Traffic Impact Assessment

Light Horse Interchange Business Hub, Eastern Creek
State Significant Development Application (SSD 9667)
Response to Submissions

Ref: 0541r04
21/01/20

Info@asongroup.com.au | +61 02 9083 6601 | Suite 5.02, Level 5, 1 Castlereagh Street, Sydney, NSW, 2000

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Project No: 0541

Project: Light Horse Interchange Business Hub – 165 Wallgrove Road and 475 Ferrers Road, Eastern Creek

Client: Western Sydney Parklands Trust

File Reference: 0541r04v2 SSD RtS TIA_Light Horse Interchange Business Hub; 165 Wallgrove Rd & 475 Ferrers Rd, Eastern Creek

Revision History

Revision	Date	Details	Author	Approved by
-	12/11/2019	Draft	A. Rasouli	T. Lewis
1	20/01/2020	Draft	A. Rasouli M. Tangonan	T. Lewis
2	21/01/2020	Issue I	M. Tangonan	

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1 Introduction

1.1 Background & Overview

Ason Group has previously prepared a Traffic Impact Assessment (TIA) for this State Significant Development Application (SSDA) — refer *0541r03v2* traffic report dated 24/05/2019. The SSDA was then proceeded to public exhibition with the Department of Planning, Industry & Environment (DPIE), Roads and Maritime Services (RMS), Transport for NSW (TfNSW) and Council providing a number of comments. Accordingly, we have been re-engaged by Western Sydney Parklands Trust (WSPT) to prepare a revised Traffic Impact Assessment (TIA) regarding this SSDA which is related to development of the Light Horse Interchange Business Hub (LIBH), Eastern Creek (the Site). This SSDA also considers the comments provided at Project Team's meeting with RMS dated 12 December 2019.

The SSDA generally provides for the following:

- A Masterplan for the staged development of the LIBH, including: -
  - Development of a regional warehousing and distribution hub with 24 hours/day, 7 days/week operation, with a total yield of 165,500m^2 of gross floor area (GFA) that includes 157,600m^2 of warehouse space and 7,900m^2 of ancillary office space;
  - Indicative site/lot layout, site access, internal road network, site levels, drainage, building envelopes, parking and landscaping;
  - Development controls; and
  - Biodiversity offsets.
- In the context of this TIA, the SSDA also provides for: -
  - Site access connection to Ferrers Road, and in turn access north to the Great Western Highway (GWH) and south to The Horsley Drive. The existing access to Wallgrove Road will be retained (and improved) for use by emergency vehicles only;
  - In conjunction with broader upgrades to the local road network, localised upgrades along the key access routes to / from the Site;
  - Site road and access intersection design profiles which provide for the largest heavy vehicles accessing the Site; and
  - A sustainable level of on-site parking provision.

Full details of the Masterplan are provided in the Environmental Impact Statement (EIS) to which this TIA accompanies. DPIE issued Secretary's Environmental Assessment Requirements (SEARs) regarding the LIBH proposal on 7th November 2018; a copy of which are included in **Appendix A**. The SEARs include a number of "*Traffic and Transport*" requirements as outlined in **Table 1** of **Section 1.3**, including a summary response to each SEAR and reference to the section of this TIA that provides more detailed steps / explanation / analysis of each SEAR.

1.2 Site & Location

The Site has a total area of approximately 29.5 hectares (ha) development and is legally known as Part of Lot 10 in DP 1061237 and Part of Lot 5 in DP 804051, with a formal address of 165 Wallgrove Road and 475 Ferrers Road, Eastern Creek. The Site is bordered by the M4 Western Motorway to the north; a SUEZ recycling centre to the south; Eastern Creek Raceway to the east; and the M7 Westlink Motorway to the west. The Site is shown in its local context in **Figure 1**.

The Site is located within the Blacktown City Council (Council) Local Government Area (LGA) and is zoned as WSP (Western Sydney Parklands) by the Council's Local Environmental Plan (BCC LEP). It is subject to State Environmental Planning Policy - Western Sydney Parklands - 2009 (SEPP-WSP) and Western Sydney Parklands - Plan of Management - 2030 (POM).

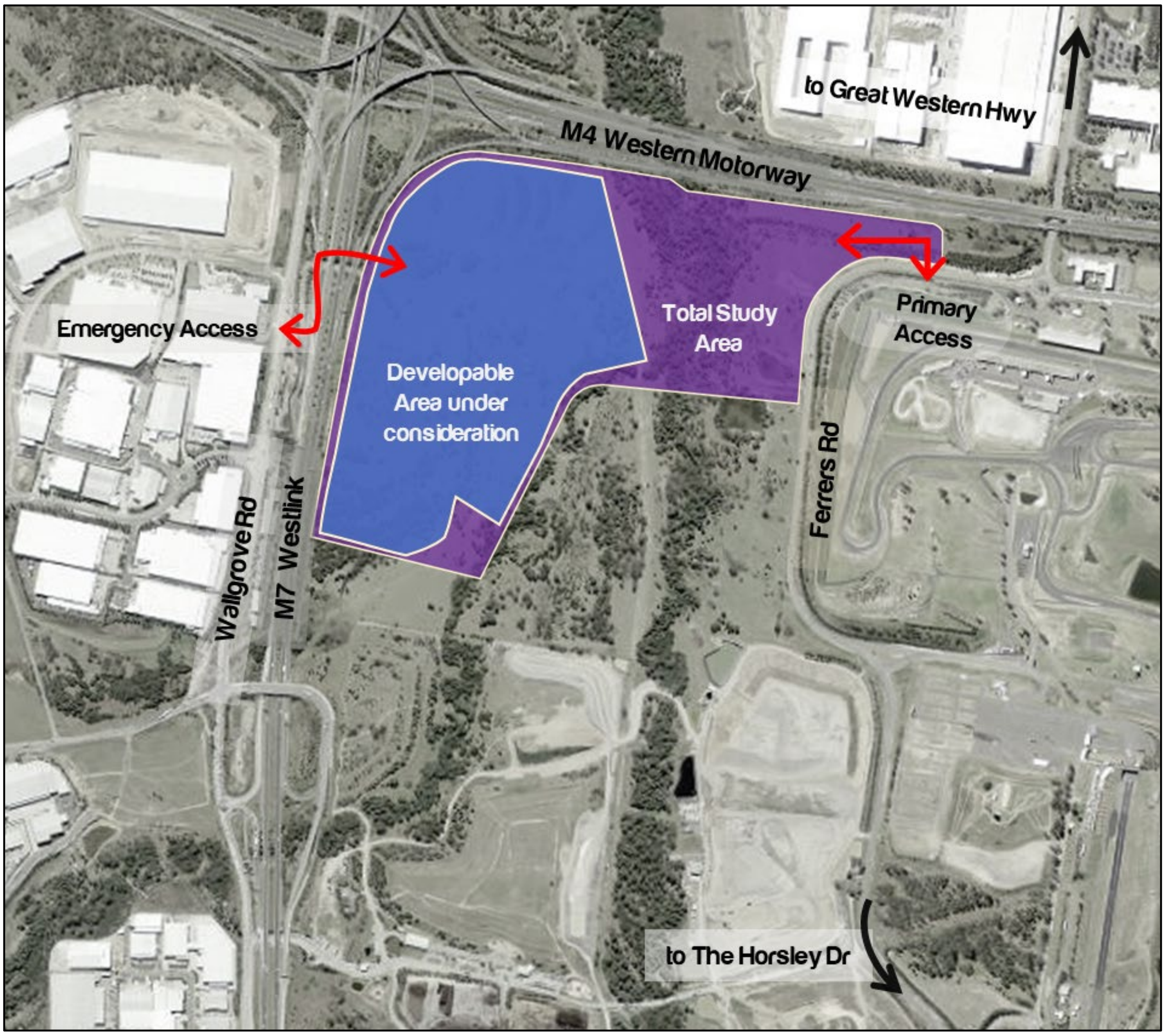


Figure 1: Site Location - Light Horse Interchange Business Hub

1.3 Secretary's Environmental Assessment Requirements

Secretary's Environmental Assessment Requirements (SEARs) were issued by the Department of Planning & Environment (DPE) on 7th November 2018 in regard to the LIBH proposal. The SEARs outline the key areas for consideration in any subsequent development application (i.e. in the SSDA) with specific requirements relating to the assessment of potential traffic and transport impacts.

The SEARs specifically relating to the traffic and transport characteristics of the Masterplan are outlined in **Table 1** below, noting that **Table 1** also provides a summary response to each SEAR, and reference to the section of this TIA providing a more detailed analysis of each SEAR.

Table 1: Secretary's Environmental Assessment Requirements - General

Source	SEARs	Summary Response	TIA Section
DPIEDPIE Traffic and Transport	A quantitative Traffic Impact Assessment prepared in accordance with relevant Blacktown City Council, Austroads and Roads and Maritime Services guidelines	Austroads, Councils DCP and RMS Guide were reviewed to identify appropriate traffic generation as well as parking provisions. Quantitative analysis was carried out to predict traffic distribution as well as the potential impact of development traffic.	3.4 4.1 to 4.3 5.1 to 5.7
DPIE: Traffic and Transport	Details of all daily and peak traffic and transport movements likely to be generated by the development including the impact on the nearby intersections and the need/associated funding for the upgrading or road improvements works (if required)	Trip generation rates were based on RMS and Ason Group surveys of like developments, while trip distribution references available Journey to Work data. SIDRA modelling was then undertaken to identify the impact of development traffic. This modelling determined that in addition to currently committed RMS upgrades and the planned upgrades within the local road network, no additional upgrade is required and the local intersections can to appropriately accommodate Base 2036 traffic flows as well as Base 2036 + Development traffic flows.	5.1 to 5.7
DPIE: Traffic and Transport	Impacts on the safety and capacity of the surrounding road network and access points, using SIDRA or similar modelling, to assess impacts from current traffic counts and cumulative traffic from existing and proposed development	As stated, SIDRA modelling was undertaken to identify the impact of development traffic. This modelling determined that in addition to currently committed RMS upgrades within the local road network, no additional upgrade is required and the local intersections can appropriately accommodate Base 2036 traffic flows as well as Base 2036 + Development traffic flows.	3.4 4.1 to 4.3 5.1 to 5.7
DPIE: Traffic and Transport	Demonstrate that sufficient pedestrian and cyclist facilities have been provided for the development	The Site enjoys excellent access to the Western Sydney Parklands existing and proposed bicycle network. Accordingly, pedestrian / cyclists shared paths have been proposed to connect to Wallgrove Road (3.5 metres wide concrete footpath) and Ferrers Road (2.5 metres wide concrete footpath), along with an internal pedestrian path along eastern side of the access road (1.2 metres wide concrete footpath).	2.5
DPIE: Traffic and Transport	Details and a justification of access to, from and within the site (vehicular and pedestrian)	Primary vehicle access to the Site will be provided to Ferrers Road, while emergency vehicle access will be provided from Wallgrove Road. Access for pedestrians (and cyclists) will be provided from Wallgrove Road and Ferrers Road.	2.2 2.3 2.5
DPIE: Traffic and Transport	Details of road upgrades, new roads or access points required for the development, if necessary	To facilitate access, a new roundabout is proposed linking the Site to Ferrers Road.	2.2 5.6
Council: Traffic matters	Parking rates for the development should be provided in accordance with Blacktown Council's Development Control Plan for the area	Council's DCP parking rates have been referenced in the assessment; however, it has been determined that an appropriate and sustainable level of parking provision is provided with reference to RMS Guide parking rates, which also reflect numerous Ason Group surveys of similar industrial sites.	6.1

Source	SEARs	Summary Response	TIA Section
RMS	Daily and peak traffic movements likely to be generated by the development including the impact on the nearby intersections and the need/associated funding for the upgrading or road improvements works (if required). The key intersections to be examined / modelled include: - Wallgrove Road / Site Access; - The Horsley Drive / Ferrers Road; - Great Western Highway / Brabham Drive	As stated, trip generation rates were based on RMS and Ason Group surveys of like developments, while trip distribution references available Journey to Work data. SIDRA modelling was then undertaken to identify the impact of development traffic. This modelling determined that the RMS planned upgrades at The Horsley Drive / Ferrers Road intersection would perform at a satisfactory level with 2036 Base + Development traffic. Furthermore, additional upgrades recently delivered at Great Western Highway / Brabham Drive / Doonside Road intersection can appropriately accommodate 2036 Background traffic flows (as well as 2036 Base + Development traffic). The Wallgrove Road access is an existing access intended for use by emergency vehicles only and therefore not materially impacted by the development. As such, the proposal does not trigger a need for changes to the intersection.	5.1 to 5.7
RMS	Details of the proposed accesses and the parking provisions associated with the proposed development including compliance with the requirements of the relevant Australian Standards (i.e.: turn paths, sight distance requirements, aisle widths, etc) and relevant parking codes. Swept path plans need to be provided.	Swept path analysis of all critical movements at proposed Ferrers Road roundabout as well as internal access roads have been undertaken to confirm compliance with relevant standards. Relevant swept path diagrams are provided in civil engineering report, provided separately to this report. It is expected that a Condition of Consent would be imposed requiring compliance with AS 2890.1 and AS 2890.2 prior to the issue of a Construction Certificate. In this regard, swept path analysis for individual building hardstands (paved area for heavy vehicle parking) will be undertaken during future stages to accompany the design development of built forms on each lot.	2.2 to 2.4
RMS	Details of service vehicle movements (including vehicle type and likely arrival and departure times)	The details of service vehicle movements to and from the Site is unknown at this stage; however, the assessment provides for some 28% of traffic movements to be heavy vehicle movements, which is in line with the heavy vehicle percentages determined by the RMS at similar industrial sites.	5.1.3
RMS	Assess the implications of the proposed development for non-car travel modes (including public transport use, walking and cycling); the potential for implementing a location-specific sustainable travel plan, and the provision of facilities to increase the non-car mode share for travel to and from the site. This will entail an assessment of the accessibility of the development site by public transport	The JTW data suggests that no employees currently travel to work in the local area by either public or active transport, with the predominant mode of choice being private vehicle, which is consistent with on-site observations. Notwithstanding, there is excellent potential for future public transport routes to service the Site, as well as future pedestrian and cycle connections to Ferrers Road and M7 Cycleway.	2.5 3.2
Transport for NSW	Details of all daily and peak traffic and transport movements likely to be generated (light and heavy vehicle, public transport, pedestrian and cycle trips) during construction and operation of the development	As stated, trip generation rates were based on RMS and Ason Group surveys of like developments, while trip distribution references available Journey to Work data. An assessment of construction traffic impacts has not been undertaken at this time as the details of the construction task are not currently available. However, a 'high-level' Construction Traffic Management Plan (CTMP) has been provided in Section 7 to include preliminary CTMP principles. It is expected that a detailed Construction Traffic Management Plan would be provided in future	5.1 5.2 7

Source	SEARs	Summary Response	TIA Section
		development applications, or prior to issue of a Construction Certificate	
Transport for NSW	Details of the current daily and peak hour vehicle, public transport, pedestrian and bicycle movements and existing traffic and transport facilities provided on the road network located adjacent to the proposed development	This assessment provides analysis of existing and future road network operations; and existing and future public and active transport services/infrastructure.	3.1 3.2 3.3
Transport for NSW	An assessment of the operation of existing and future transport networks including public transport, pedestrian and bicycle provisions and their ability to accommodate the forecast number of trips to and from the development	As stated, this assessment provides analysis and existing and future public and active transport services/infrastructure.	3.4 4.3 5.5 to 5.7
Transport for NSW	Details the type of heavy vehicles likely to be used (e.g. B-doubles) during the operation of the development and the impacts of heavy vehicles on nearby intersections	The percentage of heavy vehicles in the future traffic generation of the Site has been specifically identified with reference to RMS surveys and included in the SIDRA modelling of key intersections. From a design perspective, it is expected that the maximum vehicle accessing the Site would be B-Doubles and, as such, the future design of all access roads would appropriately consider such vehicles.	2.3 5.1.3 5.5 to 5.7
Transport for NSW	Details of access to, from and within the site to/from the local road and strategic (motorway) network including intersection location, design and sight distance (i.e. turning lanes, swept paths, sight distance requirements)	As stated, to facilitate access, a new roundabout is proposed linking the Site to Ferrers Road. Both access points comply with the sight distance requirements recommended in Austroads Guide to Road Design.	2.2 2.3
Transport for NSW	Impact of the proposed development on existing and future public transport and walking and cycling infrastructure within and surrounding the site	The Site enjoys excellent access to the Western Sydney Parklands existing and proposed bicycle network. Accordingly, Pedestrian / cyclists shared paths have been proposed to connect to Wallgrove Road (3.5 metres wide concrete footpath) and Ferrers Road (2.5 metres wide concrete footpath), along with an internal pedestrian path along eastern side of Access road (1.2 metres wide concrete footpath).	2.5 3.2
Transport for NSW	An assessment of the existing and future performance of key intersections providing access to the site (Site access with Wallgrove Road, Ferrers Road with Brabham Drive – subject to likely access routes to/from the motorway network), and any upgrades (road/intersections) required as a result of the development	As stated, SIDRA modelling was undertaken to identify the impact of development traffic. This modelling determined that in addition to currently committed RMS upgrades within the local road network, no additional upgrade is required and the local intersections can to appropriately accommodate Base 2036 traffic flows as well as Base 2036 + Development traffic flows.	3.4 4.3 5.5 to 5.7
Transport for NSW	An assessment of predicted impacts on road safety and the capacity of the road network to accommodate the development	Both access points comply with the sight distance requirements recommended in Austroads Guide to Road Design. As stated, SIDRA modelling was undertaken to identify the impact of development traffic and the capacity of the road network to accommodate the traffic.	3.4 4.3 5.5 to 5.7
Transport for NSW	Demonstrate the measures to be implemented to encourage employees of the development to make sustainable travel choices, including walking, cycling, public transport and car sharing	The Site enjoys excellent access to the Western Sydney Parklands existing and proposed bicycle network. It is anticipated that potential future development along Ferrers Road will increase the potential for new public transport (bus) routes	2.5 3.2

Source	SEARs	Summary Response	TIA Section
		servicing the Site, which would include new pedestrian/cycle infrastructure in Ferrers Road.	
Transport for NSW	Appropriate provision, design and location of on-site bicycle parking, and how bicycle provision will be integrated with the existing bicycle network	Details of the on-site bicycle parking design is currently unavailable and therefore no such assessment could be undertaken. It is expected that Conditions of Consent provided for future development applications within the LIBH will necessarily require compliance with the appropriate Australian Standards and other guidelines.	
Transport for NSW	Details of proposed number of car parking spaces and compliance with appropriate parking codes and justify the level of car parking provided on the site	Details of the on-site car parking design is currently unavailable and therefore no such assessment could be undertaken. It is expected that Conditions of Consent provided for future DA within the LIBH will necessarily require compliance with the appropriate Australian Standards and other guidelines.	
Transport for NSW	Details of access and parking arrangements for emergency vehicles	Details of the on-site access and car parking design is currently unavailable and therefore no such assessment could be undertaken. It is expected that Conditions of Consent provided for future development applications within the LIBH will necessarily require compliance with the appropriate Australian Standards and other guidelines.	
Transport for NSW	Detailed plans of the proposed layouts of the internal road network and parking provision on-site in accordance with the relevant Australian standards	The main estate road is as per the Council's guidelines. It is expected that Conditions of Consent provided for future development applications within the LIBH will necessarily require compliance with the appropriate Australian Standards and other guidelines.	
Transport for NSW	The existing and proposed pedestrian and bicycle routes and end of trip facilities within the vicinity of and surrounding the site and to public transport facilities as well as measures to maintain road and personal safety in line with CPTED principles	The Site enjoys excellent access to the Western Sydney Parklands existing and proposed bicycle network. Accordingly, Pedestrian / cyclists shared paths have been proposed to connect to Wallgrove Road (3.5 metres wide concrete footpath) and Ferrers Road (2.5 metres wide concrete footpath), along with an internal pedestrian path along eastern side of Access road (1.2 metres wide concrete footpath).	2.5 3.2
Transport for NSW	Preparation of a draft Construction Traffic Management Plan which includes: • details of vehicle routes, number of trucks, hours of operation, access management and traffic control measures for all stages of construction, • assessment of cumulative impacts associated with other construction activities, • an assessment of road safety at key intersections, • details of anticipated peak hour and daily truck movements to and from the site' • details of access arrangements for workers to/from the site, emergency vehicles and service vehicles movements, • details of temporary cycling and pedestrian access during constructions, • as assessment of traffic and transport impacts during construction and how	Final details of the construction task are not currently available. However, a 'high-level' Construction Traffic Management Plan (CTMP) has been provided in Section 7, including preliminary CTMP principles. It is expected that a detailed Construction Traffic Management Plan would be required as a standard condition of consent prior to issue of a Construction Certificate.	7.1-7.4

Source	SEARs	Summary Response	TIA Section
	these impacts will be mitigated for any associated traffic, pedestrians, cyclists and public transport operations		
Transport for NSW	The EIS should detail how the proposed development will be consistent and align with the objectives, goals and directions of the following: • Greater Sydney Region Plan; • Western Sydney District Plan; • Future Transport Strategy 2056; • Future Transport- Greater Sydney Services and Infrastructure Plan • NSW Freight & Ports Plan 2018-2023	This is a matter for the EIS (generally) and not specific to this TIA. It is expected that these documents are suitably reflected in the RMS strategic model of 2036, which formed the basis for predicting future background traffic for this TIA.	4.1 4.2

1.4 Consultation Process

The following **Table 2** presents the authority comments in relation to the original SSD submission, respective commentary and sections within this TIA where those comments are addressed.

Table 2: Authority Comments and Ason Group Response

No.	Authority Comments	Ason Group Response	TIA Section
Blacktown City Council – Planning Comments			
3	The Urban Design guidelines adopts the RMS traffic rates where the parking rates should be the same as that applied in Eastern creek Precinct Stage 3 (across Wallgrove Road) which is 1 space per 100 sqm of GFA up to 7,500 sqm and for greater than 7,500 sqm it is 1 space per 200 sqm for that part of floor space that is over 7,500 sqm.	The submitted traffic report references a range of surveyed sites to justify the use of the standard RMS rates, in place of nominal Council DCP rates for which there is not a clear basis. It is further noted that other developments in the locality (such as Ropes Crossing) have also been approved with rates less than stipulated by Council.	Section 6.
4	Consequently, we are unable to support a masterplan for buildings that nominate floor spaces for building footprints that have not been the subject of detailed assessment, specially as the building footprints are based on the parking rates in the EIS.…		
5	There is insufficient detail about the building footprints, including how access to docks by B-Double trucks will be provided. The indicative footprints represent an overdevelopment of each site. We are only prepared to support a subdivision masterplan provided the driveways and car parking are consistent with the reciprocal right of ways.	This is a detailed matter that can be resolved at DA stage. Nevertheless, reference should be made to the swept path drawings prepared by the civil engineer demonstrating manoeuvrability.	NA

No.	Authority Comments	Ason Group Response	TIA Section
6	The building concept plan is not clear about what appear to be ramps. More information is required on the ramps proposed in front of each warehouse as indicated on the Concept Masterplan.	This comment is assumed to relate to the recessed docks; typical of many warehouse type developments.	NA
Blacktown City Council – Traffic Matters			
1	It is noted that the largest vehicle to service the future lots is B-Double. Vehicular access to individual lots must cater for the manoeuvring of B-Doubles. A Condition of Consent should be imposed requiring compliance with AS2890.1 and AS2890.2 prior to issue of a Construction Certificate.	Noted. A condition to this effect is acceptable.	NA
2	It is noted that the Emergency Access Road is proposed to be 6m wide. This complies with the minimum carriageway width required by NSW Fire & Rescue.	Noted.	NA
3	It is noted that all access roads will be constructed to a carriageway width of 15.5m which complies with Blacktown City Council's Development Control Plan.	Noted	NA
4	All car park and loading area access should be constructed in full compliance with the appropriate Australian Standards, specifically AS2890.1 and AS2890.2. Swept path analysis for individual hardstand (paved area for heavy vehicle parking) must be undertaken during future stages to accompany the design development of hat future built-form on each lot, at all time.	Noted and accepted. This is a matter for future built-form Development Applications and/or Construction Certificate assessments.	NA
5	It is noted that the trip generation rates used in the report are based on TDT13/04a data, which is acceptable.	Noted.	NA
6	SIDRA analysis for various intersections indicated excessive delays at the GWH / Doonside Road / Brabham Drive intersection. The report suggested an additional 70m lane should be provided on the north approach (Doonside Road) to the GWH, to be dedicated as a left-turn only lane. That lane has improved the operational performance of the intersection. A concept design needs to be developed, including costing. The proponent for this development should pay all costs of their improvement works.	This TIA has undertaken revised modelling following additional detailed traffic and pedestrian surveys (in response to TfNSW comments) at the intersection of Doonside Drive / Great Western Highway. This revised analysis has determined that the previously identified upgrade is NOT required to support this development. With no requirements to upgrade that intersection, the need for a concept design becomes redundant.	Section 5.5.
7	Parking should be provided in accordance with the Blacktown City Council Development Control Plan.	Refer commentary above in relation to car parking rates, raised by Council's planning team.	NA

No.	Authority Comments	Ason Group Response	TIA Section
8	Shared pedestrian and cyclist access from Wallgrove Road and Ferrers Road should be provided, including the new access road for this development. Shared paths should comply with the latest State Government guideline(s).	Refer to updated civil and architectural design packages, provided separately.	NA
RMS			
1	Further information is required in relation to the impacts of the emergency access point and shared path.	Emergency vehicles are expected to access the Site infrequently and therefore are anticipated to have negligible traffic impact on the surrounding road network.	NA
2	Detailed plans are to be submitted detailing the treatment of the M7 boundary fence on Wallgrove Road. Drawing 18652_SSDA_EX01 states that the existing fences and gate will remain. Clarification is required in relation to the existing locked gate across the M7 access road.	Refer to updated civil and architectural design packages, provided separately.	NA
3	There is reference to a rock rubble drainage on Roads and Maritime / M7 land. WSPT is to clarify the extent of this work and who is to manage and maintain this asset and any resulting access issues.	Refer to consolidated response in EIS.	NA
4	Further information is required in relation to the overall management of the access gates in relation to the Emergency Access Point.	The proposed gate will generally be secured; opened as necessary for emergency vehicles.	
5	Further information is required in relation as to how WSPT propose to manage, maintain and operate the share path asset on Roads and Maritime / M7 land.	Refer to WSPT response in EIS.	NA.
6	An additional left turn lane is proposed at the intersection of Great Western Highway / Doonside Road / Brabham Drive. The applicant is to provide concept civil design plans, TCS plans and swept path plans for the proposed signal work for further assessment.	This TIA has undertaken revised modelling following additional detailed traffic and pedestrian surveys (in response to TfNSW comments) at the intersection of Doonside Drive / Great Western Highway. This revised analysis has determined that the previously identified upgrade is NOT required to support this development. With no requirements to upgrade that intersection, the need for a concept design becomes redundant.	NA.
TfNSW			
7	Based on comparison of historical aerial imagery (via Nearmap), it is noted that intersection upgrades at the Great Western Highway with Brabham Drive/Doonside Road were completed and operational in Sep/Oct 2018. Furthermore, the assessment had undertaken the intersection analysis based on survey data obtained from November 2017, which establishes the base case scenario. Having regard for the above, the existing traffic conditions may have changed, such	As recommended by TfNSW, this TIA has undertaken revised intersection counts at this signalised intersection and re-run the following scenarios: - Existing base (October 2019), - Future Base (2036 EMME projections),and - Project Case (2036 Base + Development). Results of the updated modelling for the Future Project Case suggests that this intersection does not require any additional upgrades. Regarding the additional traffic from Eastern Creek Quarter and Sydney Zoo, it is noteworthy that the future base model (RMS EMME projections) are	Section 5.5.

No.	Authority Comments	Ason Group Response	TIA Section
	that new intersection analysis would be warranted, in response to: Potential changes in signal operations and green time allocation having regard for new dual right-turns on the Great Western Highway and new pedestrian crossing legs. Potential changes in traffic volumes due to land use changes and growth (between surveyed period and current) surrounding the Huntingwood/Bungarribee area and Greater Penrith and Blacktown area. In addition to the above, it is unclear whether traffic associated with the under-construction developments at the Eastern Creek Quarter (shopping centre) and the Sydney Zoo have been accounted for within the traffic assessment.	assumed to have incorporated a reasonable contingency for future traffic associated with these components.	
DPIE			
	The traffic impact assessment (Appendix N) notes that an assessment of the construction traffic impacts has not been undertaken (pg. 5). It is requested that this assessment is undertaken in relation to the Stage 1 works.	A preliminary CTMP was prepared separately by WSPT and included in the original submission. Notwithstanding, this TIA has been updated to include high-level Construction Traffic Management Plan principles. Further detailed / specific management measures are still expected to be deferred to future CTMP documentation.	Section 7.

1.5 Study Objectives & Methodology

The key objectives of this TIA are to:

- Provide an appropriate response to the SEARs;
- Establish that the development of the Site in accordance with the Masterplan is compliant and consistent with the relevant Council planning guidelines;
- Establish that the trip generation of the Site can be appropriately accommodated by the local and sub-regional network, with due consideration of committed (by others) upgrades to several key intersections providing access for the Site;
- Demonstrate that proposed Site access driveways, car parks and service facilities can be designed to provide full compliance with the relevant Australian Standards; and
- Demonstrate that there is an appropriate and sustainable allocation of car parking across the Site.

To achieve these objectives, this TIA provides an assessment of the existing and future operation of the road network servicing the LIBH, as well as other traffic and transport related issues including car parking requirements, vehicle access, and public and active transport accessibility.

The following key tasks have been undertaken in the preparation of this TIA:

- A review of the existing and proposed future road network providing access to the regional road network.
- The quantification of existing and future traffic flows in key roads and at key intersections providing access for the LIBH, including the commission and review of peak period traffic surveys.
- An assessment of the traffic generation and distribution characteristics of the proposed LIBH, and the potential impact of those additional traffic flows on nearby key roads and intersections.
- An assessment of internal access, parking and servicing provisions with reference to the appropriate Australian Standards.

1.6 Reference Documents

This TIA specifically references the most recent assessments of key infrastructure projects within the sub-regional network providing for the Site, such as

- Aecom, *Eastern Creek Resource Energy and Business Precinct – Flood, Traffic and Access Study*, November 2013 (TAS 2013)

This TIA also references general access, traffic, and parking guidelines, including:

- RMS Guide to Traffic Generating Developments (RMS Guide)
- RMS Guide to Traffic Generating Development Updated Traffic Surveys (RMS Guide Update)
- Austroads Guide to Road Design Part 3: Road Geometry (Austroads GRD3)
- Austroads Guide to Road Design Part: 4A Unsignalised and Signalised Intersections (Austroads GRD4A)
- Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis (Austroads GTM3)
- Australian Standard 2890.1: Parking Facilities – Off Street Car Parking (AS 2890.1)
- Australian Standard 2890.2: Parking Facilities – Off Street Commercial Vehicle Facilities (AS 2890.2)
- Australian Standard 2890.6: Parking Facilities – Off Street Parking for People with Disabilities (AS 2890.6)

2 The Light Horse Business Hub Masterplan

2.1 Overview

As stated, a detailed description of the Masterplan is provided in the EIS which this TIA accompanies. In summary, the broader SSDA provides for the following:

- Approximately 157,600m^2 GFA of warehouse space and 7,900m^2 GFA of ancillary office space;
- Site access connections to Ferrers Road (primary access) and Wallgrove Road (emergency);
- In conjunction with broader upgrades to the local road network, localised upgrades along the key access routes to/from the Site;
- Design profiles of Site road and access intersections which provide for the largest heavy vehicles accessing the Site; and
- A sustainable level of on-site parking provision.

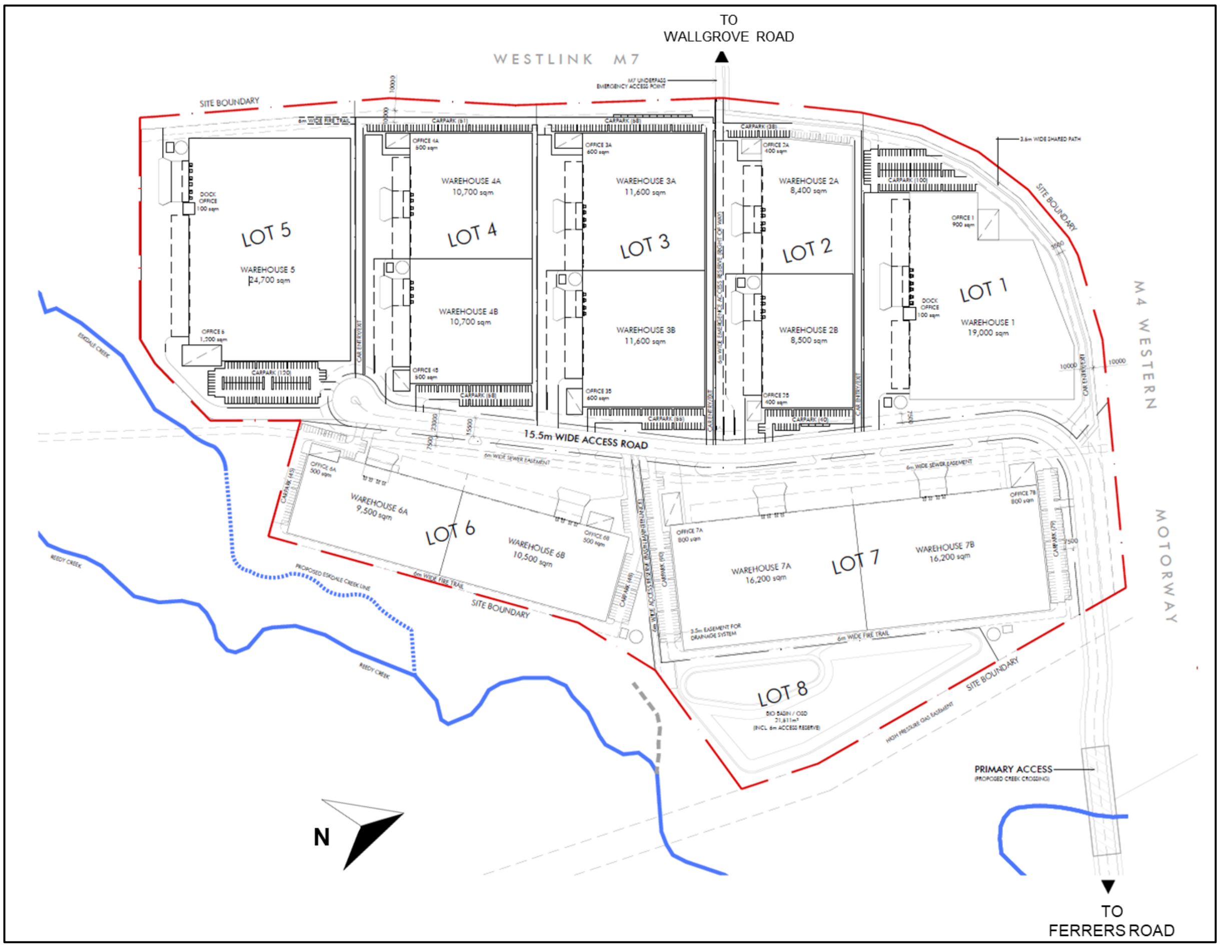


Figure 2: Light Horse Interchange Business Hub Masterplan

2.2 Site Access

2.2.1 Access Options Considered

As part of initial concept design development for this project, the following 3 access options were investigated with relevant commentary provided below.

Table 3: Access Options Considered

Ref	Description	Comments
1	Access from the south, via SUEZ	This option was deemed unsuitable having regard for: • High traffic volumes in Wallgrove Road and close-proximity to signals preventing suitable (signalised) access opportunities • Insufficient headroom under the M7 overpass bridge • Impacts on bus services – increased use of the Wallgrove Rd slip lane would likely require relocation of the existing bus stop provided therein. • Difficulties in providing required upgrades to the Wallgrove Road / SUEZ access required to support the increased cumulative traffic using that access point.
2	Wallgrove Road access	This option was deemed unsuitable having regard for: • Fundamentally, this option relies upon private land to the south which is therefore subject to timing, liability and other issues. • Difficulties in providing required upgrades to the Wallgrove Road / SUEZ access required to support the development
3	Ferrers Road connection	This option was found to be supportable and, as such, has formed the basis for further assessment.

2.2.2 Proposed Vehicular Access

Access to the LIBH will be provided through 2 connection points:

- Primary Access: via Ferrers Road, providing a new roundabout intersection to approximately 200 metres west of the existing (roundabout) intersection of Ferrers Road / Brabham Drive / Peter Brock Drive. This new roundabout would provide primary access for all vehicles. This access road has been termed "LIBH Access" for ease of reference.
- Emergency Access: via Wallgrove Road for emergency vehicles only. In this regard, the existing private road that runs eastbound from Wallgrove Road through M7 underpass is proposed to be extended to connect with LIBH Access.

The design of Ferrers Road roundabout will necessarily consider meeting the requirements of:

- Lane capacity, as determined by SIDRA modelling; and

- Turning path requirements of the largest heavy vehicles permitted to access the Site, expected to be B-Doubles.

It is noted that Ferrers Road north of the intersection with LIBH Access is already approved for heavy vehicles up to and including 26m B-Doubles, while south of the Austral Bricks site, Ferrers Road is approved for 25m B-Doubles travelling southbound only.

The Emergency Access road shall be constructed to achieve a minimum carriageway width of 6 metres to comply with NSW Fire & Rescue *Guidelines for Emergency Vehicle* Access (Policy No. 4) and other relevant emergency service access requirements.

2.3 Internal Access & Circulation for Motor Vehicles

From its intersection with Ferrers Road, the LIBH Access will run west and then south through the centre of the LIBH.

LIBH Access will be constructed in accordance with the road profiles of Blacktown City Council's Development Control Plan (BCC DCP), comprising of a 15.5 metre wide carriageway for its full length to enable two-way traffic and on-street parking (though on-street parking demand is expected to be minimal). Swept path analysis of all critical movements at proposed Ferrers Road roundabout as well as internal access roads have been undertaken to confirm compliance with relevant standards, noting that it is expected that a Condition of Consent would be imposed requiring compliance with AS 2890.1 and AS 2890.2 prior to the issue of a Construction Certificate. All swept path diagrams are provided in the Civil Engineering Report, submitted separately.

Proposed vehicular access and circulation within the Site are shown in **Figure 3**.

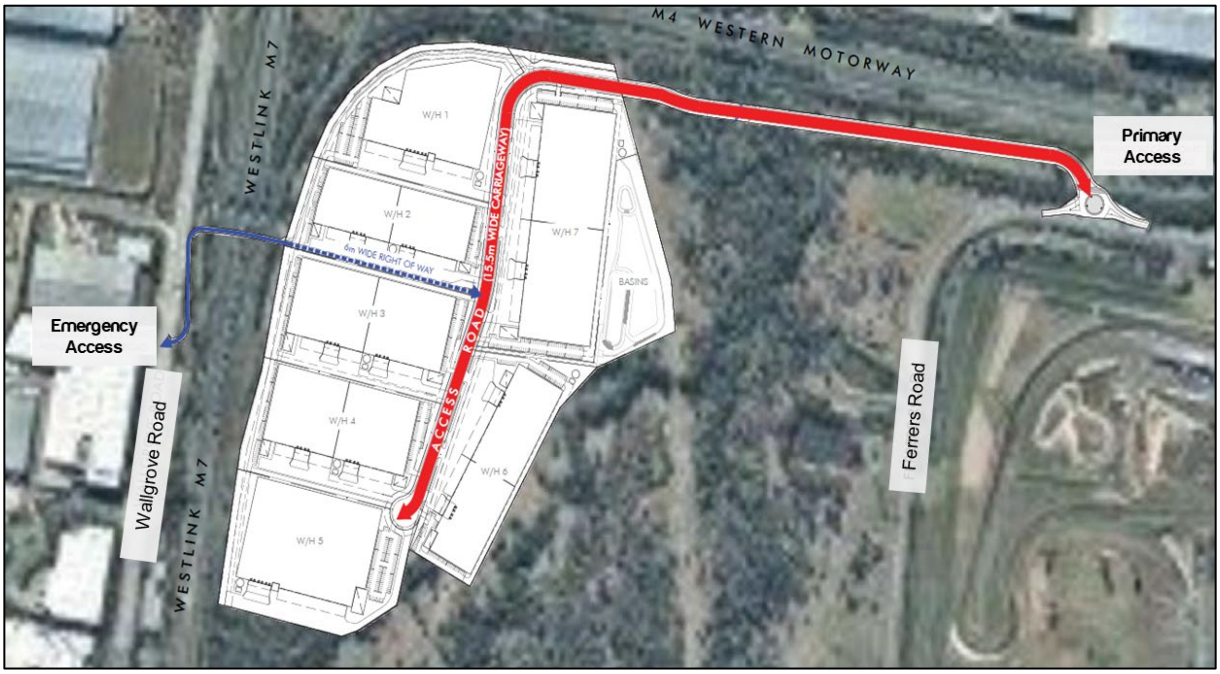


Figure 3: Vehicle Access and Circulation

2.4 Built Form

All car park and loading area access will be provided from LIBH Access via industrial driveways that will be constructed to provide full compliance with the appropriate Australian Standards; specifically AS 2890.1 and AS 2890.2. Swept path analysis for individual hardstand (paved area for heavy vehicle parking) will be undertaken during future stages to accompany the design development of that future built form on each lot, at that time.

2.5 Pedestrian and Cyclist Access

The Westlink M7 Shared Path runs parallel to the Westlink M7 directly west of the Site. While there is currently no immediate access to the Shared Path in this location, the opportunity exists to provide a shared path connection via the (currently closed) access road under the Westlink M7.

From Ferrers Road, cycle access is also available to the extensive off-road cycle network to the east of the Site (the Prospect Loop) linking to key sub-regional centres as well as public transport interchanges. Paired with the provision of appropriate on-site cycle facilities, such as bicycle storage, lockers and shower facilities, the Site is well located to generate cycle trips.

Accordingly, the following onsite Pedestrian and Cyclists facilities have been provided with this SSDA:

- Pedestrian / Cyclists shared path from Wallgrove Road (3.5 metres wide concrete footpath);
- Pedestrian / Cyclists shared path from Ferrers Road (2.5 metres wide concrete footpath); and
- Internal Pedestrian path along eastern side of LIBH Access (1.2 metres wide concrete footpath).

The proposed Pedestrian / cyclists facilities are summarised in **Figure 4**.

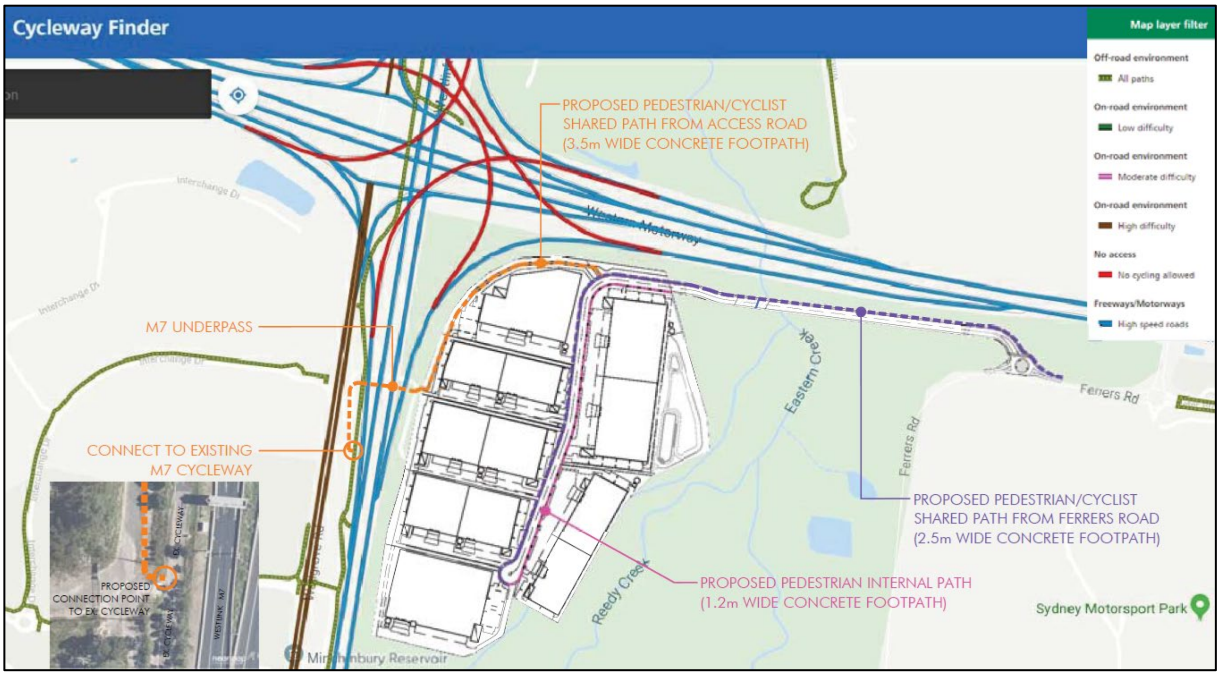


Figure 4: Proposed Pedestrian and Cyclist Facilities

3 Existing Conditions

3.1 Existing Road Network

The existing road network in the vicinity of the LIBH is shown in **Figure 5**, and key roads and intersections are further detailed below.

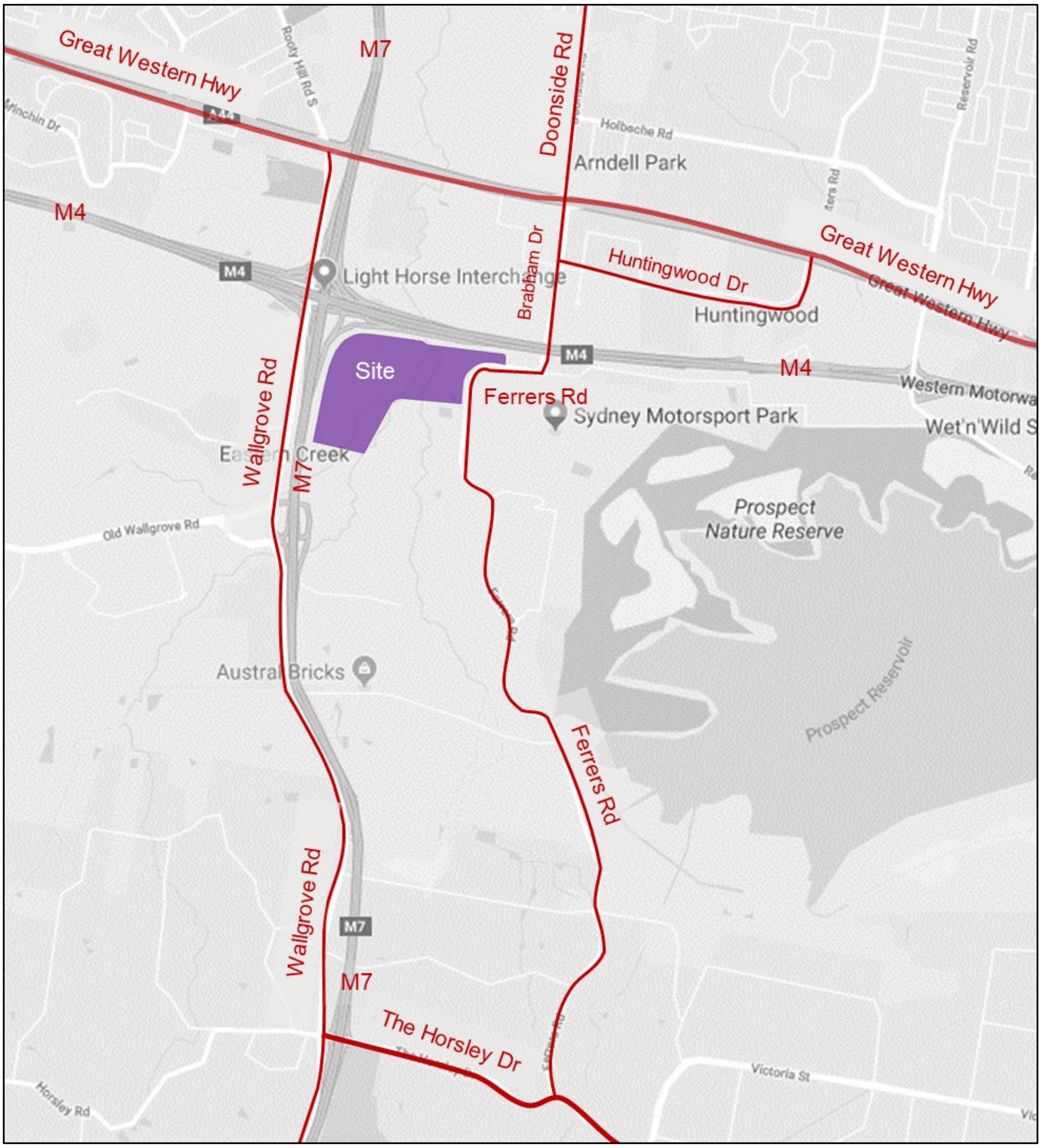


Figure 5: Existing Road Network

3.1.1 M4 Motorway

The M4 Motorway is a high capacity road link of national significance and the primary east-west connection to Western Sydney. The M4 Motorway provides a key western link between the inner west of Sydney to the M7 Motorway and the Blue Mountains. Near the Site, the M4 Motorway carries six traffic lanes within a divided carriageway and provides a major interchange with the M7 Motorway. The speed limit on the M4 Motorway is 110 km/h, and it carries approximately 100,000 vehicles per day (vpd).

3.1.2 M7 Western Motorway

The M7 Motorway is a high capacity road link of national significance and was built to accommodate future traffic growth in Western Sydney. The M7 Motorway provides a key western link between the M2 Motorway (to the north) and the M5 Motorway (to the south). Near the Site, the M7 Motorway has four traffic lanes within a divided carriageway and has a major interchange with the Great Western Highway (and as described with the M4 Motorway). Additional connections to the M7 are provided from Wallgrove Road at its intersections with Old Wallgrove Road and Mini Link Road. The speed limit on the M7 Motorway is 100 km/h, and it carries approximately 70,000 vpd.

3.1.3 Great Western Highway

The Great Western Highway (GWH) is a high capacity road link that runs parallel to the M4 Western Motorway and provides a key link between Penrith and Parramatta. In the vicinity of the Site, the GWH has four traffic lanes within a divided carriageway and on/off ramps to the M7 Westlink Motorway to the west of the Site. The speed limit on the GWH is 80 km/h, and it carries approximately 40,000 vpd.

3.1.4 Doonside Road

Doonside Road is an arterial road to the north of the Site that runs generally north-south from its intersection with Great Western Highway in the south to Bungarribee Road in the north. Near the Site, Doonside Road provides four traffic lanes within a divided carriageway. The speed limit on Doonside Road is 70 km/h, and it carries approximately 25,000 vpd.

3.1.5 Wallgrove Road

Wallgrove Road is an arterial road that runs parallel to the M7 motorway, connecting Great Western Highway at its northern end and Elizabeth Drive at its southern end. Near the site, Wallgrove Road has four traffic lanes and on/off ramps to the M4 motorway. Wallgrove Road also provides connectivity with eastern suburbs via The Horsley Drive and western areas via Old Wallgrove Road. The posted speed is 70 km/h.

3.1.6 Ferrers Road

Ferrers Road is a regional road that runs in a north-south direction between Brabham Drive to the north of the Site to The Horsley Drive to the south of the Site. Ferrers Road provides a single traffic lane in each direction, and has a posted speed limit of 60 km/h.

3.1.7 Huntingwood Drive

Huntingwood Drive is a local (industrial) road that generally runs east-west between Brabham Drive and the Great Western Highway. Huntingwood Drive provides a single traffic lane in each direction and has a posted speed limit of 50 km/h.

3.1.8 Brabham Drive

Brabham Drive is a local (industrial) road that runs north-south between Ferrers Road in the south and the GWH in the north (where is provides the southern approach to the intersection of GWH & Doonside Road). Brabham Drive provides a single wide traffic lane in each direction, and has a posted speed limit of 50km/h.

3.1.9 The Horsley Drive

The Horsley Drive is an arterial road that runs east-west near the intersection with Ferrers Road and provides two lanes in each direction. It provides key link between Eastern Creek and Hume Highway near Fairfield. The posted speed is 60 km/h and it carries approximately 40,000 vpd.

3.2 Public Transport

3.2.1 Mode Share – Journey to Work Data

The online open data hub of Transport for New South Wales (TfNSW) provides Journey to Work (JTW) data, which is derived from the 5-yearly Census of Population and Housing conducted by the Australian Bureau of Statistics (ABS). It includes data on trips related to employment as well as mode of travel to work. JTW data for the travel zone containing the Site is presented in **Figure 6**, noting that in summary the following mode share is reported:

- Vehicle (Driver and Passenger): 94%;
- Public and Active Transport: 0%; and
- Mode not stated: 6%.

The high dependence on private vehicle trips is consistent with our observations and can be largely attributed to the relatively isolated location of the area, as well as a lack of public and active transport infrastructure in the area.

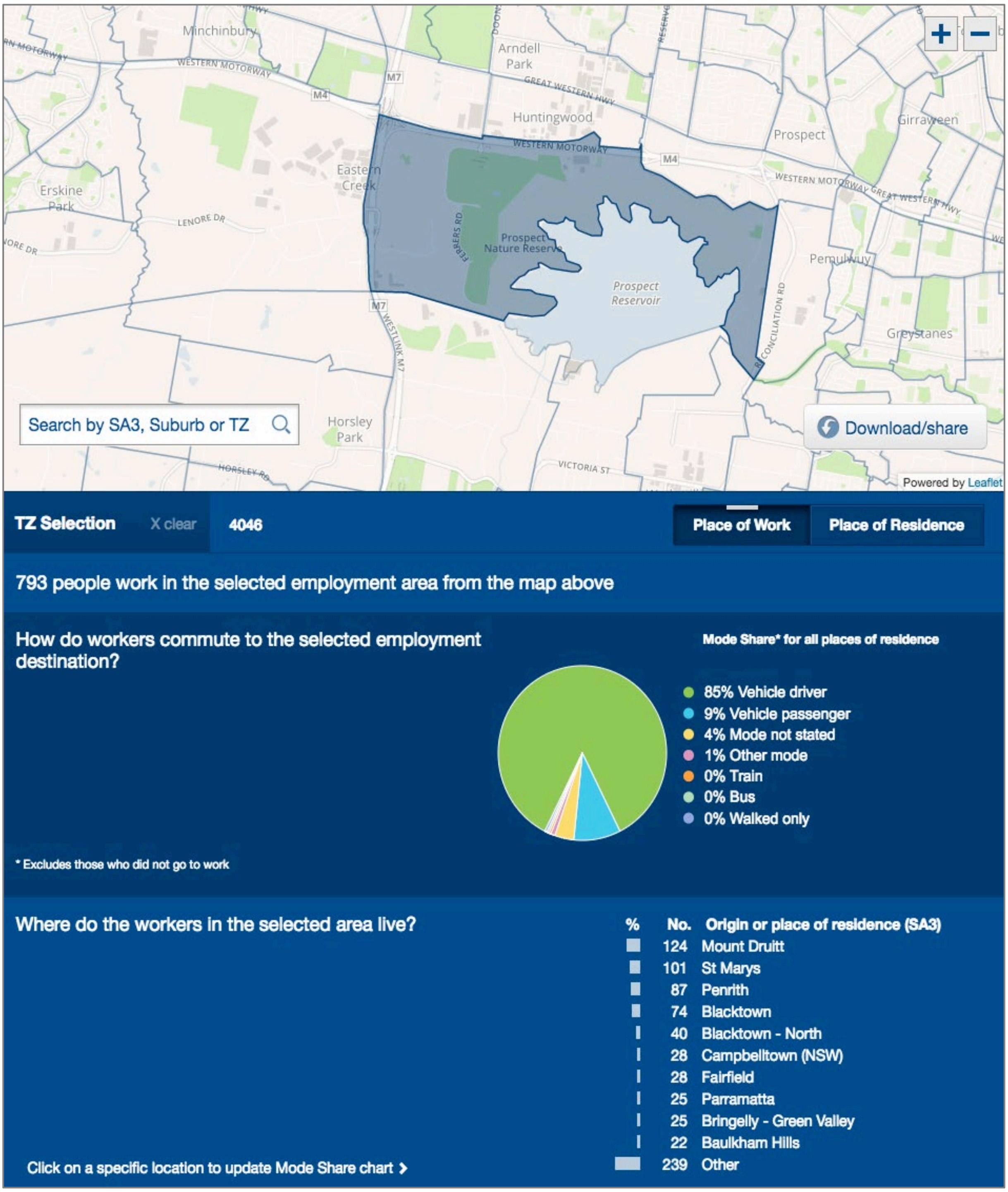


Figure 6: Journey to Work Data for the Subject Site

3.2.2 Bus Services

Busways bus services operate along Wallgrove Road to the west of the Site, and include the following routes:

- Route 738 Mount Druitt to Eastern Creek via Rooty Hill
- Route 723 Blacktown to Mount Druitt via Eastern Creek Business Park

Busways also operates services through the local industrial precinct to the north of the Site, including the following routes:

- Route 723 Blacktown to Mount Druitt via Huntingwood Drive and Brabham Drive
- Route 724 Blacktown loop service via Peter Brock Drive

These bus services operate approximately once every 30 minutes through the broader AM and PM peak periods.

It must be acknowledged that the walk distance between the Site and bus stops along these routes is outside of the 800m walk distance, which is generally considered an acceptable walk distance as part of a trip to work. While the bus stops in Wallgrove Road are nearer the Site, there is no pedestrian infrastructure on the eastern side of Wallgrove Road, nor any potential to provide an appropriate pedestrian crossing in this vicinity by which to reach the northbound bus stop on the western side of Wallgrove Road.

In addition, if the general trip profile of industrial workers is considered – including work shifts often outside of public transport peak periods and the daily use of private vehicles (for work) – there is little potential for public transport to attract any significant work trips in the short term.

Conversely, in the medium to long term there are good opportunities to provide additional bus services linking to the LIBH. The most obvious route would be along Ferrers Road itself, potentially extending north to Mount Druitt or Blacktown, and south to Fairfield or Liverpool. The viability of such a future route would specifically depend upon further development along the Ferrers Road corridor (particularly to the south near Horsley Drive), noting that the available north-south routes to the east (Cumberland Highway) and west (Wallgrove Road) provide the more efficient sub-regional routes at this time.

3.3 Existing Traffic Flows

3.3.1 Traffic Survey Locations

Traffic surveys were undertaken in November 2017 (the 2017 surveys) at the key intersections north and south of the Site, including:

- Great Western Highway / Huntingwood Road;
- Great Western Highway / Brabham Drive / Doonside Road;
- Brabham Drive / Huntingwood Drive;
- Brabham Drive / Ferrers Road / Peter Brock Drive; and
- Ferrers Road / The Horsley Drive.

Furthermore, as part of this revised TIA, a revised traffic survey has been undertaken in October 2019 at the signalised intersection of Great Western Highway / Doonside Road / Brabham Drive (the 2019 survey) in response to TfNSW comments in consideration of the recent changes to that intersection. Accordingly, the base scenario SIDRA results undertaken as part of this TIA refers to the updated 2019 surveys at this intersection. Furthermore, it is also noted that the 2019 surveys included pedestrian counts at this intersection which have now been included in the modelled intersection.

The traffic survey data is provided in **Appendix B.**

3.4 Intersection Performance – Existing Conditions

Performance of the key intersections were assessed using SIDRA Intersection modelling.

It is noted that during Site visits undertaken by Ason Group through AM and PM peak periods, it was observed that queues at the key intersections detailed above did not “spill back” to any upstream intersections. As such, SIDRA modelling was carried out on isolated intersections.

SIDRA assessment of “Existing Conditions” refers to analysis of the surveyed peak hour traffic at each intersection under existing road geometries.

SIDRA Modelling outputs provide various performance parameters. The key parameters are:

- Average Vehicle Delay (AVD) – The AVD (or average delay per vehicle in seconds) for intersections provides a measure of the operational performance of an intersection and is used to determine an intersection’s Level of Service. For signalised intersections, the AVD reported relates to the average of all vehicle movements through the intersection. For priority (Give Way, Stop &

Roundabout controlled) intersections, the AVD reported is that for the movement with the highest AVD.

- Level of Service (LoS) – This is a comparative measure that provides an indication of the operating performance, based on AVD.

Table 4 provides a baseline for LoS assessment as recommended by the RMS Guide to Traffic Generating Developments.

Table 4: RMS Level of Service Summary

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

SIDRA layouts for these intersections are presented in the figures below.

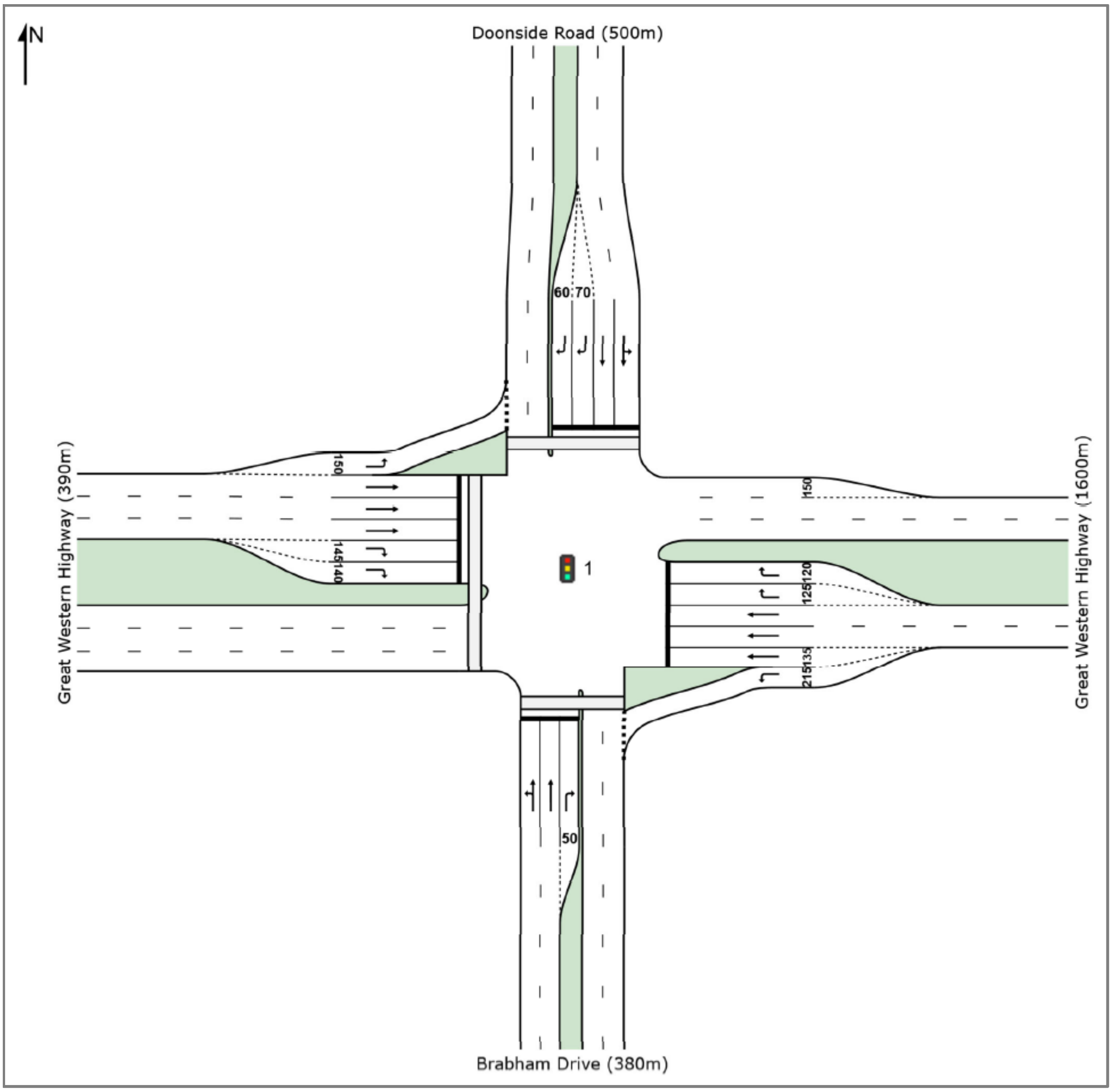


Figure 7: GWH / Brabham Drive / Doonside Road – Existing Layout

It is noteworthy that this intersection has recently been upgraded as part of the RMS identified upgrade works which is discussed in the next section of this TIA.

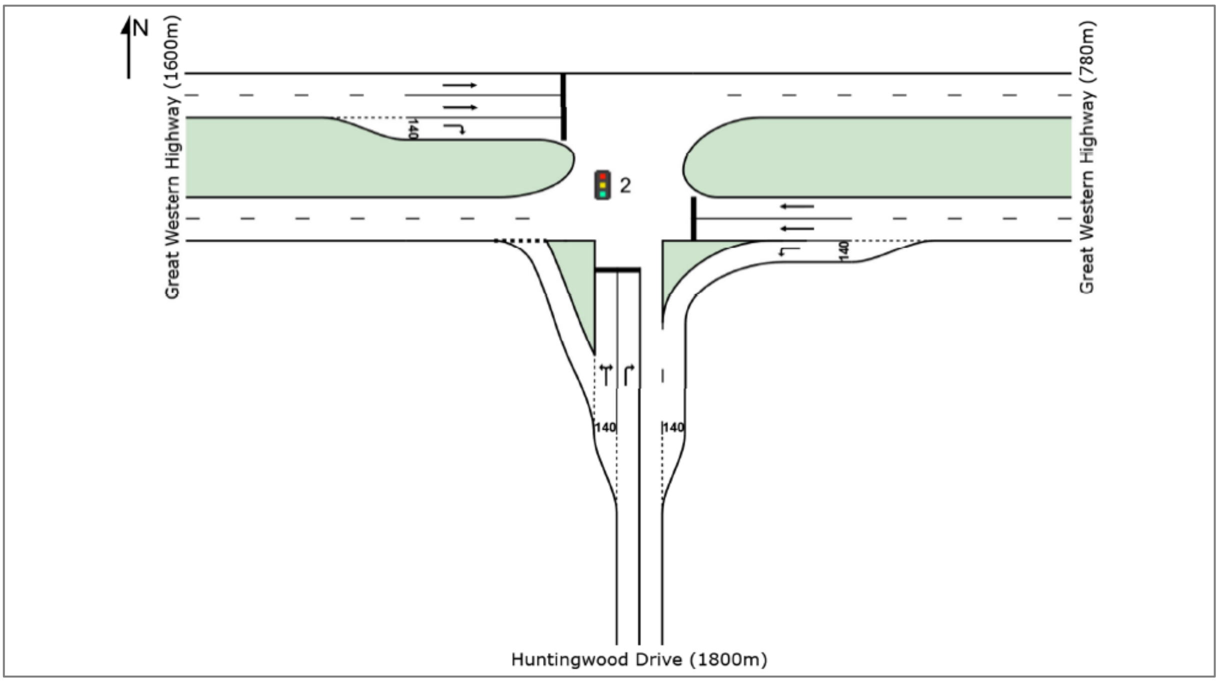


Figure 8: GWH / Huntingwood Drive – Existing Layout

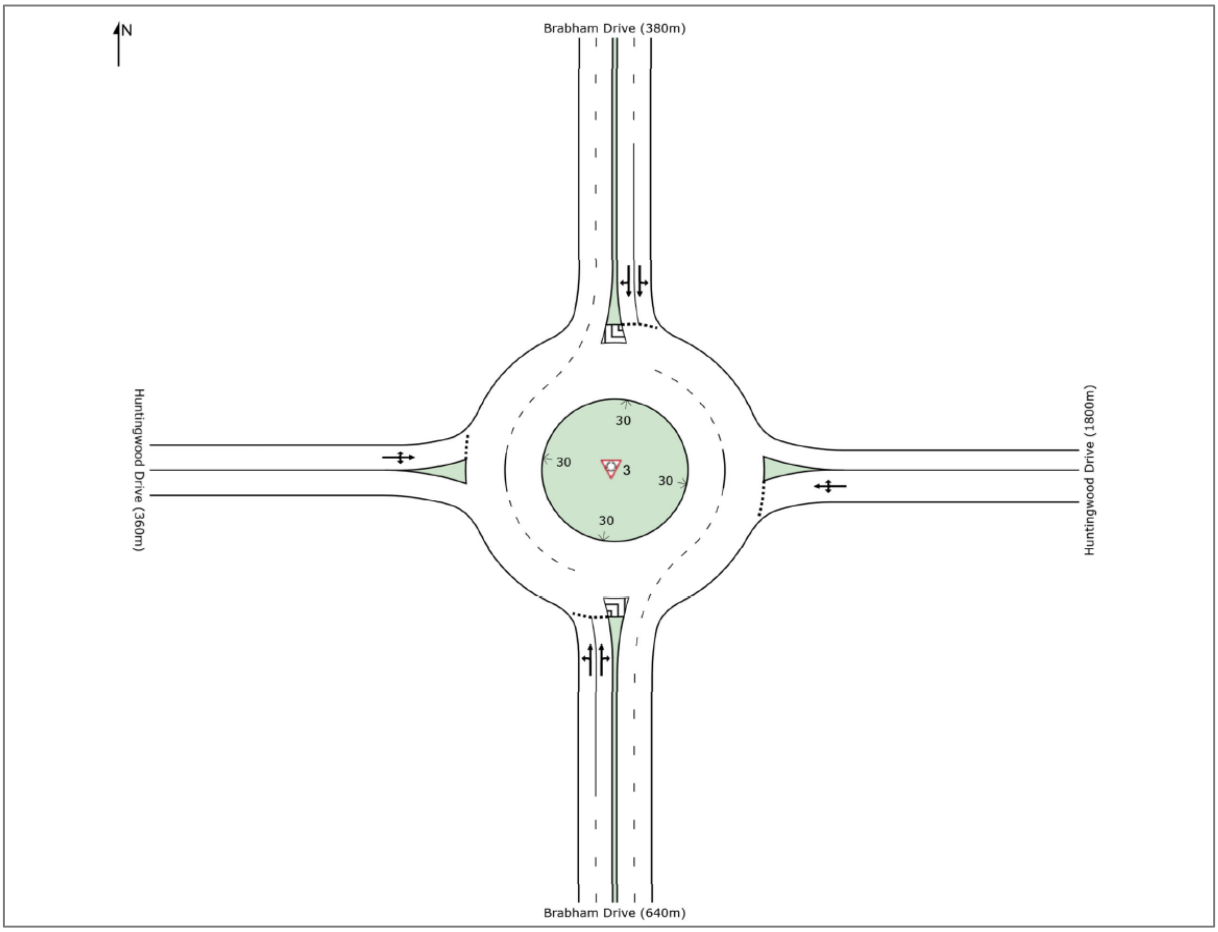


Figure 9: Brabham Drive / Huntingwood Drive – Existing Layout

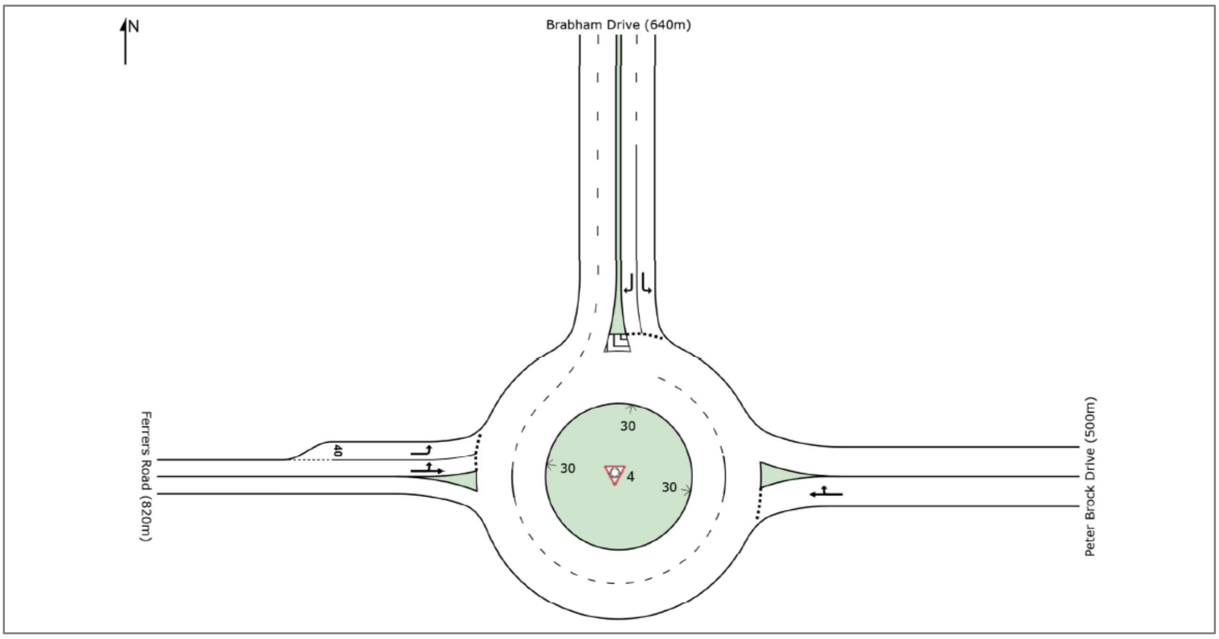


Figure 10: Brabham Drive / Ferrers Road / Peter Brock Drive – Existing Layout

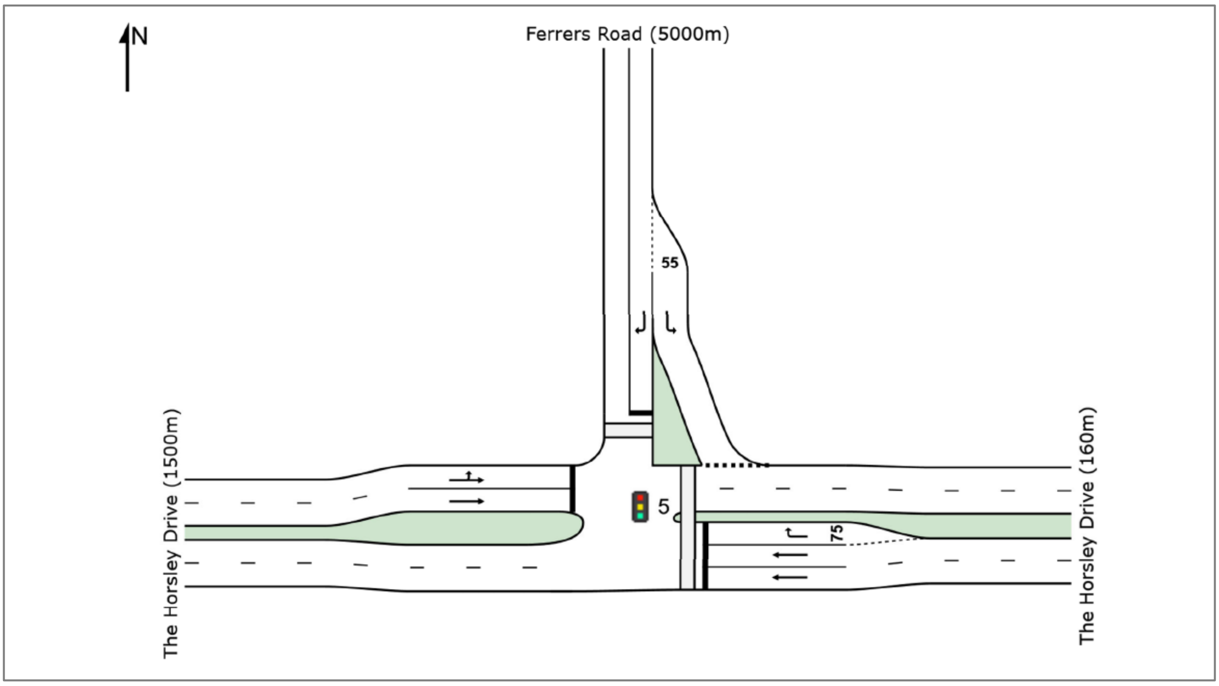


Figure 11: The Horsley Drive / Ferrers Road – Existing Layout

A summary of the SIDRA analysis of Existing Conditions is provided in **Table 5**; detailed SIDRA outputs are provided in **Appendix C**.

Table 5: Intersection Performance – Existing Conditions

Intersection	Control Type	Period	Intersection Delay	Level of Service
Great Western Highway / Doonside Road / Brabham Drive	Signals	AM	44	D
		PM	45	D
Great Western Highway / Huntingwood Drive	Signal	AM	9	A
		PM	23	B
Brabham Drive / Huntingwood Drive	Roundabout[1]	AM	14	A
		PM	14	A
Ferrers Road / Brabham Drive / Peter Brock Drive	Roundabout[1]	AM	11	A
		PM	15	B
The Horsley Drive / Ferrers Road	Signals	AM	38	C
		PM	20	B

Note 1: Intersection delay / LoS for roundabouts, as well as other types of priority-controlled intersections, relates to Worst Movement result. For signalized intersections, reported delay relates to overall average intersection delay, weighted by turn volumes.

With reference to **Table 5**, the SIDRA analysis indicates that the key intersections currently operate satisfactorily under the existing baseline scenario.

4 Future Base Case

4.1 Background Traffic

4.1.1 Future Base Year

Further to the determination of an estimated construction completion date of 2026 for the LIBH, a forecast year of 2036 has been selected for the assessment of future conditions. Base 2036 traffic volumes (i.e. without the LIBH) were determined with reference to annual growth forecasts in the local road network, as described below.

4.1.2 Growth Rate for Background Traffic

In order to determine background traffic volumes for the Base 2036 forecast year, Ason Group has collated RMS traffic growth rates from the 2036 Sydney Traffic Forecasting Model (2036 STFM). It may be noted that “Link” growth rates reported in the 2036 STFM were the primary reference in determining turn volumes at respective approaches, while intersection growth rates (also reported in the 2036 STFM) were adopted where ‘Link’ rates were not available.

These growth rates were then applied to the traffic survey data to obtain 2036 traffic volume (Base 2036), again noting that these volumes do not include the potential traffic generation of the LIBH.

4.2 Recent and Planned Road Network Upgrades

RMS has identified a number of upgrade requirements within the local road network to appropriately accommodate forecast traffic flow increases within the broader sub-region. Recently installed and planned upgrades of specific relevance to the assessment of the LIBH are detailed in sections below.

4.2.1 Great Western Highway / Doonside Road / Brabham Drive

Recent upgrades at the Great Western Highway / Doonside Road / Brabham Drive includes:

- Widening of the Great Western Highway (from the central median) to provide additional right turn lanes for the movements from Great Western Highway to both Doonside Road and to Brabham Drive;
- Widening of the existing eastbound and westbound left turn slip lanes from Great Western Highway to both Doonside Road and to Brabham Drive and
- The introduction of signalised pedestrian crossings on both the Doonside Road and Brabham Drive approaches to Great Western Highway.

These upgrades are shown in **Figure 12** and the modified intersection configuration is provided in **Figure 13**.

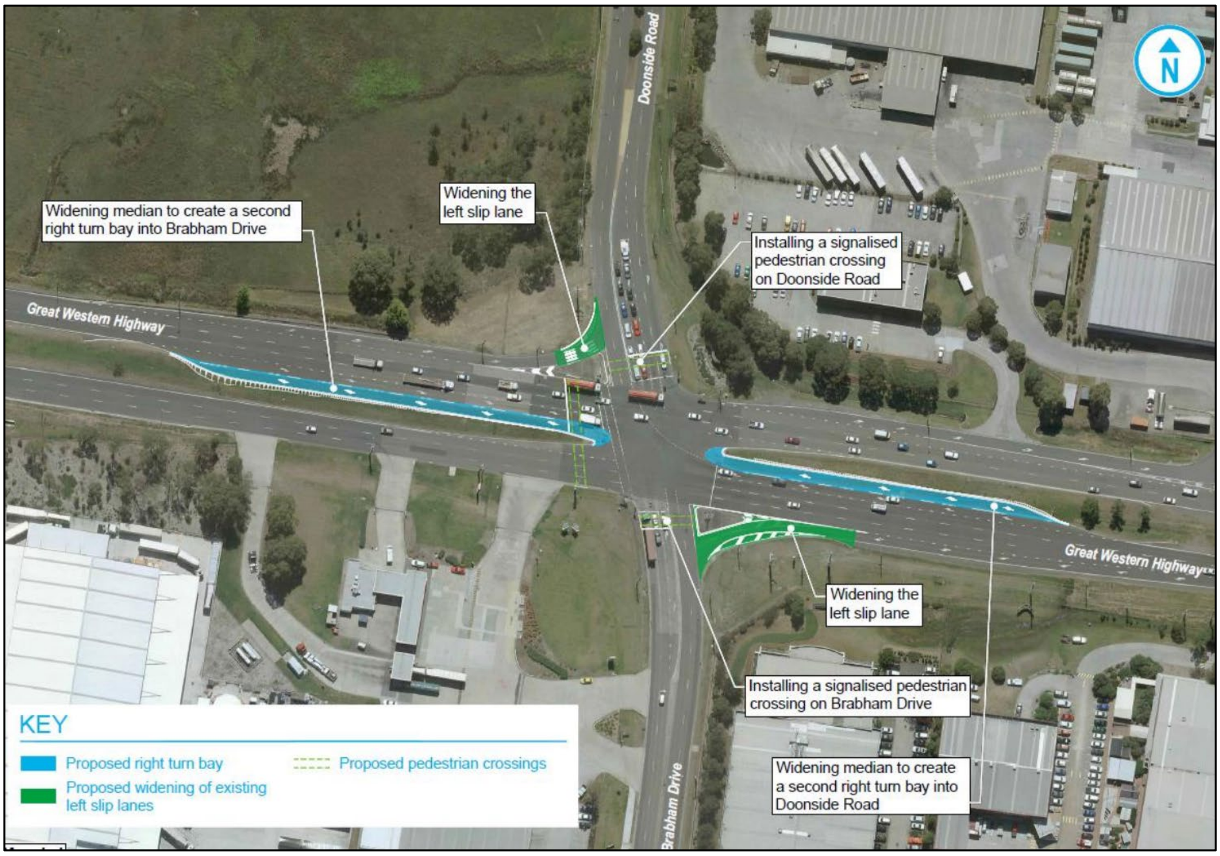


Figure 12: Recent Upgrades at Great Western Highway / Brabham Drive / Doonside Road

Figure 13: GWH / Brabham Drive / Doonside Road – Existing intersection

4.2.2 The Horsley Drive

Proposed upgrades along the Horsley Drive include:

- Widening of the existing road to a 4-lane divided carriageway road between the M7 Motorway and Cowpasture Road, to include a wide central median allowing for further widening to a 6-lane divided carriageway in the future;
- The provision of an additional eastbound lane from west of Ferrers Road to Cowpasture Road; and
- The construction of a pedestrian and cyclist shared path along the length of The Horsley Drive, connecting to the existing Western Sydney Parklands cycleway.

4.2.3 The Horsley Drive / Ferrers Road intersection

Potential proposed upgrades at the Horsley Drive / Ferrers Road intersection include:

- The provision of a left turn slip-lane from The Horsley Drive to Ferrers Road;
- The duplication of the right turn bays from The Horsley Drive to Ferrers Road; and
- The Duplication of the left-turn slip lane from Ferrers Road to The Horsley Drive.

These upgrades are presented in the **Figure 14** while the modified SIDRA layout for testing the upgrade is provided in **Figure 15**.

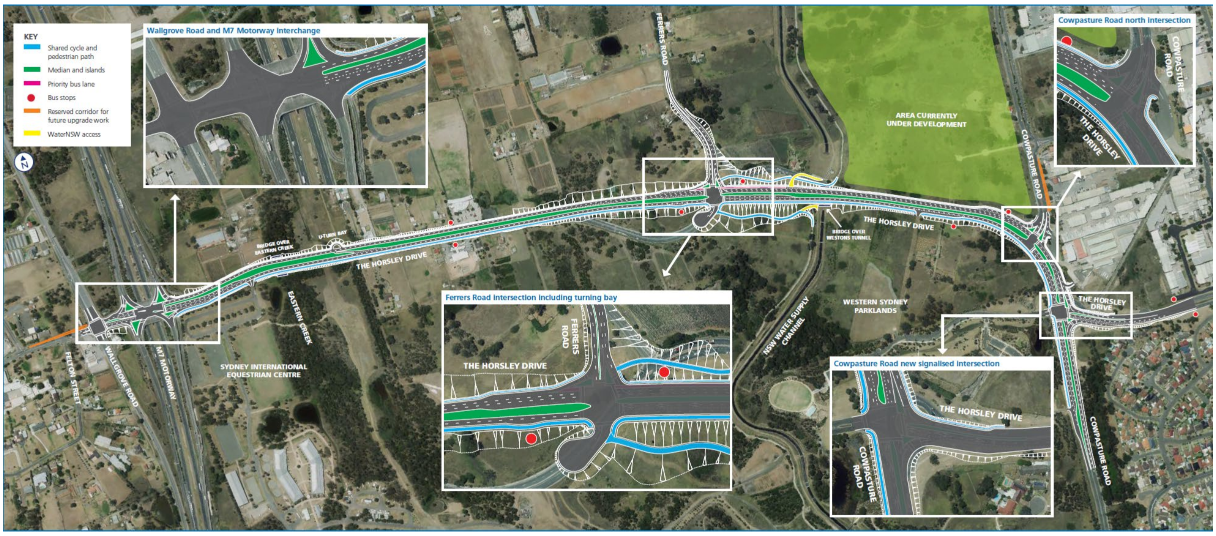


Figure 14: Planned Upgrades to The Horsley Drive

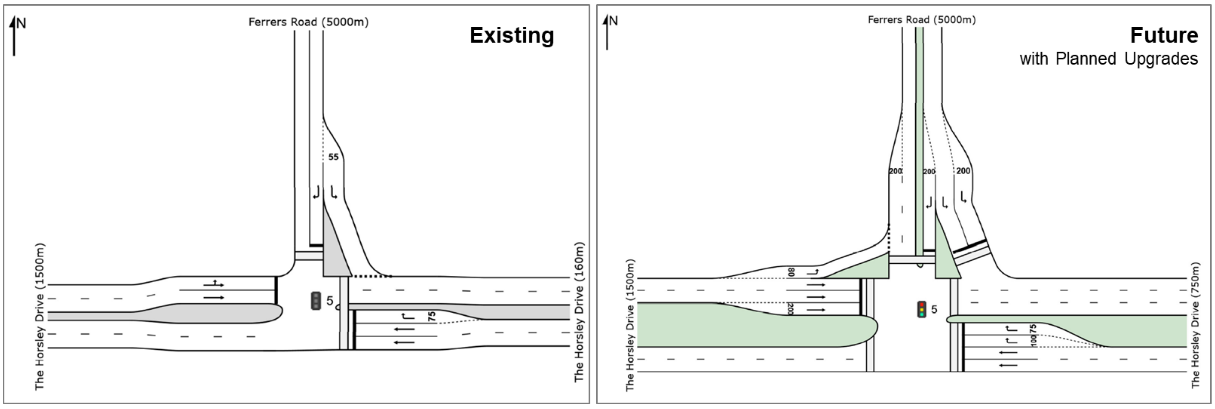


Figure 15: The Horsley Drive / Ferrers Road – Existing and Future Layouts

It should be noted that during a recent meeting with RMS on 12 December 2019, RMS indicated that the planned upgrade of this intersection has not yet been funded and there is no committed timing for this upgrade. As a result, the Horsley Drive / Ferrers Road Intersection has additionally been modelled for the 2036 Base Case without upgrades.

4.3 Intersection Performance – 2036 Base Case

The key intersections were assessed in SIDRA for 2036 Base Case, which includes:

- background traffic volumes,
- as mentioned above, two options for the intersection of The Horsley Drive / Ferrers Road as follows:
  - considering existing geometry,
  - with planned upgrades and
- existing road geometry at the remaining intersections.

SIDRA results are summarised in the following tables, while detailed outputs are provided in **Appendix C**.

Table 6: Intersection Performance – 2036 Base

Intersection	Control Type	Period	Intersection Delay	Level of Service
Great Western Highway / Doonside Road / Brabham Drive	Signals	AM	50	D
		PM	47	D
Great Western Highway / Huntingwood Drive	Signals	AM	11	A
		PM	26	B
Brabham Drive / Huntingwood Drive	Roundabout	AM	15	B
		PM	17	B
Ferrers Road / Brabham Drive / Peter Brock Drive	Roundabout	AM	13	A
		PM	21	B
The Horsley Drive / Ferrers Road (Existing Geometry)	Signals	AM	177	F
		PM	245	F
The Horsley Drive / Ferrers Road (Planned Upgrades)	Signals	AM	19	B
		PM	21	B

With reference to Table 6, the SIDRA analysis indicates that the key intersections would operate satisfactorily under the 2036 Base scenario when the intersection of The Horsley Drive / Ferrers Road is upgraded as discussed previously. However, without the intersection upgrades, the Horsley Drive / Ferrers Road intersection performs at LoS F, exceeding capacity as a result of forecast background growth. With the exception of this intersection, the average delay and LoS does not significantly change when compared to the existing SIDRA results.

5 Project Case

5.1 Traffic Generation

5.1.1 Daily Vehicle Trips

The RMS Guide recommends daily vehicle trip rates of 4 per 100m^2 GFA for warehouse floorspace, and 10 trips per 100m^2 GFA for office floorspace.

Application of these trip rates to the Masterplan results in a daily trip generation of 7,078 vehicle trips per day.

5.1.2 Peak Hour Trips – Standard Use Assessment

The peak hour trip generation of the LIBH has been estimated with reference to the RMS Guide Update, which reports surveys of a number of large industrial developments; specifically, Ason Group has referenced the trip rates surveyed by the RMS at the following sites, which provide similarly land use profiles to the LIBH:

- Site 1: Erskine Park Industrial Estate, Erskine Park;
- Site 3: Wonderland Business Park, Eastern Creek; and
- Site 4: Riverwood Business Park, Riverwood.

With reference to the RMS Guide Update, the average AM and PM peak hour trip rates for these three sites are as follows:

- AM Rate 0.247 trip per 100m^2 of GFA.
- PM Rate 0.182 trip per 100m^2 of GFA.

With reference to the RMS Guide Update trip rates, and to provide a robust assessment, this assessment adopts trip rates that are conservatively higher than the average of the three sites mentioned above, as shown below, being:

- AM Rate: 0.25 trip per 100m^2 of GFA
- PM Rate: 0.20 trip per 100m^2 of GFA

Accordingly, the estimated maximum generation of the LIBH is summarised in **Table 7**.

Table 7: Summary of LIBH Traffic Generation

Land-use	GFA (m^2)	AM Trip Rate (per 100m^2 of GFA)	PM Trip Rate (per 100m^2 of GFA)	AM Trips (veh/hr)	PM Trips (veh/hr)
Warehouse Development	165,500	0.25	0.20	420 *	340 *

* Rounded up

With reference to Table 7, the LIBH is therefore estimated to generate up to 420 vehicle trips and 340 vehicle trips in the AM and PM peak hours respectively., noting that these totals represent two-way traffic flows.

5.1.3 Percentage of Heavy Vehicles

Further reference to the RMS Guide Update indicates that heavy vehicles constitute a significant percentage of the total trip generation of similar industrial sites; referring again to the surveys of the Eastern Creek and Erskine Park industrial sites provided in the RMS Guide Update, heavy vehicles (for example: B-Triples) made up 28% and 26% of the total peak hour vehicle flows respectively.

A heavy vehicle percentage of 28% has been adopted for the assessment.

5.2 Trip Distribution

5.2.1 Arrival and Departure Distribution

The arrival and departure distribution profile adopted for the assessment is based on past surveys and assessments of industrial sites across Western Sydney, being: -

- AM Peak Hour – 80% arrival and 20% departure
- PM Peak Hour – 20% arrival and 80% departure

Accordingly, the total number of inbound and outbound trips are as follows:

- AM Peak Hour – 336 in and 84 out
- PM Peak Hour – 68 in and 272 out

5.2.2 Directional Distribution – Journey to Work Data

The assignment of trips to the road network referenced the JTW data, and indicates the following direction distribution of trips:

- 54% of trips to/from the north-west (e.g. Mount Druitt, St Marys, Penrith);
- 20% of trips to/from the north (e.g. Blacktown);
- 20% of trips to/from the south (e.g. Campbelltown, Fairfield); and
- 6% of trips to/from east (e.g. Parramatta).

5.2.3 Route Choice Assumptions

A review of the most efficient travel routes between the LIBH and key metropolitan and regional centres was carried out to determine the assignment of trips to the available routes. In this regard, a total of eight (8) travel zones were identified (to which trips are generated to / from), as shown in **Figure 16.**

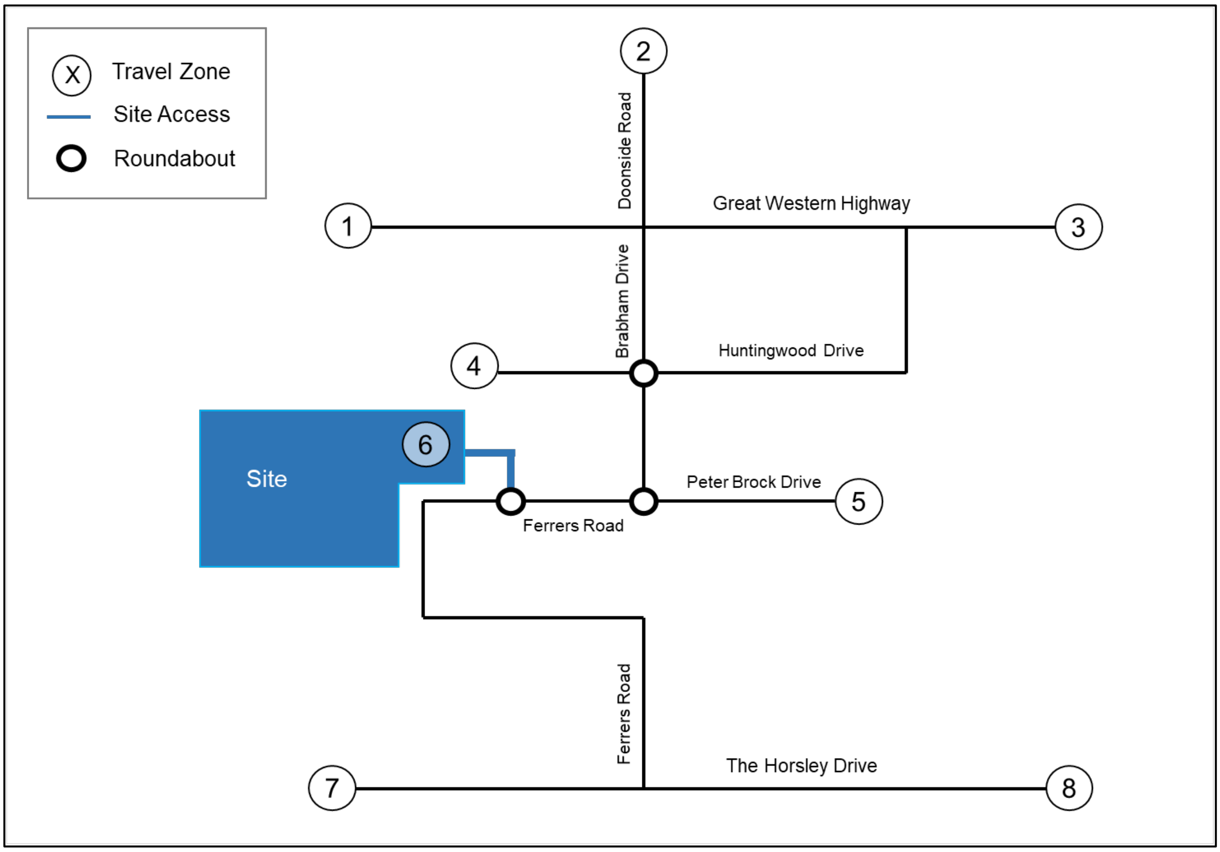


Figure 16: Travel Zones adopted for Trip Distribution

With reference to Figure 16, the following trip assignment assumptions were adopted based on JTW data (section 5.2.2) and Google travelling routes:

- All vehicles travelling to / from the north-west (54%) were assigned to the western side of GWH (Zone 1 in Figure 16).
- For all vehicle trips travelling to / from the north (20%), a 50-50 split has been estimated between Doonside Road (Zone 2) and eastern side of GWH (Zone 3).
- Vehicles travelling to / from the south were further divided into two groups such as south-east (e.g. Fairfield) and south-west (e.g. Campbelltown) and assigned to different sides of The Horsley Drive. All vehicles to / from south-east (13%) were assigned to zone 8, whereas those travelling to / from south-west (7%) were assigned to zone 7.
- All vehicles traveling to and from the east (6%) have been assigned on Ferrers Road via Peter Brock Drive (Zone 5).

5.3 Project Case Traffic Volumes

The LIBH traffic flows were added to the 2036 background traffic to form the “Project Case” traffic volumes, as presented in **Appendix B**.

5.4 SIDRA Layout of LIBH Access

The proposed roundabout at Ferrers Road and LIBH Access has been modelled as a single lane roundabout with two lanes (1 per direction) on each approach. It was estimated that the proposed roundabout will be located approximately 250 metres west of the Brabham Drive / Ferrers Road / Peter Brock Drive roundabout. The SIDRA layout of the proposed Ferrers Road / LIBH Access roundabout is shown in **Figure 17**.

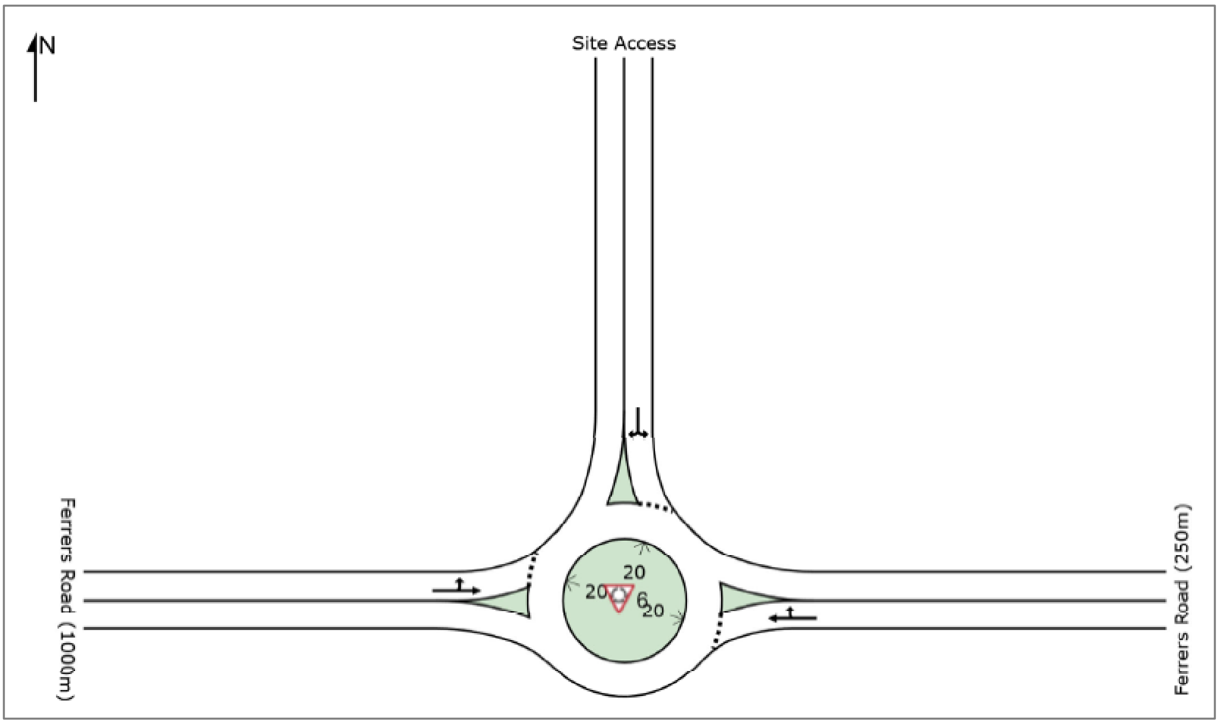


Figure 17: LIBH Access at Ferrers Road – SIDRA Layout

5.5 Intersection Performance – 2036 Project Case

The operation of all key intersections has been assessed for "Project Case", which includes:

- project Case traffic volumes (2036 Background plus LIBH traffic, section 5.3);
- two options for the intersection of The Horsley Drive / Ferrers Road which includes with and without proposed upgrades (refer section 4.2);
- proposed layout for LIBH Access (section 5.4); and
- existing road geometry at the remaining intersections.

Table 8: SIDRA Results – Project Case

Intersection	Control Type	Period	Intersection Delay	Level of Service
Great Western Highway / Doonside Road / Brabham Drive (Existing layout)	Signals	AM	56	D
		PM	53	D
Great Western Highway / Huntingwood Drive	Signals	AM	12	A
		PM	27	B
Brabham Drive / Huntingwood Drive	Roundabout	AM	18	B
		PM	19	B
Ferrers Road / Brabham Drive / Peter Brock Drive	Roundabout	AM	19	B
		PM	28	B
The Horsley Drive / Ferrers Road (Existing Geometry)	Signals	AM	202	F
		PM	246	F
The Horsley Drive / Ferrers Rd (Planned Upgrades)	Signals	AM	20	B
		PM	26	B
Ferrers Road / LIBH Access	Roundabout	AM	51	D
		PM	30	C

As demonstrated, generally the results indicate similar performance to the 2036 Baseline Results in Table 6, with generally minor increases to intersection delay throughout. This is attributed to the relatively minor impact of development traffic volumes distributed to the network. Similarly, The Horsley

Drive / Ferrers Road intersection with existing geometry continues to perform at LoS F, prior to planned upgrades at that location; a result of forecast background traffic growth.

Table 9 below compares the total modelled demand flows of the 2036 Base and Project scenarios for the intersection.

Table 9: The Horsley Park / Ferrers Road Future Traffic Volumes

Peak	2036 Base	2036 Project Case	% Difference
AM	4,361 (4,591)	4,443 (4,677)	*+ 1.9%*
PM	5,006 (5,269)	5,070 (5,337)	*+ 1.3%*

Note: Numbers above are modelling input volumes. Numbers in brackets denote modelled demand total flows as veh/hr.

The above table demonstrates that increased traffic volumes of the 2036 Project Case resultant from the development traffic are relatively insignificant, denoting an increase of only 1.9% and 1.3% in the respective AM and PM Peaks. This confirms that the future intersection performance remains largely attributed to background growth.

5.6 Interim Network Performance

With the exception of The Horsley Drive / Ferrers Road intersection, all intersections are deemed to operate satisfactorily under future 2036 conditions and do not rely upon upgrades. As such, assessment of 'interim' conditions is not considered necessary.

The Horsley Drive / Ferrers Road will also operate satisfactorily following completion of earmarked upgrades. However, with no funding or timing commitment to those upgrades, further consideration has been given to the interim performance of that intersection.

Sensitivity modelling has been undertaken to explore the impact of the addition of development traffic to the existing (surveyed) base volumes. A summary of these results is provided below.

Table 10: The Horsley Drive / Ferrers Road Results

Intersection	Period	2019 Existing Base		2019 Project Case	
		Intersection Delay	Level of Service	Intersection Delay	Level of Service
The Horsley Drive / Ferrers Road (Existing Geometry)	AM	38	C	53	D
	PM	20	B	20	B

It is evident that the intersection will still operate satisfactorily, with LoS D during the AM Peak and the retention of the LoS B during the PM Peak.

Regardless, the proposed upgrades to The Horsley Drive / Ferrers Road intersection would readily accommodate both the future base and project case traffic volumes, as indicated in the SIDRA results above.

6 Parking Requirements

6.1 Proposed Car Parking Rates

SEPP (Western Sydney Parklands) 2009 states the following:

Clause 6A – Development control plans – A development control plan does not apply to the Western Sydney Parklands unless it is made by the Director-General.

As such, the provisions of the Blacktown City Council DCP do not strictly apply to the proposed development.

Notwithstanding, the SEPP does not provide alternative parking requirements and, as such, reference is made to Council's controls and the widely accepted RMS *Guide to Traffic Generating Developments*, the latter being adopted as relevant parking rates for numerous State Significant Development (SSD) concept plan approvals in the locality (Oakdale for example).

6.1.1 Council DCP Parking Requirement

Part A6 of the BCC DCP requires that car parking for general industries, warehouses and distribution centres across the LGA be provided at the rate of 1 space per 75m^2 GFA plus 1 space per 40m^2 for the office component of such development.

The application of these rates to the proposed development result in a significant theoretical car parking requirement of 2,292 spaces. In the opinion of Ason Group, this is a level of parking that is significantly in excess of the parking actually required for the LIBH, as detailed in sections below.

Furthermore, it is emphasised that the BCC DCP does not strictly apply and these figures are provided for information only.

6.1.2 RMS Guide Parking Requirement

Section 5.11.2 of the RMS Guide requires parking for warehouse developments be provided at the rate of 1 space per 300m^2 of GFA.

The car parking rate of 1 space per 300m^2 adopted in the RMS Guide was established through surveys of 10 facilities. The surveys undertaken by the RMS demonstrated car parking requirements that ranged between one space per 80m^2 and one space per 960m^2 with a mean and standard deviation of one space per 338m^2 and one space per 280m^2 respectively. The adopted rate of 1 space per 300m^2 therefore reflected a "middle range" parking rate. Furthermore, the adopted parking rate was also based on employee densities of approximately 45 employees per hectare – almost double the densities established by the DPIE for the WSEA.

6.1.3 Standard Use Demands Derived from Other Similar Developments

For the purpose of this assessment, Ason Group has undertaken surveys of eight comparable industrial developments to establish the effective parking rate of operational developments within the WSEA, surveys which have adopted the same methodology as that used in establishing the RMS Guide rates. The surveys included industrial developments (generally warehouse) in numerous locations including:

- Erskine Park,
- Oakdale Central; and
- M7 Business Hub.

The results of these surveys are summarised in **Table 11**.

Table 11: Effective Parking Rates for Surveyed Developments

Site Address	Car Parking Provided	Total GFA (m^2)	Maximum Parking Demand	Effective Parking Rate (1 space per Xm^2)
Bunning's – 8 Interchange Dr	140	55,550	68	817
Toll – Lot 11 Wonderland Dr	137	27,440	47	584
Ingram Micro – 23 Wonderland Dr	300	36,610	183	200
DHL – Milner Avenue	115	20,170	109	185
Kimberly Clarke – 35 Sarah Andrews Cl	100	45,210	78	580
Linfox – 25 Sarah Andrews Cl	217	51,200	116	441
Ubeeco – 28 Sarah Andrews Cl	150	10,865	71	153
Woolworths – 29 Sarah Andrews Cl	280	52,705	197	268
Total Average Rate				**403**

The surveys demonstrated a range of between 1 space per 153m^2 and 1 space per 817m^2 with a mean and standard deviation of 1 space per 403m^2 and 1 space per 241m^2 respectively. Accordingly, based on the methodology adopted in the RMS Guide, the "middle range" car parking rate based on the surveys would be in the order of 1 space per 350m^2.

These rates are consistent with those established by the RMS Guide and indeed suggest that a reduction in overall car parking is justified in comparison to the parking rates provided in the BCC DCP. Furthermore, as mentioned above, these rates are consistent with other approved developments within the broader area. For example, the industrial precincts of Oakdale South and Oakdale West to the west of the Site which provide similar development to this SSDA.

6.2 Proposed Parking Provision

Having regard for the above, it is recommended that the car parking rates as approved in the Oakdale South be adopted as minimum requirement. The proposed car parking rates are outlined **Table 12**.

Table 12: Proposed Warehouse Car Parking Rates

Land Use	Minimum Car Parking Rate
Warehouse / Distribution	1 space per 300m^2
Office	1 space per 40m^2

The adoption of a minimum rate of 1 space per 300m^2 GFA for warehouse floorspace and 1 space per 40m^2 for office floorspace is considered appropriate and sustainable and is consistent with both the RMS Guidelines and State planning policies. The proposed minimum rates will also enable the required flexibility in the design of future developments whilst still ensuring that parking is provided to accommodate both the current and future parking requirements of tenants. For all other non-warehouse uses, it is proposed that parking be provided in accordance with the BCC DCP.

The specific car parking requirements for each lot/building within the Site would be considered in more detail at the relevant DA stages. However, based on the current master plan, these rates can be readily satisfied.

It is noted that the *Disability (Access to Premises – Buildings) Standards 2010* require accessible car parking spaces be provided at the following rate for Class 5, 7, 8 and 9c buildings:

- 1 accessible space for every 100 car parking spaces, or part thereof

It is assumed that any subsequent applications will demonstrate a satisfactory provision of accessible car parking is provided.

Finally, it is expected that a Condition of Consent in regard to future applications would require that all car parking and service vehicle areas be designed in accordance with the relevant Australian Standards including, AS2890.1 AS 2890.2 and AS2890.6.

7 Preliminary Construction Traffic Management Plan

A detailed Construction Traffic Management Plan (CTMP) will be provided as part of detailed construction phase planning, once a builder is appointed. For the purposes of this TIA, the following general principles for managing construction traffic have been assumed and provide an understanding of the likely traffic impacts during the construction period. It should be noted that the construction programme for the development has not yet been finalised.

7.1 Haulage Routes

The primary potential haulage route to and from the Site would be via Wallgrove Road, with trucks accessing the Site from the M7 Motorway from the north and via Great Western Highway or Western Motorway. M7 is also anticipated to be the primary arterial route to provide access for construction vehicles via Horsley Drive interchange to/from the south of the Site. Given that these routes currently carry high volumes of heavy vehicles, construction of the development would not have a significant impact on the performance of these roads. The movement of materials shall be managed through the scheduling of deliveries and would aim to minimise, as far as practicable, the number of heavy vehicles accessing the Site during peak network periods and weekends. Furthermore, it is important to note that the Wallgrove Road currently provides a left turn deceleration lane into the existing access point connecting the M7 underpass running towards the Site which provides further safety for the construction vehicle accessibility. In this regard reference should be made to **Figure 18**.

Figure 18: Wallgrove Road Deceleration Lane - Looking South

Once the Ferrers Road access road is complete, it is expected that construction traffic will then also benefit from that access point.

Construction periods generating more than 20 heavy vehicle movements per day shall include:

- Vehicle Movement Plan (VMP) showing access routes
- Suitable Traffic Control Plan (TCPs), prepared by a person with Traffic Control at Worksites to safely manage access to the site.

7.2 Proposed Working Hours

Construction works will vary depending on the phase of construction and associated activities and includes both construction and design personnel. The size of the on-site workforce has not been finalised and as a result, the peak working population on-site at any given time during the construction period may vary. Construction works would be undertaken during standard construction-working hours, which are likely to be as follows:

- Monday to Friday: 7.00AM to 6.00PM
- Saturday: 7.00AM to 1.00PM
- Sunday and Public holidays: No planned work.

It may (on occasions) be necessary to undertake night works to minimise disruption to traffic.

7.3 Construction Traffic Generation

Light vehicle traffic generation would be generally associated with staff movements to and from the Site. Staff would be comprised of project managers, various trades and general construction staff. Over the full construction period, the peak workforce represents the worst-case scenario for vehicle movements during the morning or evening road network peak hour. The workforce arrival and departure periods (6.30-7.00AM and 5.00-5.30PM) represent the peak construction traffic generation periods.

Light vehicle construction trips are expected to arrive in the morning and depart in the evening and the number of trips would be based on the workforce numbers. Parking for all construction related-vehicles shall be provided wholly on-site.

Heavy vehicle traffic would mainly be generated by activities associated with the delivery of construction equipment and delivery of material for construction works. As the construction programme has yet to be finalised, a worst-case scenario for heavy vehicle movements per day required for the delivery of construction materials to the Site cannot be accurately determined. However, these deliveries are likely to occur outside of the peak network traffic periods and would have limited (if any) impact to traffic on the surrounding major road network.

Importantly, the construction traffic volumes are expected to be lower than the volumes anticipated for the Proposal once it becomes operational. Therefore, recognising that the key intersections are anticipated to perform satisfactorily once the Proposal is completed, it can be assumed that the intersection would satisfactorily accommodate the lower volumes of construction traffic.

Furthermore, it is expected that suitable TCPs shall be prepared to safely manage site access for any periods generating more than 20 heavy vehicle movements per day, in accordance with the Traffic Control at Worksites Manual.

7.4 Construction Mitigation Measures

While the traffic impacts of construction of the development are likely to be negligible, the following measures shall be undertaken to minimise the impacts of the construction activities of the development:

- Traffic control would be required at the site access (including the existing Wallgrove Road access point and the M7 underpass) to manage and regulate traffic movements into and out of the site during construction.
- Disruption to road users would be kept to a minimum by scheduling intensive delivery activities outside of peak network hours.
- Construction and delivery vehicles shall be restricted from using residential roads in the locality. Given the nature of the locality, this is not expected to cause undue impact on construction vehicle access.

7.5 Relevant Documents

As discussed before, a construction management plan has been prepared by Western Sydney Parkland Trust in March 2019 which provides preliminary information regarding the infrastructure and earthworks of the Proposal. Reference can also be made to this document as necessary.

8 Conclusions

- Western Sydney Parklands Trust has engaged Ason Group to prepare a Traffic Impact Assessment (TIA) to examine the access, traffic and parking characteristics of a SSDA providing for the development of the Light Horse Interchange Business Hub (LIBH) at 165 Wallgrove Road and 475 Ferrers Road, Eastern Creek.
- This revised report (RtS TIA) has been updated in response to the matters raised as part of the initial submission of the SSDA. Of note, this revised TIA includes:
  - updated assessment of the Great Western Highway / Doonside Road / Brabham Drive having regard for more recent traffic surveys in 2019.
  - further detail in relation to construction impacts and traffic management measures.
  - updated assessment of The Horsley Drive / Ferrers Road intersection having regard for recent advice provided by RMS in December 2019.
- The SSDA provides for -
  - A Masterplan development providing a regional warehousing and distribution hub with 24 hours/day, 7 days/week operation.
  - A total yield of 165,500m^2 GFA, including 157,600m^2 of warehouse floorspace and 7,900m^2 of ancillary office floorspace;
  - Site access connections to Ferrers Road (LIBH Access) forming a single-lane roundabout. The existing Wallgrove Road access is to be maintained for emergency vehicle access only;
  - In conjunction with broader upgrades to the local road network, localised upgrades along the key access routes to/from the Site;
  - A sustainable level of on-site parking provision; and
  - Shared pedestrian and cyclist access from Wallgrove Road and Ferrers Road (3.5m and 2.5m wide concrete footpath, respectively), as well as internal pedestrian path along eastern side of LIBH access road (1.2m wide concrete footpath).
- Traffic surveys were undertaken at the key intersections providing access between the Site and the sub-regional road network, including:
  - Great Western Highway / Huntingwood Road (November 2017 and October 2019);
  - Great Western Highway / Brabham Drive / Doonside Road (November 2017);
  - Brabham Drive / Huntingwood Drive (November 2017);
  - Brabham Drive / Ferrers Road / Peter Brock Drive (November 2017); and
  - Ferrers Road / The Horsley Drive (November 2017).

- Background traffic growth at the key intersection through to a future forecast year of 2036 was determined with reference to the RMS 2036 STFM outputs.
- The traffic generation of the LIBH was determined with reference to the RMS Guide and RMS Guide Update, as well as relevant survey data of other similar developments. Trip distribution was determined with reference to Journey-to-Work data.
- SIDRA intersection analysis was undertaken to measure the performance of the key intersections during the AM and PM peak hours for the following scenarios:
  - Existing Conditions,
  - 2036 Base Case (background traffic with and without planned upgrades at the intersection of The Horsley Drive / Ferrers Road), and
  - Project Case (2036 background plus development traffic, with planned upgrades).
- The SIDRA modelling outcomes can be summarised as:
  - LIBH Access: The proposed one-lane roundabout at Ferrers Road is expected to operate at acceptable Level of Service (or LoS) during both peak periods.
  - All key local intersections will operate at a LoS D or better during both peak hours through 2036 even with the introduction of the LIBH traffic flows and considering planned upgrades at the intersection of The Horsley Drive / Ferrers Road.
  - As such, no additional modification of these intersections beyond the anticipated upgrades are required.
  - Planned upgrades to The Horsley Drive / Ferrers Road are required as a result of forecast background traffic growth and not directly as a result of this development. In the short-term, prior to realisation of that forecast background growth, there is sufficient spare capacity to accommodate development traffic without upgrades; Existing Project Case (2019 surveys + development) modelling resulting in a LoS D and B during AM and PM peak periods, respectively.
- It is proposed that minimum car parking rates – based on the RMS Guide and detailed parking surveys undertaken by Ason Group – be adopted for the LIBH. The application of these rates – being 1 space per 300m^2 GFA for warehouse floorspace and 1 space per 40m^2 GFA for office floorspace.
- It is expected that any future development applications will demonstrate a satisfactory provision of car parking (including accessible car parking) and that Conditions of Consent relating to future development applications shall require that all car parking and service vehicle areas be designed in accordance with the relevant Australian Standards.

- Construction traffic volumes will be less than the future operational traffic and, therefore, will not have an unacceptable impact on the surrounding road network. A detailed and comprehensive Construction Traffic Management Plan (CTMP) is expected to be prepared prior to construction that identifies further pedestrian and traffic management measures, as necessary, in response to the further development of the construction methodology.

It is therefore concluded that the Light Horse Interchange Business Hub is supportable on traffic planning grounds.

Appendix A

Secretary's Environmental Assessment Requirements

Planning Secretary's Environmental Assessment Requirements

Section 4.12(8) of the *Environmental Planning and Assessment Act 1979*
Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*

Application Number	SSD 9667
Project Name	Light Horse Interchange Business Hub, Eastern Creek
Development	• concept proposal for the staged redevelopment of the site as an industrial business hub with approximately 157,000 sqm of industrial and light industrial floorspace and 8,000 sqm ancillary office floorspace • detailed proposal for the first stage of development which will include demolition works, bulk earthworks, installation of infrastructure and subdivision of the site
Location	Lot 10 in DP 1061237 and Lot 5 in DP 804051, Eastern Creek within Blacktown Local Government Area
Applicant	Western Sydney Parklands Trust
Date of Issue	7 November 2018
General Requirements	The environmental impact statement (EIS) must be prepared in accordance with, and meet the minimum requirements of, clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation). In addition, the EIS must include: • a detailed description of the development, including: – the need for the proposed development – justification for the proposed development – likely staging of the development – likely interactions between the development and existing, approved and proposed operations in the vicinity of the site – plans of any proposed building works • consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments • a risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment • a detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes: – a description of the existing environment, using sufficient baseline data – an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes – a description of the measures that would be implemented to avoid, minimise, mitigate and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/ or contingency plans to manage significant risks to the environment • a consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS. The EIS must also be accompanied by a report from a qualified quantity surveyor providing:

	• a detailed calculation of the capital investment value (CIV) (as defined in clause 3 of the Regulation) of the proposal, including details of all assumptions and components from which the CIV calculation is derived. The report shall be prepared on company letterhead and indicate applicable GST component of the CIV • an estimate of jobs that will be created during the proposed development • certification that the information provided is accurate at the date of preparation.
Key issues	The EIS must address the following specific matters: • **Statutory and Strategic Context** – including: – detailed justification that the proposed land use is permissible, taking into consideration the State Environmental Planning Policy (Western Sydney Parklands) 2009 – details of any proposed consolidation or subdivision of land and – demonstration that the proposal is consistent with all relevant planning strategies, environmental planning instruments, adopted precinct plans, draft district plan(s) and adopted management plans and justification for any inconsistencies. The following must be addressed: o State Environmental Planning Policy (Western Sydney Parklands) 2009 o Greater Sydney Region Plan: A Metropolis of Three Cities o Our Greater Sydney 2056: South District Plan o Future Transport Strategy 2056. • **Planning Agreement/Development Contributions** – demonstration that satisfactory arrangements have been or would be made to provide, or contribute to the provision of, necessary local and regional infrastructure required to support the development. • **Suitability of the Site** – including an analysis of site constraints, such as flooding impacts and future road and road corridors. • **Community and Stakeholder Engagement** – including: – a detailed community and stakeholder participation strategy which identifies who in the community has been consulted and a justification for their selection, other stakeholders consulted and the form(s) of consultation, including a justification for this approach – a report on the results of the implementation of the strategy including issues raised by the community and surrounding land owners and occupiers that may be impacted by the proposal – details of how issues raised during community and stakeholder consultation have been addressed and whether they have resulted in changes to the proposal – details of the proposed approach to future community and stakeholder engagement based on the results of consultation. • **Traffic and Transport** – including: – a quantitative Traffic Impact Assessment prepared in accordance with relevant Blacktown City Council, Austroads and Roads and Maritime Services guidelines – details of all daily and peak traffic and transport movements likely to be generated by the development including the impact on the nearby intersections and the need/associated funding for the upgrading or road improvements works (if required) – impacts on the safety and capacity of the surrounding road network and access points, using SIDRA or similar modelling, to assess impacts from current traffic counts and cumulative traffic from existing and proposed development

	– demonstrate that sufficient pedestrian and cyclist facilities have been provided for the development – details and a justification of access to, from and within the site (vehicular and pedestrian) – details of road upgrades, new roads or access points required for the development, if necessary. • **Contamination** – including**:** - a detailed assessment of the extent and nature of any contamination of the soil, groundwater and soil vapour - an assessment of potential risks to human health and the environmental receptors in the vicinity of the site - a description and appraisal of any mitigation and monitoring measures - consideration of whether the site is suitable for the proposed development. • **Flooding** – a detailed hydrological and hydraulic assessment which includes the following: – a comprehensive assessment of the impact of flooding on the development for the full range of flood events up to the probable maximum flood. This assessment should address any relevant provisions of the NSW Floodplain Development Manual (2005) including the potential effects of climate change, sea level rise and an increase in rainfall intensity – consideration of current flooding behaviour and impacts, including on flood detention areas, how flood behaviour and impacts will change due to the proposal and how these changes will be mitigated – assessment of the impact of the development on flood behaviour (i.e., levels, velocities and duration of flooding) and on adjacent, downstream and upstream areas – detail an emergency response plan for the site, which includes consideration of a flood-free access to or from the development site in extreme flood events. • **Hazards and Risk** – including: – a preliminary risk screening completed in accordance with State Environmental Planning Policy No. 33 - Hazardous and Offensive Development and Applying SEPP 33 (DoP, 2011), with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development. Should the preliminary risk screening indicate that the development is "potentially hazardous", a Preliminary Hazard Analysis (PHA) must be prepared in accordance with Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011) – ongoing consultation with Jemena on the high-pressure gas pipeline adjacent to the development area with regards to requirements of Australian Standard AS 2885 Pipelines - Gas and liquid petroleum – a hazard analysis undertaken in accordance with the Department of Planning's Hazardous Industry Planning Advisory Paper No. 6, 'Hazard Analysis' and Multi-Level Risk Assessment (DoP, 2011). It must include, and not be limited to, an assessment on risk exposures to potential populations within the development from the high-pressure gas pipeline located within or near the development area. The risks established in the hazard analysis must be compared against the relevant qualitative and quantitative risk criteria detailed in the Department of Planning's Hazardous Industry Planning Advisory Paper No. 10, 'Land Use Safety Planning'. If a Safety Management Study (SMS) required under AS

	2885 Pipelines - Gas and liquid petroleum is available, the SMS must be included in the hazard analysis. • **Soils and Water** – including: – a description of the water demands and a breakdown of water supplies, including a detailed site water balance – identification of any water licensing requirements under the *Water Act 1912* or *Water Management Act 2000* – details of proposed erosion and sediment controls during construction – an assessment of potential impacts on surface and groundwater resources, drainage patterns, soil (stability, salinity and acid sulfate soils), related infrastructure, watercourses and riparian land and proposed mitigation, management and monitoring measures. • **Biodiversity** – including an assessment of the proposal's biodiversity impacts in accordance with the *Biodiversity Conservation Act 2016*, including the preparation of a Biodiversity Development Assessment Report (BDAR) where required under the Act, except where a waiver for preparation of a BDAR has been granted. • **Infrastructure Requirements** – including: – a detailed written and/or geographical description of infrastructure required on the site – identification of any infrastructure upgrades required off-site to facilitate the development, and describe any arrangements to ensure that the upgrades will be implemented in a timely manner and maintained – an infrastructure delivery and staging plan, including a description of how infrastructure on and off-site will be co-ordinated and funded to ensure it is in place prior to the commencement of construction – an assessment of the impacts of the development on existing infrastructure surrounding the site. • **Urban Design and Visual** – including: – consideration of the layout and design of the development having regard to the surrounding vehicular, pedestrian and cycling networks – detailed plans showing suitable landscaping which incorporates endemic species. • **Heritage** – including an Aboriginal Cultural Heritage Assessment Report prepared in consultation with Aboriginal people and in accordance with Office of Environment and Heritage guidelines. • **Noise and Vibration**– including: – a quantitative noise and vibration impact assessment undertaken by a suitably qualified person in accordance with the relevant Environment Protection Authority guidelines and including an assessment of nearby sensitive receivers – cumulative impacts of other developments – details of proposed mitigation, management and monitoring measures. • **Bushfire** – including an assessment against the requirements of *Planning for Bushfire Protection 2006*, particularly access and provision of water supply for firefighting purposes. • **Waste** – including: – details of the quantities and classification of all waste streams to be generated on site during the development – details of waste storage, handling and disposal during the development and – details of the measures that would be implemented to ensure that the development is consistent with the aims, objectives and

	guidance in the NSW Waste Avoidance and Resource Recovery Strategy 2014-2021. • **Air Quality** – including: – an assessment of the air quality impacts (including dust) during the development, in accordance with the relevant Environment Protection Authority guidelines – details of proposed mitigation, management and monitoring measures.
Plans and Documents	The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Regulation. You should provide these as part of the EIS rather than as separate documents.
Consultation	During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with: • Blacktown City Council • Jemena Gas Networks • Roads and Maritime Services • Transport for NSW • Department of Industry – Crown Lands and Water • Office of Environment and Heritage • Environment Protection Authority • Fire and Rescue NSW • Rural Fire Service • Sydney Water • WaterNSW • surrounding local residents and stakeholders • any other public transport, utilities or community service providers. The EIS must describe the consultation process and the issues raised and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.
Further consultation after 2 years	If you do not lodge a Development Application and EIS for the development within 2 years of the issue date of these SEARs, you must consult further with the Secretary in relation to the preparation of the EIS.
References	The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, the following attachment contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this proposal.

Appendix B

Traffic Diagrams

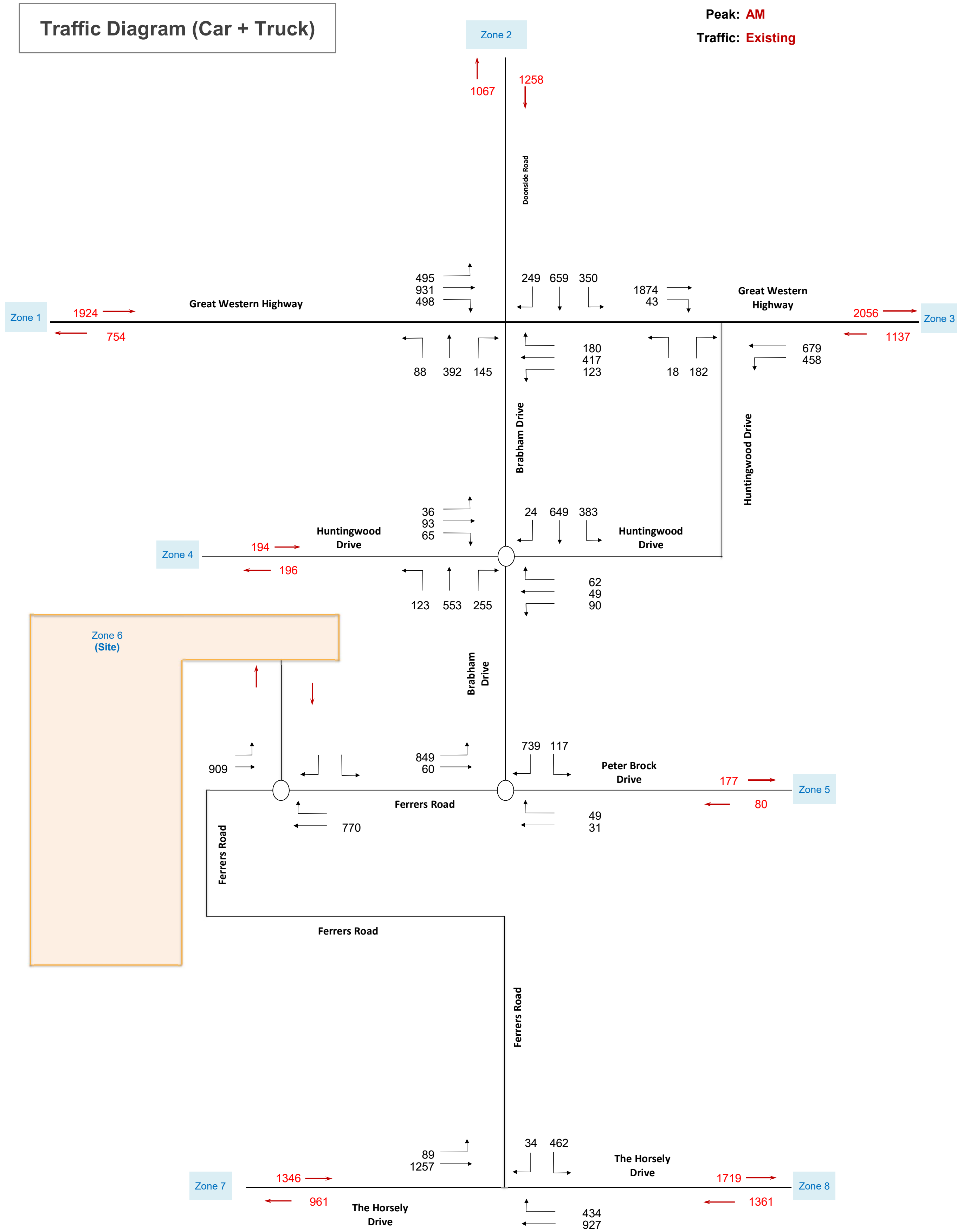
B1:

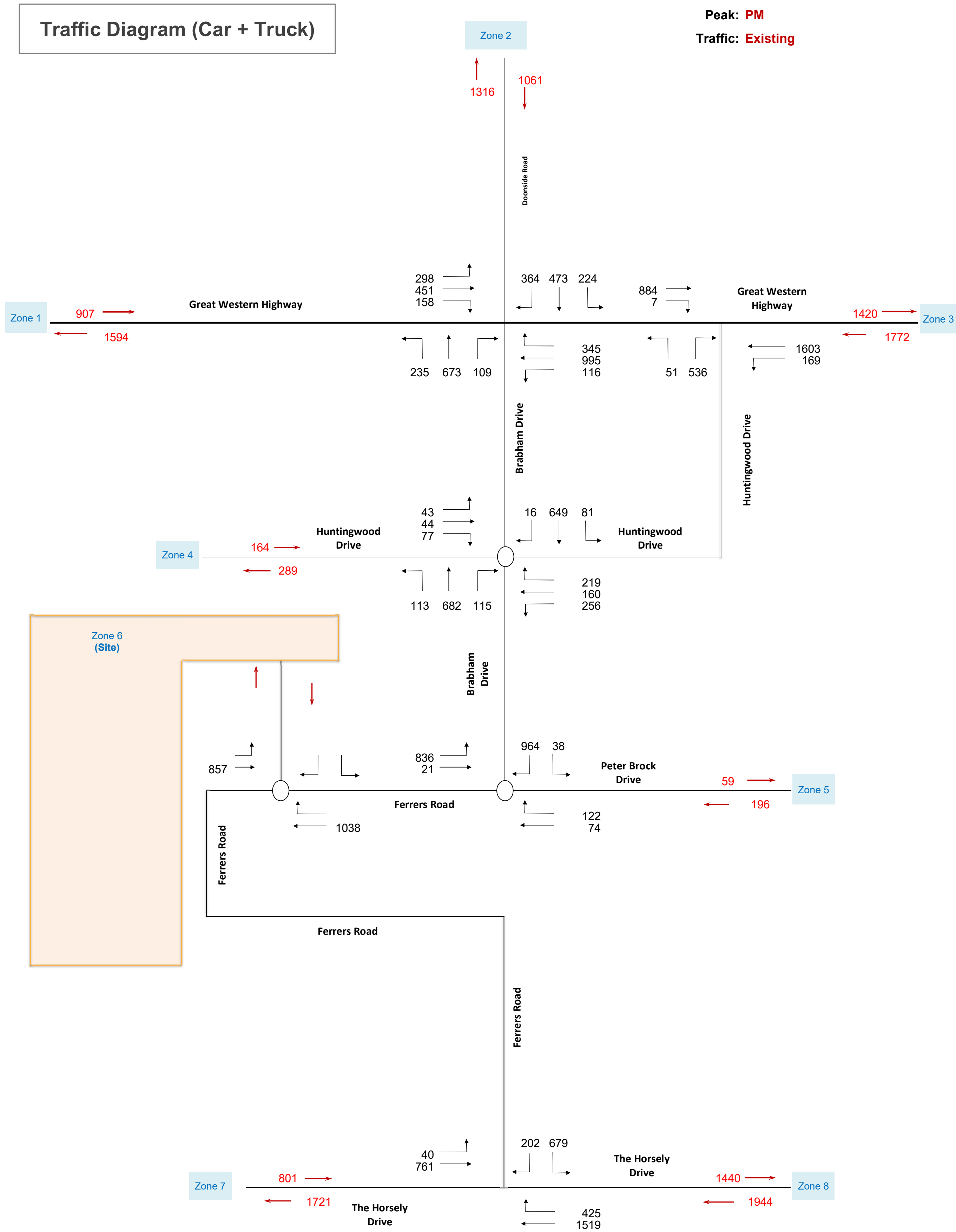
Existing Traffic (Surveyed)

Traffic Diagram (Car + Truck)

Peak: AM

Traffic: Existing





Traffic Diagram (Car + Truck)
Peak: PM
Traffic: Existing
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6
(Site)
Zone 7
Zone 8
Great Western Highway
Great Western Highway
Doonside Road
Brabham Drive
Brabham Drive
Huntingwood Drive
Huntingwood Drive
Huntingwood Drive
Peter Brock Drive
Ferrers Road
Ferrers Road
Ferrers Road
Ferrers Road
The Horsely Drive
The Horsely Drive
1316
1061
907
1594
1420
1772
164
289
59
196
801
1721
1440
1944
298
451
158
364 473 224
884
7
235 673 109
345
995
116
51 536
1603
169
43
44
77
16 649 81
113 682 115
219
160
256
857
836
21
964 38
1038
122
74
40
761
202 679
425
1519

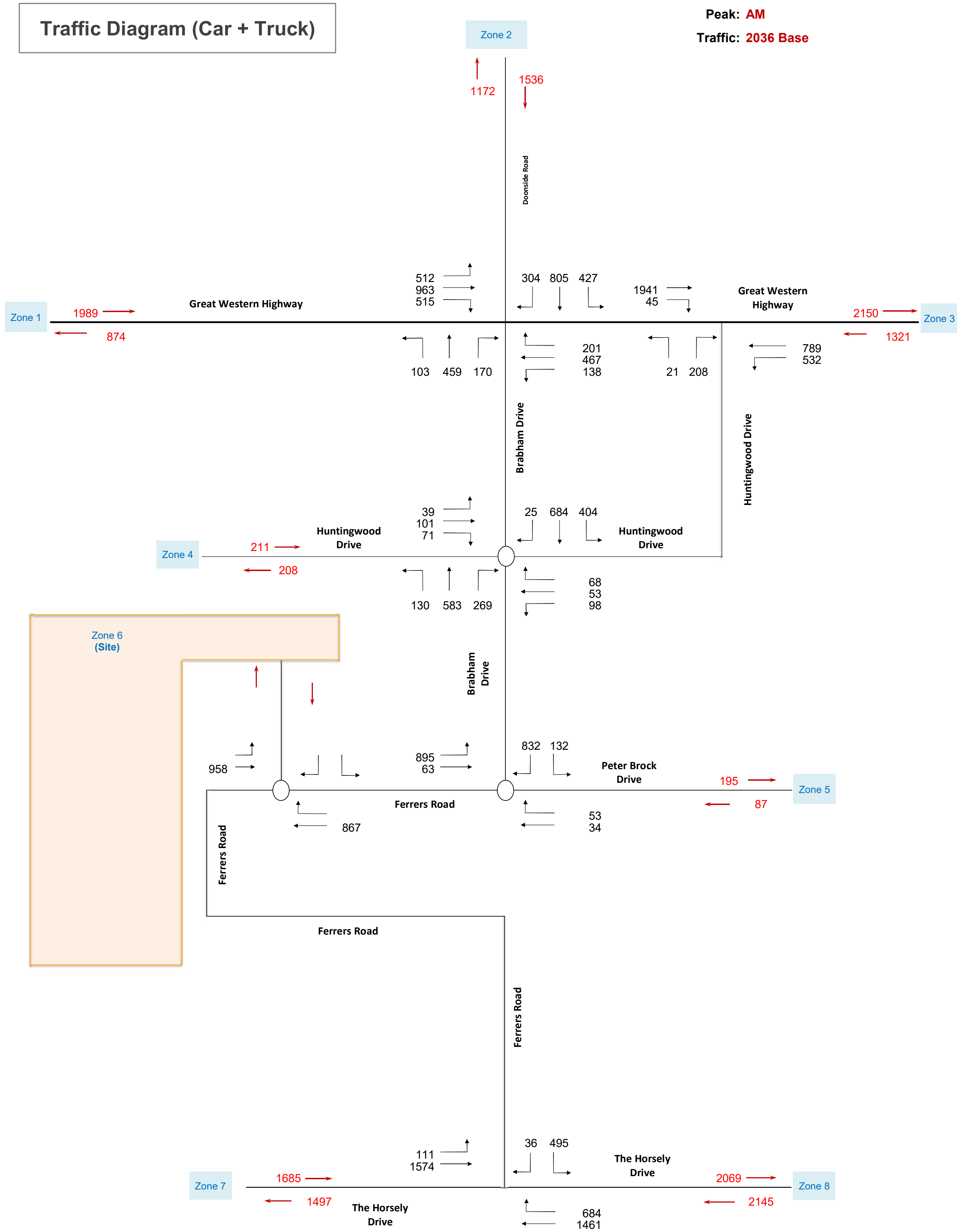
B2:

2036 Background Traffic

Traffic Diagram (Car + Truck)

Peak: AM

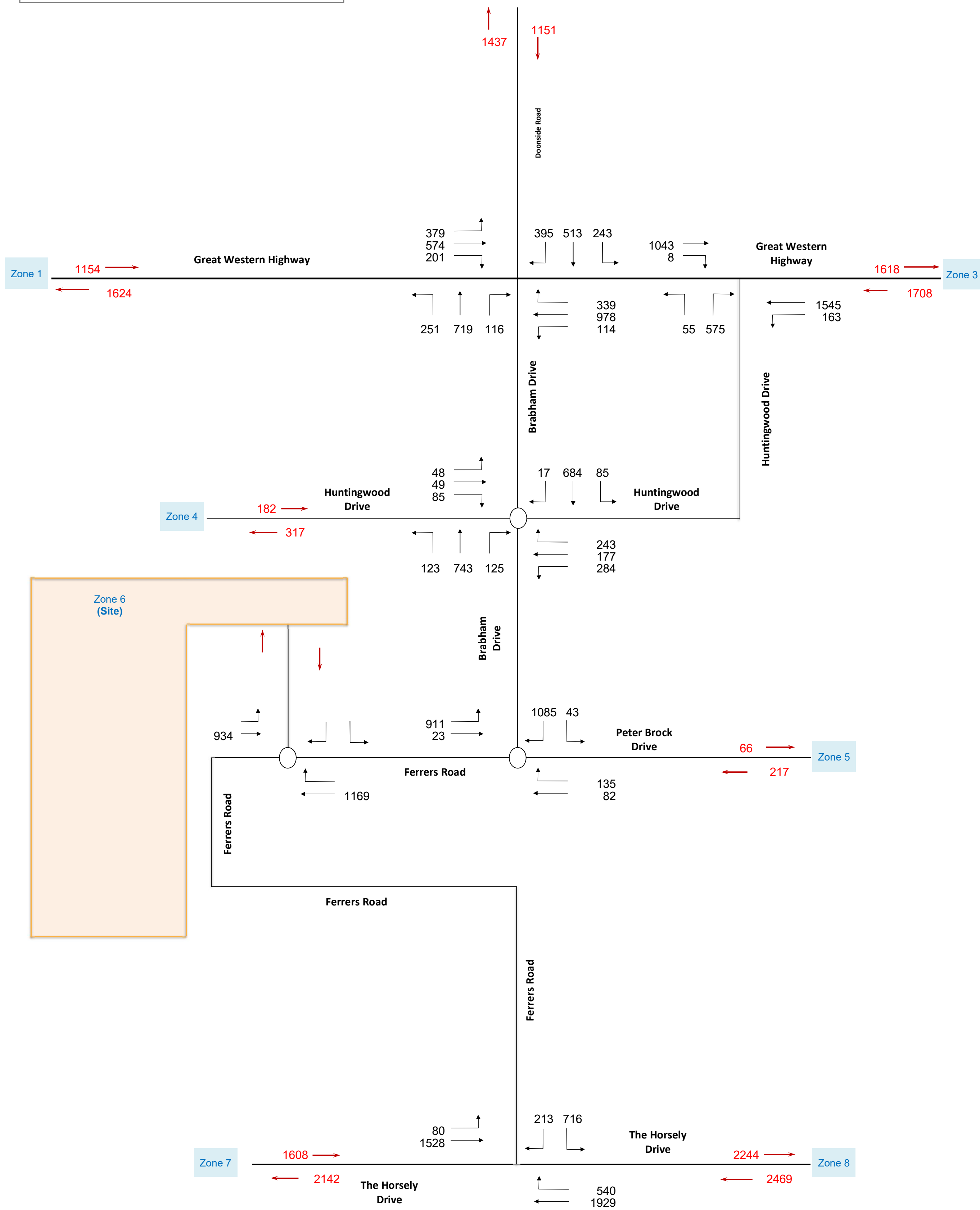
Traffic: 2036 Base



Traffic Diagram (Car + Truck)

Peak: PM

Traffic: 2036 Base



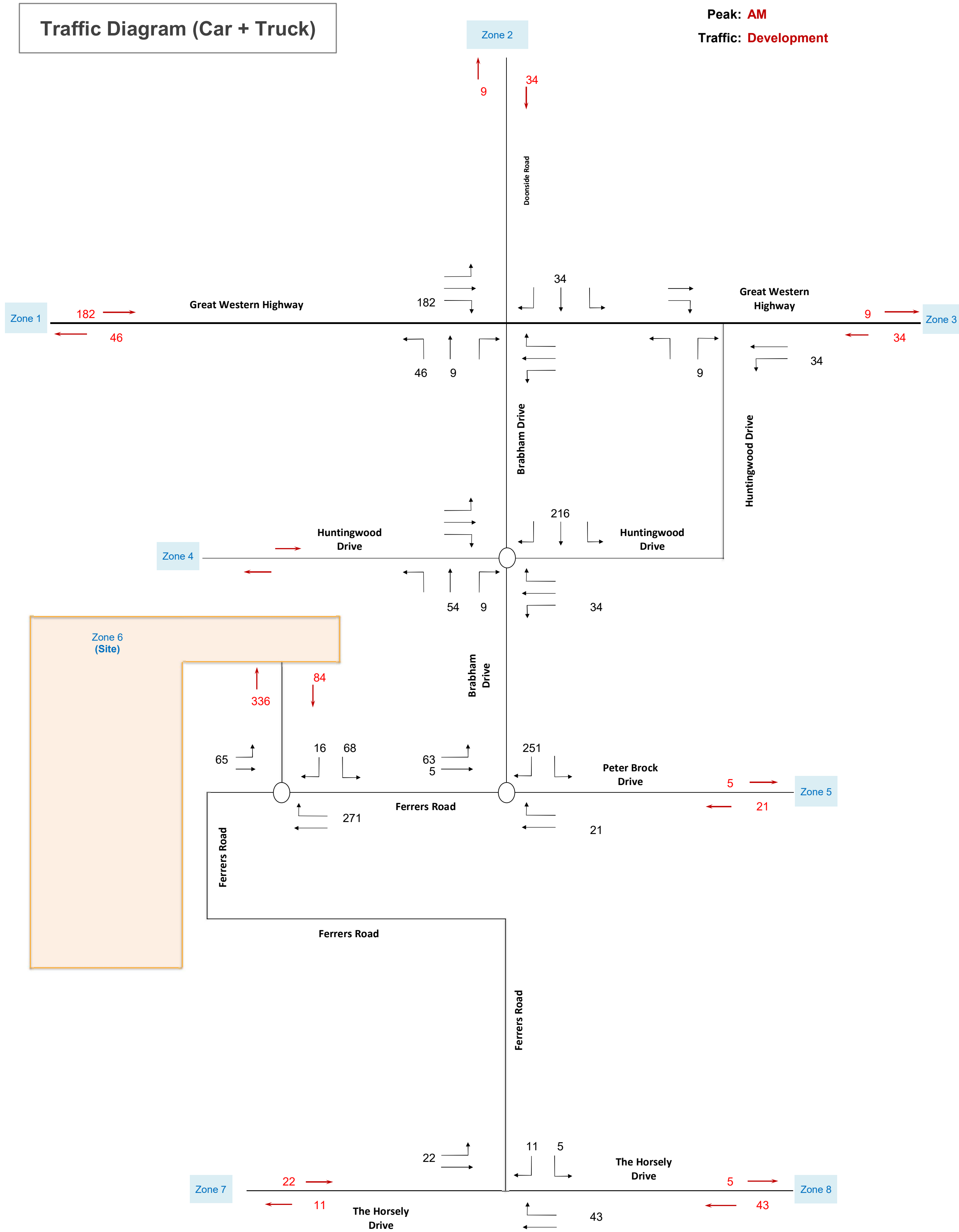
B3:

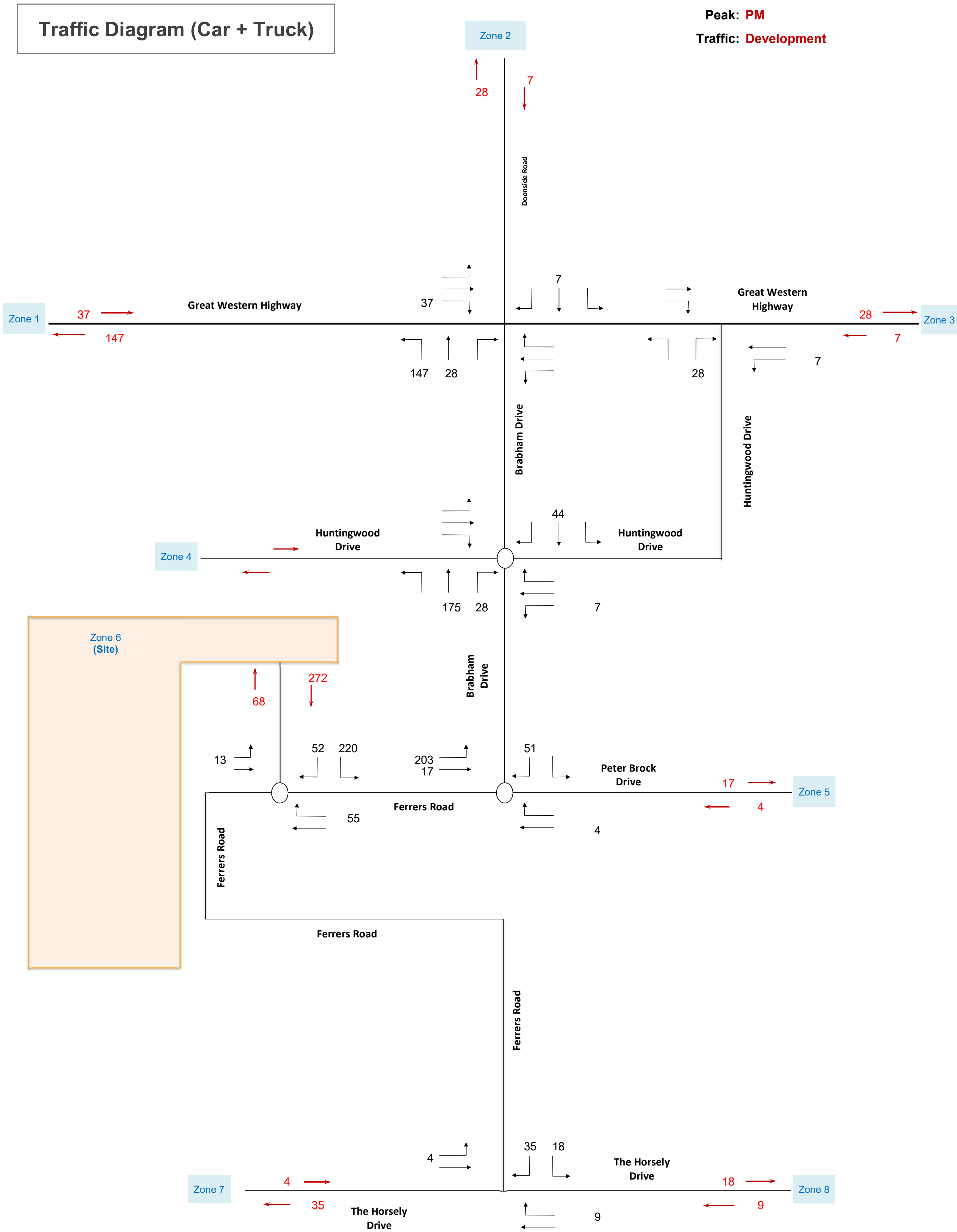
Development Traffic

Traffic Diagram (Car + Truck)

Peak: AM

Traffic: Development





Traffic Diagram (Car + Truck)
Peak: PM
Traffic: Development
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6
(Site)
Zone 7
Zone 8
Great Western Highway
Great Western
Highway
Doonside Road
Brabham Drive
Huntingwood Drive
Huntingwood
Drive
Huntingwood
Drive
Brabham
Drive
Peter Brock
Drive
Ferrers Road
Ferrers Road
Ferrers Road
Ferrers Road
The Horsely
Drive
The Horsely
Drive
28
7
37
147
37
7
147
28
28
28
7
7
44
175
28
7
272
68
13
52
220
203
17
51
55
4
17
4
4
35
18
4
35
18
9
9

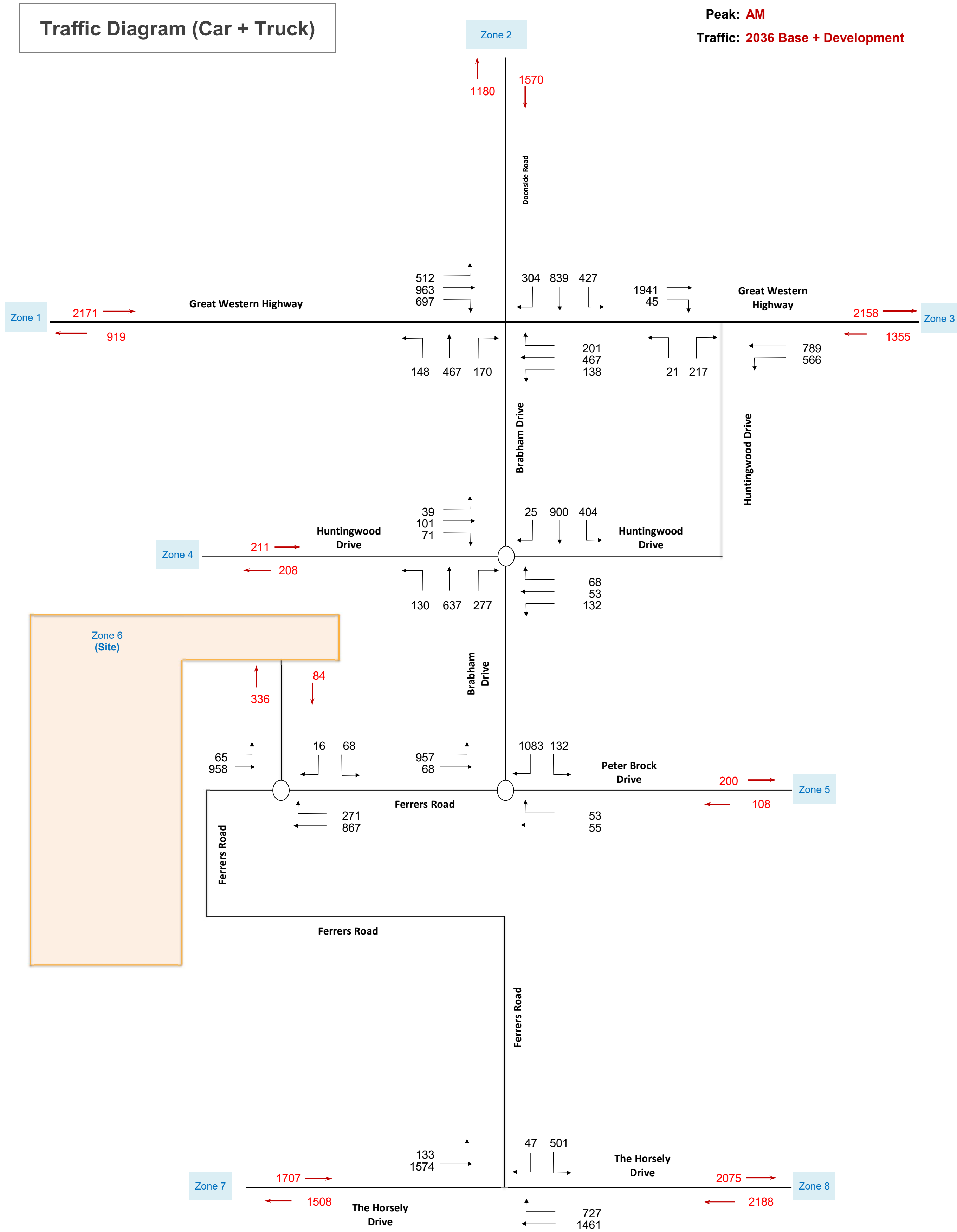
B4:

2036 Background plus Development Traffic

Traffic Diagram (Car + Truck)

Peak: AM

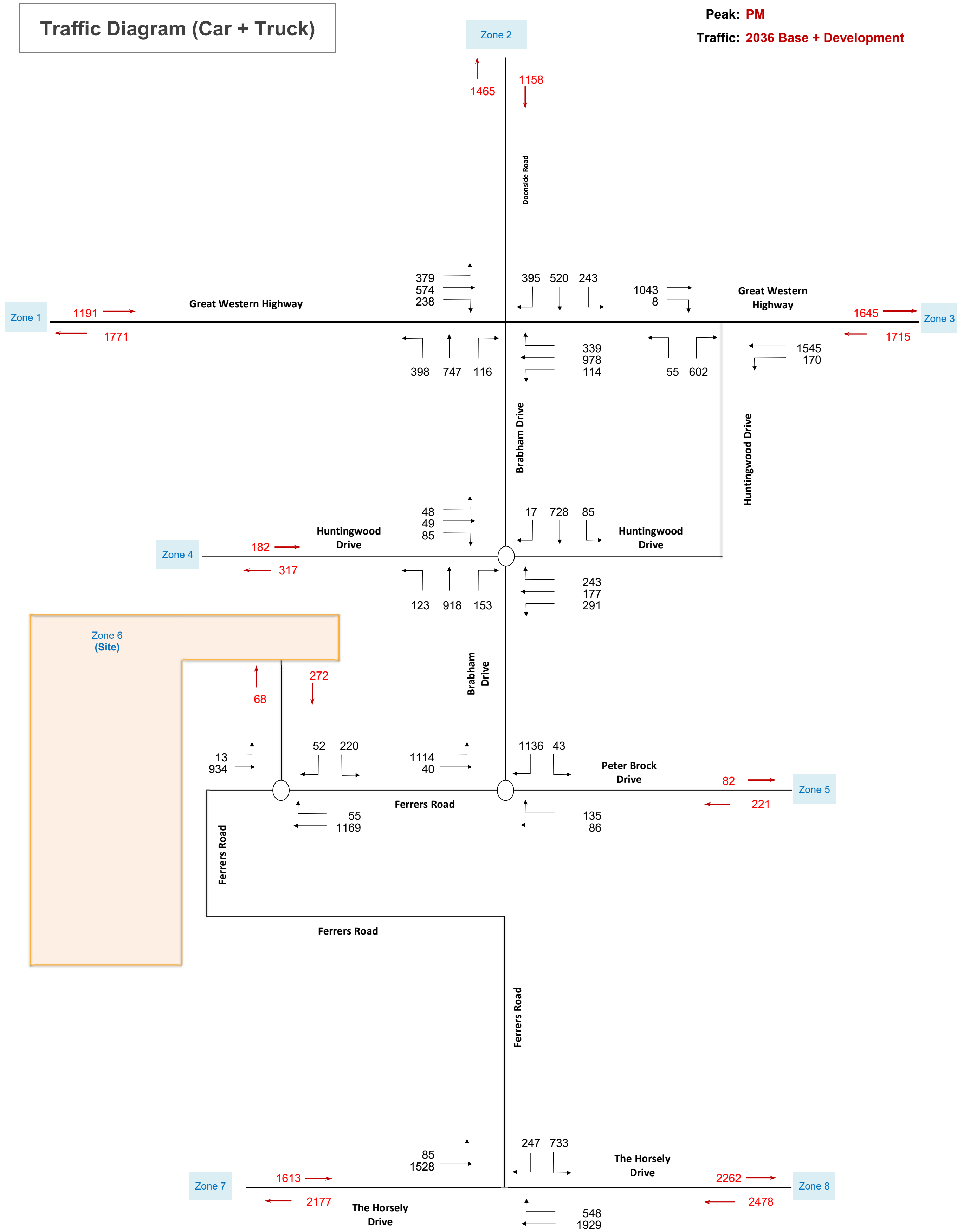
Traffic: 2036 Base + Development



Traffic Diagram (Car + Truck)

Peak: PM

Traffic: 2036 Base + Development



Appendix C

SIDRA Results

C1:

Existing Conditions

USER REPORT FOR SITE

Project: [0541] GWH_Doonside Road_Brabham Drive

Template: Default Site User Report

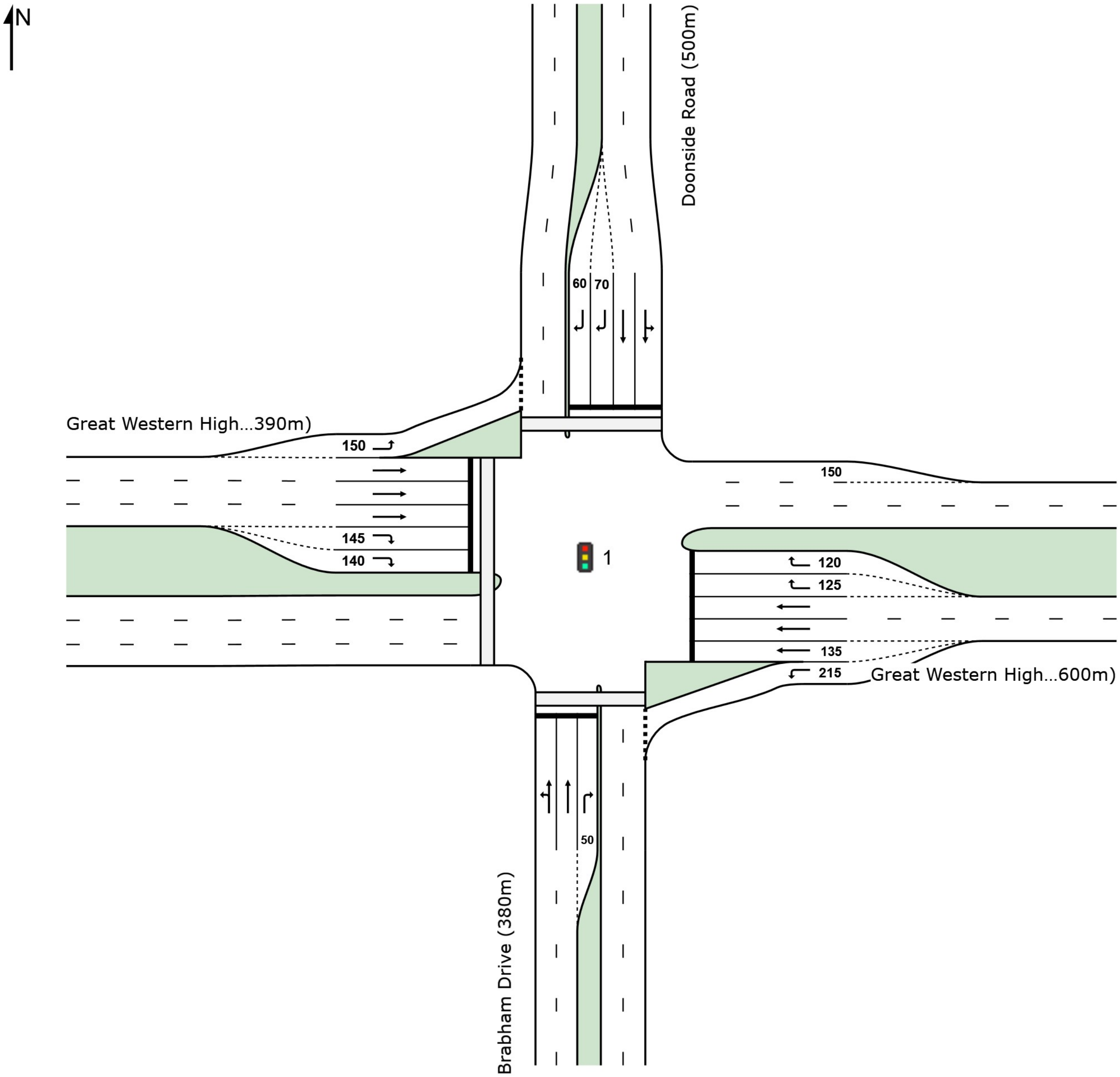
Site: 1 [[2019 Existing_AM] Doonside x GWH x Brabham]

Doonside Road x Great Western Highway x Brabham Drive Intersection, Eastern Creek

Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Green Split Priority has been specified
Phase Sequence: Standard Diamond (VV1120)
Reference Phase: Phase A
Input Phase Sequence: G, G1*, G2*, A, B*, C*, D, D1*, D2*, E, F1*, F2*
Output Phase Sequence: G, G2*, A, D, E
(* Variable Phase)

Site Layout



Input Volumes

Volume Display Method: Total and Veh

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brabham Drive (380m)													
Lane 1	245	18.9	645	0.380	100	30.2	LOS C	10.2	83.1	Full	380	0.0	0.0
Lane 2	260	8.9	684	0.380	100	29.2	LOS C	11.0	83.1	Full	380	0.0	0.0
Lane 3	153	12.4	196	0.779	100	66.9	LOS E	9.4	73.2	Short	50	0.0	NA
Approach	658	13.4		0.779		38.3	LOS C	11.0	83.1				
East: Great Western Highway (1600m)													
Lane 1	129	12.2	862	0.150	100	19.2	LOS B	3.4	26.0	Short	215	0.0	NA
Lane 2	145	10.3	196	0.742	100	60.2	LOS E	8.8	67.3	Short	135	0.0	NA
Lane 3	147	10.3	198	0.742	100	60.2	LOS E	8.9	68.0	Full	1600	0.0	0.0
Lane 4	147	10.3	198	0.742	100	60.2	LOS E	8.9	68.0	Full	1600	0.0	0.0
Lane 5	95	7.2	133	0.711	100	70.8	LOS F	5.9	43.5	Short	125	0.0	NA
Lane 6	95	7.2	133	0.711	100	70.8	LOS F	5.9	43.5	Short	120	0.0	NA
Approach	758	9.9		0.742		55.8	LOS D	8.9	68.0				
North: Doonside Road (500m)													
Lane 1	583	9.7	737	0.790	100	39.2	LOS C	30.4	230.8	Full	500	0.0	0.0
Lane 2	479	5.8	607[1]	0.790	100	37.6	LOS C	24.6	180.9	Full	500	0.0	0.0
Lane 3	132	9.6	204	0.646	100	63.9	LOS E	7.7	58.5	Short	70	0.0	NA
Lane 4	130	9.6	202	0.646	100	64.0	LOS E	7.6	58.0	Short	60	0.0	NA
Approach	1324	8.3		0.790		43.6	LOS D	30.4	230.8				
West: Great Western Highway (390m)													
Lane 1	521	9.1	1242	0.420	100	11.6	LOS A	9.3	70.3	Short	150	0.0	NA
Lane 2	294	8.5	436	0.675	85[6]	45.5	LOS D	15.8	118.9	Full	390	0.0	0.0
Lane 3	345	8.5	436	0.791	100	50.3	LOS D	20.1	151.1	Full	390	0.0	0.0
Lane 4	341	8.5	431	0.791	100	50.3	LOS D	19.9	149.7	Full	390	0.0	0.0
Lane 5	262	7.6	354	0.740	100	58.4	LOS E	15.1	112.4	Short	145	0.0	NA
Lane 6	262	7.6	354	0.740	100	58.4	LOS E	15.1	112.4	Short	140	0.0	NA
Approach	2025	8.4		0.791		41.8	LOS C	20.1	151.1				
Intersection	4765	9.3		0.791		44.0	LOS D	30.4	230.8				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

USER REPORT FOR SITE

Project: [0541] GWH_Doonside Road_Brabham Drive

Template: Default Site User Report

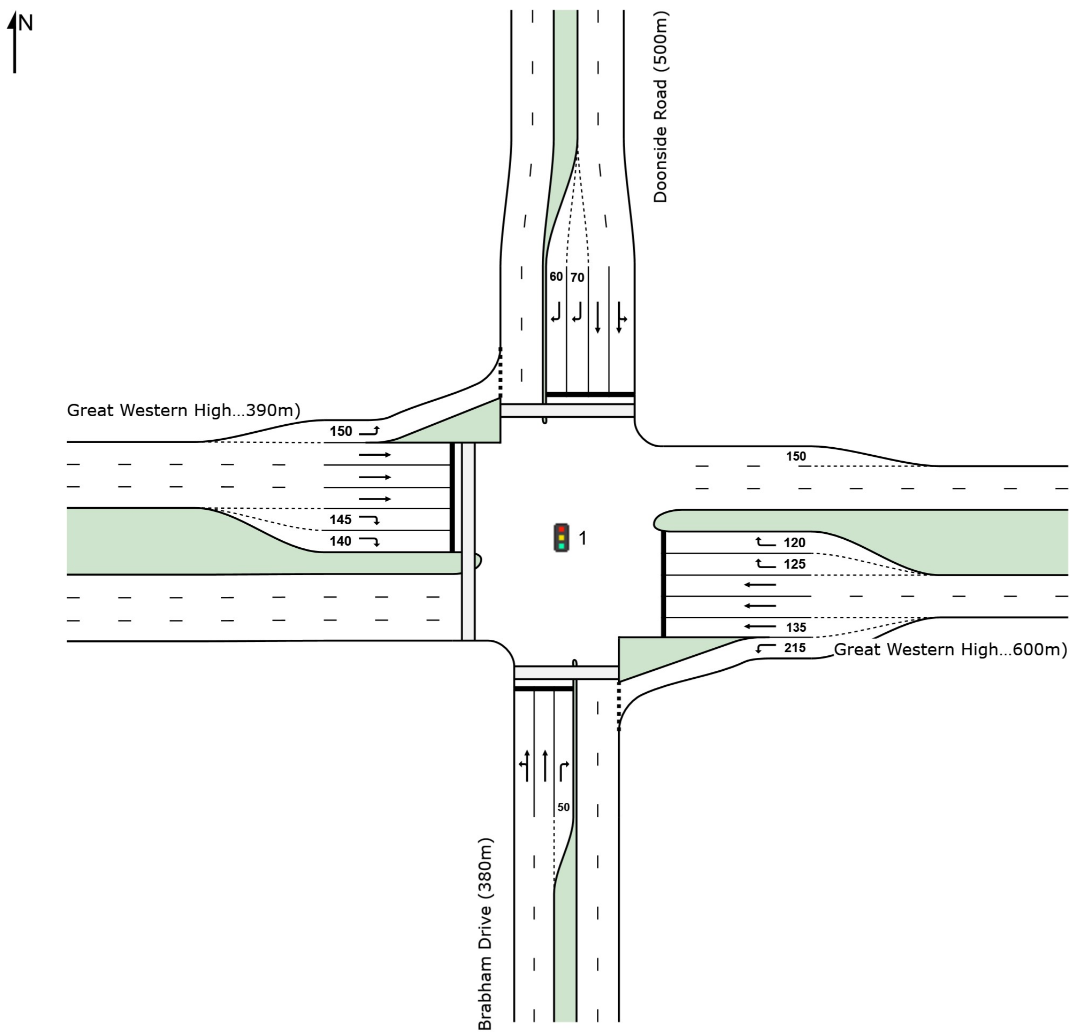
Site: 1 [[2019 Existing_PM] Doonside x GWH x Brabham]

Doonside Road x Great Western Highway x Brabham Drive Intersection, Eastern Creek

Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Green Split Priority has been specified
Phase Sequence: Standard Diamond (VV1120)
Reference Phase: Phase A
Input Phase Sequence: G, G1*, G2*, A, B*, C*, D, D1*, D2*, E, F1*, F2*
Output Phase Sequence: G, G1*, A, D, D2*, E
(* Variable Phase)

Site Layout



Input Volumes

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brabham Drive (380m)													
Lane 1	517	4.6	666	0.776	100	40.1	LOS C	27.4	199.2	Full	380	0.0	0.0
Lane 2	438	2.5	565[1]	0.776	100	37.5	LOS C	22.5	160.9	Full	380	0.0	0.0
Lane 3	115	4.6	221	0.519	100	60.3	LOS E	6.5	47.2	Short	50	0.0	NA
Approach	1071	3.7		0.776		41.2	LOS C	27.4	199.2				
East: Great Western Highway (1600m)													
Lane 1	122	7.8	1186	0.103	100	11.7	LOS A	1.9	14.0	Short	215	0.0	NA
Lane 2	347	6.1	448	0.773	100	48.5	LOS D	19.8	146.2	Short	135	0.0	NA
Lane 3	350	6.1	453	0.773	100	48.4	LOS D	20.0	147.6	Full	1600	0.0	0.0
Lane 4	350	6.1	453	0.773	100	48.4	LOS D	20.0	147.6	Full	1600	0.0	0.0
Lane 5	182	3.2	304	0.597	100	58.3	LOS E	10.1	72.3	Short	125	0.0	NA
Lane 6	182	3.2	304	0.597	100	58.3	LOS E	10.1	72.3	Short	120	0.0	NA
Approach	1533	5.6		0.773		47.8	LOS D	20.0	147.6				
North: Doonside Road (500m)													
Lane 1	379	6.7	736	0.515	100	33.6	LOS C	16.7	123.4	Full	500	0.0	0.0
Lane 2	354	5.3	688	0.515	100	33.0	LOS C	16.1	118.0	Full	500	0.0	0.0
Lane 3	193	10.4	246	0.782	100	65.4	LOS E	11.8	89.7	Short	70	0.0	NA
Lane 4	191	10.4	244	0.782	100	65.5	LOS E	11.6	88.8	Short	60	0.0	NA
Approach	1117	7.5		0.782		44.3	LOS D	16.7	123.4				
West: Great Western Highway (390m)													
Lane 1	314	13.1	985	0.318	100	17.0	LOS B	7.9	61.6	Short	150	0.0	NA
Lane 2	143	4.2	272	0.525	85[6]	52.6	LOS D	7.9	57.5	Full	390	0.0	0.0
Lane 3	167	4.2	272	0.615	100	53.5	LOS D	9.4	68.4	Full	390	0.0	0.0
Lane 4	165	4.2	269	0.615	100	53.5	LOS D	9.3	67.7	Full	390	0.0	0.0
Lane 5	83	15.8	112	0.744	100	72.9	LOS F	5.2	41.7	Short	145	0.0	NA
Lane 6	83	15.8	112	0.744	100	72.9	LOS F	5.2	41.7	Short	140	0.0	NA
Approach	955	9.2		0.744		44.8	LOS D	9.4	68.4				
Intersection	4675	6.3		0.782		44.9	LOS D	27.4	199.2				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

MOVEMENT SUMMARY

Site: 2 [Huntingwood x GWH_ Existing_ AM]

Huntingwood Drive x Great Western Highway T-Intersection, Huntingwood
Road Conditions: 2018 Existing
Traffic: 2018 AM Base
Signals - Fixed Time Isolated   Cycle Time = 66 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Huntingwood Drive (1800m)											
1	L2	19	50.0	0.706	37.2	LOS C	3.4	29.8	1.00	0.88	54.3
3	R2	192	22.5	0.706	39.5	LOS C	3.6	30.4	1.00	0.87	49.4
Approach		211	25.0	0.706	39.3	LOS C	3.6	30.4	1.00	0.88	49.9
East: Great Western Highway (780m)											
4	L2	482	10.0	0.278	7.8	LOS A	0.0	0.0	0.00	0.60	73.2
5	T1	715	8.8	0.355	9.1	LOS A	6.5	49.0	0.60	0.52	73.8
Approach		1197	9.3	0.355	8.6	LOS A	6.5	49.0	0.36	0.55	73.5
West: Great Western Highway (1600m)											
11	T1	1973	7.0	0.727	5.6	LOS A	18.4	136.4	0.63	0.58	76.0
12	R2	45	18.6	0.304	40.1	LOS C	1.5	12.0	0.97	0.74	55.1
Approach		2018	7.3	0.727	6.4	LOS A	18.4	136.4	0.64	0.58	75.1
All Vehicles		3425	9.1	0.727	9.2	LOS A	18.4	136.4	0.56	0.59	72.1

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

MOVEMENT SUMMARY

Site: 2 [Huntingwood x GWH_ Existing_ PM]

Huntingwood Drive x Great Western Highway T-Intersection, Huntingwood
Road Conditions: 2018 Existing
Traffic: 2018 PM Base
Signals - Fixed Time Isolated   Cycle Time = 107 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Huntingwood Drive (1800m)											
1	L2	54	23.5	0.799	59.8	LOS E	16.3	121.3	1.00	0.96	50.0
3	R2	564	4.3	0.799	56.1	LOS D	16.6	120.7	1.00	0.93	45.9
Approach		618	6.0	0.799	56.4	LOS D	16.6	121.3	1.00	0.93	46.3
East: Great Western Highway (780m)											
4	L2	178	19.5	0.109	7.9	LOS A	0.0	0.0	0.00	0.59	72.6
5	T1	1687	4.4	0.797	19.8	LOS B	34.8	252.6	0.86	0.79	67.6
Approach		1865	5.8	0.797	18.7	LOS B	34.8	252.6	0.78	0.77	68.1
West: Great Western Highway (1600m)											
11	T1	931	3.7	0.363	8.0	LOS A	10.3	74.5	0.47	0.41	74.5
12	R2	7	28.6	0.085	62.4	LOS E	0.4	3.4	0.97	0.66	50.0
Approach		938	3.9	0.363	8.4	LOS A	10.3	74.5	0.47	0.42	74.1
All Vehicles		3421	5.3	0.799	22.7	LOS B	34.8	252.6	0.73	0.70	63.6

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

MOVEMENT SUMMARY

Site: 3 [Huntingwood x Brabham_ Existing_ AM]

Huntingwood Drive x Brabham Drive Intersection, Eastern Creek
Road Conditions: 2018 Existing
Traffic: 2018 AM Base
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brabham Drive (640m)											
1	L2	129	18.7	0.370	4.7	LOS A	2.9	21.9	0.45	0.45	53.8
2	T1	582	8.7	0.370	4.4	LOS A	2.9	21.9	0.46	0.49	55.3
3	R2	268	9.0	0.370	10.4	LOS A	2.8	20.9	0.48	0.58	57.2
Approach		980	10.1	0.370	6.1	LOS A	2.9	21.9	0.46	0.51	56.0
East: Huntingwood Drive (1800m)											
4	L2	95	18.9	0.292	6.0	LOS A	1.2	10.6	0.60	0.73	56.7
5	T1	52	34.7	0.292	6.2	LOS A	1.2	10.6	0.60	0.73	57.0
6	R2	65	40.3	0.292	12.2	LOS A	1.2	10.6	0.60	0.73	56.8
Approach		212	29.4	0.292	7.9	LOS A	1.2	10.6	0.60	0.73	56.8
North: Brabham Drive (380m)											
7	L2	403	10.4	0.519	6.7	LOS A	4.3	32.6	0.75	0.70	56.5
8	T1	683	5.1	0.519	7.3	LOS A	4.3	32.6	0.76	0.75	54.4
9	R2	25	16.7	0.519	13.9	LOS A	4.3	31.7	0.77	0.77	52.0
Approach		1112	7.3	0.519	7.3	LOS A	4.3	32.6	0.76	0.73	55.5
West: Huntingwood Drive (360m)											
10	L2	38	52.8	0.285	7.1	LOS A	1.1	9.1	0.58	0.72	49.1
11	T1	98	19.4	0.285	6.0	LOS A	1.1	9.1	0.58	0.72	56.9
12	R2	68	24.6	0.285	12.0	LOS A	1.1	9.1	0.58	0.72	53.7
Approach		204	27.3	0.285	8.2	LOS A	1.1	9.1	0.58	0.72	55.3
All Vehicles		2507	11.9	0.519	6.9	LOS A	4.3	32.6	0.61	0.64	55.8

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

MOVEMENT SUMMARY

Site: 3 [Huntingwood x Brabham_ Existing_ PM]

Huntingwood Drive x Brabham Drive Intersection, Eastern Creek
Road Conditions: 2018 Existing
Traffic: 2018 PM Base
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brabham Drive (640m)											
1	L2	119	21.2	0.468	6.5	LOS A	4.0	29.6	0.76	0.62	52.3
2	T1	718	4.4	0.468	6.2	LOS A	4.0	29.6	0.77	0.66	54.1
3	R2	121	12.2	0.468	12.6	LOS A	3.7	27.2	0.78	0.71	57.0
Approach		958	7.5	0.468	7.1	LOS A	4.0	29.6	0.77	0.66	54.6
East: Huntingwood Drive (1800m)											
4	L2	269	4.7	0.747	8.3	LOS A	5.5	40.5	0.76	0.97	56.1
5	T1	168	6.3	0.747	8.2	LOS A	5.5	40.5	0.76	0.97	56.4
6	R2	231	9.1	0.747	14.0	LOS A	5.5	40.5	0.76	0.97	56.5
Approach		668	6.6	0.747	10.3	LOS A	5.5	40.5	0.76	0.97	56.3
North: Brabham Drive (380m)											
7	L2	85	28.4	0.318	5.3	LOS A	2.2	17.1	0.51	0.49	56.6
8	T1	683	6.0	0.318	5.0	LOS A	2.2	17.1	0.53	0.51	55.5
9	R2	17	25.0	0.318	11.4	LOS A	2.2	16.0	0.54	0.52	53.2
Approach		785	8.8	0.318	5.2	LOS A	2.2	17.1	0.52	0.50	55.7
West: Huntingwood Drive (360m)											
10	L2	45	23.3	0.261	6.8	LOS A	1.1	8.7	0.66	0.80	49.2
11	T1	46	11.4	0.261	6.3	LOS A	1.1	8.7	0.66	0.80	56.6
12	R2	81	11.7	0.261	12.1	LOS A	1.1	8.7	0.66	0.80	53.4
Approach		173	14.6	0.261	9.2	LOS A	1.1	8.7	0.66	0.80	54.1
All Vehicles		2584	8.1	0.747	7.4	LOS A	5.5	40.5	0.68	0.71	55.5

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

MOVEMENT SUMMARY

Site: 4 [Ferrers x Brabham x Peter Brock_ Existing_ AM]

Ferrers Road x Brabham Drive x Peter Brock Drive, Eastern Creek
Road Conditions: 2018 Existing
Traffic: 2018 AM Base
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Peter Brock Drive (500m)											
5	T1	33	19.4	0.120	5.8	LOS A	0.5	4.5	0.61	0.73	51.2
6	R2	52	22.4	0.120	11.4	LOS A	0.5	4.5	0.61	0.73	50.0
Approach		84	21.3	0.120	9.2	LOS A	0.5	4.5	0.61	0.73	50.5
North: Brabham Drive (640m)											
7	L2	123	23.9	0.120	4.3	LOS A	0.7	5.7	0.25	0.44	52.1
9	R2	778	7.7	0.471	9.6	LOS A	4.1	30.3	0.30	0.58	54.8
Approach		901	9.9	0.471	8.9	LOS A	4.1	30.3	0.29	0.56	54.5
West: Ferrers Road (820m)											
10	L2	894	8.0	0.336	3.9	LOS A	2.3	17.1	0.24	0.42	56.7
11	T1	63	8.3	0.336	3.8	LOS A	2.2	16.8	0.24	0.42	54.7
Approach		957	8.0	0.336	3.9	LOS A	2.3	17.1	0.24	0.42	56.6
All Vehicles		1942	9.5	0.471	6.5	LOS A	4.1	30.3	0.28	0.50	55.4

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

MOVEMENT SUMMARY

Site: 4 [Ferrers x Brabham x Peter Brock_ Existing_ PM]

Ferrers Road x Brabham Drive x Peter Brock Drive, Eastern Creek
Road Conditions: 2018 Existing
Traffic: 2018 PM Base
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Peter Brock Drive (500m)											
5	T1	78	6.8	0.346	9.4	LOS A	2.0	15.5	0.79	0.90	49.5
6	R2	128	15.6	0.346	15.2	LOS B	2.0	15.5	0.79	0.90	48.1
Approach		206	12.2	0.346	13.0	LOS A	2.0	15.5	0.79	0.90	48.7
North: Brabham Drive (640m)											
7	L2	40	7.9	0.035	3.8	LOS A	0.2	1.4	0.13	0.42	52.6
9	R2	1015	6.0	0.574	9.4	LOS A	6.3	46.4	0.20	0.57	55.1
Approach		1055	6.1	0.574	9.2	LOS A	6.3	46.4	0.20	0.57	55.1
West: Ferrers Road (820m)											
10	L2	880	6.0	0.349	4.3	LOS A	2.4	18.0	0.39	0.48	56.3
11	T1	22	14.3	0.349	4.3	LOS A	2.4	17.6	0.40	0.49	54.2
Approach		902	6.2	0.349	4.3	LOS A	2.4	18.0	0.40	0.48	56.3
All Vehicles		2163	6.7	0.574	7.5	LOS A	6.3	46.4	0.34	0.57	55.0

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

MOVEMENT SUMMARY

Site: 5 [Horsley x Ferrers_ Existing_ AM]

The Horsley Drive x Ferrers Road T-Intersection, Horsley Park
Road Conditions: 2018 Existing
Traffic: 2018 AM Base
Signals - Fixed Time Isolated   Cycle Time = 78 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: The Horsley Drive (160m)											
5	T1	976	25.6	0.381	3.1	LOS A	6.0	51.3	0.35	0.31	66.8
6	R2	457	9.7	0.982	74.2	LOS F	27.4	207.7	1.00	1.19	48.2
Approach		1433	20.5	0.982	25.8	LOS B	27.4	207.7	0.56	0.59	54.4
North: Ferrers Road (5000m)											
7	L2	486	8.9	0.532	21.0	LOS B	10.5	78.9	0.74	0.87	56.0
9	R2	36	47.1	0.335	46.4	LOS D	1.4	13.9	0.98	0.73	54.3
Approach		522	11.5	0.532	22.7	LOS B	10.5	78.9	0.76	0.86	55.8
West: The Horsley Drive (1500m)											
10	L2	94	19.1	0.958	60.8	LOS E	40.2	324.1	1.00	1.27	53.7
11	T1	1323	17.7	0.958	55.3	LOS D	40.2	324.1	1.00	1.27	42.2
Approach		1417	17.8	0.958	55.6	LOS D	40.2	324.1	1.00	1.27	44.2
All Vehicles		3372	18.0	0.982	37.9	LOS C	40.2	324.1	0.78	0.92	51.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	21	33.3	LOS D	0.0	0.0	0.92	0.92
P3	North Full Crossing	21	16.0	LOS B	0.0	0.0	0.64	0.64
All Pedestrians		42	24.6	LOS C			0.78	0.78

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 5 [Horsley x Ferrers_ Existing_ PM]

The Horsley Drive x Ferrers Road T-Intersection, Horsley Park
Road Conditions: 2018 Existing
Traffic: 2018 PM Base
Signals - Fixed Time Isolated   Cycle Time = 65 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: The Horsley Drive (160m)											
5	T1	1599	9.9	0.648	6.5	LOS A	14.6	111.1	0.62	0.57	64.4
6	R2	447	6.8	0.869	38.9	LOS C	16.8	124.4	1.00	1.01	53.0
Approach		2046	9.3	0.869	13.6	LOS A	16.8	124.4	0.70	0.66	58.6
North: Ferrers Road (5000m)											
7	L2	715	5.3	0.615	14.1	LOS A	10.0	73.1	0.68	0.84	57.2
9	R2	213	5.0	0.856	43.2	LOS D	7.9	57.7	1.00	1.00	55.2
Approach		927	5.2	0.856	20.8	LOS B	10.0	73.1	0.76	0.88	56.6
West: The Horsley Drive (1500m)											
10	L2	42	55.0	0.850	38.6	LOS C	15.3	129.5	1.00	1.04	56.5
11	T1	801	21.3	0.850	32.6	LOS C	15.5	127.9	1.00	1.03	50.2
Approach		843	23.0	0.850	32.9	LOS C	15.5	129.5	1.00	1.03	51.1
All Vehicles		3817	11.3	0.869	19.6	LOS B	16.8	129.5	0.78	0.80	56.6

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	21	26.8	LOS C	0.0	0.0	0.91	0.91
P3	North Full Crossing	21	20.0	LOS C	0.0	0.0	0.79	0.79
All Pedestrians		42	23.4	LOS C			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

C2:

2036 Base Case

USER REPORT FOR SITE

Project: [0541] GWH_Doonside Road_Brabham Drive

Template: Default Site User Report

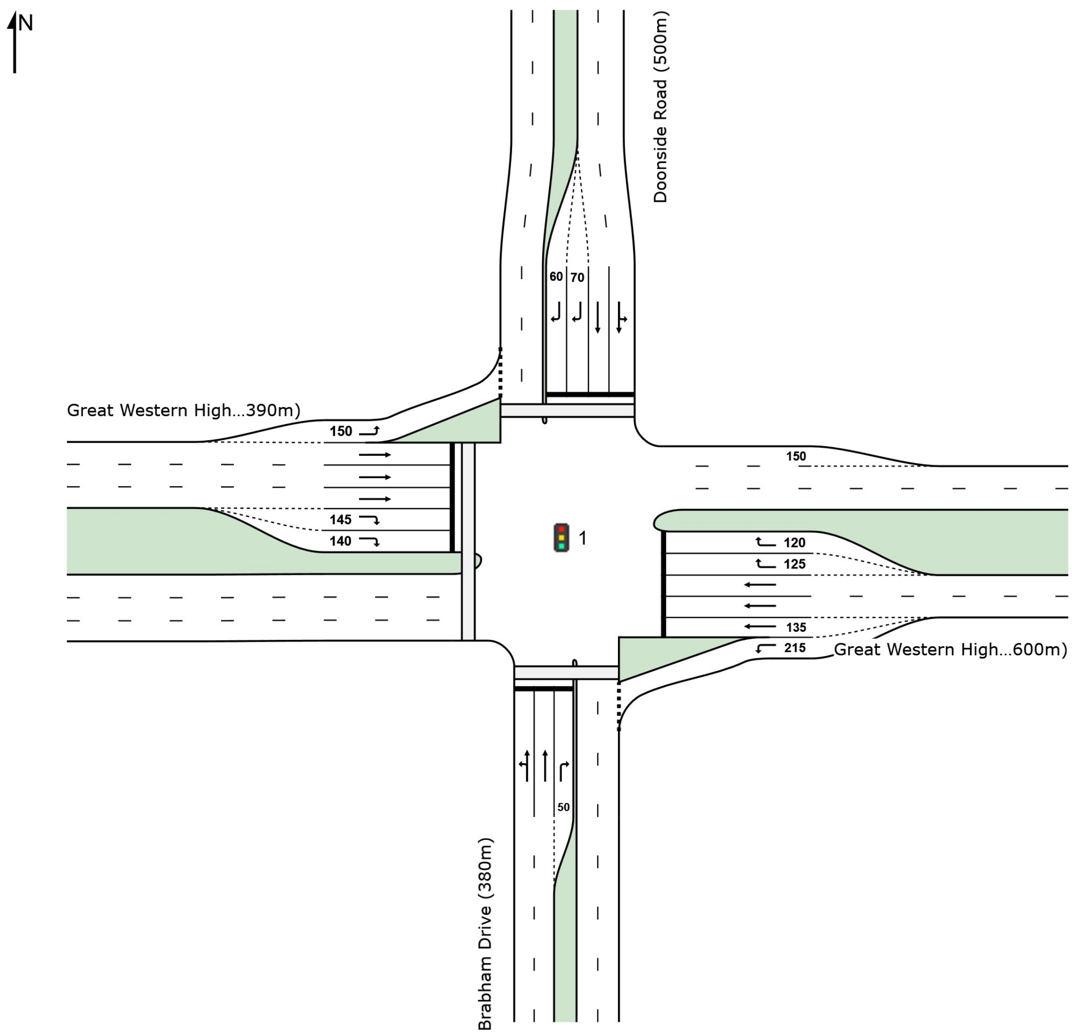
Site: 1 [[2036 Future_AM] Doonside x GWH x Brabham]

Doonside Road x Great Western Highway x Brabham Drive Intersection, Eastern Creek

Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Green Split Priority has been specified
Phase Sequence: Standard Diamond (VV1120)
Reference Phase: Phase A
Input Phase Sequence: G, G1*, G2*, A, B*, C*, D, D1*, D2*, E, F1*, F2*
Output Phase Sequence: G, G2*, A, D, D1*, E, F2*
(* Variable Phase)

Site Layout



Input Volumes

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brabham Drive (380m)													
Lane 1	318	17.8	507	0.628	100	39.2	LOS C	15.3	123.1	Full	380	0.0	0.0
Lane 2	273	8.9	435 [1]	0.628	100	38.2	LOS C	13.4	100.6	Full	380	0.0	0.0
Lane 3	179	12.4	196	0.913	100	78.8	LOS F	12.4	96.2	Short	50	0.0	NA
Approach	771	13.4		0.913		48.1	LOS D	15.3	123.1				
East: Great Western Highway (1600m)													
Lane 1	145	12.3	793	0.183	100	23.0	LOS B	4.4	34.0	Short	215	0.0	NA
Lane 2	163	10.3	196	0.830	100	64.1	LOS E	10.4	78.8	Short	135	0.0	NA
Lane 3	164	10.3	198	0.830	100	64.0	LOS E	10.5	79.6	Full	1600	0.0	0.0
Lane 4	164	10.3	198	0.830	100	64.0	LOS E	10.5	79.6	Full	1600	0.0	0.0
Lane 5	106	7.5	118	0.895	100	80.5	LOS F	7.2	53.3	Short	125	0.0	NA
Lane 6	106	7.5	118	0.895	100	80.5	LOS F	7.2	53.3	Short	120	0.0	NA
Approach	848	9.9		0.895		61.1	LOS E	10.5	79.6				
North: Doonside Road (500m)													
Lane 1	721	6.3	799	0.902	100	51.5	LOS D	46.3	341.9	Full	500	0.0	0.0
Lane 2	576	5.5	639 [1]	0.902	100	50.4	LOS D	35.8	262.5	Full	500	0.0	0.0
Lane 3	161	16.8	292	0.551	100	32.8	LOS C	4.8	38.8	Short	70	0.0	NA
Lane 4	159	16.8	289	0.551	100	32.8	LOS C	4.8	38.4	Short	60	0.0	NA
Approach	1617	8.1		0.902		47.4	LOS D	46.3	341.9				
West: Great Western Highway (390m)													
Lane 1	539	9.2	1256	0.429	100	12.2	LOS A	10.1	76.2	Short	150	0.0	NA
Lane 2	304	8.5	405	0.753	85 [6]	49.8	LOS D	17.4	130.6	Full	390	0.0	0.0
Lane 3	356	8.5	405	0.881	100	60.2	LOS E	23.3	174.6	Full	390	0.0	0.0
Lane 4	353	8.5	400	0.881	100	60.3	LOS E	23.0	173.0	Full	390	0.0	0.0
Lane 5	271	7.6	310	0.874	100	70.3	LOS E	17.7	132.2	Short	145	0.0	NA
Lane 6	271	7.6	310	0.874	100	70.3	LOS E	17.7	132.2	Short	140	0.0	NA
Approach	2095	8.4		0.881		49.0	LOS D	23.3	174.6				
Intersection	5331	9.3		0.913		50.3	LOS D	46.3	341.9				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

USER REPORT FOR SITE

Project: [0541] GWH_Doonside Road_Brabham Drive

Template: Default Site User Report

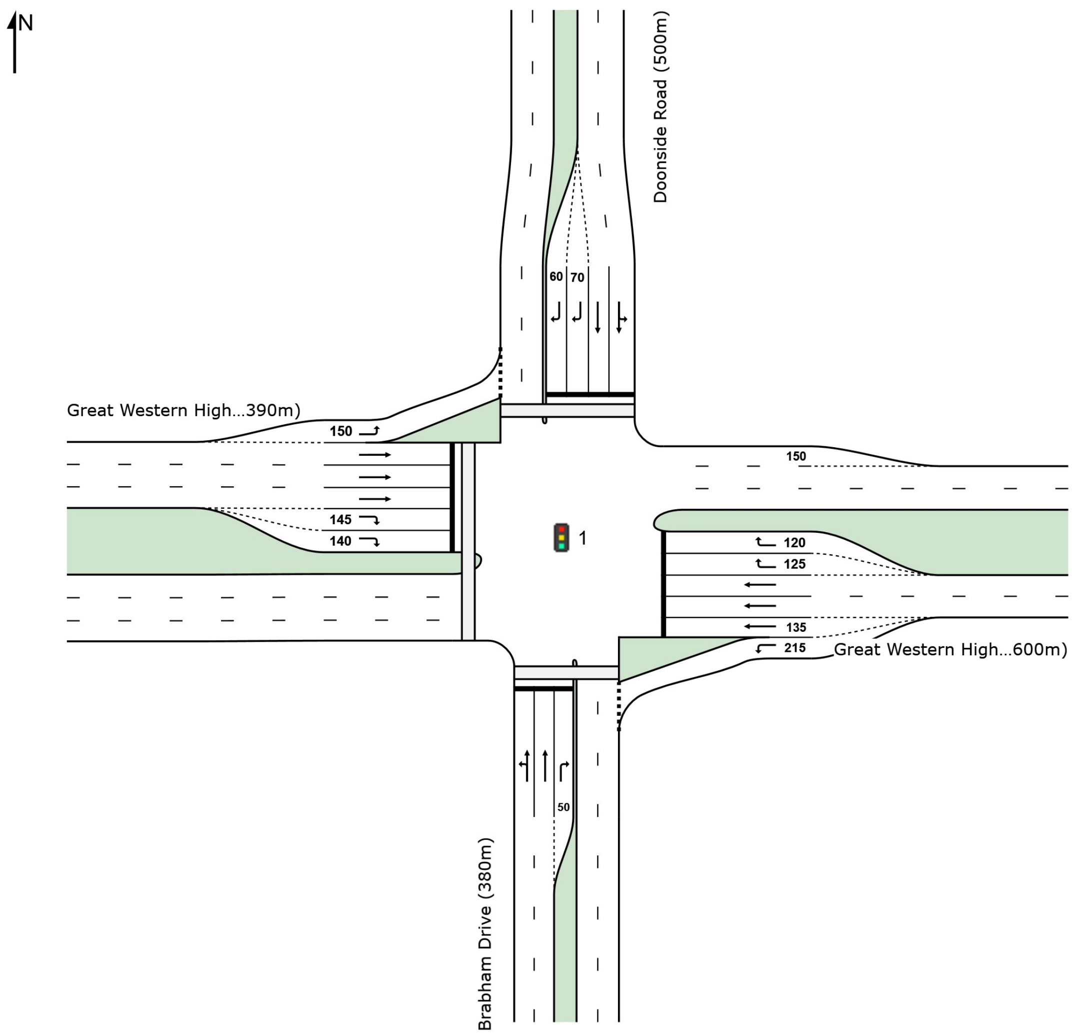
Site: 1 [[2036 Future_PM] Doonside x GWH x Brabham]

Doonside Road x Great Western Highway x Brabham Drive Intersection, Eastern Creek

Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Green Split Priority has been specified
Phase Sequence: Standard Diamond (VV1120)
Reference Phase: Phase A
Input Phase Sequence: G, G1*, G2*, A, B*, C*, D, D1*, D2*, E, F1*, F2*
Output Phase Sequence: G, G1*, A, D, D2*, E
(* Variable Phase)

Site Layout



Input Volumes

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brabham Drive (380m)													
Lane 1	552	4.5	667	0.829	100	44.3	LOS D	31.5	229.2	Full	380	0.0	0.0
Lane 2	469	2.5	565[1]	0.829	100	41.8	LOS C	25.8	184.7	Full	380	0.0	0.0
Lane 3	122	4.3	222	0.551	100	60.5	LOS E	6.9	50.4	Short	50	0.0	NA
Approach	1143	3.7		0.829		45.0	LOS D	31.5	229.2				
East: Great Western Highway (1600m)													
Lane 1	120	7.9	1149	0.104	100	12.6	LOS A	2.0	15.2	Short	215	0.0	NA
Lane 2	341	6.1	418	0.816	100	52.7	LOS D	20.5	150.8	Short	135	0.0	NA
Lane 3	344	6.1	422	0.816	100	52.7	LOS D	20.7	152.2	Full	1600	0.0	0.0
Lane 4	344	6.1	422	0.816	100	52.7	LOS D	20.7	152.2	Full	1600	0.0	0.0
Lane 5	178	3.2	258	0.690	100	62.6	LOS E	10.4	74.7	Short	125	0.0	NA
Lane 6	178	3.2	258	0.690	100	62.6	LOS E	10.4	74.7	Short	120	0.0	NA
Approach	1506	5.6		0.816		51.8	LOS D	20.7	152.2				
North: Doonside Road (500m)													
Lane 1	419	6.6	750	0.559	100	33.5	LOS C	18.7	138.0	Full	500	0.0	0.0
Lane 2	377	5.3	675[1]	0.559	100	32.6	LOS C	17.2	125.7	Full	500	0.0	0.0
Lane 3	209	10.4	261	0.802	100	65.7	LOS E	12.9	98.1	Short	70	0.0	NA
Lane 4	207	10.4	258	0.802	100	65.7	LOS E	12.7	97.2	Short	60	0.0	NA
Approach	1212	7.5		0.802		44.3	LOS D	18.7	138.0				
West: Great Western Highway (390m)													
Lane 1	399	13.2	976	0.409	100	18.8	LOS B	11.4	88.9	Short	150	0.0	NA
Lane 2	181	4.2	304	0.597	85[6]	51.6	LOS D	10.1	73.1	Full	390	0.0	0.0
Lane 3	212	4.2	304	0.700	100	53.5	LOS D	12.2	88.6	Full	390	0.0	0.0
Lane 4	210	4.2	301	0.700	100	53.5	LOS D	12.1	87.7	Full	390	0.0	0.0
Lane 5	106	15.9	126	0.841	100	75.8	LOS F	6.9	54.9	Short	145	0.0	NA
Lane 6	106	15.9	126	0.841	100	75.8	LOS F	6.9	54.9	Short	140	0.0	NA
Approach	1215	9.2		0.841		45.7	LOS D	12.2	88.9				
Intersection	5076	6.5		0.841		47.0	LOS D	31.5	229.2				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

MOVEMENT SUMMARY

Site: 2 [Huntingwood x GWH_ Future_ AM]

Huntingwood Drive x Great Western Highway T-Intersection, Huntingwood
Road Conditions: 2018 Existing
Traffic: 2036 AM Background
Signals - Fixed Time Isolated   Cycle Time = 110 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Huntingwood Drive (1800m)											
1	L2	22	47.6	0.686	56.3	LOS D	6.3	54.7	1.00	0.86	50.1
3	R2	219	22.6	0.686	58.4	LOS E	6.6	55.4	1.00	0.85	44.9
Approach		241	24.9	0.686	58.2	LOS E	6.6	55.4	1.00	0.85	45.4
East: Great Western Highway (780m)											
4	L2	560	10.0	0.323	7.8	LOS A	0.0	0.0	0.00	0.60	73.2
5	T1	831	8.9	0.349	9.4	LOS A	10.0	75.5	0.49	0.43	73.6
Approach		1391	9.3	0.349	8.8	LOS A	10.0	75.5	0.29	0.50	73.4
West: Great Western Highway (1600m)											
11	T1	2043	7.1	0.701	6.1	LOS A	26.0	192.8	0.53	0.49	75.7
12	R2	47	17.8	0.351	61.6	LOS E	2.5	20.5	0.98	0.75	50.3
Approach		2091	7.3	0.701	7.4	LOS A	26.0	192.8	0.54	0.50	74.5
All Vehicles		3722	9.2	0.701	11.2	LOS A	26.0	192.8	0.48	0.52	70.9

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

MOVEMENT SUMMARY

Site: 2 [Huntingwood x GWH_ Future_ PM]

Huntingwood Drive x Great Western Highway T-Intersection, Huntingwood
Road Conditions: 2018 Existing
Traffic: 2036 PM Background
Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Huntingwood Drive (1800m)											
1	L2	58	23.6	0.740	65.9	LOS E	20.7	154.7	0.98	0.91	48.8
3	R2	605	4.3	0.740	61.8	LOS E	21.3	154.7	0.98	0.88	44.6
Approach		663	6.0	0.740	62.2	LOS E	21.3	154.7	0.98	0.89	45.1
East: Great Western Highway (780m)											
4	L2	172	19.6	0.105	7.9	LOS A	0.0	0.0	0.00	0.59	72.6
5	T1	1626	4.3	0.760	23.0	LOS B	42.0	305.0	0.80	0.74	65.9
Approach		1798	5.8	0.760	21.6	LOS B	42.0	305.0	0.73	0.73	66.6
West: Great Western Highway (1600m)											
11	T1	1098	3.7	0.434	11.6	LOS A	17.3	124.7	0.51	0.46	72.2
12	R2	8	25.0	0.125	81.3	LOS F	0.6	5.0	0.99	0.67	46.5
Approach		1106	3.9	0.434	12.2	LOS A	17.3	124.7	0.51	0.46	71.8
All Vehicles		3567	5.3	0.760	26.2	LOS B	42.0	305.0	0.71	0.67	62.0

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

MOVEMENT SUMMARY

Site: 3 [Huntingwood x Brabham_ Future_ AM]

Huntingwood Drive x Brabham Drive Intersection, Eastern Creek
Road Conditions: 2018 Existing
Traffic: 2036 AM Background
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brabham Drive (640m)											
1	L2	137	18.5	0.396	4.8	LOS A	3.1	24.1	0.48	0.46	53.6
2	T1	614	8.7	0.396	4.5	LOS A	3.1	24.1	0.49	0.50	55.1
3	R2	283	8.9	0.396	10.5	LOS A	3.0	22.9	0.51	0.59	57.2
Approach		1034	10.1	0.396	6.2	LOS A	3.1	24.1	0.49	0.52	55.9
East: Huntingwood Drive (1800m)											
4	L2	103	19.4	0.333	6.3	LOS A	1.5	12.7	0.63	0.77	56.6
5	T1	56	35.8	0.333	6.5	LOS A	1.5	12.7	0.63	0.77	56.9
6	R2	72	39.7	0.333	12.5	LOS A	1.5	12.7	0.63	0.77	56.7
Approach		231	29.7	0.333	8.2	LOS A	1.5	12.7	0.63	0.77	56.7
North: Brabham Drive (380m)											
7	L2	425	10.4	0.562	7.6	LOS A	5.3	39.9	0.79	0.77	56.3
8	T1	720	5.1	0.562	8.3	LOS A	5.3	39.9	0.81	0.82	54.1
9	R2	26	16.0	0.562	14.9	LOS B	5.2	38.0	0.81	0.84	51.7
Approach		1172	7.3	0.562	8.2	LOS A	5.3	39.9	0.80	0.80	55.3
West: Huntingwood Drive (360m)											
10	L2	41	53.8	0.322	7.5	LOS A	1.3	10.9	0.61	0.75	48.8
11	T1	106	19.8	0.322	6.4	LOS A	1.3	10.9	0.61	0.75	56.8
12	R2	75	23.9	0.322	12.3	LOS A	1.3	10.9	0.61	0.75	53.4
Approach		222	27.5	0.322	8.6	LOS A	1.3	10.9	0.61	0.75	55.1
All Vehicles		2658	12.0	0.562	7.5	LOS A	5.3	39.9	0.65	0.69	55.7

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

MOVEMENT SUMMARY

Site: 3 [Huntingwood x Brabham_ Future_ PM]

Huntingwood Drive x Brabham Drive Intersection, Eastern Creek
Road Conditions: 2018 Existing
Traffic: 2036 PM Background
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brabham Drive (640m)											
1	L2	129	21.1	0.540	7.4	LOS A	5.2	38.7	0.84	0.72	51.9
2	T1	782	4.4	0.540	7.3	LOS A	5.2	38.7	0.85	0.78	53.6
3	R2	132	12.0	0.540	14.1	LOS A	5.0	36.8	0.85	0.85	56.7
Approach		1043	7.5	0.540	8.2	LOS A	5.2	38.7	0.85	0.78	54.2
East: Huntingwood Drive (1800m)											
4	L2	299	4.6	0.854	10.9	LOS A	8.2	60.9	0.86	1.12	55.2
5	T1	186	6.2	0.854	10.8	LOS A	8.2	60.9	0.86	1.12	55.4
6	R2	256	9.1	0.854	16.6	LOS B	8.2	60.9	0.86	1.12	55.5
Approach		741	6.5	0.854	12.8	LOS A	8.2	60.9	0.86	1.12	55.3
North: Brabham Drive (380m)											
7	L2	89	28.2	0.343	5.5	LOS A	2.5	18.9	0.55	0.51	56.5
8	T1	720	6.0	0.343	5.2	LOS A	2.5	18.9	0.56	0.53	55.3
9	R2	18	23.5	0.343	11.6	LOS A	2.4	17.6	0.57	0.54	53.0
Approach		827	8.8	0.343	5.4	LOS A	2.5	18.9	0.56	0.52	55.5
West: Huntingwood Drive (360m)											
10	L2	51	22.9	0.318	7.3	LOS A	1.4	11.4	0.71	0.84	48.8
11	T1	52	12.2	0.318	6.9	LOS A	1.4	11.4	0.71	0.84	56.4
12	R2	89	11.8	0.318	12.7	LOS A	1.4	11.4	0.71	0.84	53.1
Approach		192	14.8	0.318	9.7	LOS A	1.4	11.4	0.71	0.84	53.8
All Vehicles		2803	8.1	0.854	8.7	LOS A	8.2	60.9	0.76	0.80	54.9

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

MOVEMENT SUMMARY

Site: 4 [Ferrers x Brabham x Peter Brock_ Future_ AM]

Ferrers Road x Brabham Drive x Peter Brock Drive, Eastern Creek
Road Conditions: 2018 Existing
Traffic: 2036 AM Background
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Peter Brock Drive (500m)											
5	T1	36	20.6	0.147	6.9	LOS A	0.7	6.1	0.68	0.79	50.6
6	R2	56	22.6	0.147	12.5	LOS A	0.7	6.1	0.68	0.79	49.4
Approach		92	21.8	0.147	10.3	LOS A	0.7	6.1	0.68	0.79	49.9
North: Brabham Drive (640m)											
7	L2	139	24.2	0.136	4.4	LOS A	0.8	6.6	0.27	0.44	52.1
9	R2	876	7.7	0.532	9.7	LOS A	5.0	37.4	0.33	0.57	54.7
Approach		1015	10.0	0.532	9.0	LOS A	5.0	37.4	0.32	0.56	54.5
West: Ferrers Road (820m)											
10	L2	942	8.0	0.356	4.0	LOS A	2.5	19.0	0.26	0.43	56.7
11	T1	66	7.9	0.356	3.8	LOS A	2.5	18.6	0.26	0.42	54.6
Approach		1008	8.0	0.356	3.9	LOS A	2.5	19.0	0.26	0.43	56.5
All Vehicles		2115	9.6	0.532	6.6	LOS A	5.0	37.4	0.31	0.50	55.2

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

MOVEMENT SUMMARY

Site: 4 [Ferrers x Brabham x Peter Brock_ Future_ PM]

Ferrers Road x Brabham Drive x Peter Brock Drive, Eastern Creek
Road Conditions: 2018 Existing
Traffic: 2036 PM Background
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Peter Brock Drive (500m)											
5	T1	86	7.3	0.460	15.3	LOS B	3.4	26.0	0.90	1.05	46.7
6	R2	139	15.9	0.460	21.2	LOS B	3.4	26.0	0.90	1.05	45.2
Approach		225	12.6	0.460	18.9	LOS B	3.4	26.0	0.90	1.05	45.8
North: Brabham Drive (640m)											
7	L2	45	7.0	0.039	3.8	LOS A	0.2	1.6	0.14	0.42	52.6
9	R2	1142	6.0	0.647	9.4	LOS A	8.3	61.0	0.24	0.56	55.0
Approach		1187	6.0	0.647	9.2	LOS A	8.3	61.0	0.24	0.56	54.9
West: Ferrers Road (820m)											
10	L2	959	6.0	0.387	4.4	LOS A	2.9	21.1	0.44	0.50	56.2
11	T1	24	13.0	0.387	4.4	LOS A	2.8	20.6	0.44	0.50	54.1
Approach		983	6.2	0.387	4.4	LOS A	2.9	21.1	0.44	0.50	56.1
All Vehicles		2396	6.7	0.647	8.2	LOS A	8.3	61.0	0.38	0.58	54.5

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

USER REPORT FOR SITE

Project: 0541m01_2020 Modelling

Template: Default Site User Report

Site: 5 [[s02] Horsley x Ferrers_ Future_ AM]

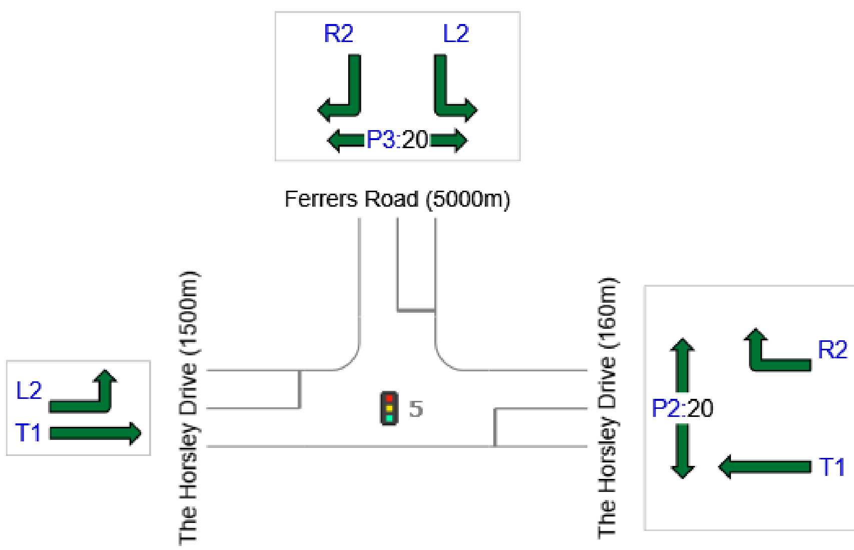
The Horsley Drive x Ferrers Road T-Intersection, Horsley Park
Road Conditions: 2018 Existing
Traffic: 2036 AM Future Baseline
Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 78 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Three Phase
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Input Volumes

Volume Display Method: Total and Veh

	R2	L2
Tot	36	495
LV	19	451
HV	17	44



HV	LV	Tot	
21	90	111	L2
278	1296	1574	T1

	Tot	LV	HV
R2	684	618	66
T1	1461	1087	374

	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: The Horsley Drive (160m)	2145	1705	440
N: Ferrers Road (5000m)	531	470	61
W: The Horsley Drive (1500m)	1685	1386	299
Total	4361	3561	800

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: The Horsley Drive (160m)													
Lane 1	769	25.6	1279	0.601	100	4.1	LOS A	12.5	106.6	Full	160	0.0	0.0
Lane 2	769	25.6	1279	0.601	100	4.1	LOS A	12.5	106.6	Full	160	0.0	100.0[8]
Lane 3	720	9.6	461[1]	1.562	100	548.3	LOS F	138.7	1051.5	Short	75	0.0	NA
Approach	2258	20.5		1.562		177.7	LOS F	138.7	1051.5				
North: Ferrers Road (5000m)													
Lane 1	521	8.9	989	0.527	100	18.9	LOS B	10.3	77.9	Short	55	0.0	NA
Lane 2	38	47.2	160	0.236	100	42.1	LOS C	1.4	13.8	Full	5000	0.0	0.0
Approach	559	11.5		0.527		20.5	LOS B	10.3	77.9				
West: The Horsley Drive (1500m)													
Lane 1	886	17.8	738	1.200	100	226.5	LOS F	106.3	858.1	Full	1500	0.0	0.0
Lane 2	888	17.7	740	1.200	100	225.5	LOS F	106.3	856.4	Full	1500	0.0	0.0
Approach	1774	17.7		1.200		226.0	LOS F	106.3	858.1				
Intersection	4591	18.3		1.562		177.2	LOS F	138.7	1051.5				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.

USER REPORT FOR SITE

Project: 0541m01_2020 Modelling

Template: Default Site User Report

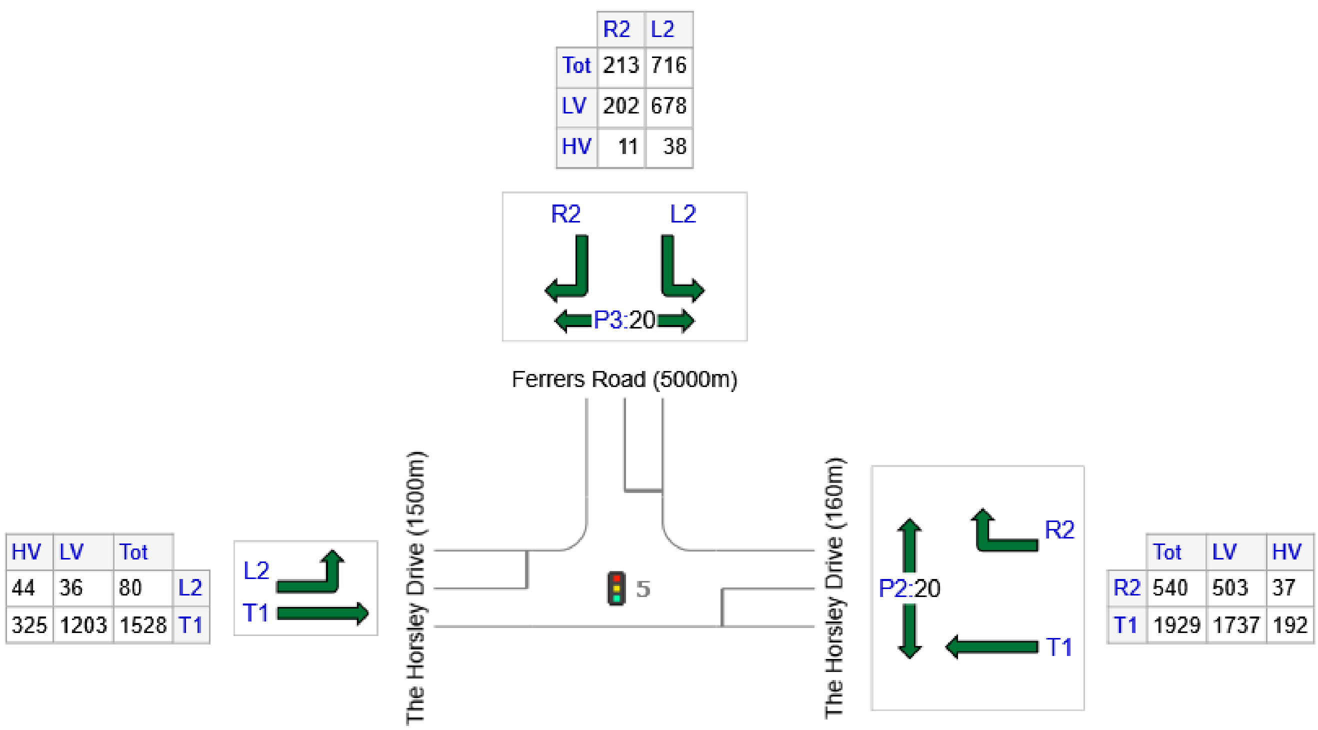
Site: 5 [[s02] Horsley x Ferrers_ Future_ PM]

The Horsley Drive x Ferrers Road T-Intersection, Horsley Park
Road Conditions: 2018 Existing
Traffic: 2036 PM Future Baseline
Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 65 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Three Phase
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Input Volumes

Volume Display Method: Total and Veh



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: The Horsley Drive (160m)	2469	2240	229
N: Ferrers Road (5000m)	929	880	49
W: The Horsley Drive (1500m)	1608	1239	369
Total	5006	4359	647

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: The Horsley Drive (160m)													
Lane 1	1142	10.0	1233	0.926	100	29.4	LOS C	47.3	359.1	Full	160	0.0	80.5
Lane 2	889	10.0	960 [1]	0.926	100	30.9	LOS C	32.2	244.8	Full	160	0.0	79.5 [8]
Lane 3	568	6.9	515	1.104	100	146.7	LOS F	47.9	355.3	Short	75	0.0	NA
Approach	2599	9.3		1.104		55.6	LOS D	47.9	359.1				
North: Ferrers Road (5000m)													
Lane 1	754	5.3	1244	0.606	100	12.6	LOS A	9.8	71.9	Short	55	0.0	NA
Lane 2	224	5.2	331	0.678	100	34.5	LOS C	7.2	52.3	Full	5000	0.0	0.0
Approach	978	5.3		0.678		17.6	LOS B	9.8	71.9				
West: The Horsley Drive (1500m)													
Lane 1	839	24.7	492	1.705	100	667.6	LOS F	174.2	1476.9	Full	1500	0.0	3.6
Lane 2	854	21.3	501	1.705	100	666.4	LOS F	177.0	1465.3	Full	1500	0.0	2.9
Approach	1693	22.9		1.705		667.0	LOS F	177.0	1476.9				
Intersection	5269	12.9		1.705		244.9	LOS F	177.0	1476.9				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.

MOVEMENT SUMMARY

Site: 5 [Horsley x Ferrers_ Future (with RMS Upgrade)_ AM]

The Horsley Drive x Ferrers Road
Road Conditions: The Horsley Drive Upgrades (RMS)
Traffic: 2036 AM Background
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: The Horsley Drive (750m)											
5	T1	1538	25.6	0.593	4.0	LOS A	12.4	106.0	0.45	0.41	64.6
6	R2	720	9.6	0.753	37.3	LOS C	13.9	105.3	0.97	0.90	54.0
Approach		2258	20.5	0.753	14.6	LOS B	13.9	106.0	0.62	0.57	58.4
North: Ferrers Road (5000m)											
7	L2	521	8.9	0.322	22.2	LOS B	6.8	51.1	0.71	0.76	56.2
9	R2	38	47.2	0.364	47.7	LOS D	1.5	15.2	0.99	0.73	54.3
Approach		559	11.5	0.364	23.9	LOS B	6.8	51.1	0.73	0.76	56.1
West: The Horsley Drive (1500m)											
10	L2	117	18.9	0.115	10.4	LOS A	1.4	11.1	0.39	0.67	60.1
11	T1	1657	17.7	0.745	23.4	LOS B	19.0	153.0	0.90	0.84	55.8
Approach		1774	17.7	0.745	22.5	LOS B	19.0	153.0	0.87	0.83	56.5
All Vehicles		4591	18.3	0.753	18.8	LOS B	19.0	153.0	0.73	0.69	57.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	21	34.3	LOS D	0.0	0.0	0.93	0.93
P22	East Stage 2	21	34.3	LOS D	0.0	0.0	0.93	0.93
P3	North Full Crossing	21	19.6	LOS B	0.0	0.0	0.70	0.70
P3S	North Slip/Bypass Lane Crossing	21	17.6	LOS B	0.0	0.0	0.66	0.66
P41	West Stage 1	21	17.6	LOS B	0.0	0.0	0.66	0.66
P42	West Stage 2	21	34.3	LOS D	0.0	0.0	0.93	0.93
All Pedestrians		126	26.3	LOS C			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 5 [Horsley x Ferrers_ Future (with RMS Upgrade)_ PM]

The Horsley Drive x Ferrers Road
Road Conditions: The Horsley Drive Upgrades (RMS)
Traffic: 2036 PM Background
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: The Horsley Drive (750m)											
5	T1	2031	10.0	0.792	9.2	LOS A	27.0	205.4	0.73	0.69	62.1
6	R2	568	6.9	0.755	41.0	LOS C	11.3	84.1	0.99	0.90	53.5
Approach		2599	9.3	0.792	16.1	LOS B	27.0	205.4	0.79	0.73	58.2
North: Ferrers Road (5000m)											
7	L2	754	5.3	0.442	22.6	LOS B	10.3	75.2	0.74	0.78	56.2
9	R2	224	5.2	0.834	48.5	LOS D	9.8	71.6	1.00	0.97	54.7
Approach		978	5.3	0.834	28.5	LOS C	10.3	75.2	0.80	0.83	55.8
West: The Horsley Drive (1500m)											
10	L2	84	55.0	0.093	10.0	LOS A	0.8	8.4	0.34	0.65	60.0
11	T1	1608	21.3	0.761	25.0	LOS B	19.1	158.4	0.92	0.87	55.2
Approach		1693	22.9	0.761	24.3	LOS B	19.1	158.4	0.89	0.86	55.8
All Vehicles		5269	12.9	0.834	21.1	LOS B	27.0	205.4	0.82	0.79	56.8

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	21	34.3	LOS D	0.0	0.0	0.93	0.93
P22	East Stage 2	21	34.3	LOS D	0.0	0.0	0.93	0.93
P3	North Full Crossing	21	20.3	LOS C	0.0	0.0	0.71	0.71
P3S	North Slip/Bypass Lane Crossing	21	18.2	LOS B	0.0	0.0	0.68	0.68
P41	West Stage 1	21	16.9	LOS B	0.0	0.0	0.65	0.65
P42	West Stage 2	21	32.4	LOS D	0.0	0.0	0.90	0.90
All Pedestrians		126	26.1	LOS C			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

C3:

Project Case

USER REPORT FOR SITE

Project: [0541] GWH_Doonside Road_Brabham Drive

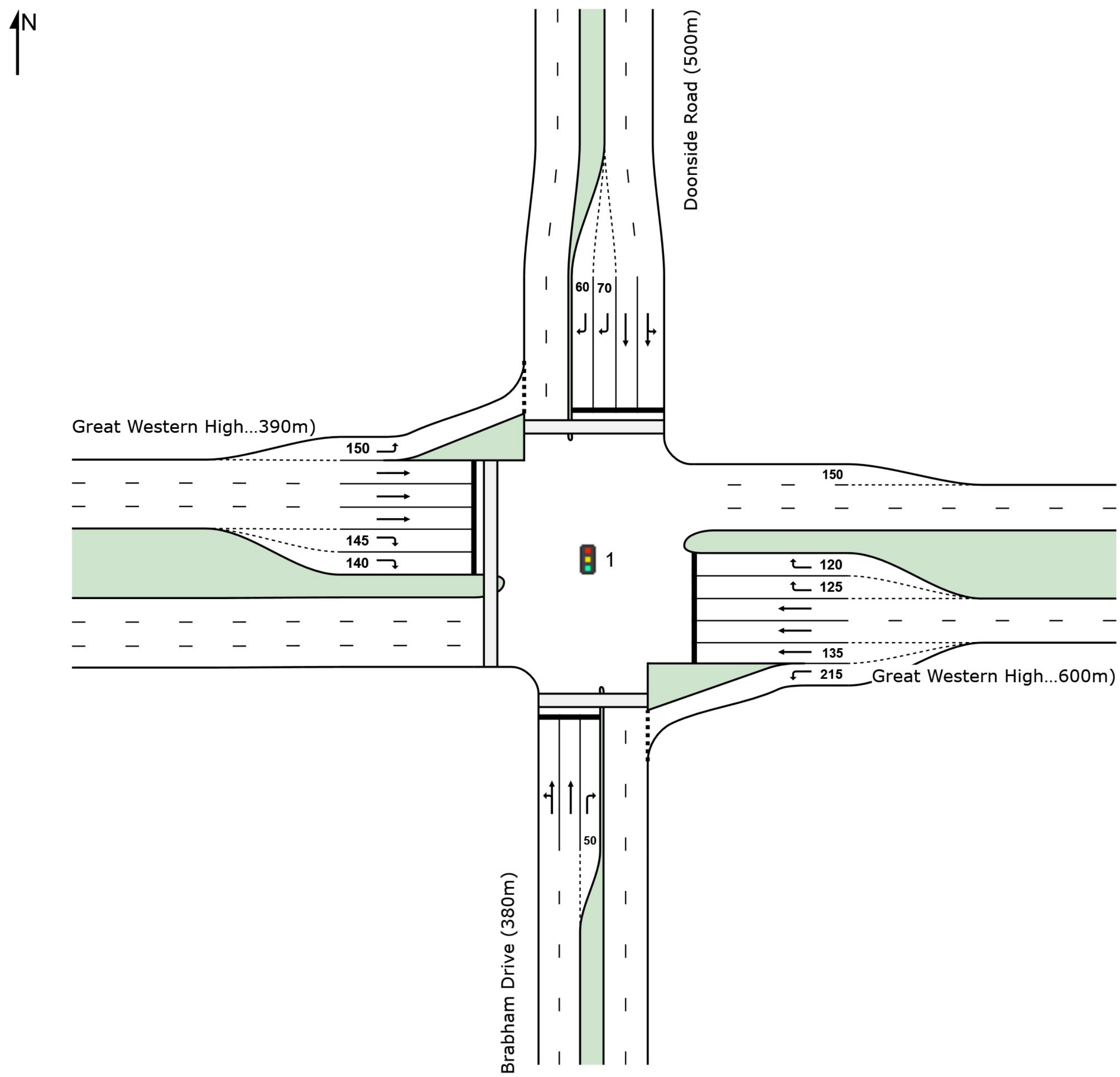
Template: Default Site User Report

Site: 1 [[2036 Future+Dev_AM] Doonside x GWH x Brabham]

Doonside Road x Great Western Highway x Brabham Drive Intersection, Eastern Creek
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Standard Diamond (VV1120) - Copy
Reference Phase: Phase A
Input Phase Sequence: G, G2, A, D, E, F2
Output Phase Sequence: G, G2, A, D, E, F2

Site Layout



Input Volumes

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brabham Drive (380m)													
Lane 1	358	19.6	507	0.705	100	38.4	LOS C	17.3	141.7	Full	380	0.0	0.0
Lane 2	290	9.2	411 [1]	0.705	100	39.4	LOS C	14.5	109.7	Full	380	0.0	0.0
Lane 3	179	12.4	182	0.983	100	99.8	LOS F	14.2	110.2	Short	50	0.0	NA
Approach	826	14.4		0.983		52.1	LOS D	17.3	141.7				
East: Great Western Highway (1600m)													
Lane 1	145	12.3	686	0.212	100	29.1	LOS C	5.2	40.3	Short	215	0.0	NA
Lane 2	163	10.3	181	0.900	100	71.2	LOS F	11.0	83.9	Short	135	0.0	NA
Lane 3	164	10.3	183	0.900	100	71.1	LOS F	11.1	84.7	Full	1600	0.0	0.0
Lane 4	164	10.3	183	0.900	100	71.1	LOS F	11.1	84.7	Full	1600	0.0	0.0
Lane 5	106	7.5	162	0.651	100	67.6	LOS E	6.3	47.2	Short	125	0.0	NA
Lane 6	106	7.5	162	0.651	100	67.6	LOS E	6.3	47.2	Short	120	0.0	NA
Approach	848	9.9		0.900		63.1	LOS E	11.1	84.7				
North: Doonside Road (500m)													
Lane 1	740	6.7	780	0.948	100	66.3	LOS E	54.5	403.0	Full	500	0.0	0.0
Lane 2	593	6.4	626 [1]	0.948	100	65.1	LOS E	42.2	311.7	Full	500	0.0	0.0
Lane 3	161	16.8	264	0.609	100	34.2	LOS C	4.9	39.4	Short	70	0.0	NA
Lane 4	159	16.8	261	0.609	100	34.2	LOS C	4.9	39.0	Short	60	0.0	NA
Approach	1653	8.5		0.948		59.6	LOS E	54.5	403.0				
West: Great Western Highway (390m)													
Lane 1	539	9.2	1243	0.434	100	12.5	LOS A	10.7	80.6	Short	150	0.0	NA
Lane 2	304	8.5	436	0.699	85 [6]	46.1	LOS D	16.6	124.5	Full	390	0.0	0.0
Lane 3	356	8.5	436	0.818	100	52.1	LOS D	21.4	160.5	Full	390	0.0	0.0
Lane 4	353	8.5	431	0.818	100	52.2	LOS D	21.2	159.0	Full	390	0.0	0.0
Lane 5	367	12.9	385	0.954	100	85.6	LOS F	27.9	217.1	Short	145	0.0	NA
Lane 6	367	12.9	385	0.954	100	85.6	LOS F	27.9	217.1	Short	140	0.0	NA
Approach	2286	10.1		0.954		52.7	LOS D	27.9	217.1				
Intersection	5614	10.2		0.983		56.2	LOS D	54.5	403.0				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

USER REPORT FOR SITE

Project: [0541] GWH_Doonside Road_Brabham Drive

Template: Default Site User Report

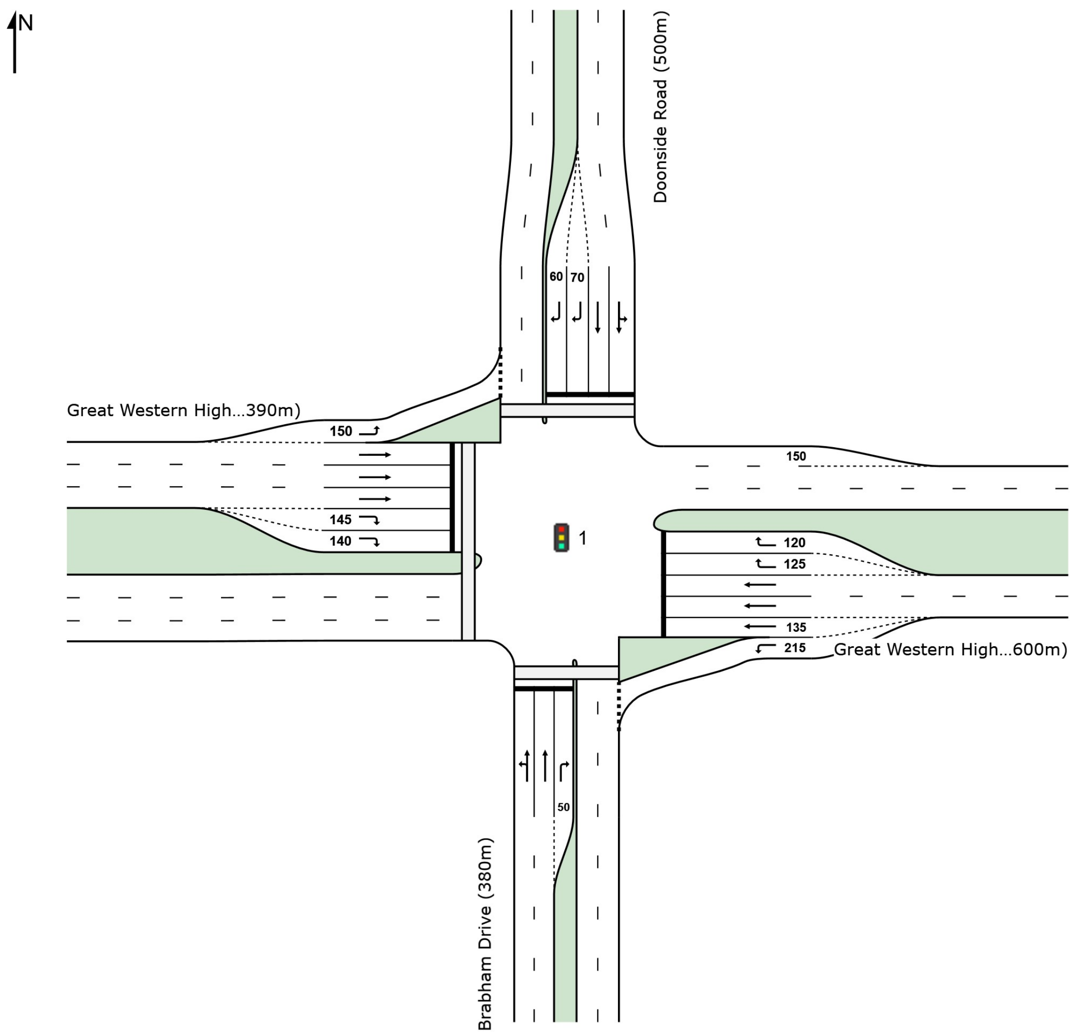
Site: 1 [[2036 Future+Dev_PM] Doonside x GWH x Brabham]

Doonside Road x Great Western Highway x Brabham Drive Intersection, Eastern Creek

Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 120 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Green Split Priority has been specified
Phase Sequence: Standard Diamond (VV1120)
Reference Phase: Phase A
Input Phase Sequence: G, G1*, G2*, A, B*, C*, D, D1*, D2*, E, F1*, F2*
Output Phase Sequence: G, G1*, A, D, D2*, E
(* Variable Phase)

Site Layout



Input Volumes

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Brabham Drive (380m)													
Lane 1	644	10.7	719	0.896	100	51.9	LOS D	41.5	317.3	Full	380	0.0	0.0
Lane 2	561	3.5	626[1]	0.896	100	49.0	LOS D	34.7	250.3	Full	380	0.0	0.0
Lane 3	122	4.3	222	0.551	100	60.5	LOS E	6.9	50.4	Short	50	0.0	NA
Approach	1327	7.1		0.896		51.5	LOS D	41.5	317.3				
East: Great Western Highway (1600m)													
Lane 1	120	7.9	1125	0.107	100	12.9	LOS A	2.1	15.7	Short	215	0.0	NA
Lane 2	341	6.1	371	0.918	100	68.1	LOS E	23.7	174.7	Short	135	0.0	NA
Lane 3	344	6.1	375	0.918	100	68.0	LOS E	23.9	176.3	Full	1600	0.0	0.0
Lane 4	344	6.1	375	0.918	100	68.0	LOS E	23.9	176.3	Full	1600	0.0	0.0
Lane 5	178	3.2	243	0.733	100	64.7	LOS E	10.6	76.5	Short	125	0.0	NA
Lane 6	178	3.2	243	0.733	100	64.7	LOS E	10.6	76.5	Short	120	0.0	NA
Approach	1506	5.6		0.918		62.8	LOS E	23.9	176.3				
North: Doonside Road (500m)													
Lane 1	424	6.7	780	0.544	100	32.8	LOS C	18.7	138.5	Full	500	0.0	0.0
Lane 2	379	5.6	696[1]	0.544	100	31.0	LOS C	16.8	123.2	Full	500	0.0	0.0
Lane 3	209	10.4	232	0.902	100	76.6	LOS F	14.2	108.6	Short	70	0.0	NA
Lane 4	207	10.4	229	0.902	100	76.8	LOS F	14.1	107.6	Short	60	0.0	NA
Approach	1219	7.6		0.902		47.2	LOS D	18.7	138.5				
West: Great Western Highway (390m)													
Lane 1	399	13.2	898	0.445	100	22.2	LOS B	13.1	101.9	Short	150	0.0	NA
Lane 2	181	4.2	288	0.631	85[6]	52.8	LOS D	10.2	74.1	Full	390	0.0	0.0
Lane 3	212	4.2	288	0.738	100	55.5	LOS D	12.5	90.7	Full	390	0.0	0.0
Lane 4	210	4.2	285	0.738	100	55.6	LOS D	12.4	89.8	Full	390	0.0	0.0
Lane 5	125	17.6	138	0.906	100	81.5	LOS F	8.6	69.5	Short	145	0.0	NA
Lane 6	125	17.6	138	0.906	100	81.5	LOS F	8.6	69.5	Short	140	0.0	NA
Approach	1254	9.7		0.906		49.7	LOS D	13.1	101.9				
Intersection	5306	7.4		0.918		53.3	LOS D	41.5	317.3				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

MOVEMENT SUMMARY

Site: 2 [Huntingwood x GWH_ Future + Dev_ AM]

Huntingwood Drive x Great Western Highway T-Intersection, Huntingwood
Road Conditions: 2018 Existing (Site access to/from Ferrers Road only)
Traffic: 2036 AM Background with Development
Signals - Fixed Time Isolated Cycle Time = 110 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Huntingwood Drive (1800m)											
1	L2	22	47.6	0.659	55.2	LOS D	6.5	55.9	1.00	0.85	50.4
3	R2	228	22.6	0.659	57.2	LOS E	6.8	56.8	1.00	0.84	45.2
Approach		251	24.8	0.659	57.0	LOS E	6.8	56.8	1.00	0.84	45.7
East: Great Western Highway (780m)											
4	L2	596	11.1	0.346	7.8	LOS A	0.0	0.0	0.00	0.60	73.1
5	T1	831	8.9	0.349	9.4	LOS A	10.0	75.5	0.49	0.43	73.6
Approach		1426	9.8	0.349	8.8	LOS A	10.0	75.5	0.29	0.50	73.3
West: Great Western Highway (1600m)											
11	T1	2043	7.1	0.709	6.6	LOS A	27.1	200.9	0.55	0.51	75.4
12	R2	47	17.8	0.395	63.1	LOS E	2.6	20.9	0.99	0.75	50.0
Approach		2091	7.3	0.709	7.9	LOS A	27.1	200.9	0.56	0.52	74.2
All Vehicles		3767	9.4	0.709	11.5	LOS A	27.1	200.9	0.48	0.53	70.7

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

MOVEMENT SUMMARY

Site: 2 [Huntingwood x GWH_ Future + Dev_ PM]

Huntingwood Drive x Great Western Highway T-Intersection, Huntingwood
Road Conditions: 2018 Existing (Site access to/from Ferrers Road only)
Traffic: 2036 PM Background with Development
Signals - Fixed Time Isolated   Cycle Time = 140 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Huntingwood Drive (1800m)											
1	L2	58	23.6	0.755	66.7	LOS E	21.8	163.8	0.98	0.92	48.6
3	R2	634	5.3	0.755	62.2	LOS E	22.4	163.7	0.98	0.89	44.5
Approach		692	6.8	0.755	62.6	LOS E	22.4	163.8	0.98	0.89	44.9
East: Great Western Highway (780m)											
4	L2	179	20.0	0.110	7.9	LOS A	0.0	0.0	0.00	0.59	72.6
5	T1	1626	4.3	0.772	23.8	LOS B	43.0	312.1	0.82	0.75	65.5
Approach		1805	5.9	0.772	22.2	LOS B	43.0	312.1	0.73	0.74	66.2
West: Great Western Highway (1600m)											
11	T1	1098	3.7	0.439	12.1	LOS A	17.6	127.4	0.52	0.47	71.9
12	R2	8	25.0	0.125	81.3	LOS F	0.6	5.0	0.99	0.67	46.5
Approach		1106	3.9	0.439	12.7	LOS A	17.6	127.4	0.52	0.47	71.5
All Vehicles		3603	5.5	0.772	27.0	LOS B	43.0	312.1	0.72	0.69	61.5

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

MOVEMENT SUMMARY

Site: 3 [Huntingwood x Brabham_ Future + Dev_ AM]

Huntingwood Drive x Brabham Drive Intersection, Eastern Creek
Road Conditions: 2018 Existing (Site access to/from Ferrers Road only)
Traffic: 2036 AM Background with Development
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brabham Drive (640m)											
1	L2	137	18.5	0.426	4.8	LOS A	3.6	27.6	0.51	0.47	53.5
2	T1	671	10.4	0.426	4.6	LOS A	3.6	27.6	0.52	0.51	55.0
3	R2	292	9.7	0.426	10.6	LOS A	3.4	26.2	0.54	0.59	57.1
Approach		1099	11.2	0.426	6.2	LOS A	3.6	27.6	0.52	0.52	55.8
East: Huntingwood Drive (1800m)											
4	L2	139	21.2	0.473	8.1	LOS A	2.5	21.8	0.77	0.91	56.1
5	T1	56	35.8	0.473	8.4	LOS A	2.5	21.8	0.77	0.91	56.4
6	R2	72	39.7	0.473	14.4	LOS A	2.5	21.8	0.77	0.91	56.2
Approach		266	29.2	0.473	9.9	LOS A	2.5	21.8	0.77	0.91	56.2
North: Brabham Drive (380m)											
7	L2	425	10.4	0.694	10.0	LOS A	8.9	68.2	0.89	0.92	55.6
8	T1	947	10.6	0.694	11.2	LOS A	8.9	68.2	0.90	0.97	52.1
9	R2	26	16.0	0.694	18.0	LOS B	8.5	64.7	0.91	1.00	48.9
Approach		1399	10.6	0.694	11.0	LOS A	8.9	68.2	0.90	0.95	53.7
West: Huntingwood Drive (360m)											
10	L2	41	53.8	0.338	7.9	LOS A	1.4	11.9	0.64	0.78	48.6
11	T1	106	19.8	0.338	6.7	LOS A	1.4	11.9	0.64	0.78	56.7
12	R2	75	23.9	0.338	12.6	LOS A	1.4	11.9	0.64	0.78	53.3
Approach		222	27.5	0.338	8.9	LOS A	1.4	11.9	0.64	0.78	55.0
All Vehicles		2986	13.7	0.694	9.0	LOS A	8.9	68.2	0.73	0.78	54.9

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

MOVEMENT SUMMARY

Site: 3 [Huntingwood x Brabham_ Future + Dev_ PM]

Huntingwood Drive x Brabham Drive Intersection, Eastern Creek
Road Conditions: 2018 Existing (Site access to/from Ferrers Road only)
Traffic: 2036 PM Background with Development
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Brabham Drive (640m)											
1	L2	129	21.1	0.670	9.5	LOS A	8.4	64.2	0.93	0.90	51.3
2	T1	966	8.9	0.670	9.6	LOS A	8.4	64.2	0.94	0.93	52.6
3	R2	161	15.0	0.670	16.7	LOS B	7.9	60.2	0.94	0.98	56.0
Approach		1257	11.0	0.670	10.5	LOS A	8.4	64.2	0.94	0.93	53.3
East: Huntingwood Drive (1800m)											
4	L2	306	5.2	0.898	13.3	LOS A	10.1	75.1	0.90	1.23	54.4
5	T1	186	6.2	0.898	13.2	LOS A	10.1	75.1	0.90	1.23	54.5
6	R2	256	9.1	0.898	19.0	LOS B	10.1	75.1	0.90	1.23	54.6
Approach		748	6.8	0.898	15.2	LOS B	10.1	75.1	0.90	1.23	54.5
North: Brabham Drive (380m)											
7	L2	89	28.2	0.378	5.8	LOS A	2.9	22.0	0.61	0.53	56.4
8	T1	766	7.3	0.378	5.5	LOS A	2.9	22.0	0.62	0.55	55.0
9	R2	18	23.5	0.378	11.9	LOS A	2.7	20.4	0.63	0.57	52.6
Approach		874	9.8	0.378	5.6	LOS A	2.9	22.0	0.62	0.55	55.2
West: Huntingwood Drive (360m)											
10	L2	51	22.9	0.390	8.8	LOS A	2.0	15.4	0.79	0.92	47.8
11	T1	52	12.2	0.390	8.3	LOS A	2.0	15.4	0.79	0.92	55.9
12	R2	89	11.8	0.390	14.1	LOS A	2.0	15.4	0.79	0.92	52.2
Approach		192	14.8	0.390	11.1	LOS A	2.0	15.4	0.79	0.92	53.1
All Vehicles		3071	9.8	0.898	10.3	LOS A	10.1	75.1	0.83	0.90	54.2

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

MOVEMENT SUMMARY

Site: 4 [Ferrers x Brabham x Peter Brock_ Future + Dev_ AM]

Ferrers Road x Brabham Drive x Peter Brock Drive, Eastern Creek
Road Conditions: 2018 Existing (Site access to/from Ferrers Road only)
Traffic: 2036 AM Background with Development
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Peter Brock Drive (500m)											
5	T1	58	21.8	0.294	13.1	LOS A	1.8	15.0	0.89	0.94	40.6
6	R2	56	22.6	0.294	18.6	LOS B	1.8	15.0	0.89	0.94	46.5
Approach		114	22.2	0.294	15.8	LOS B	1.8	15.0	0.89	0.94	43.9
North: Brabham Drive (640m)											
7	L2	139	24.2	0.138	4.4	LOS A	0.8	6.7	0.28	0.45	52.1
9	R2	1140	12.4	0.710	10.1	LOS A	9.3	71.8	0.47	0.56	50.4
Approach		1279	13.7	0.710	9.4	LOS A	9.3	71.8	0.45	0.54	50.6
West: Ferrers Road (250m)											
10	L2	1007	9.3	0.384	4.0	LOS A	3.0	22.8	0.28	0.43	54.6
11	T1	72	10.3	0.384	3.9	LOS A	2.9	22.2	0.29	0.42	51.1
Approach		1079	9.4	0.384	4.0	LOS A	3.0	22.8	0.28	0.43	54.4
All Vehicles		2472	12.2	0.710	7.4	LOS A	9.3	71.8	0.40	0.51	51.7

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

MOVEMENT SUMMARY

Site: 4 [Ferrers x Brabham x Peter Brock_ Future + Dev_ PM]

Ferrers Road x Brabham Drive x Peter Brock Drive, Eastern Creek
Road Conditions: 2018 Existing (Site access to/from Ferrers Road only)
Traffic: 2036 PM Background with Development
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Peter Brock Drive (500m)											
5	T1	91	8.1	0.563	21.7	LOS B	4.8	37.3	0.97	1.17	36.7
6	R2	142	15.6	0.563	27.6	LOS B	4.8	37.3	0.97	1.17	42.3
Approach		233	12.7	0.563	25.3	LOS B	4.8	37.3	0.97	1.17	40.5
North: Brabham Drive (640m)											
7	L2	45	7.0	0.041	3.9	LOS A	0.2	1.7	0.20	0.42	52.4
9	R2	1196	7.0	0.702	9.7	LOS A	10.2	75.6	0.38	0.54	51.3
Approach		1241	7.0	0.702	9.5	LOS A	10.2	75.6	0.38	0.54	51.4
West: Ferrers Road (250m)											
10	L2	1173	10.0	0.488	4.6	LOS A	4.1	31.3	0.50	0.52	53.7
11	T1	42	20.0	0.488	4.7	LOS A	4.0	30.5	0.51	0.52	50.0
Approach		1215	10.3	0.488	4.6	LOS A	4.1	31.3	0.50	0.52	53.5
All Vehicles		2688	9.0	0.702	8.6	LOS A	10.2	75.6	0.48	0.58	50.9

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

USER REPORT FOR SITE

Project: 0541m01_2020 Modelling

Template: Default Site User Report

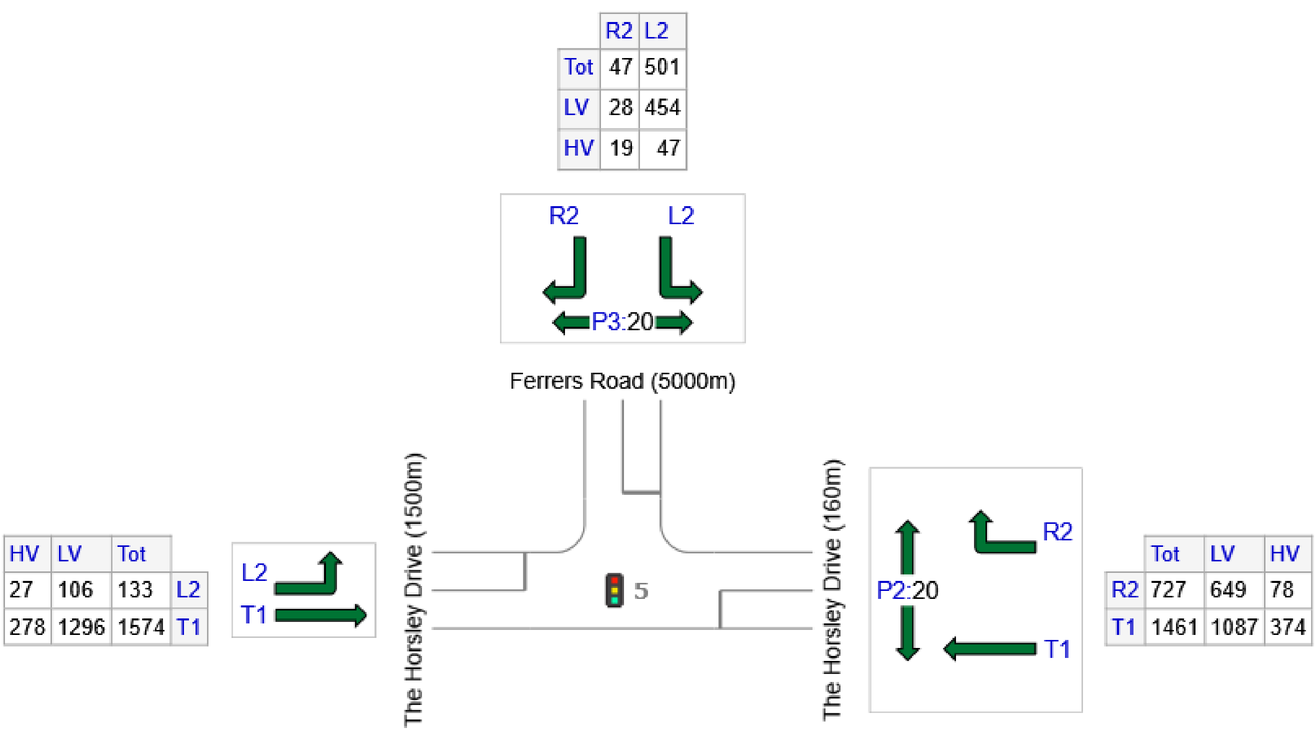
Site: 5 [[s03] Horsley x Ferrers_ Future + Dev_AM]

The Horsley Drive x Ferrers Road T-Intersection, Horsley Park
Road Conditions: 2018 Existing
Traffic: 2036 AM Future Baseline with Development
Site Category: (None)
Signals - Fixed Time Isolated   Cycle Time = 78 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Three Phase
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Input Volumes

Volume Display Method: Total and Veh



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: The Horsley Drive (160m)	2188	1736	452
N: Ferrers Road (5000m)	548	482	66
W: The Horsley Drive (1500m)	1707	1402	305
Total	4443	3620	823

Lane Use and Performance														
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: The Horsley Drive (160m)													
Lane 1	769	25.6	1279	0.601	100	4.1	LOS A	12.5	106.6	Full	160	0.0	0.0
Lane 2	769	25.6	1279	0.601	100	4.1	LOS A	12.5	106.6	Full	160	0.0	100.0 [8]
Lane 3	765	10.7	457 [1]	1.673	100	646.8	LOS F	160.4	1226.2	Short	75	0.0	NA
Approach	2303	20.7		1.673		217.7	LOS F	160.4	1226.2				
North: Ferrers Road (5000m)													
Lane 1	527	9.4	986	0.535	100	19.0	LOS B	10.5	79.2	Short	55	0.0	NA
Lane 2	49	40.4	166	0.297	100	42.3	LOS C	1.8	17.4	Full	5000	0.0	0.0
Approach	577	12.0		0.535		21.0	LOS B	10.5	79.2				
West: The Horsley Drive (1500m)													
Lane 1	897	18.1	737	1.216	100	240.7	LOS F	111.4	900.8	Full	1500	0.0	0.0
Lane 2	900	17.7	740	1.216	100	239.6	LOS F	111.5	898.8	Full	1500	0.0	0.0
Approach	1797	17.9		1.216		240.2	LOS F	111.5	900.8				
Intersection	4677	18.5		1.673		202.1	LOS F	160.4	1226.2				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.

USER REPORT FOR SITE

Project: 0541m01_2020 Modelling

Template: Default Site User Report

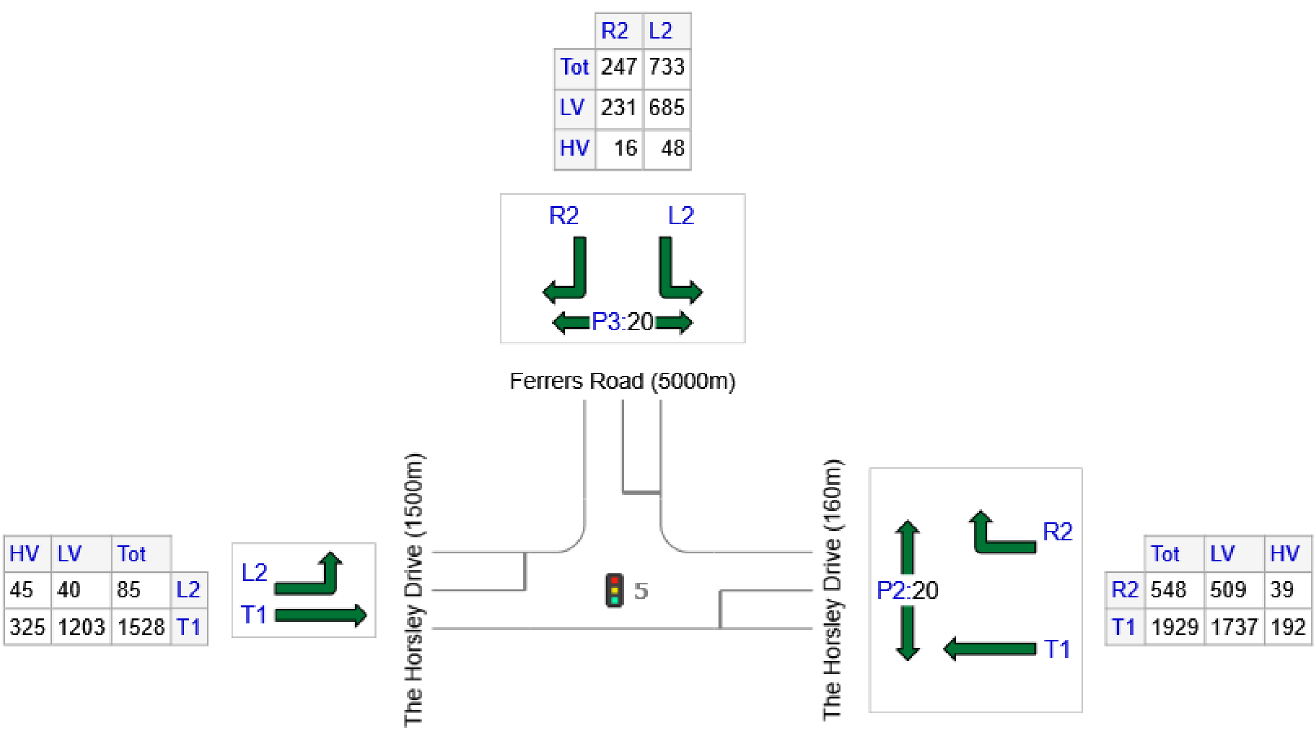
Site: 5 [[s03] Horsley x Ferrers_ Future + Dev_PM]

The Horsley Drive x Ferrers Road T-Intersection, Horsley Park
Road Conditions: 2018 Existing
Traffic: 2036 PM Future Baseline with Development
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 65 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Three Phase
Reference Phase: Phase B
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Input Volumes

Volume Display Method: Total and Veh



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
E: The Horsley Drive (160m)	2477	2246	231
N: Ferrers Road (5000m)	980	916	64
W: The Horsley Drive (1500m)	1613	1243	370
Total	5070	4405	665

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: The Horsley Drive (160m)													
Lane 1	1140	10.0	1233	0.925	100	29.1	LOS C	47.0	356.8	Full	160	0.0	79.9
Lane 2	890	10.0	963[1]	0.925	100	30.6	LOS C	32.1	244.0	Full	160	0.0	87.0[8]
Lane 3	577	7.1	514	1.122	100	161.3	LOS F	51.6	383.4	Short	75	0.0	NA
Approach	2607	9.3		1.122		58.8	LOS E	51.6	383.4				
North: Ferrers Road (5000m)													
Lane 1	772	6.5	1234	0.625	100	12.8	LOS A	10.5	77.4	Short	55	0.0	NA
Lane 2	260	6.5	328	0.793	100	37.9	LOS C	9.0	66.5	Full	5000	0.0	0.0
Approach	1032	6.5		0.793		19.1	LOS B	10.5	77.4				
West: The Horsley Drive (1500m)													
Lane 1	841	24.6	492	1.710	100	672.1	LOS F	175.3	1486.5	Full	1500	0.0	4.2
Lane 2	856	21.3	501	1.710	100	670.8	LOS F	178.2	1474.4	Full	1500	0.0	3.5
Approach	1698	22.9		1.710		671.5	LOS F	178.2	1486.5				
Intersection	5337	13.1		1.710		246.1	LOS F	178.2	1486.5				

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

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.

MOVEMENT SUMMARY

Site: 5 [Horsley x Ferrers_ Future + Dev (RMS Upgrade)_ AM]

The Horsley Drive x Ferrers Road
Road Conditions: The Horsley Drive Upgrades (RMS)
Traffic: 2036 AM Background with Development (Site access to/from Ferrers Road only)
Signals - Fixed Time Isolated   Cycle Time = 80 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: The Horsley Drive (750m)											
5	T1	1538	25.6	0.593	4.0	LOS A	12.4	106.0	0.45	0.41	64.6
6	R2	765	10.7	0.771	37.4	LOS C	14.9	114.3	0.98	0.91	54.0
Approach		2303	20.7	0.771	15.1	LOS B	14.9	114.3	0.63	0.58	58.2
North: Ferrers Road (5000m)											
7	L2	527	9.4	0.318	21.5	LOS B	6.7	50.9	0.69	0.76	56.3
9	R2	49	40.4	0.458	48.0	LOS D	2.0	19.2	1.00	0.75	54.3
Approach		577	12.0	0.458	23.8	LOS B	6.7	50.9	0.72	0.75	56.1
West: The Horsley Drive (1500m)											
10	L2	140	20.3	0.142	10.9	LOS A	1.7	14.4	0.41	0.68	60.1
11	T1	1657	17.7	0.769	25.3	LOS B	19.9	160.5	0.92	0.88	55.1
Approach		1797	17.9	0.769	24.2	LOS B	19.9	160.5	0.88	0.86	56.0
All Vehicles		4677	18.5	0.771	19.7	LOS B	19.9	160.5	0.74	0.71	57.1

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	21	34.3	LOS D	0.0	0.0	0.93	0.93
P22	East Stage 2	21	34.3	LOS D	0.0	0.0	0.93	0.93
P3	North Full Crossing	21	20.3	LOS C	0.0	0.0	0.71	0.71
P3S	North Slip/Bypass Lane Crossing	21	18.2	LOS B	0.0	0.0	0.68	0.68
P41	West Stage 1	21	16.9	LOS B	0.0	0.0	0.65	0.65
P42	West Stage 2	21	34.3	LOS D	0.0	0.0	0.93	0.93
All Pedestrians		126	26.4	LOS C			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 5 [Horsley x Ferrers_ Future + Dev (RMS Upgrade)_ PM]

The Horsley Drive x Ferrers Road
Road Conditions: The Horsley Drive Upgrades (RMS)
Traffic: 2036 PM Background with Development (Site access to/from Ferrers Road only)
Signals - Fixed Time Isolated   Cycle Time = 110 seconds (Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: The Horsley Drive (750m)											
5	T1	2031	10.0	0.841	12.2	LOS A	41.9	318.7	0.71	0.67	60.7
6	R2	577	7.1	0.718	49.7	LOS D	14.8	110.1	0.98	0.86	52.3
Approach		2607	9.3	0.841	20.5	LOS B	41.9	318.7	0.77	0.71	56.9
North: Ferrers Road (5000m)											
7	L2	772	6.5	0.439	27.5	LOS B	14.0	103.3	0.73	0.78	55.4
9	R2	261	6.5	0.851	61.9	LOS E	15.4	113.6	1.00	0.95	53.0
Approach		1033	6.5	0.851	36.2	LOS C	15.4	113.6	0.80	0.83	54.7
West: The Horsley Drive (1500m)											
10	L2	89	52.9	0.095	10.1	LOS A	1.1	10.8	0.29	0.64	60.0
11	T1	1608	21.3	0.730	28.5	LOS C	24.2	200.3	0.88	0.81	53.9
Approach		1698	22.9	0.730	27.6	LOS B	24.2	200.3	0.85	0.80	54.7
All Vehicles		5338	13.1	0.851	25.8	LOS B	41.9	318.7	0.80	0.76	55.6

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P21	East Stage 1	21	45.5	LOS E	0.1	0.1	0.91	0.91
P22	East Stage 2	21	43.7	LOS E	0.1	0.1	0.89	0.89
P3	North Full Crossing	21	23.6	LOS C	0.0	0.0	0.66	0.66
P3S	North Slip/Bypass Lane Crossing	21	21.7	LOS C	0.0	0.0	0.63	0.63
P41	West Stage 1	21	20.4	LOS C	0.0	0.0	0.61	0.61
P42	West Stage 2	21	41.1	LOS E	0.1	0.1	0.86	0.86
All Pedestrians		126	32.7	LOS D			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 6 [Site x Ferrers_ Future + Dev_ AM]

Site Access x Ferrers Road Intersection, Eastern Creek
Road Conditions: Existing 2018 (plus Proposed Site access to/from Ferrers Road only)
Traffic: 2036 AM Background with Development
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Ferrers Road (250m)											
8	T1	913	8.2	0.768	4.1	LOS A	15.5	120.1	0.34	0.40	55.2
9	R2	285	28.0	0.768	9.0	LOS A	15.5	120.1	0.34	0.40	51.3
Approach		1198	12.9	0.768	5.3	LOS A	15.5	120.1	0.34	0.40	54.5
North: Site Access											
10	L2	72	27.9	0.283	13.8	LOS A	2.0	17.4	0.98	0.99	38.7
12	R2	17	31.3	0.283	18.5	LOS B	2.0	17.4	0.98	0.99	48.5
Approach		88	28.6	0.283	14.7	LOS B	2.0	17.4	0.98	0.99	41.3
West: Ferrers Road (1000m)											
1	L2	68	27.7	1.017	50.7	LOS D	53.2	402.1	1.00	1.96	38.2
2	T1	1008	8.0	1.017	49.7	LOS D	53.2	402.1	1.00	1.96	36.1
Approach		1077	9.3	1.017	49.8	LOS D	53.2	402.1	1.00	1.96	36.3
All Vehicles		2363	11.8	1.017	25.9	LOS B	53.2	402.1	0.67	1.13	43.5

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

MOVEMENT SUMMARY

Site: 6 [Site x Ferrers_ Future + Dev_ PM]

Site Access x Ferrers Road Intersection, Eastern Creek
Road Condition: Existing 2018 (plus Proposed Site access to/from Ferrers Road only)
Traffic: 2036 PM Background with Development
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Ferrers Road (820m)											
8	T1	1231	6.1	0.884	5.4	LOS A	23.9	177.4	0.88	0.45	53.9
9	R2	58	27.3	0.884	10.6	LOS A	23.9	177.4	0.88	0.45	46.4
Approach		1288	7.0	0.884	5.7	LOS A	23.9	177.4	0.88	0.45	53.6
North: Site Access											
10	L2	232	27.7	0.674	25.6	LOS B	7.0	60.5	1.00	1.27	33.2
12	R2	56	28.3	0.674	30.1	LOS C	7.0	60.5	1.00	1.27	44.0
Approach		287	27.8	0.674	26.5	LOS B	7.0	60.5	1.00	1.27	36.1
West: Ferrers Road (1000m)											
1	L2	14	30.8	0.692	5.0	LOS A	9.5	70.3	0.50	0.43	52.3
2	T1	983	6.2	0.692	4.8	LOS A	9.5	70.3	0.50	0.43	54.9
Approach		997	6.5	0.692	4.8	LOS A	9.5	70.3	0.50	0.43	54.9
All Vehicles		2573	9.2	0.884	7.7	LOS A	23.9	177.4	0.74	0.54	52.0

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