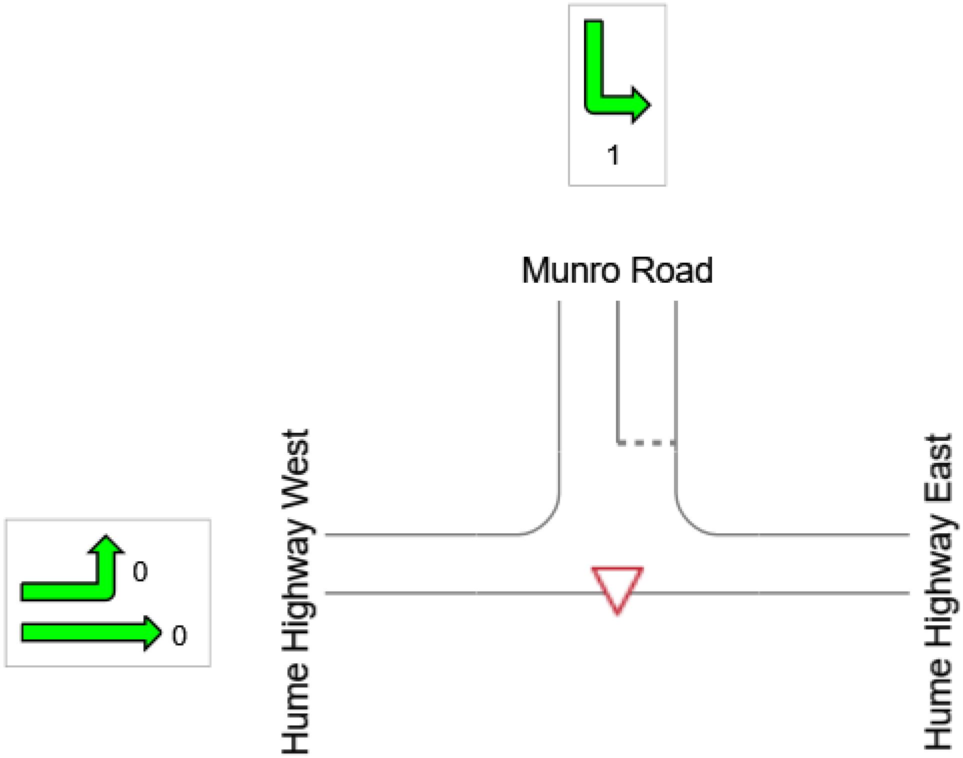
Largest 95% Back of Queue Distance for any lane used by vehicle movement (metres)

▽ Site: [Hume Hwy Munro Rd - Post Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Vehicle Queue (%ile)	1	0	1



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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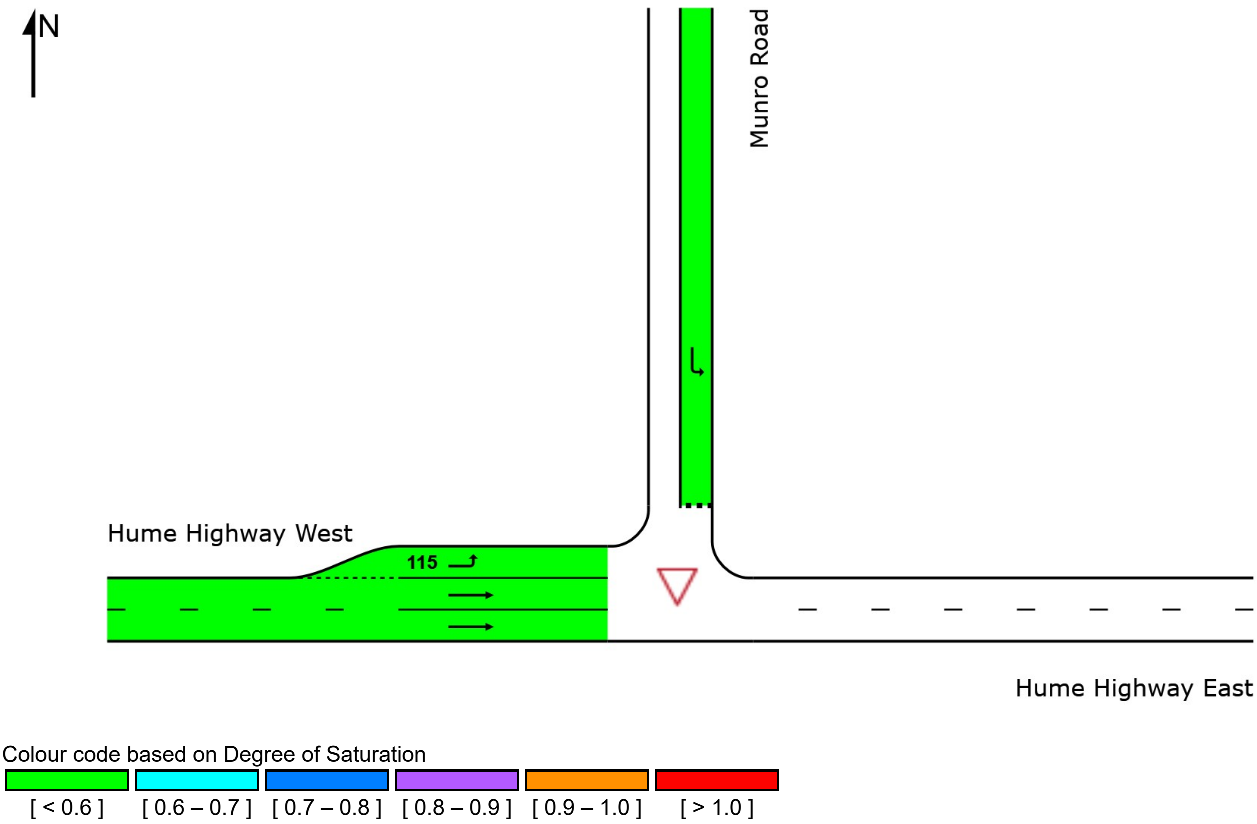
DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Site: [Hume Hwy Munro Rd - Post Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

	Approaches		Intersection
	North	West	
Degree of Saturation	0.03	0.39	0.39



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LEVEL OF SERVICE

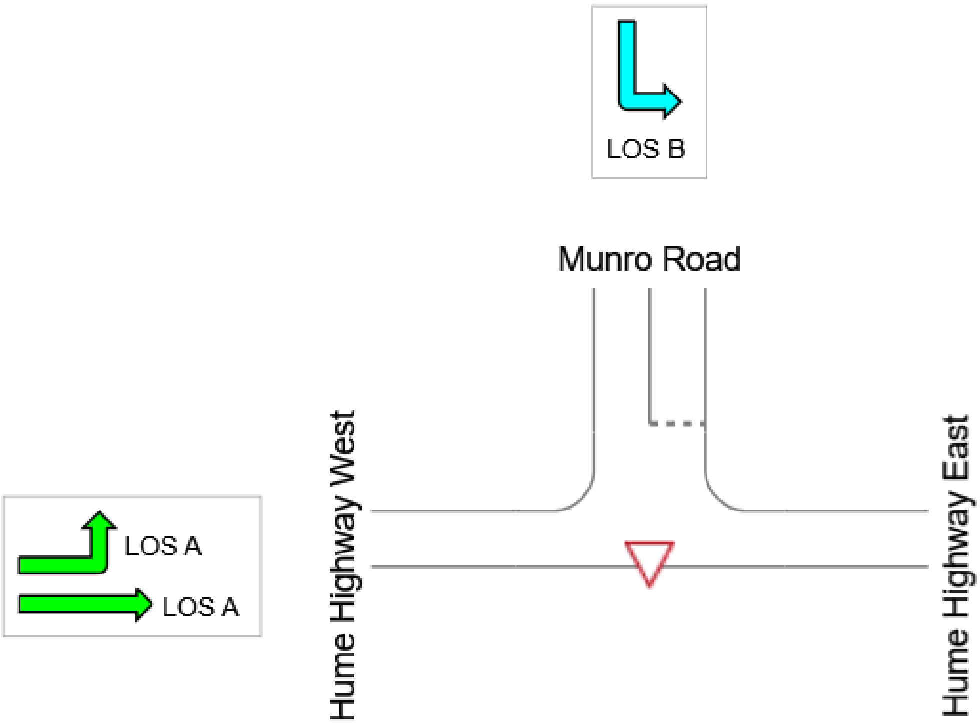
Movement Level of Service

Site: [Hume Hwy Munro Rd - Post Development AM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
LOS	B	NA	NA



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

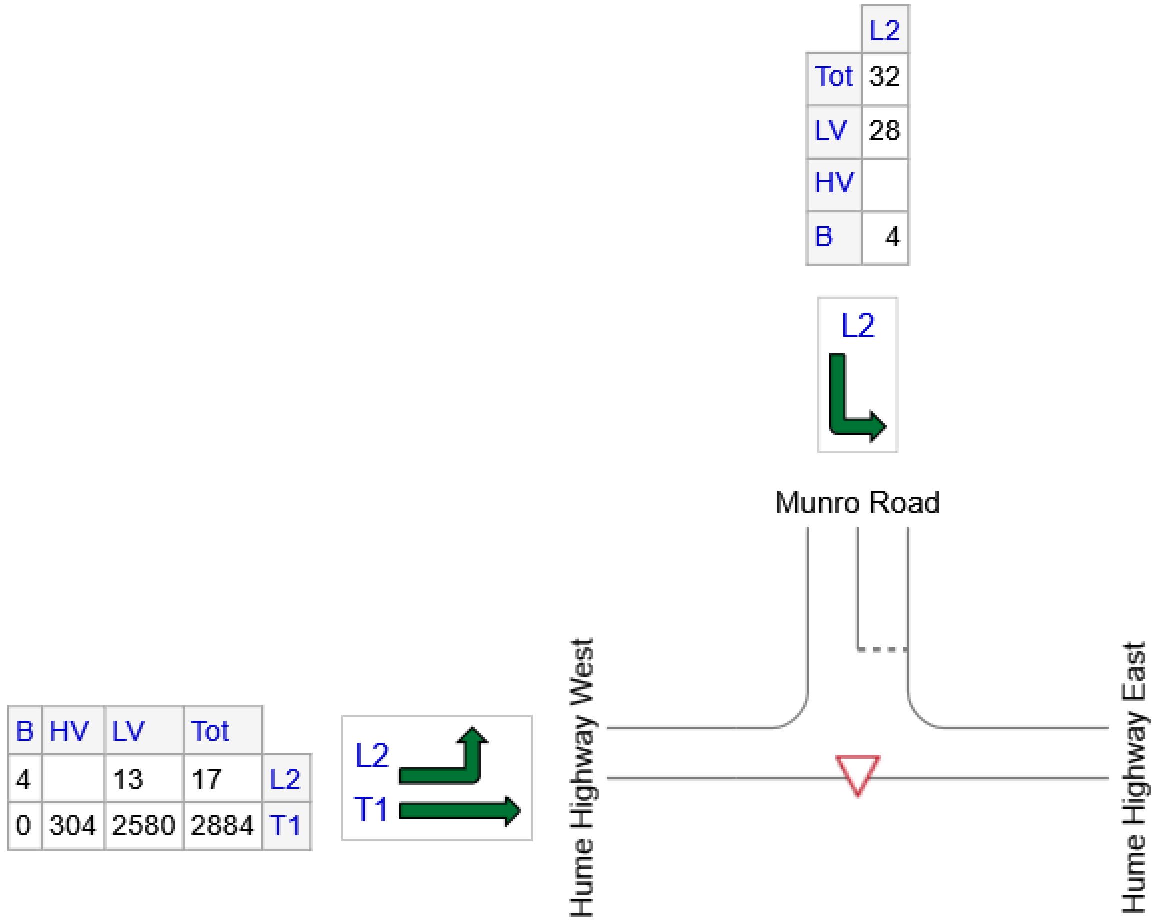
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: [Hume Hwy Munro Rd - Post Development - PM]

Site Category: (None)
Giveway / Yield (Two-Way)

Volume Display Method: Separate



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Buses (B)
N: Munro Road	32	28	-	4
W: Hume Highway West	2901	2593	304	4
Total	2933	2621	304	8

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DELAY (CONTROL)

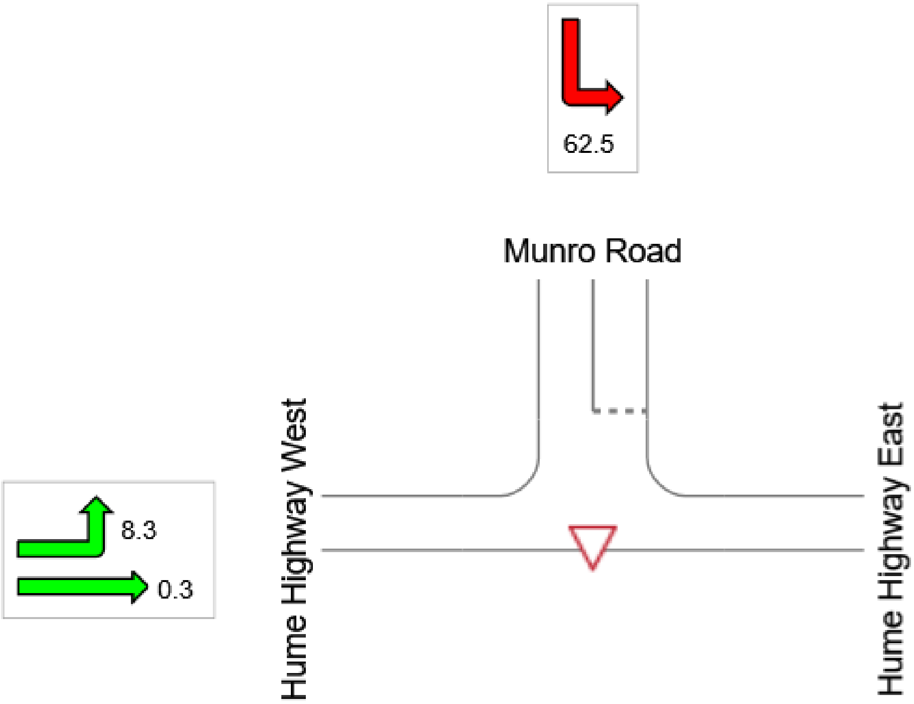
Average control delay per vehicle, or average pedestrian delay (seconds)

▽ Site: [Hume Hwy Munro Rd - Post Development - PM]

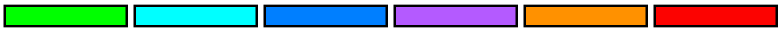
Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Delay (Control)	62.5	0.4	1.0
LOS	F	NA	NA



Colour code based on Level of Service



LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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QUEUE DISTANCE (%ILE)

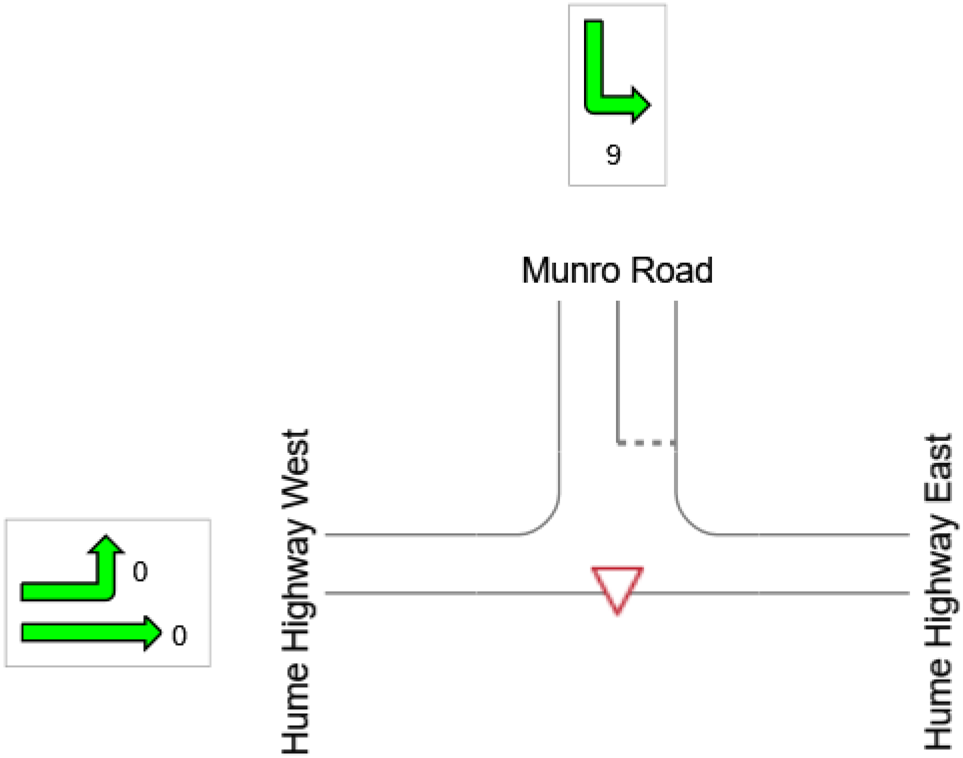
Largest 95% Back of Queue Distance for any lane used by vehicle movement (metres)

▽ Site: [Hume Hwy Munro Rd - Post Development - PM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Vehicle Queue (%ile)	9	0	9



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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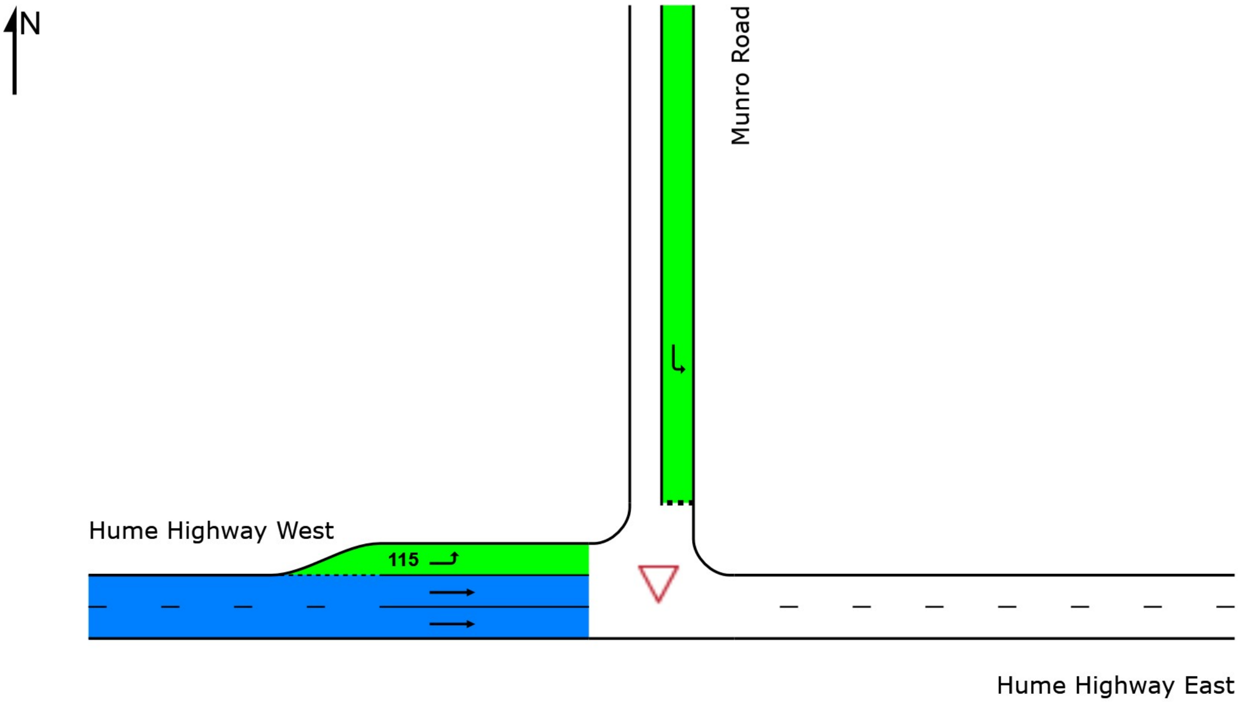
DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

▽ Site: [Hume Hwy Munro Rd - Post Development - PM]

Site Category: (None)
Giveway / Yield (Two-Way)

	Approaches		Intersection
	North	West	
Degree of Saturation	0.39	0.78	0.78



Colour code based on Degree of Saturation

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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LEVEL OF SERVICE

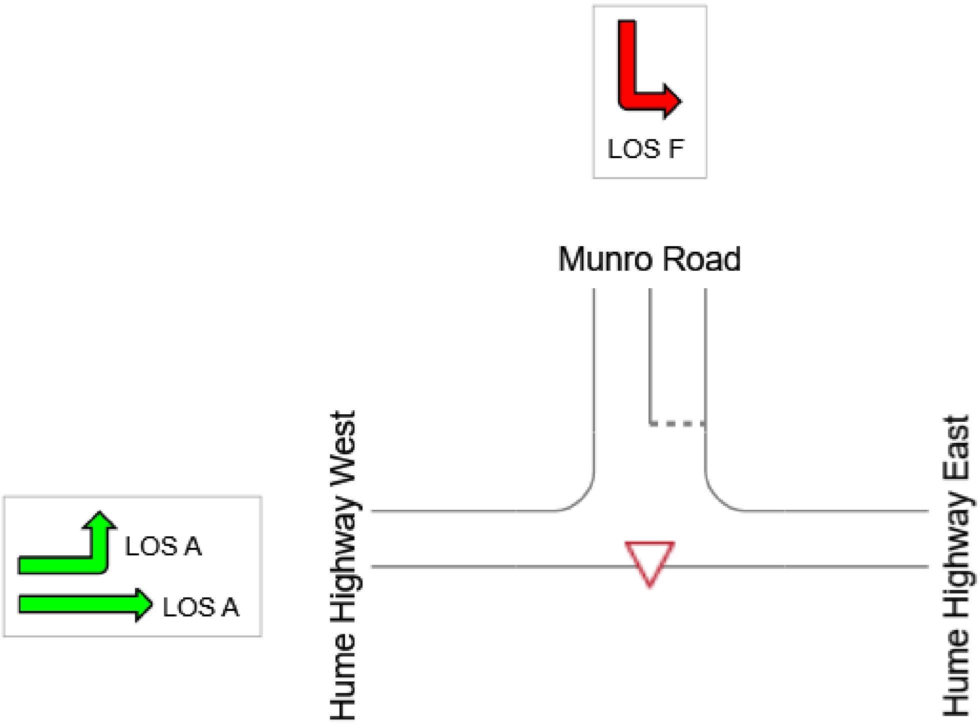
Movement Level of Service

▽ Site: [Hume Hwy Munro Rd - Post Development - PM]

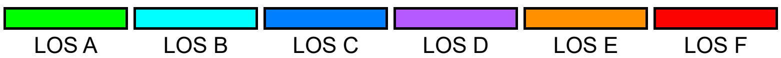
Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
LOS	F	NA	NA



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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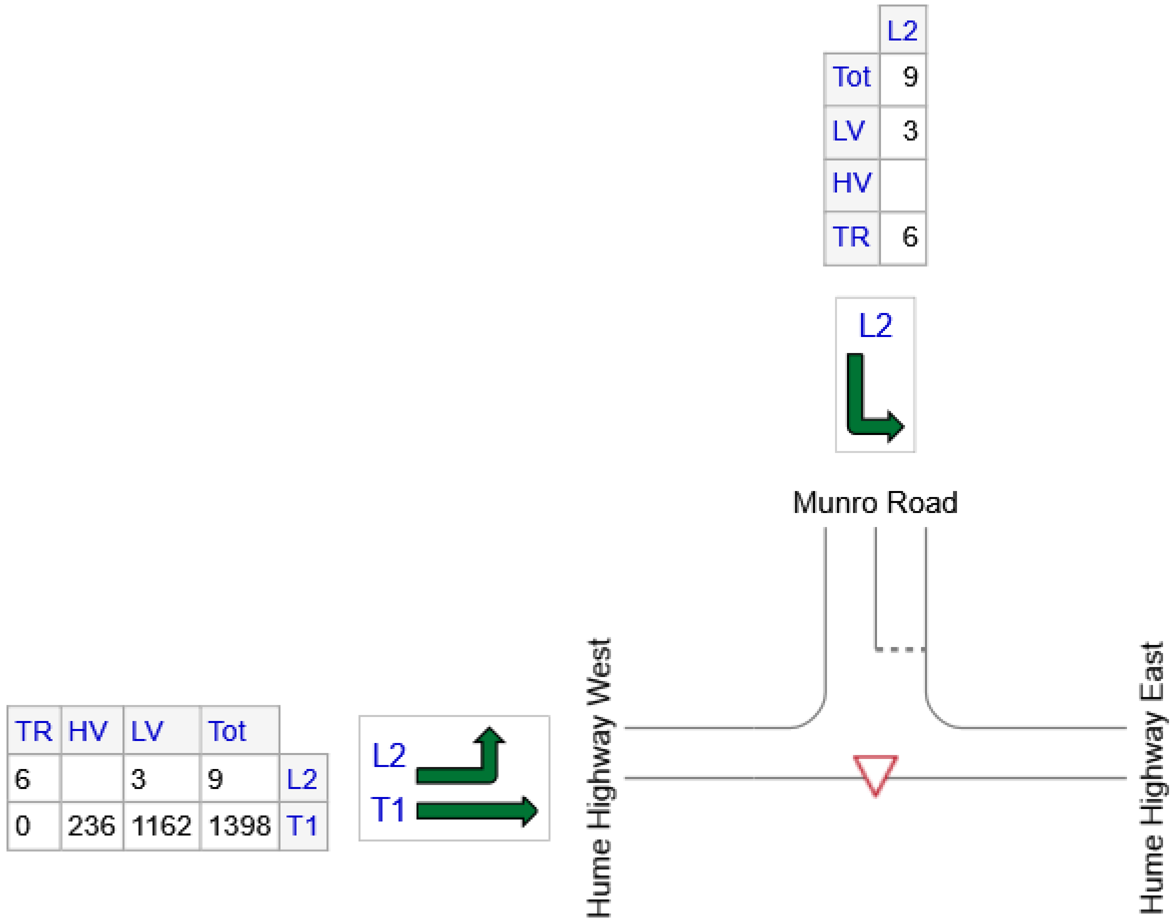
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: [Hume Hwy Munro Rd - Post Development - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

Volume Display Method: Separate



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Large Trucks (TR)
N: Munro Road	9	3	-	6
W: Hume Highway West	1407	1165	236	6
Total	1416	1168	236	12

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DELAY (CONTROL)

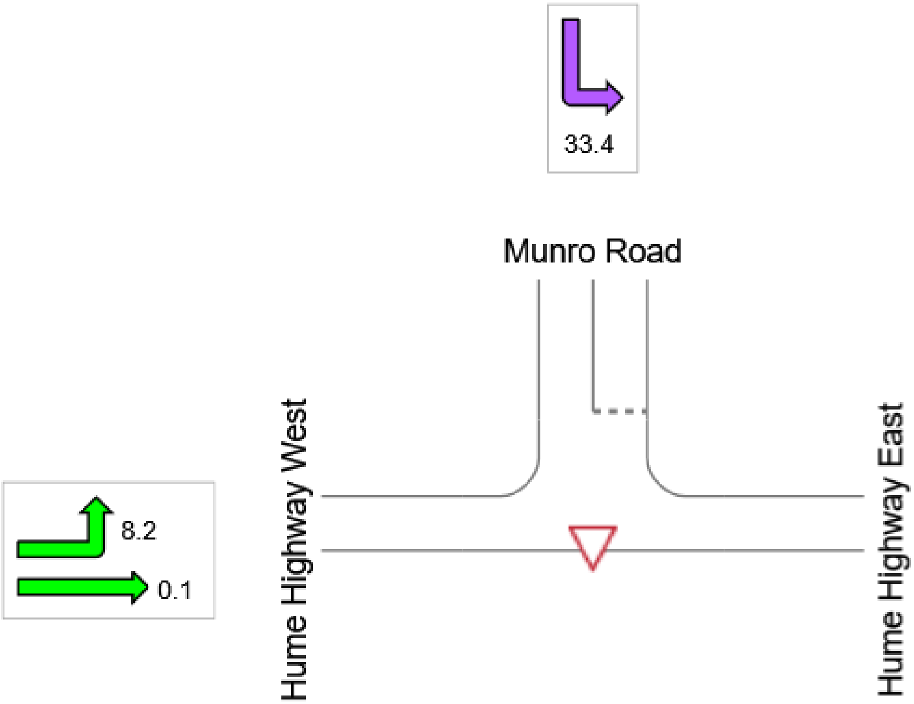
Average control delay per vehicle, or average pedestrian delay (seconds)

▽ Site: [Hume Hwy Munro Rd - Post Development - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Delay (Control)	33.4	0.1	0.3
LOS	D	NA	NA



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

QUEUE DISTANCE (%ILE)

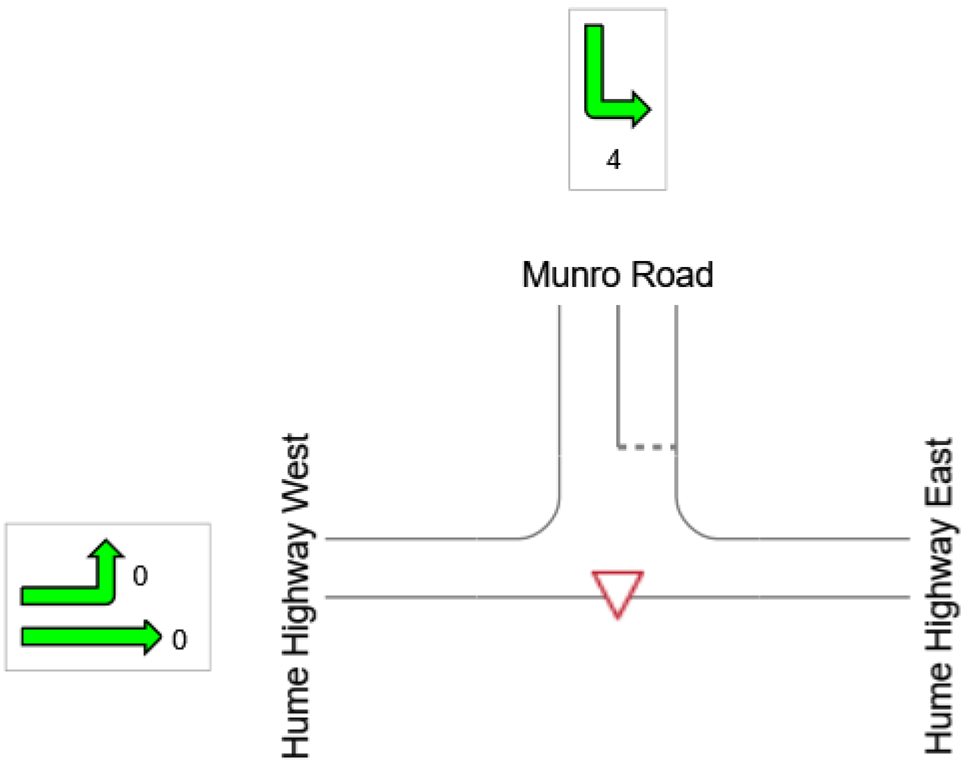
Largest 95% Back of Queue Distance for any lane used by vehicle movement (metres)

▽ Site: [Hume Hwy Munro Rd - Post Development - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
Vehicle Queue (%ile)	4	0	4



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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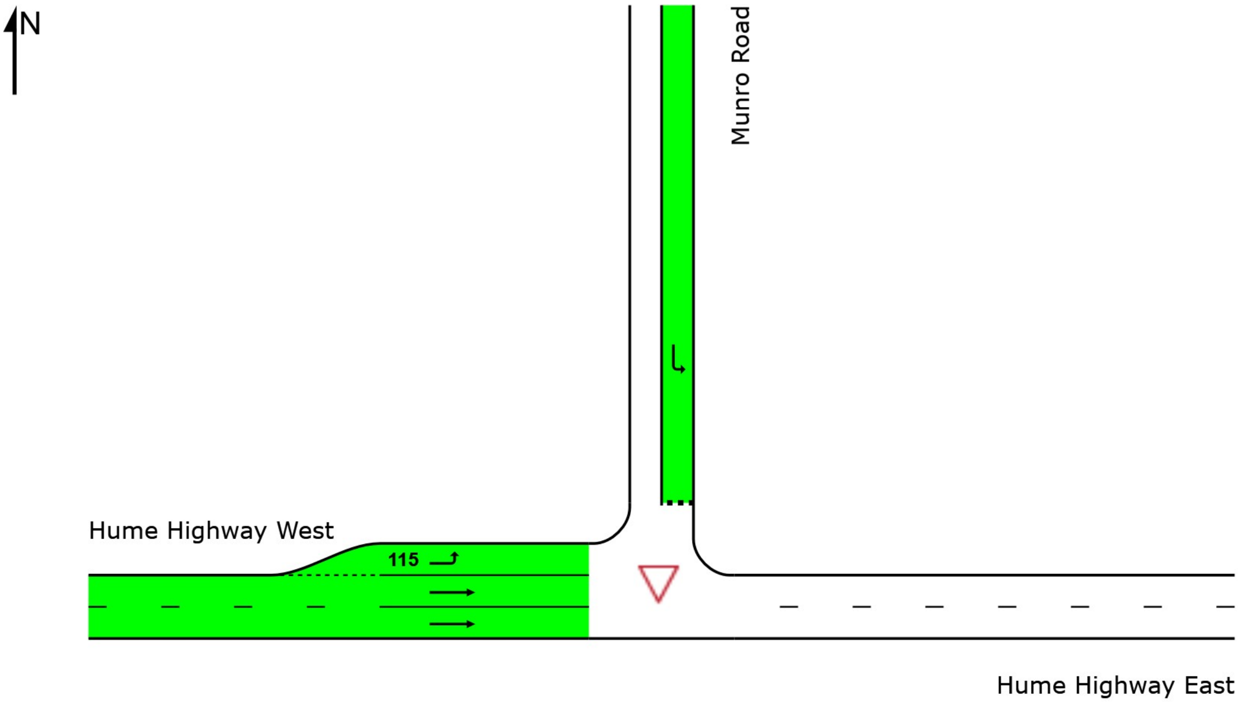
DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

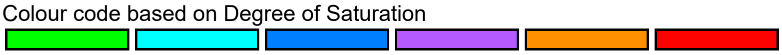
Site: [Hume Hwy Munro Rd - Post Development - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

	Approaches		Intersection
	North	West	
Degree of Saturation	0.07	0.39	0.39



Colour code based on Degree of Saturation



[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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LEVEL OF SERVICE

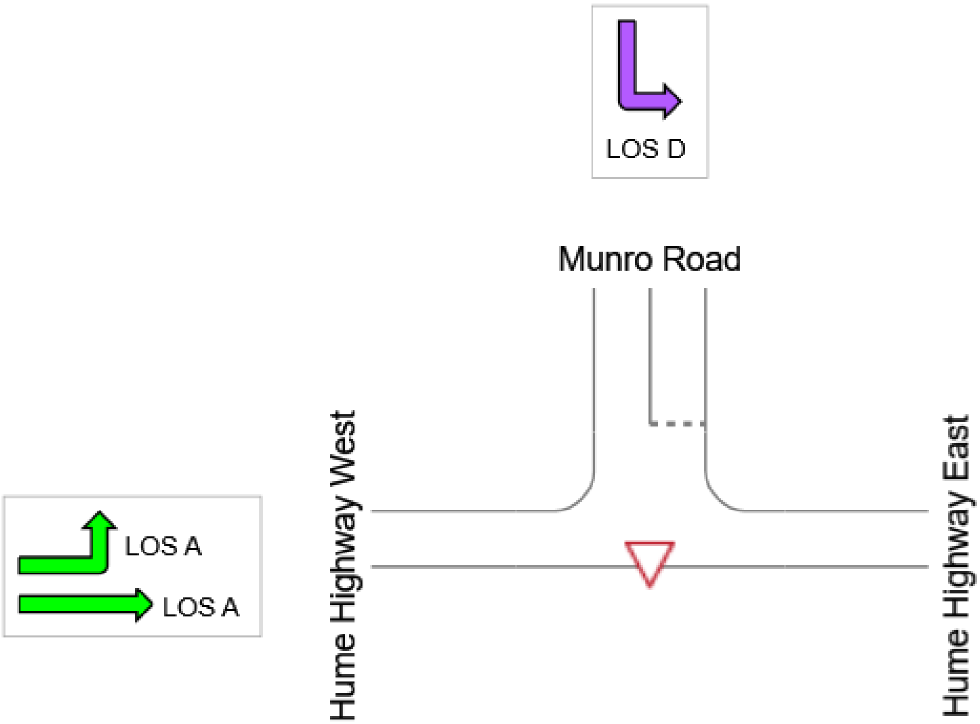
Movement Level of Service

▽ Site: [Hume Hwy Munro Rd - Post Development - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches		Intersection
	North	West	
LOS	D	NA	NA



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

APPENDIX D

SIDRA MODELLING RESULTS FOR THE SITE ACCESS ROAD OFF MUNRO ROAD

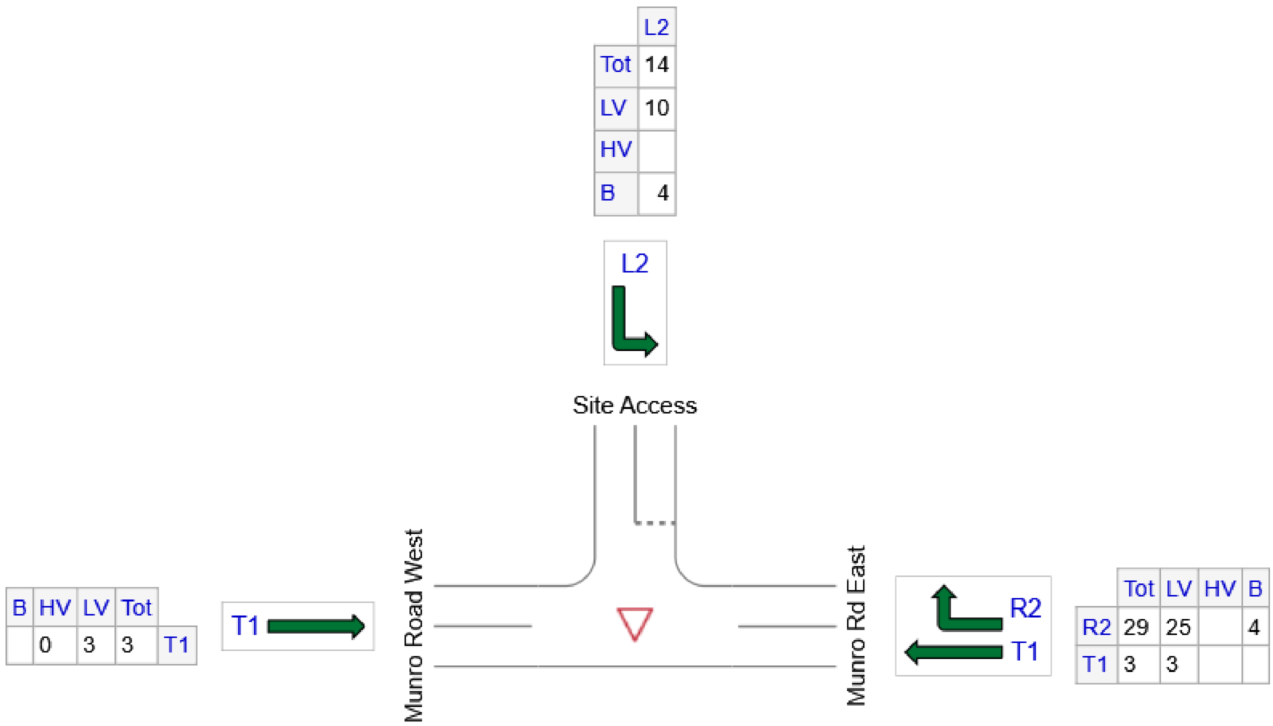
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

▽ Site: [Site Access - Post Develoment AM]

Site Category: (None)
Giveway / Yield (Two-Way)

Volume Display Method: Separate



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Buses (B)
E: Munro Rd East	32	28	-	4
N: Site Access	14	10	-	4
W: Munro Road West	3	3	0	-
Total	49	41	0	8

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DELAY (CONTROL)

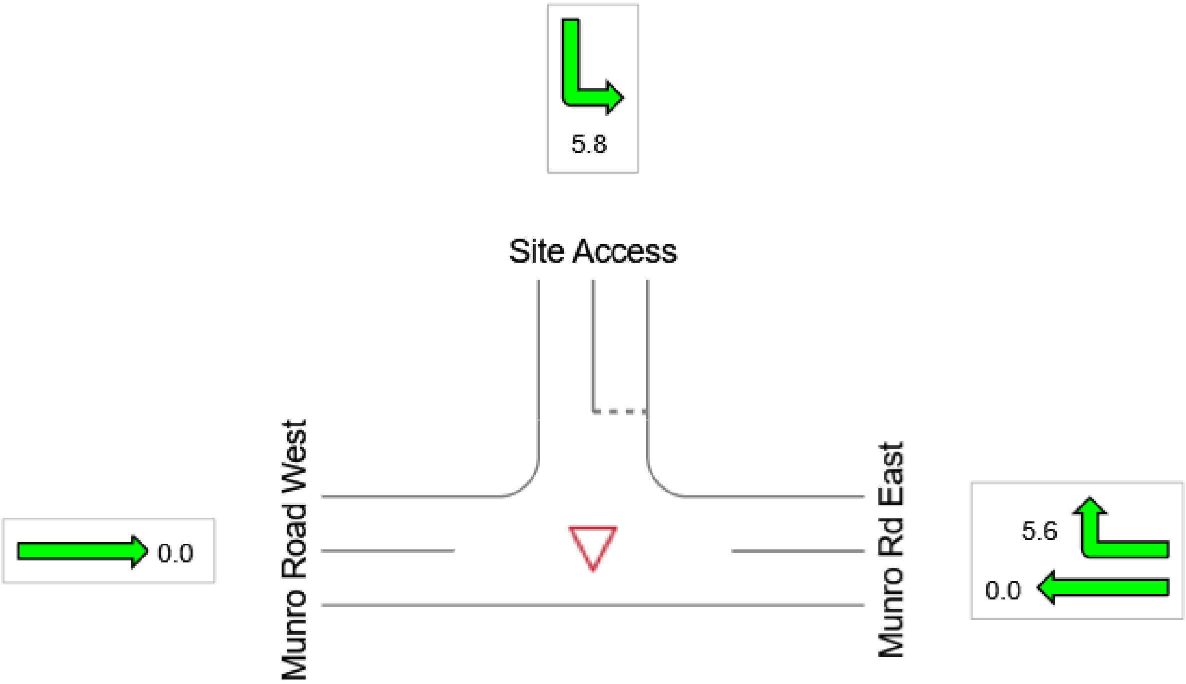
Average control delay per vehicle, or average pedestrian delay (seconds)

▽ Site: [Site Access - Post Develoment AM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches			Intersection
	East	North	West	
Delay (Control)	5.1	5.8	0.0	5.0
LOS	NA	A	NA	NA



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

QUEUE DISTANCE (%ILE)

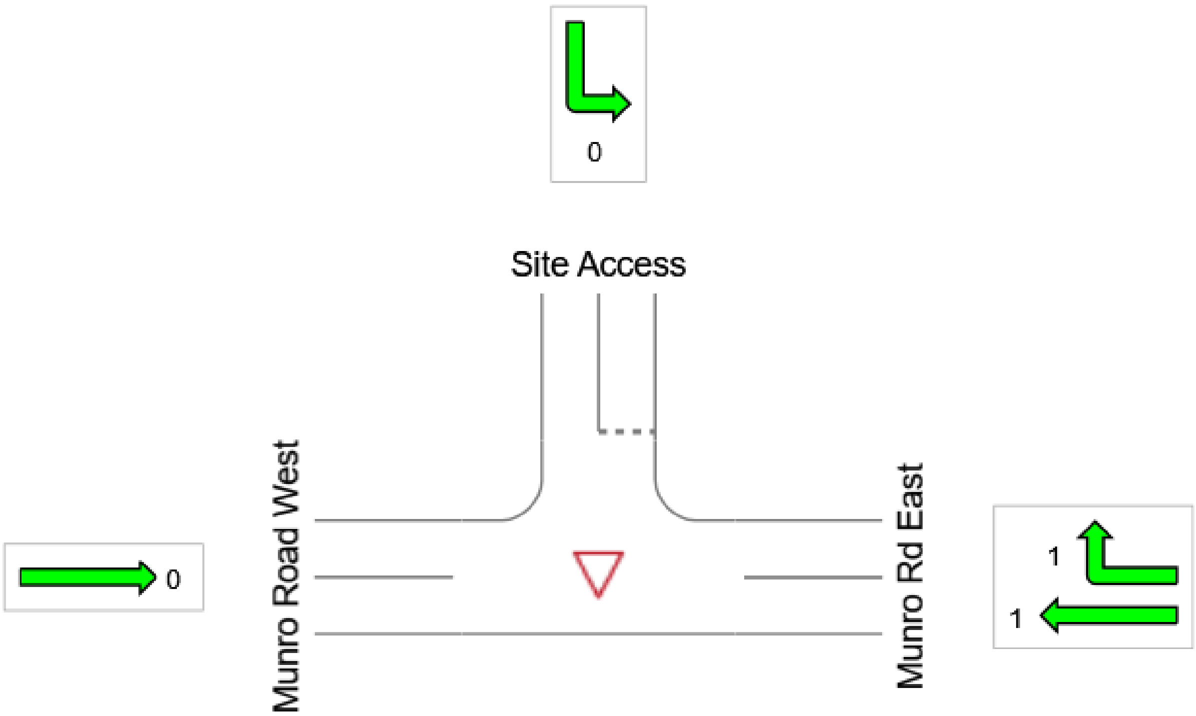
Largest 95% Back of Queue Distance for any lane used by vehicle movement (metres)

▽ Site: [Site Access - Post Develoment AM]

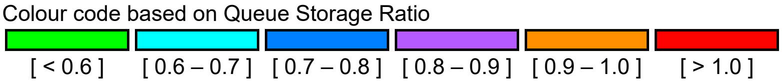
Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches			Intersection
	East	North	West	
Vehicle Queue (%ile)	1	0	0	1



Colour code based on Queue Storage Ratio



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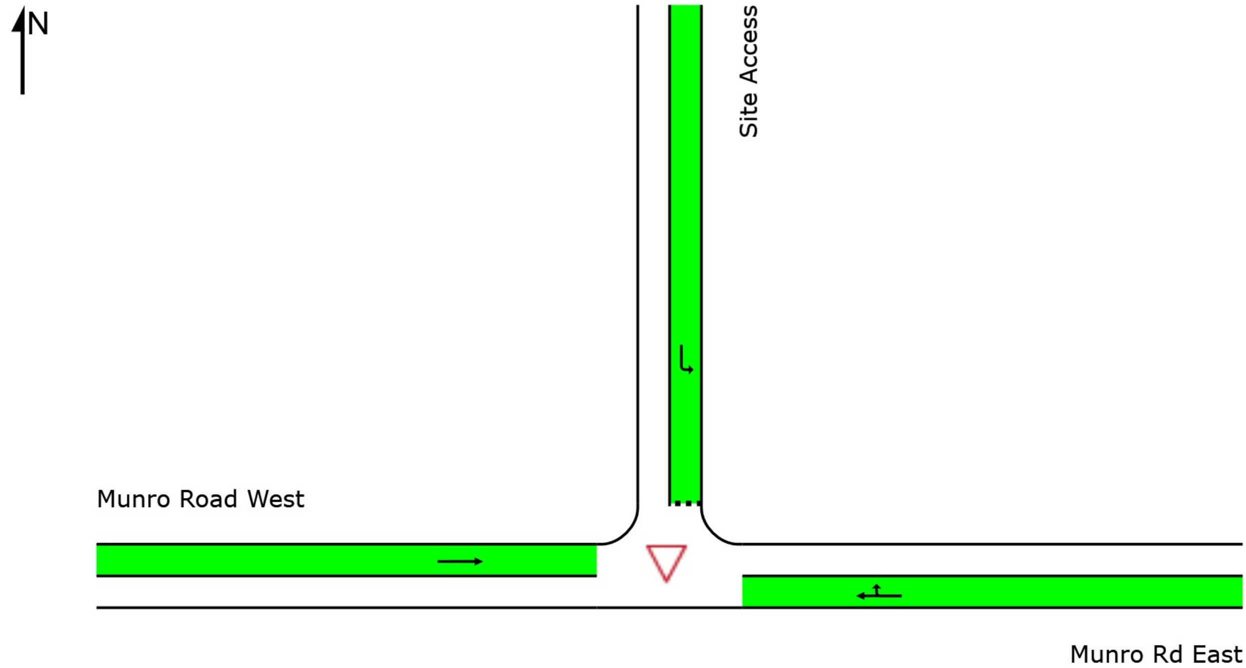
DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Site: [Site Access - Post Develoment AM]

Site Category: (None)
Giveway / Yield (Two-Way)

	Approaches			Intersection
	East	North	West	
Degree of Saturation	0.02	0.01	0.00	0.02



Colour code based on Degree of Saturation

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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LEVEL OF SERVICE

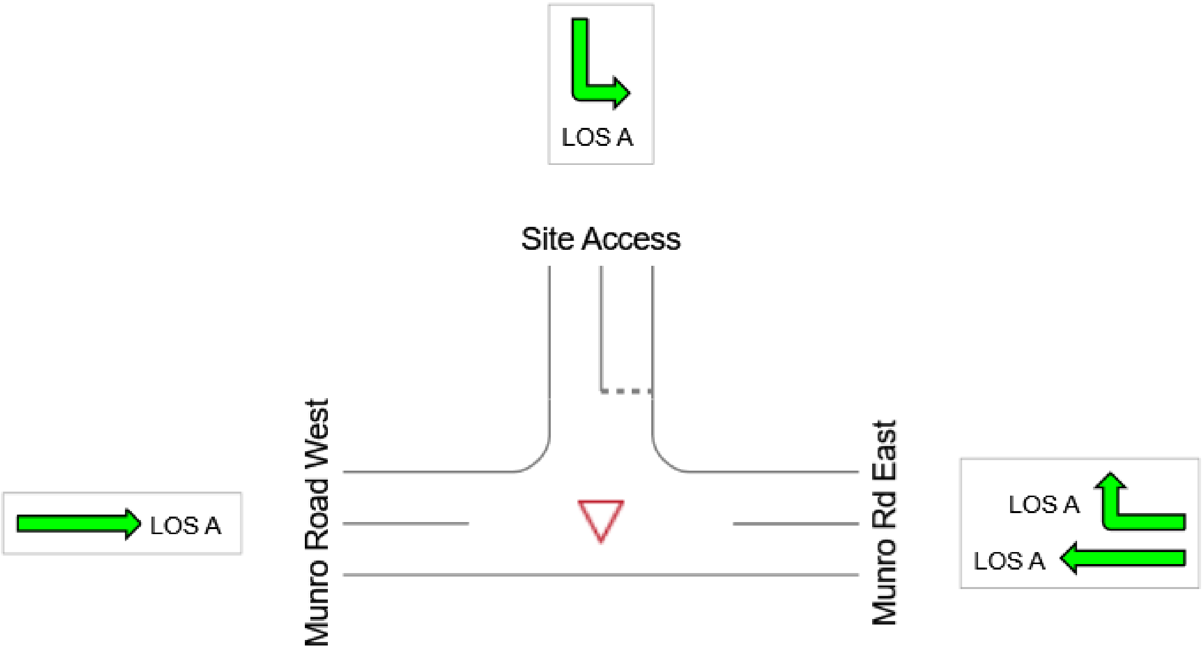
Movement Level of Service

▽ Site: [Site Access - Post Develoment AM]

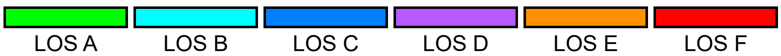
Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches			Intersection
	East	North	West	
LOS	NA	A	NA	NA



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

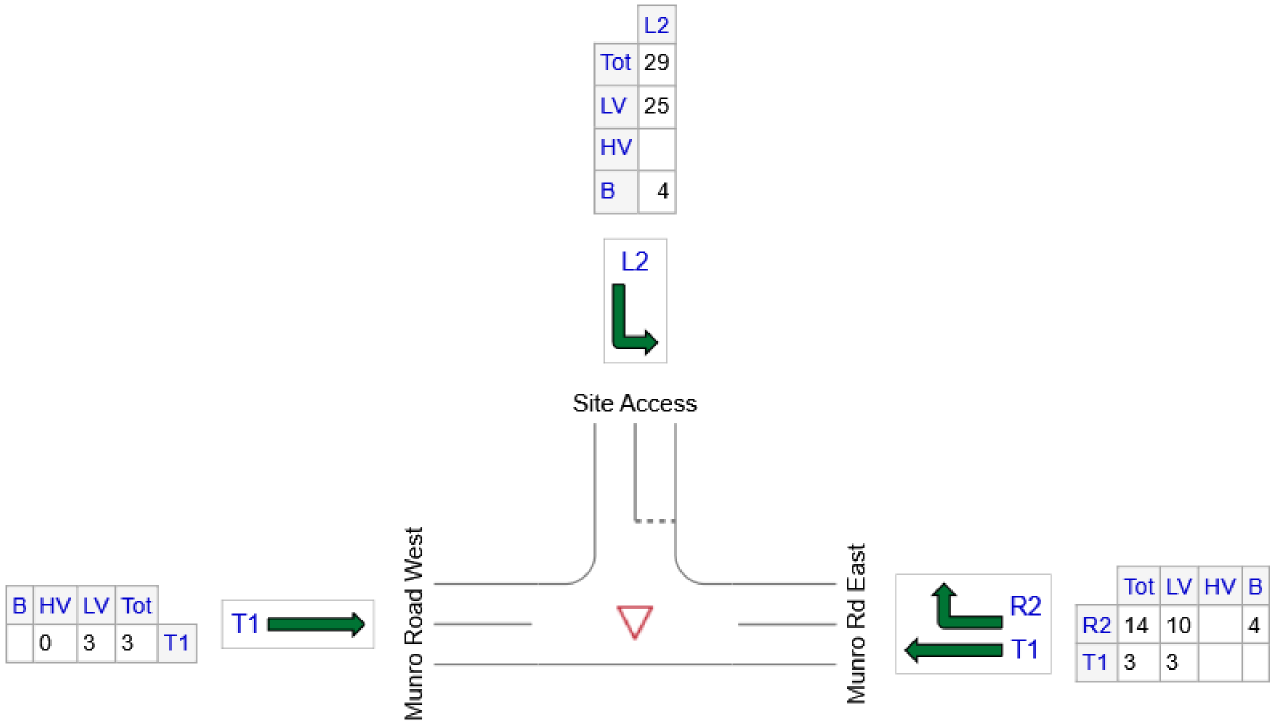
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: [Site Access - Post Develoment PM]

Site Category: (None)
Giveway / Yield (Two-Way)

Volume Display Method: Separate



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Buses (B)
E: Munro Rd East	17	13	-	4
N: Site Access	29	25	-	4
W: Munro Road West	3	3	0	-
Total	49	41	0	8

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DELAY (CONTROL)

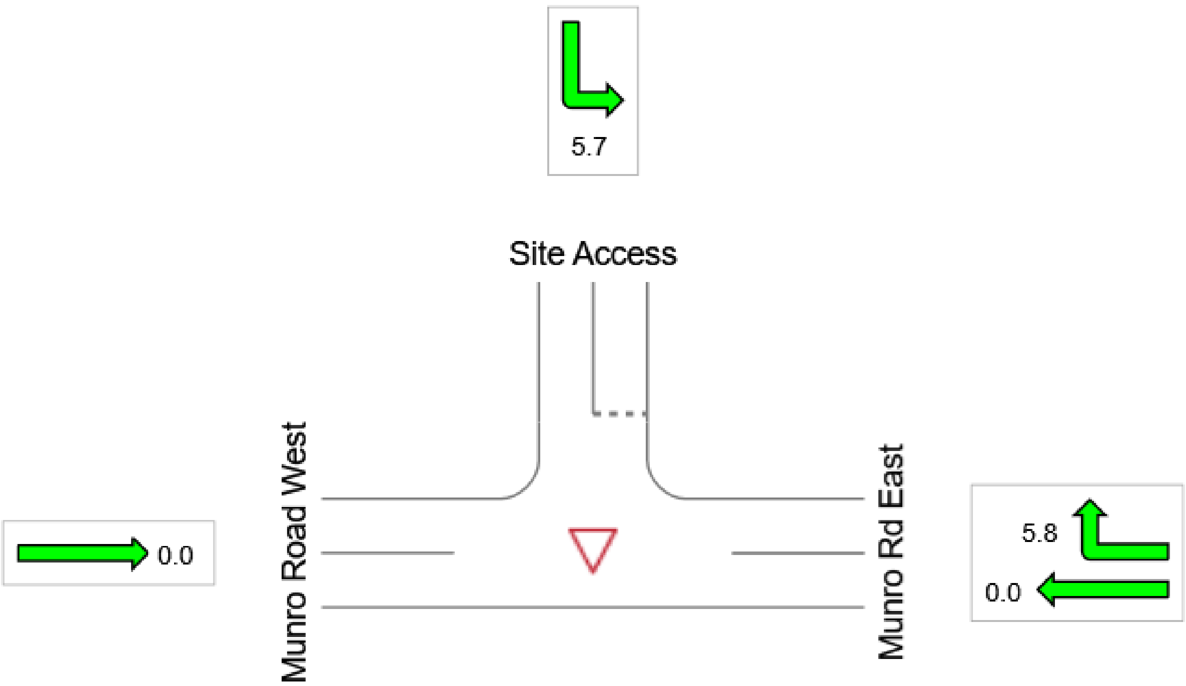
Average control delay per vehicle, or average pedestrian delay (seconds)

▽ Site: [Site Access - Post Develoment PM]

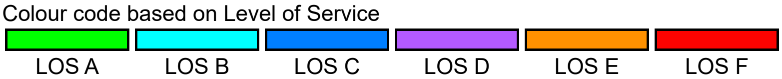
Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches			Intersection
	East	North	West	
Delay (Control)	4.8	5.7	0.0	5.0
LOS	NA	A	NA	NA



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

QUEUE DISTANCE (%ILE)

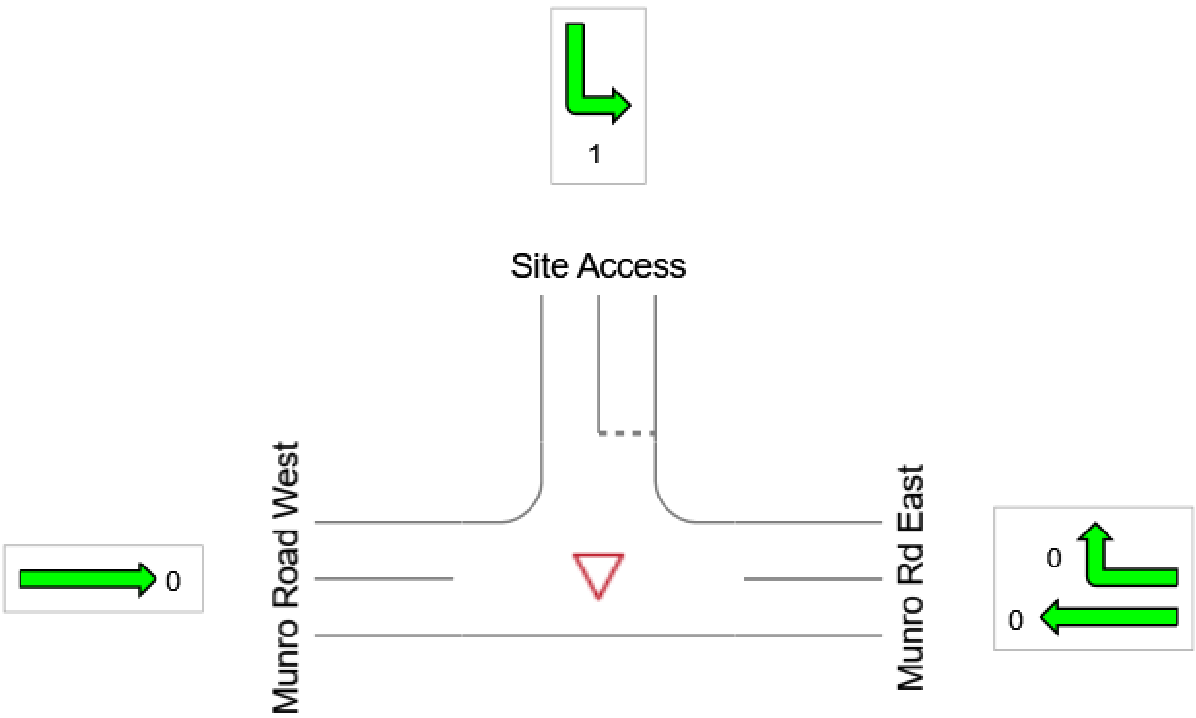
Largest 95% Back of Queue Distance for any lane used by vehicle movement (metres)

▽ Site: [Site Access - Post Develoment PM]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches			Intersection
	East	North	West	
Vehicle Queue (%ile)	0	1	0	1



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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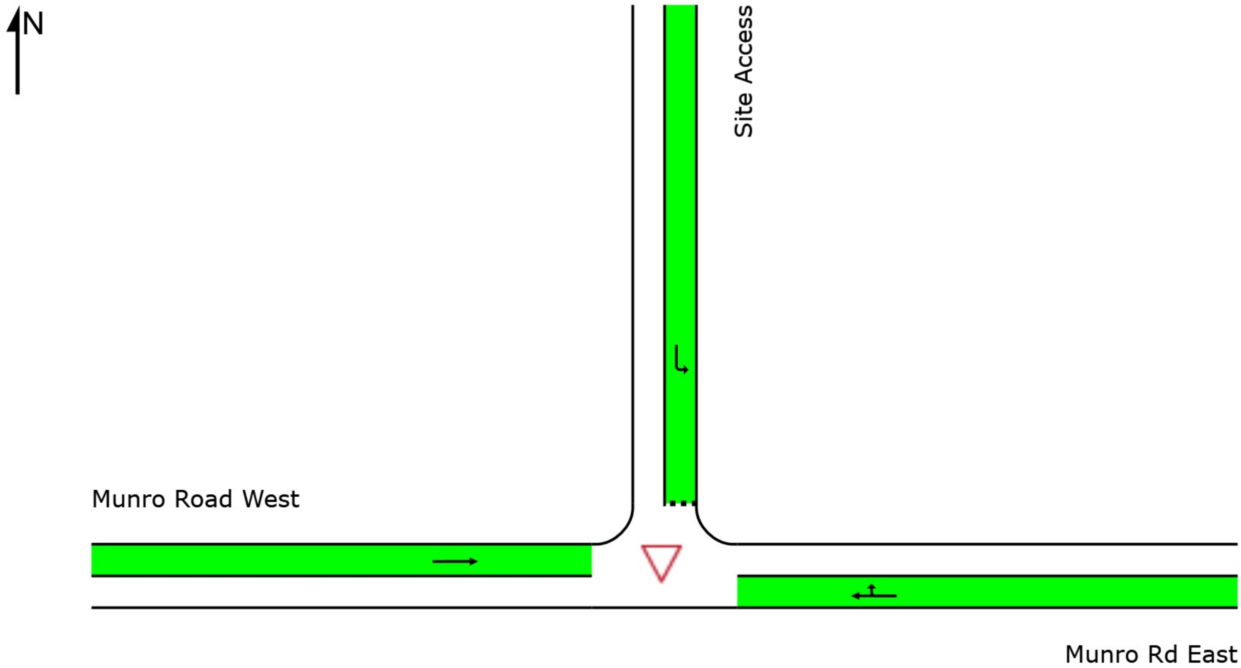
DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

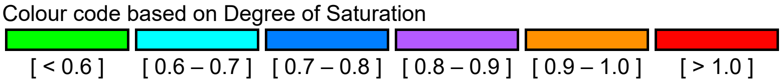
Site: [Site Access - Post Develoment PM]

Site Category: (None)
Giveway / Yield (Two-Way)

	Approaches			Intersection
	East	North	West	
Degree of Saturation	0.01	0.02	0.00	0.02



Colour code based on Degree of Saturation



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LEVEL OF SERVICE

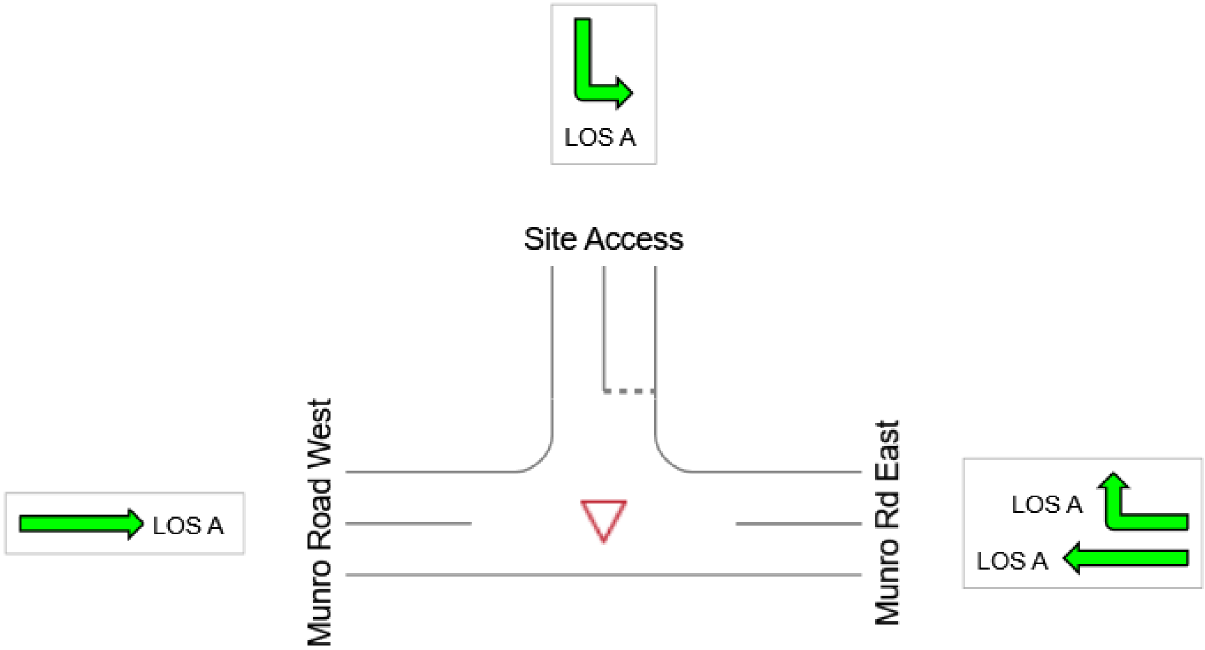
Movement Level of Service

Site: [Site Access - Post Develoment PM]

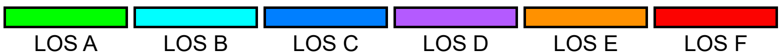
Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches			Intersection
	East	North	West	
LOS	NA	A	NA	NA



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

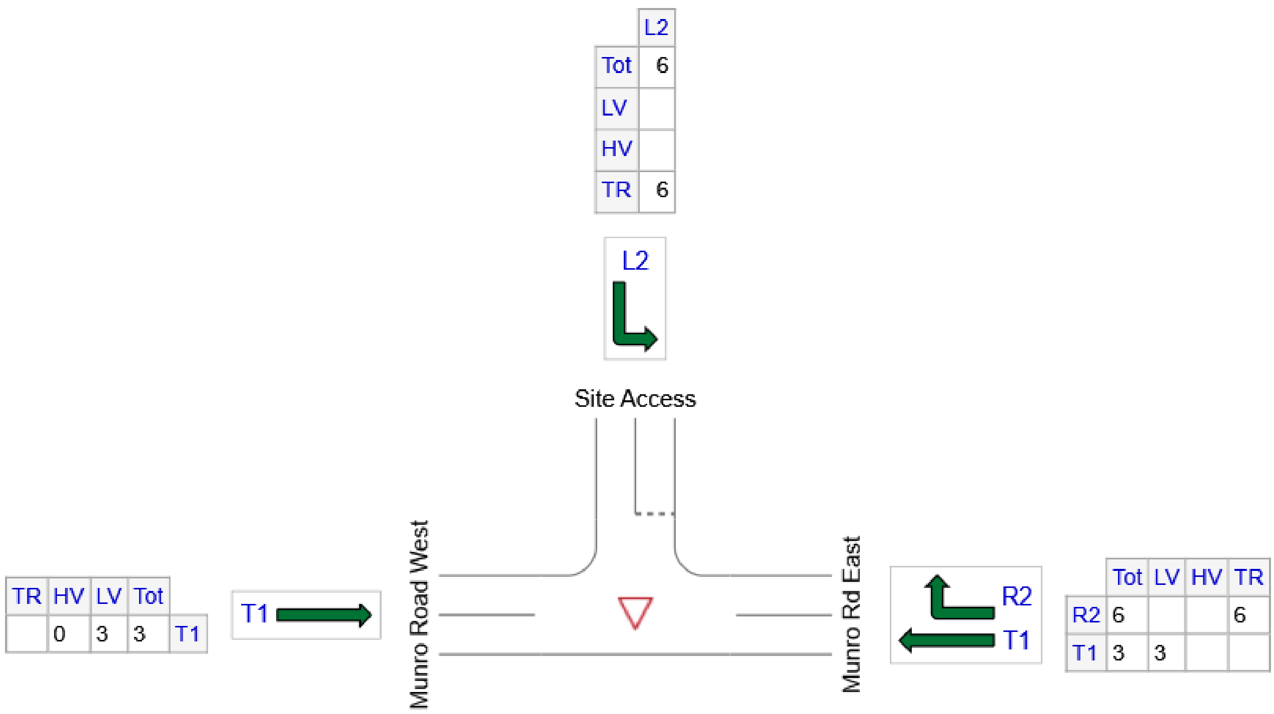
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: [Site Access - Post Develoment - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

Volume Display Method: Separate



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)	Large Trucks (TR)
E: Munro Rd East	9	3	-	6
N: Site Access	6	-	-	6
W: Munro Road West	3	3	0	-
Total	18	6	0	12

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DELAY (CONTROL)

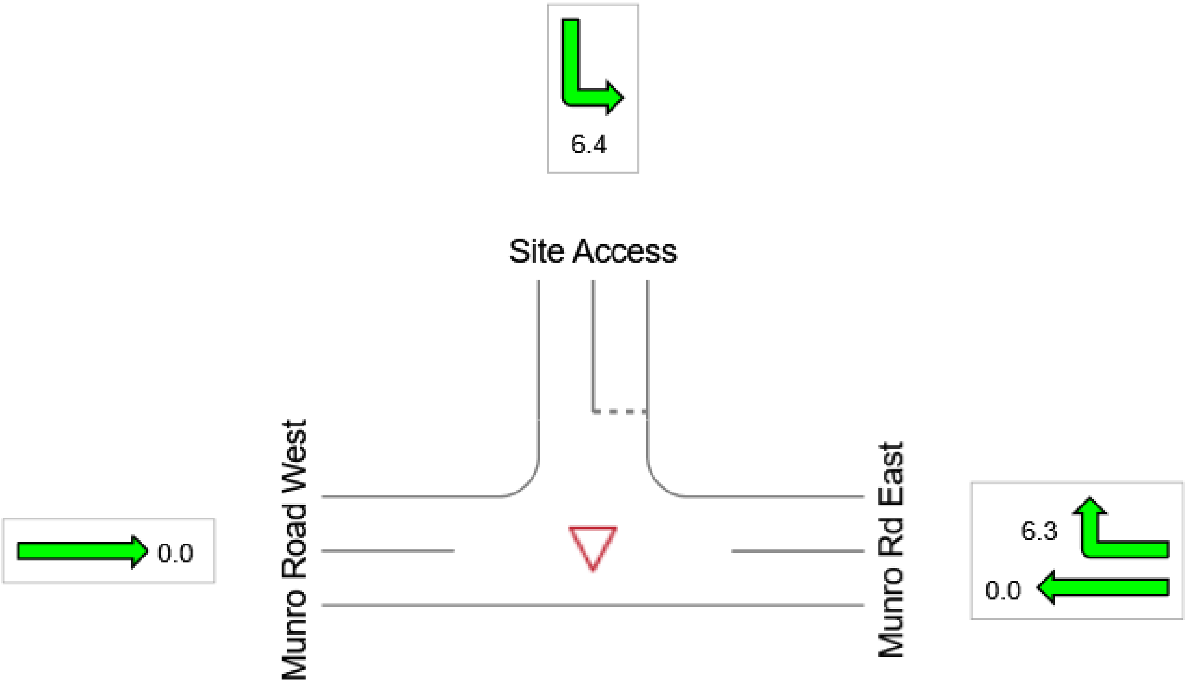
Average control delay per vehicle, or average pedestrian delay (seconds)

▽ Site: [Site Access - Post Develoment - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches			Intersection
	East	North	West	
Delay (Control)	5.1	6.4	0.0	4.3
LOS	NA	A	NA	NA



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

QUEUE DISTANCE (%ILE)

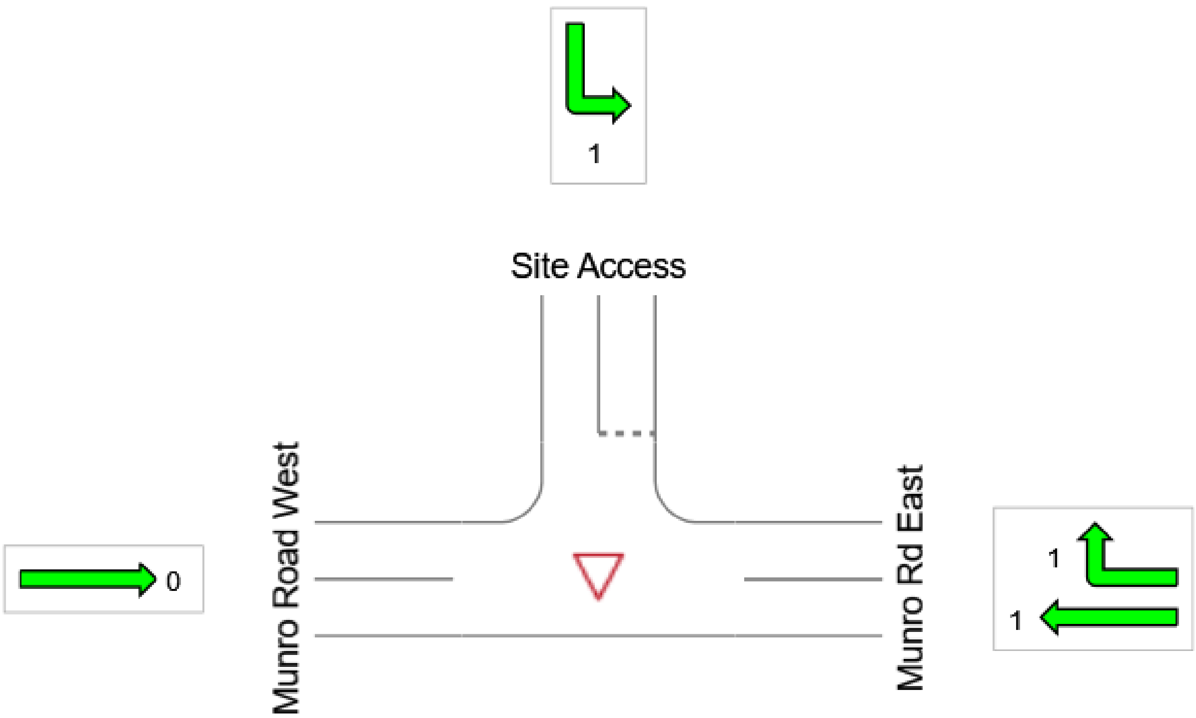
Largest 95% Back of Queue Distance for any lane used by vehicle movement (metres)

▽ Site: [Site Access - Post Develoment - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches			Intersection
	East	North	West	
Vehicle Queue (%ile)	1	1	0	1



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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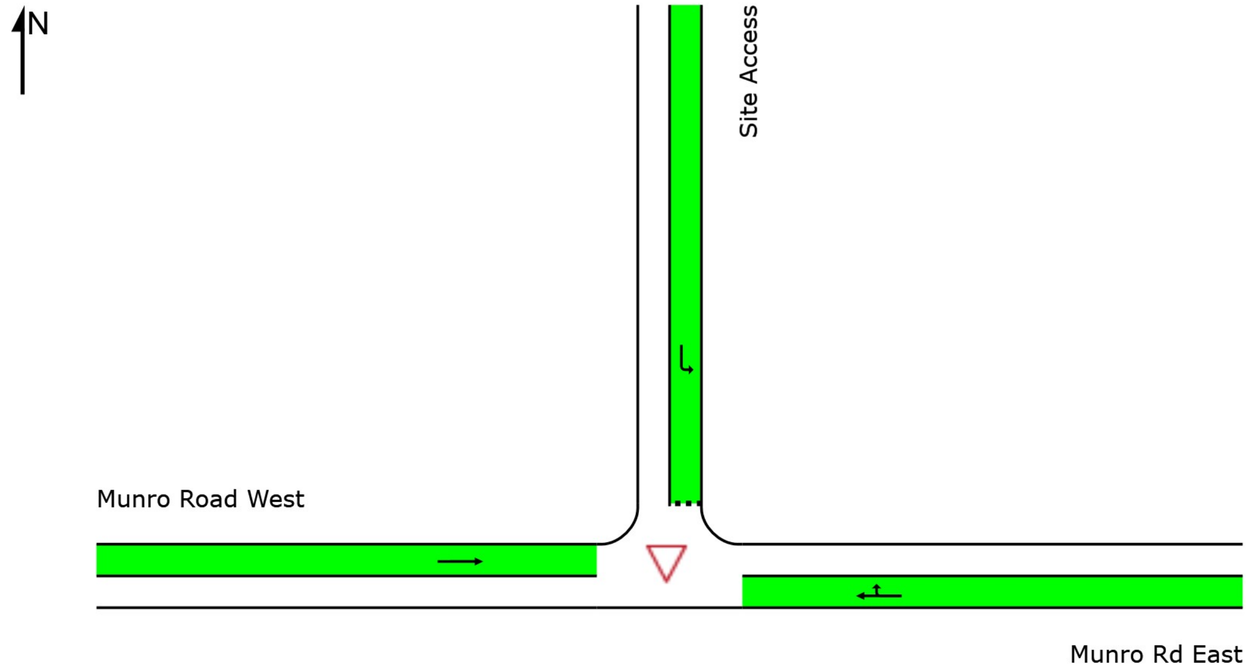
DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Site: [Site Access - Post Develoment - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

	Approaches			Intersection
	East	North	West	
Degree of Saturation	0.01	0.01	0.00	0.01



Colour code based on Degree of Saturation

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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LEVEL OF SERVICE

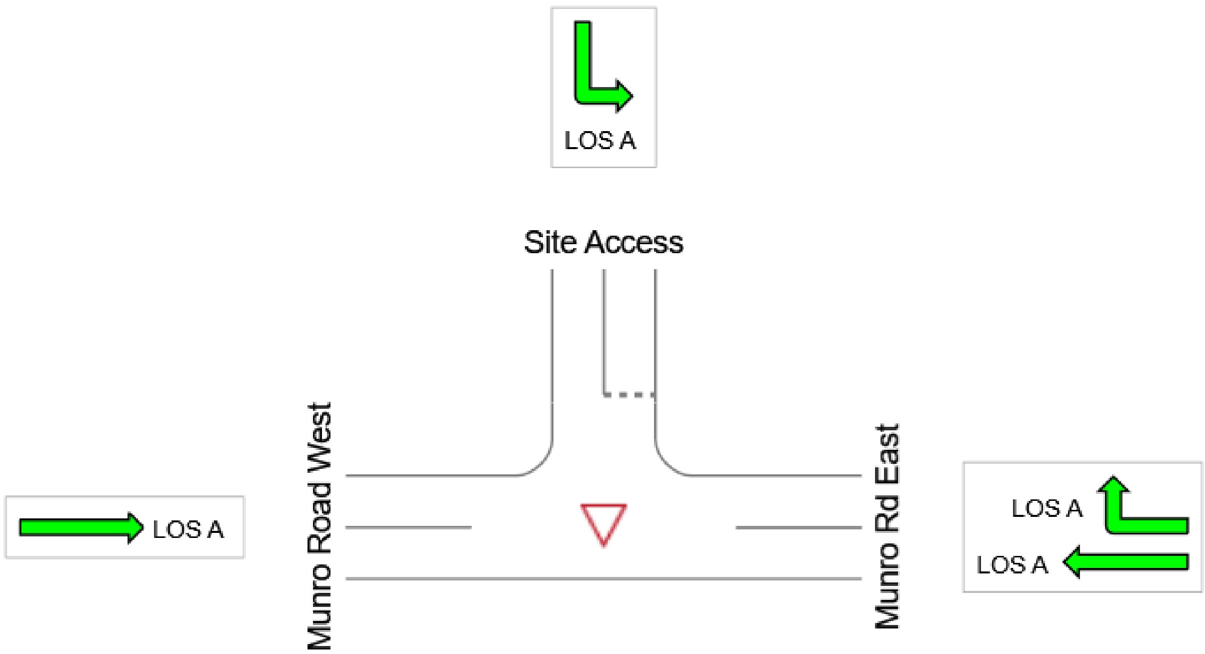
Movement Level of Service

▽ Site: [Site Access - Post Develoment - Only Trucks]

Site Category: (None)
Giveway / Yield (Two-Way)

All Movement Classes

	Approaches			Intersection
	East	North	West	
LOS	NA	A	NA	NA



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
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Premise