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Amendment C192 & C193 Greater Shepparton Planning Scheme - Panel Hearing

Expert //	Reece Humphreys
Client //	Greater Shepparton Council
Instructed by //	Mark Bartley, HWL Ebsworth
Reference //	V126570
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Amendment C192 & C193

Greater Shepparton Planning Scheme

Panel Hearing

Issue: A 17/07/17

Client: Greater Shepparton Council
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GTA Consultants Office: VIC

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1. Introduction

1.1 Background

Amendment C192 of the City of Greater Shepparton Planning Scheme seeks to update the Municipal Strategic Statement and Activity Centre Zone to implement the recommendations of the Commercial Activity Centre Strategy, November 2015. Concurrently, the Greater Shepparton City Council has exhibited Amendment C193 and Planning Permit Application 2016-269 which is to be heard at the same hearing.

Both amendments will result in an increase in retail floor area in the City of Shepparton and have the potential to impact the transport network, at both a broader and local level.

I have been instructed by HWL Ebsworth Lawyers in July 2017 to consider and address the traffic and transport matters associated with the two Amendments and planning permit application, and to provide and prepare an expert evidence report on those issues for presentation at the upcoming hearing.

In preparing this report, I have relied upon information prepared by the City of Greater Shepparton, VicRoads and previous reports prepared by our office. My report is an independent traffic and transport evidence report and is not a peer review of the previous work undertaken by others.

1.2 Expert Witness Details

Reece Humphreys BE (Civil)
Director – GTA Consultants
L25, 55 Collins Street, Melbourne
Areas of Expertise: Traffic Engineering, Modelling & Transport Planning

I have a Bachelor of Engineering degree and over fifteen years' experience spanning transport planning, modelling, traffic engineering, land use development and transport impact assessments. This experience covers a mixture of tasks ranging from strategic transport planning and analysis of projects in Melbourne and most major cities across Australia through to traffic and transport engineering advice. I have completed a number of projects for VicRoads and the NSW RMS including a series of large regional transport models, strategic corridor modelling, strategic transport planning advice and independent auditing and peer reviewing. More recently, I have assisted with planning approval for a number of large scale rezoning and development applications as well as advisory committees in Melbourne.

I have held numerous committee positions in the transport field and currently serve as a committee member on the AITPM, convening the 2017 National Transport Conference.

Further details of my experience are provided in Appendix A.

1.3 Relationship to Applicant

I have no ongoing private or business relationship with the applicant, and have been retained to provide expert witness services at the hearing for a mutually agreed fee. GTA have previously provided advice to Council on the Shepparton Bypass and Ford Road Upgrade.

1.4 Instructions

I have been engaged to prepare and present expert traffic and transport evidence as part of the Panel Hearing to consider the two Amendments and planning permit application. Prior to preparing this evidence I was briefed by HWL Ebsworth regarding the proposal via both oral and written instructions.

This evidence has been prepared having consideration of the following matters:

i Whether or not there are any fundamental traffic and transport reasons for Amendment C192 to proceed
ii Whether or not there are any fundamental traffic and transport reasons for Amendment C193 to proceed
iii The traffic and transport impact of Permit Application No. 2016-269

1.5 References

In preparing this evidence, reference has been made to the following:

- City of Greater Shepparton Planning Scheme
- Australian Standard/ New Zealand Standard, Parking Facilities (AS2890)
- Materials exhibited for amendment C192
- Material exhibited for amendment C193
- plans prepared as part of the exhibited documents
- traffic and car parking surveys undertaken by GTA as referenced in the context of this report
- various technical data as referenced in this report
- an inspection of the site and its surrounds
- other documents as nominated.

1.6 Tests, Experiments & Assistance

In preparing this evidence, I received assistance from the following people:

Alex Blackett	Associate	BE (Civil)
Leonardo Ortiz	Senior Consultant – Transport Modelling	MA (Economics).

2. Shepparton Transport Network

2.1 Overview

Population growth in the City of Shepparton has resulted in an increase in traffic volumes on the network, both in terms of private and commercial vehicle movements. As a thriving regional city with a strong economy that provides an attractive lifestyle opportunity, it is important that the transport network has the ability to respond to land use changes into the future.

The Shepparton transport network is defined by the Goulburn River, the railway line and the Central Business District (CBD) grid layout. Two major north-south and east-west arterial roads intersect within the Shepparton CBD, namely the Goulburn Valley Highway and the Midland Highway, respectively. There are a number of sub-arterial roads that also intersect within the Shepparton township. Historically, these intersecting arterial roads brought passer-by visitors and activation of the township.

There is a bicycle network that has been identified in past work for the Greater Shepparton City Council, as well as several public bus routes and state bus routes.

Shepparton also has a state train line that passes through it which provides the town with freight uses and provides another mode to get to Melbourne and northern parts of the state.

2.2 Key Roads – Amendment C193

The following is a description of the key roads that relevant to Amendment C193 and are described in the following sub sections.

2.2.1 Goulburn Valley Highway (Numurkah Road)

Goulburn Valley Highway functions as a primary arterial road (under VicRoads control) and is located within a Road Zone (Category 1) in the Greater Shepparton Planning Scheme.

South of Doody Street it is a divided two-way road aligned in a north-south direction and configured with two-lane, nine metre wide carriageways in both directions. The road reserve is approximately 80m wide and contains service roads in either direction for the majority of its length, except proximate to intersections. Between Doody Street and Ford Road (to the north) it transitions to an undivided road and North of Ford Road, Goulburn Valley Highway is an undivided two lane road (one lane in each direction) set within a 50m wide roads reserve.

In the vicinity of Ford Road, Goulburn Valley Highway carries in the order of 13,900[1] vehicles per day.

2.2.2 Ford Road

Ford Road functions as a local access road in the section fronting 10 Ford Road and 221-229 Numurkah Road, controlled by Council. It is a two-way road aligned in an east-west direction and configured with a two-lane, 7.5 metre wide carriageway set within a 40 metre wide road reserve (approximately). Ford Road carries approximately 3,000 vehicles per day[1].

[1] Based on Peak hour traffic counts undertaken in July 2016 and assuming a peak to daily ratio of 8%

2.2.3 Wanganui Road

Wanganui Road functions as a secondary arterial road (under VicRoads control) and is located within a Road Zone (Category 2) in the Greater Shepparton Planning Scheme. It is a two-way road aligned in an east-west direction and configured with a two-lane, 7.5 metre wide carriageway set within a 20 metre wide road reserve (approximately). Wanganui Road carries approximately 1,900 vehicles per day[1].

2.3 Shepparton Transport Model – Amendment C192

The recommendations of the Commercial Activity Centres Strategy include an increase in retail and commercial land use changes in Greater Shepparton, which will have the potential to change traffic patterns across the network. In order to test the suitability of these increases on the broader transport network, the forecasted floor space growth has been assessed using the Shepparton Strategic Transport Model. The strategic transport model was developed for the Shepparton Bypass by consultants AECOM, and GTA has obtained a copy of this model for this assessment.

A strategic model is a tool used to forecast travel demand within a given period under certain circumstances, i.e. road network, public transport, tolls or other transport associated costs. The travel demand is converted to traffic forecasts that are distributed across the transport network.

Strategic models are generally used to evaluate the implementation of major transport infrastructure projects that might affect the traffic behaviour of an area, to assess the response of the users to infrastructure schemes and to evaluate significant changes in land use that might affect the level of trip production and/or attraction of a certain area, among others.

The Shepparton Strategic Transport Model includes forecasted scenarios for the years 2011, 2016, 2021, 2031 and 2041 with road networks that reflect mainly to two different sets of network cases:

- a Business As Usual (BAU) case reflecting the existing transport network and forecast growth in line with government projections, and
- the proposed Shepparton Bypass (Stage 1) with forecast growth in line with government projections.

For the assessment undertaken as part of this panel hearing, an evaluation of the increase in floor area as a result of Amendment C192 has been considered. The results of the future year assessments are discussed in more detail in Section 4.

2.3.1 Model Suitability

In 2016, the Greater Shepparton City Council commissioned AECOM to update the Shepparton Strategic Transport Model. GTA has validated that the model version being used for this assessment effectively replicates the traffic volumes reported by AECOM in the Demand Forecast and Economic Evaluation Report[2] in all relevant scenarios for the purpose of this assessment.

Additionally, it was verified that the extent of the recommendations contained within the Commercial Activity Centre Strategy are reasonably covered by the area represented in the Strategic Model, i.e. the City of Greater Shepparton.

[1] Based on Peak hour traffic counts undertaken in July 2016 and assuming a peak to daily ratio of 8%
[2] AECOM, 2016, Shepparton Bypass Strategic Model Update – Demand Forecast and Economic Evaluation.

2.3.2 Existing Network Performance

The model is able to provide a range of outputs to represent network performance including average speeds, travel times and degree of saturation (volume to capacity). The degree of saturation represents the level of congestion and the 2016 AM and PM peaks are shown in Figure 2.1 and Figure 2.2.

Figure 2.1: 2016 AM Peak Degree of Saturation

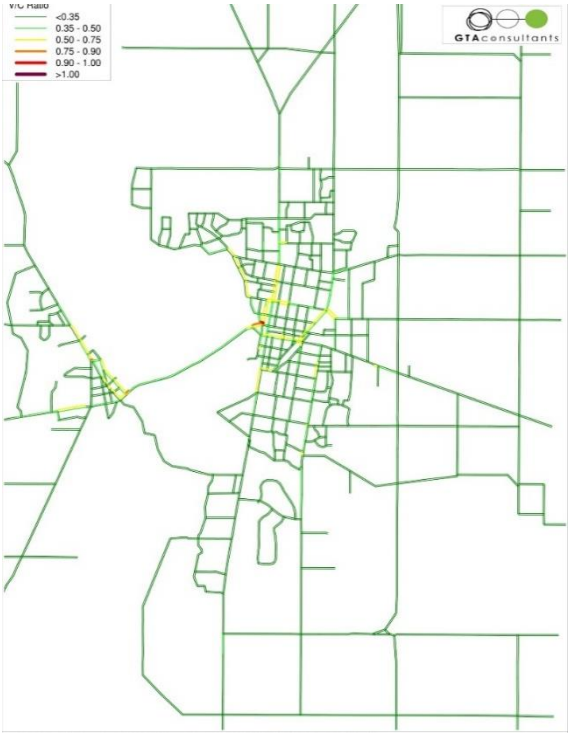


Figure 2.2: 2016 PM Peak Degree of Saturation

The modelling results show that overall, the network is currently afforded with high levels of available capacity with some congestion experienced in an around the Shepparton CBD on Fryers Street near the Midland Highway and around the Maroopna township in both peak periods. It is noted that this model represents a two-hour period (industry standard) and that some localised congestion is likely to occur for shorter periods during the relevant peaks. My brief is to review the network performance broadly as part of both Amendment C192 and C193 and as such, I do not touch on localised issues.

2.4 Intersection Turning Volumes – Amendment C193

Amendment C193 is more specific in terms of the potential transport impacts of the network and as such traffic movement counts at the intersection of Goulburn Valley Highway / Ford Road / Wanganui Road, as well as Goulburn Valley Highway / Numurkah Road (eastern service road) were completed during the following peak periods:

- 4:00pm - 6:30pm on Monday 18 July 2016
- 11:00am – 2:00pm on Saturday 16 July 2016

The AM peak has been excluded due to the fact that the proposal will generate relatively minor levels of traffic in that period. These counts are approximately 12 months old and are considered suitable for use as part of this assessment. The existing PM and Saturday peak hour traffic volumes are shown in Figure 2.3 and Figure 2.4 respectively.

Figure 2.3: Existing PM Peak Hour Traffic Volumes

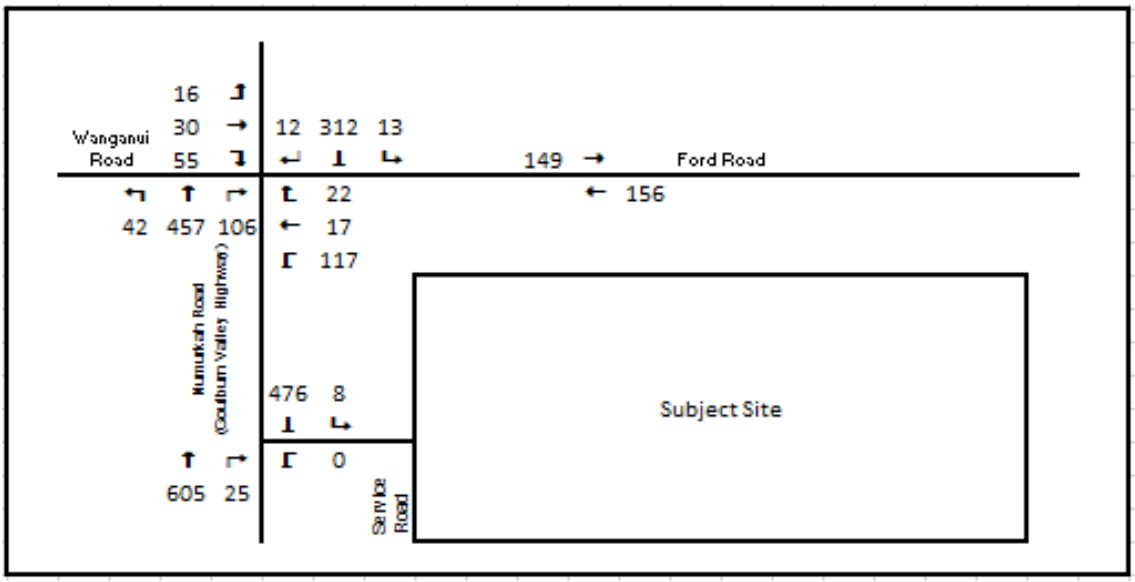
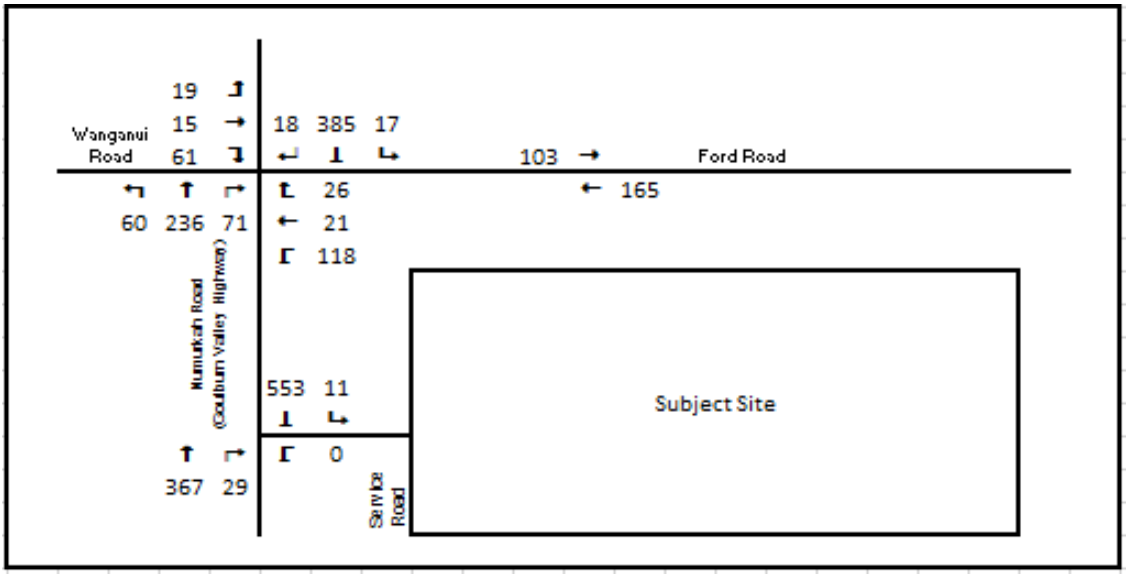


Figure 2.4: Existing Saturday Peak Hour Traffic Volumes



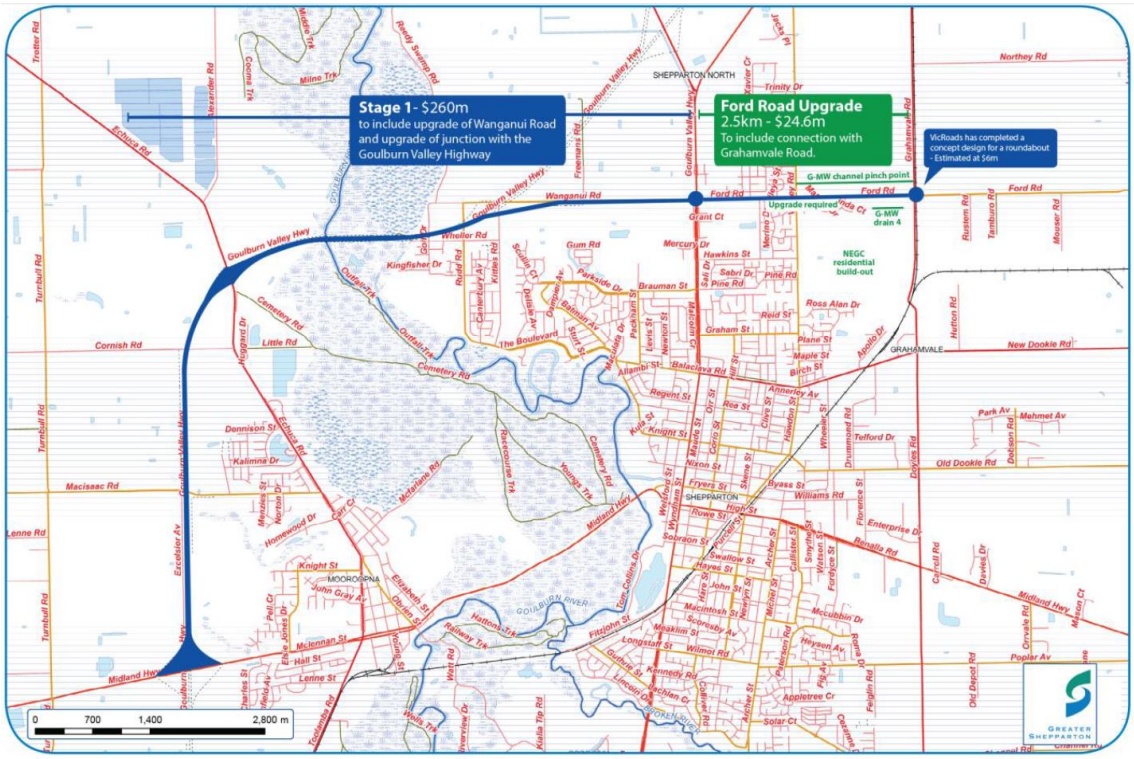
The data shows that during the PM peak the volumes on Goulburn Valley Highway are higher in the northbound direction than the southbound direction, which demonstrates a tidal nature for commuters travelling home from their places of employment in the Shepparton CBD. The Saturday midday peak shows that the dominant flow is in the southbound direction on the Goulburn Valley Highway, however, flows are more closely balanced.

2.5 Shepparton Bypass

The Shepparton Bypass is proposed as a 36 kilometre north-south route running west of Shepparton and Mooroopna and linking the Goulburn Valley Highway to the Midland Highway. The first stage is planned to run from the Midland Highway west of Mooroopna via Mooroopna-Echuca Road to Numurkah Road/ Goulburn Valley Highway north of Shepparton via Wanganui Road.

A staged approach is currently being investigated with Stage 1 to provide a single carriageway connection between the Goulburn Valley Highway and the Midland Highway. Grahamvale Road at the eastern end of Stage 1 forms part of the Shepparton Alternate Route. The location of the bypass in the context of Shepparton is shown in Figure 2.5.

Figure 2.5: Shepparton Bypass



The Stage 1 Bypass Project consist of the following two sub-stages: -

- Stage 1A: 5km link between Echuca-Mooroopna Road to the Goulburn Valley Highway, including a second river crossing and improvements to the existing Wanganui and Ford roads. Including the signalisation of the Ford Road / Goulbarn Valley Highway / Wanganui Road intersection. Estimate cost is $180 million (2016 dollars).
- Stage 1B: 5km link between Echuca-Mooroopna Road to the Midland Highway, including a new intersection at the Midland Highway. Estimated cost is $80 million (2016 dollars).

The Stage 1 Bypass Project aims to increase road capacity and ensure efficiency, safety and cost-reduction for freight operators, while also reducing industry risk and diverting significant volumes of heavy vehicle movements from Shepparton's CBD.

The 2017/18 state budget has allocated $10.2 million over three years to undertake preparatory works which includes the upgrading of the Goulburn Valley Highway / Ford Road and Wanganui Road Intersections. Concept plans have been prepared and are currently with VicRoads and Council for comment. The upgrade will essentially result in the duplication of the Goulburn Valley Highway through the Wanganui Road and Ford Road intersections, as well as the re-alignment of Wanganui Road to align with Ford Road.

3. Policy and Document Review

3.1 Introduction

There are a number of key policy and best practice planning documents which provide guidance on matters relating to traffic and transport planning in Shepparton and in particular Amendment C192.

Those considered most important to any evaluation of the strategic benefits of Amendment C192 are set out in the following sections together with a brief summary of their application.

3.2 Commercial Activity Centres Strategy 2015

The City of Greater Shepparton *Commercial Activity Centres Strategy*, dated November 2015 and prepared by Essential Economics, sets out a strategy for future retail planning for the Goulburn Valley region for the next 20 years. The report includes a number of recommendations and, amongst other things, seeks to provide the guidance for the commercial areas of Shepparton.

The report states that the majority of additional commercial floor space recommended as part of the strategy be accommodated within the existing town centre, along Wyndham Street, as well as through an expansion to the Shepparton Market Place on Benalla Road. The strategy also identifies a number of Sub-Regional Centres for growth which include Shepparton North, Riverside and Maroopna.

An action plan was developed for the study which includes a range of objectives relating to transport. These objectives include activation of the Maude Street Mall as a shared space, the promotion of cycle friendly infrastructure, convenience orientated car parking and the encouragement of enterprise corridors. The strategy also recommends a free or near-free shuttle linking the CBD with the Marketplace and Riverside.

The strategy forecasts growth in Shepparton for both retail and commercial floor area which is generally higher than the current growth rates. It does not indicate that the current population growth will continue at its current rate, however it does highlight that retail growth will be a result of other forms of spending in Shepparton such as escape spending.

3.3 Policy Review

3.3.1 Municipal Strategic Statement

The Municipal Strategic Statement (MSS) for Greater Shepparton City Council is outlined in Clause 21 of the Greater Shepparton Planning Scheme. The MSS outlines the strategic visions for the municipality with regards to the following:

- Municipal Profile
- Key Influences and Issues
- Vision, Sustainability Principles and Strategic Directions
- Settlement
- Environment
- Economic Development
- Infrastructure.

The key visions most relevant to this project is **Clause 21.07-1 – Infrastructure, Transport**, which states the following:

- The development and maintenance of safe and efficient traffic and transport systems throughout the municipality is a priority. Key initiatives requiring implementation include:
- The development of a second river crossing.
- The development of an integrated road network for general road users which seeks to minimise intrusion to the local road networks and the central Shepparton area.
- The development of the Goulburn Valley Highway Shepparton Bypass.
- Linkages between the Goulburn Valley Highway Bypass and the surrounding arterial road network in order to reduce traffic intrusion to the central shopping area.
- An integrated transport network to better link road and rail freight which will work to reduce freight traffic intrusion to the central Shepparton and Mooroopna areas.
- Road widening where required, particularly in areas where traffic is likely to increase as a result of the Goulburn Valley highway Shepparton Bypass.
- The planning of freeways and highways and the planning and control of land use and development in the areas through which they pass should be coordinated and integrated especially on the Goulburn Valley Highway.

The vision for this aspect of the project aligns well with Amendment C192 in that it seeks to integrate land use and transport, as well as in the longer term objective to construct the bypass.

3.3.2 Clause 18 of the Victorian Planning Provisions

Clause 18 of the Planning Scheme is designed to reflect the intent of State Government guidance and contains objectives and strategies in relation to transport which are relevant to Amendment C192, including, but not limited to:

- Create a safe and sustainable transport system by integrating land-use and transport.
- Coordinate development of all transport modes to provide a comprehensive transport system.
- Provide a Principal Public Transport Network that allows for circumferential, in addition to radial movements.
- Manage the road system to achieve integration, choice and balance by developing an efficient and safe network and making the most of existing infrastructure.
- Facilitate and safeguard pedestrian and cyclists' access to public.
- Promote the use of sustainable personal transport, and
- Integrate planning for cycling with land use and development planning and encourage as alternative modes of travel.

This clause seeks to support population and employment growth together with a need to manage the by-product of that growth in the form of increased demand on the transport system. Moreover, Amendment C192 allows the achievement of Transport Choice for users through the implementation of the integration of public transport to the Shepparton Marketplace and the encouragement of pedestrian and cycling through the town centre.

Transport choice is one of the desirable outcomes of planning for growth whereby real alternatives exist for people to travel by private car, on-road public transport, as well as walking and cycling.

3.3.3 SmartRoads

SmartRoads is a VicRoads policy which sets strategic 'modal' priorities on the road network at different times of the day and underpins many of the strategies significant to the operational directions that support broader strategies around land use and transport. *"There is no single*

solution to managing congestion on our roads. Sustainable management of congestion will require an integrated approach involving better management of the existing network, building new infrastructure, visionary land use planning, encouraging sustainable transport modes, and changes in behaviour by individuals, businesses and a level of government."

All road users will continue to have access to all roads, however, certain routes will be managed to work better for cars while others for freight, public transport, cyclists and pedestrians during the various peak and off-peak periods. In this regard, the following is noted by VicRoads for the various modes assigned to arterial roads across the network that form part of the Network

Operating Plans:

- Facilitate good pedestrian access into and within activity centres in periods of high demand
- Prioritise trams and buses on key public transport routes that link activity centres during morning and afternoon peak periods
- Encourage cars to use alternative routes around activity centres to reduce the level of 'through' traffic
- Encourage bicycles through further developing the bicycle network
- Prioritise trucks on important transport routes that link freight hubs and at times that reduce conflict with other transport modes

The above modal aspirations are targeted towards achieving a more efficient transport network. As it relates to the two amendments, I note the following:

- Benalla Road, east of Archer Street, is a Principal Bicycle Route and Bus Priority Route
- The Shepparton CBD is a combination of Pedestrian Priority Area's, Bus Priority Routes and Principle Bicycle Route's
- Goulburn Valley Highway (Numurkah Road) is a Principal Bicycle Route and Traffic Route along the frontage of at 221-229 Numurkah Road, and
- Doyles Road and Grahamvale Road, to the east of the township, is the only notable preferred Traffic Route in Shepparton.

Overall, the planning of the SmartRoads network within Shepparton looks to promote sustainable and alternate modes of transport above motor vehicle which helps guide for strong planning considerations for future network planning.

3.4 Transport Integration Act (2010)

The Transport Integration Act (TIA) is the primary transport statute for Victoria, and has caused significant change to the way transport decisions are undertaken. The TIA requires that all transport agencies work together to achieve an integrated and sustainable transport system. The TIA is designed to consider all users and modes against a set of objectives and principles.

The TIA:

- unifies all elements of the transport portfolio to ensure that transport agencies work together towards the common goal of an integrated transport system
- provides a framework for integrated and sustainable transport policy and operations
- recognises that the transport system should be conceived and planned as a single system performing multiple tasks rather than separate transport modes
- integrates land use and transport planning and decision-making by extending the framework to land use agencies whose decisions can significantly impact on transport ("interface bodies")
- re-constitutes transport agencies and aligns their charters to make them consistent with the framework.

The TIA forms an overarching legislative framework for transport related state planning policies and has been integrated within the Victoria Planning Provisions (VPP). The relevance to C192 is critical to ensure that decisions made for planning consider the impact of transport on land use into the future.

4. The Proposal

4.1 Amendment C192

The proposed Amendment updates the Municipal Strategic Statement (MSS) and Activity Centre Zone to implement the recommendations of the Commercial Activity Centres Strategy, November 2015. There are a number of changes that relate to traffic and transport which primarily seek to ensure that:

- a corridor access strategy is developed for any relevant access strategies and,
- the future transport planning for the Shepparton CBD encourages cycling and walking, thus reducing the reliability on motor vehicles.

As it relates to Wyndham Street (precinct 3b in ACZ), the schedule seeks to enforce the level of access to commercial and retail uses by ensuring the passing bays are provided and that traffic does not bank up on Wyndham Street itself.

4.1.1 Commercial Activity Centres Strategy Land Uses Projections

The Commercial Activity Centre Strategy provides projections for future growth in retail and commercial floorspaces in Table 4.1, noting that final details of any development will be resolved during the course of future planning applications.

Table 4.1: Retail and Commercial Floorspace Future Growth Projections

Land Use Type	Low Growth Scenario	High Growth Scenario
Retail	35,000sqm	55,000sqm
Commercial	15,000sqm	20,000sqm

Increases in retail and commercial floor areas as contemplated in Table 4.1 will no doubt have traffic and transport impacts on the road network. Without knowing in detail, the location of these land uses, it is difficult to precisely define what the effect on the transport network will be, however the question becomes the accessibility of that impact and in determining that question we have undertaken an assessment on the ability of the network to respond to this growth has been undertaken in Section 5.

Any detailed assessment of future opportunities will raise questions of transport design and management, and these will be dealt with at an appropriate time as part of future planning applications.

4.2 Amendment C193

Amendment C193 proposes to rezone land at 221-229 Numurkah Road and 10 Ford Road, Shepparton from the Commercial 2 Zone to Commercial 1 Zone and apply the Public Acquisition Overlay to part of 221-229 Numurkah Road, Shepparton, part of 38-50 Ford Road, Shepparton and part of 25 Hawkins Road, Shepparton.

The Amendment responds to and implements the findings and recommendations of the Commercial Activity Centres Strategy, November 2015 in relation to Shepparton North in seeking to rezone land to facilitate the development of a supermarket and associated retail floorspace.

In terms of the planning scheme amendment, the following updates and changes to the Greater Shepparton Planning Scheme are proposed:

- Rezone land at 221-229 Numurkah Road and 10 Ford Road, Shepparton North from Commercial 2 Zone to Commercial 1 Zone
- Apply a Public Acquisition Overlay to part of 221-229 Numurkah Road, part of 38-50 Ford Road and part of 25 Hawkins Road, in favour of Council, to provide for drainage infrastructure for the broader catchment via the Yakka Basin
- Amend Schedule to Clause 45.01
- Amend planning scheme map nos. 14 and 14PAO

4.2.1 Permit Application No. 2016-269

The rezoning of the land at 221-229 Numurkah Road and 10 Ford Road will allow for the site to be developed in accordance with the planning controls of a Commercial 1 Zone. The proposed permit is for a mixed use development consisting of the following uses:

- Supermarket (with Liquor Store) 3,960 sqm
- Speciality Retail (consisting of 14 stores) 2,030 sqm
- Medical Centre 300 sqm
- Community Centre 100 sqm

The Greater Shepparton Commercial Activity Centres Strategy (2015) identifies Shepparton North has as a Sub-Regional Centre and the implementation of the predominately retail mixed use development proposal at 221-229 Numurkah Road and 10 Ford Road in Shepparton is generally consistent with this policy direction. As such, the Shepparton North Sub-Regional Centre, including the development proposal at 221-229 Numurkah Road and 10 Ford Road, is to be considered as part of the above strategic transport planning activities in Amendment C192.

It is also noted that the proposed permit conditions for the proposed development include a VicRoads condition requiring the proponent to arrange for the 'construction of traffic signals and street lighting at Numurkah Road/Ford Road/Wanganui Road intersection'.

Further discussion on the appropriateness of this condition is provided in Section 6.

5. Assessment of Amendment C192

5.1 Introduction

As part of my brief I have been requested to investigate the traffic and transport implications of Amendment C192. The amendment seeks, amongst other things, to adopt the recommendations of the Commercial Activity Centres Strategy 2015. Therefore, in order to test the impact of the amendment on the transport network, I have undertaken additional testing using the Shepparton Strategic Transport Model (SSTM) which includes the floor spaces contemplated by the retail strategy.

This section summarises my findings.

5.2 Transport Assessment Methodology

The level of retail floor space predicted for Shepparton has been obtained from the Commercial Activity Centres Strategy 2015. Scenarios for low and high growth are limited to particular areas of Shepparton and reflect increments above the level of the retail floor space that is currently within the SSTM (i.e. Business As Usual) as shown in Table 5.1.

Table 5.1: Forecast Growth Rates for Retail Employment in Shepparton

Period	Shepparton Strategic Transport Model BAU	Commercial Strategy Low Growth Scenario	Commercial Strategy High Growth Scenario
2016-2036 Retail Emp.	13.7%	15.6%	24.0%

BAU: Business As Usual

In addition to employment, one of the key drivers in the generation of traffic movements is population. The population projection that is forecasted for Shepparton by 2036 is an increase of 17%. In each of the tests undertaken with the use of the SSTM, the population growth has remained consistent (at 17%) which in reality with higher employment growth would likely increase proportionally, notwithstanding this, it has remained at 17% in this analysis.

The Strategy also defined the distribution of the estimated growth among the retail zones, underlining the CBD retail matureness and allowing for higher growth rates in the other areas which is reproduced in Table 5.2.

Table 5.2: Commercial Centre Type distribution

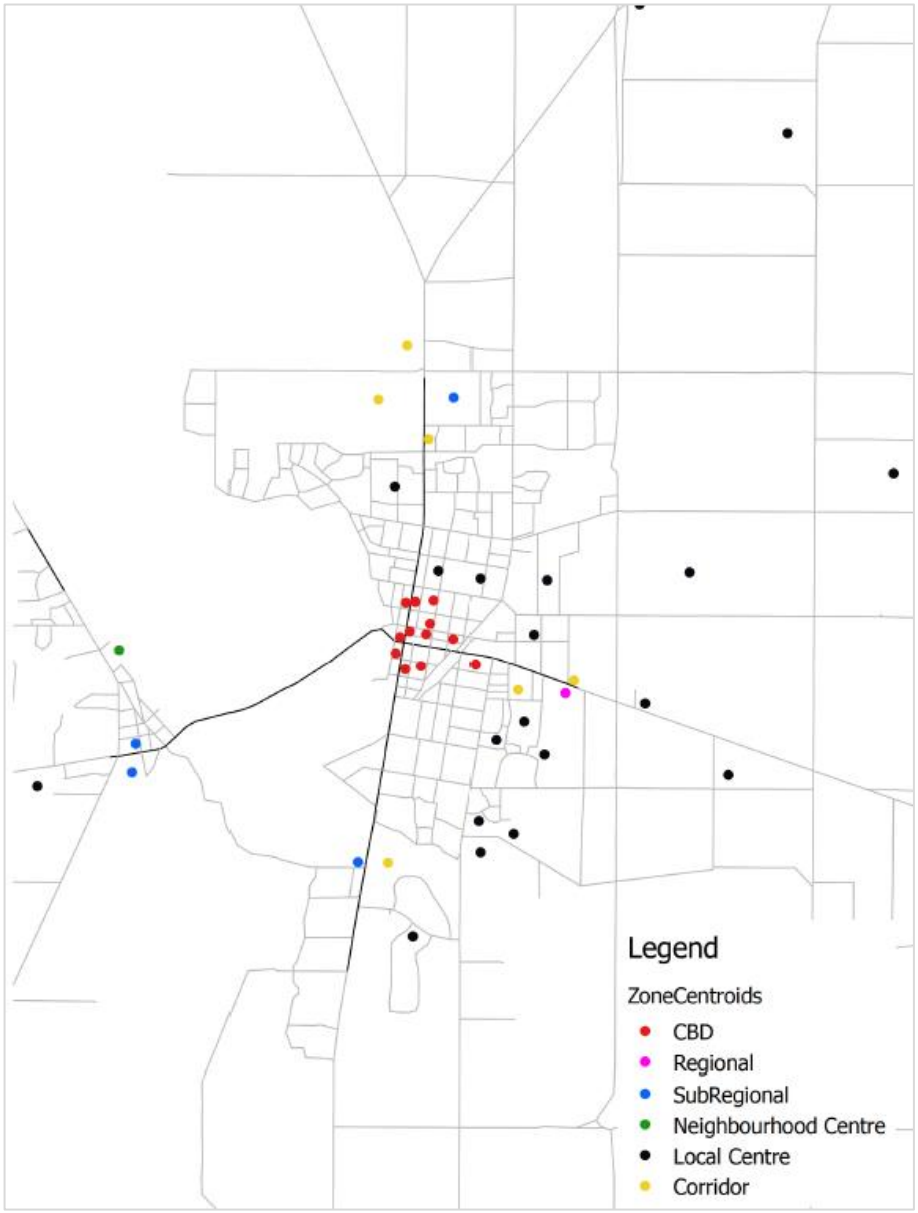
Commercial Centre Type	Current Share	Expected Share of Growth Low	Expected Share of Growth High
CBD	39%	30%	40%
Regional	7%	10%	15%
Sub Regional	16%	15%	25%
Neighbourhood	11%	5%	10%
Local Centres	3%	1%	3%
Enterprise Corridors	24%	30%	40%

Source: Commercial Activity Centres Strategy

The high growth scenario provided in Table 5.2 shows that there is expected to be a shift from the current share with higher proportions in Sub Regional and Enterprise Corridors.

In evaluating the traffic impact, the high growth scenario was adopted, which was to reflect a worst-case scenario or conservative outcome. The estimated increase in retail floor space estimated for year 2036 was translated into an increase in the number of retail jobs in the particular areas indicated in the Commercial Strategy which is shown graphically in Figure 5.1.

Figure 5.1: Shepparton Strategic Transport Model – Application of Retail Growth



The alignment of the increase in retail floor area above the BAU was undertaken to ensure that there is alignment between the retail strategy and the transport model. This alignment includes the specific areas such as the Shepparton Market Place and Shepparton North.

5.3 Future Year Network Performance

The additional retail floor space growth scenarios were evaluated for the forecast year of 2041[3], which aligned with the forecast census year. It is noted that the retail strategy is 2036 and forecasts from the strategy have been extrapolapolated to 2041. I have extracted the degree of

[3] Modelled years are 2021, 2031, and 2041 only

saturation plots for the business as usual and high growth scenarios which are shown in Figure 5.2 to Figure 5.4.

Figure 5.2: 2041 AM Peak BAU - Degree of Saturation

Figure 5.3: 2041 AM Peak High Retail Growth - Degree of Saturation

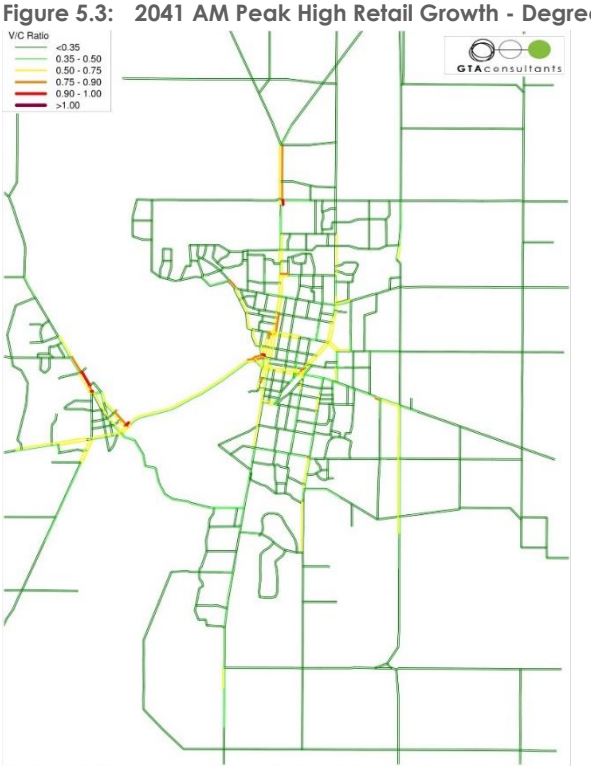
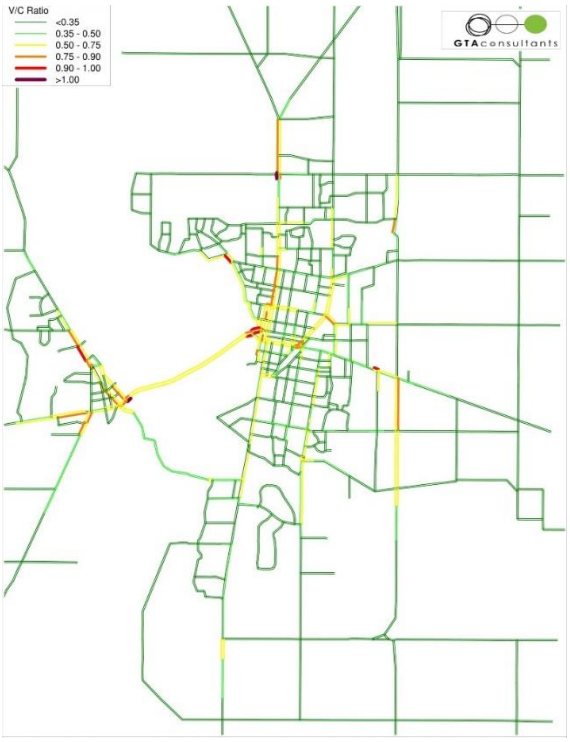


Figure 5.4: 2041 PM Peak BAU - Degree of Saturation

Figure 5.5: 2041 PM Peak High Retail Growth - Degree of Saturation



The results highlight that from a network wide perspective, the additional floor area, when compared to the business as usual, will be able to be absorbed by the available capacity in the network and is not expected to prejudice the ability for the network to respond. Whilst Increased congestion will occur through the CBD, Goulburn Valley Highway will experience congestion around the Ford Road intersection. It is noted that the model does not include the recently

announced upgrades to the intersection at this location which is considered acceptable and will be alleviated by the construction of the bypass.

In order to quantify the increases in traffic demand, Table 5.3 and Table 5.4 have been prepared to demonstrate the marginal differences in volumes for the BAU and High Retail Growth during each of the respective periods. The bypass option has been included in these results to demonstrate the benefits that it provides to the Midland Highway through the CBD.

Table 5.3: Link volumes (2hr) at Key Locations – AM peak period

Location	Direction	2016 BAU	2041 Business as usual	2041 High Retail High	2041 High Retail with Stage 1 Bypass
Goulburn Valley Highway North of Ford Road	Northbound	780	1,040	1,050	1,050
	Southbound	1,180	1,600	1,640	1,580
Goulburn Valley Highway South of Ford Road	Northbound	1,250	1,570	1,570	1,510
	Southbound	1,460	2,050	2,090	2,180
Benalla Road east of Mitchell Street	Eastbound	600	890	900	870
	Westbound	1,090	1,850	1,860	1,860
Midland Highway at the Goulburn River crossing	Eastbound	3,160	3,780	3,820	2,980
	Westbound	1,930	2,740	2,730	2,150
Goulburn Valley Highway (Wyndham Street) north of Knight Street	Northbound	1,600	2,120	2,140	1,970
	Southbound	1,840	2,800	2,840	2,810
Goulburn Valley Highway (Wyndham Street) north of High Street	Northbound	970	1,250	1,360	1,280
	Southbound	940	1,260	1,440	1,200

Table 5.4: Link volumes (2hr) at Key Locations – PM peak period

Location	Direction	2016 Business as usual	2041 Business as usual	2041 High Retail High	2041 High Retail with Stage 1 Bypass
Goulburn Valley Highway North of Ford Road	Northbound	1,260	1,710	1,710	1,660
	Southbound	820	1,210	1,210	1,210
Goulburn Valley Highway South of Ford Road	Northbound	1,530	2,190	2,190	2,320
	Southbound	1,240	1,740	1,740	1,790
Benalla Road east of Mitchell Street	Eastbound	1,180	2,010	2,050	2,000
	Westbound	760	1,200	1,190	1,190
Midland Highway at the Goulburn River crossing	Eastbound	2,290	3,180	3,170	2,510
	Westbound	3,410	4,060	4,110	3,250
Goulburn Valley Highway (Wyndham Street) north of Knight Street	Northbound	2,010	3,100	3,120	3,060
	Southbound	1,710	2,440	2,460	2,340
Goulburn Valley Highway (Wyndham Street) north of High Street	Northbound	1,010	1,540	1,410	1,340
	Southbound	1,070	1,500	1,470	1,370

The model outputs show that the changes in floor area will have marginal changes in terms of traffic volumes across key roads on the network, which is predominantly due to the fact that the population growth between the scenarios is consistent at 17%, noted that as previously mentioned population may increase with a high employment scenario. Volumes on Wyndham

Street through the CBD are not expected to vary significantly with the additional floor area indicating that the network will still have some resilience to respond to any increased demand and changes in travel behaviour.

The introduction of the bypass will reduce traffic west of the CBD in the order of 20% with traffic flows on the Midland Highway at the Goulburn River expected to drop to similar levels experienced today.

5.3.1 Shepparton Marketplace

The increase in floor space at the Shepparton Marketplace is expected to result in marginal differences between traffic volumes on Benalla Road in the sites vicinity. Volumes on Benalla Road in the vicinity of the Shepparton Marketplace will be expected to experience increases in the order of 200 vehicles over the two-hour peak periods. These flows are within acceptable limits for a two-way divided arterial.

Indeed, there will likely be some site-specific design issues that arise in the short term as a result of the floor space increases and these will be required to be addressed as part of separate planning applications.

In summary, the results of the modelling have indicated that from a capacity perspective, the increase in floor area from 15,000 to 22,500sqm can be absorbed by the network. It is noted that this review is strategic in nature and does not consider operational challenges that exists on the corridor. These are matters that can be addressed in isolation as part of a corridor management strategy in consultation with VicRoads and Council.

5.4 Summary of Network Performance

Having regard to the above it is in my view that:

- the previous work undertaken as part of the bypass report had a lower estimate on retail growth than the retail strategy, however this has not impacted on my findings,
- population growth has been assumed to occur regardless of the level of retail floor area, increasing at a rate of 17% by 2036,
- by 2041, the network is expected to experience some increases in congestion as a result of growth. Areas that are expected to experience the higher levels of congestion are around the High Street / Wyndham Street intersection and the Goulburn Valley Highway / Ford Road Intersection. Notwithstanding this, the higher levels of congestion are not expected to have any unreasonable or detrimental impacts on the networth,
- the increase in retail activity as a result of the Commercial Activity Centre Strategy suggests that there will be marginal increases on the Goulburn Valley Highway
- Volume increases on the Goulburn Valley Highway as a result of the retail strategy will be in the order of 50 to 100 vehicles per hour, and
- the introduction of Stage 1 of the Bypass significantly improves traffic conditions on the Goulburn Valley Highway .

The network is afforded capacity both now and into the future, and apart from some localised points of congestion and is sufficient to accommodate the high growth forecast outlined in the Greater Shepparton Commercial Activity Centre Strategy.

5.5 Suitability of Amendment C192

I am satisfied that the investigations of the amendment will not have an adverse impact on the transport network. Moreover, I have reviewed the particulars of the Amendment and am satisfied that they are suitable for adoption.

As it relates to the Clause set out for Wyndham Street and Sub Precinct 3D, the schedule state:

- *Access to the rear of the development should provide passing or staging bays to ensure that vehicles do not bank up on Wyndham Street and present a dangerous situation to passing traffic*

Whilst this clause is sensible from a traffic planning and management outcome, I do question the need for this to be included as part of C192 given that the planning provisions under Clause 52 and 55 also provide guidance in this area. Notwithstanding, the inclusion of this clause is supportable.

6. Assessment of Amendment C193 & Permit Application 2016-269

6.1 Approach

As part of my brief I have been requested to investigate the traffic and transport implications of the rezoning as well as the proposed planning permit for consideration. The rezoning of the land allows for a range of uses that would be required to be considered as part of future planning applications.

This section of the report considers the following:

- The transport implications of the rezoning of land located at 221-229 Numurkah Road and 10 Ford Road in Shepparton (Amendment C193), having consideration for the possible land uses for the site, and
- The parking provision, site access arrangements and car parking layout considered as part of the planning permit application (Permit Application 2016-269)

The proposal includes the development of land located at 221-229 Numurkah Road and 10 Ford Road in Shepparton into the land uses summarised in Table 6.1. It is noted that the schedule also includes the yields and type of development expected to be accommodated by the four pad sites.

Table 6.1: Development Schedule

Use	Size
Supermarket	3,960 sqm
Specialty Retail	2,030 sqm
Medical Centre	6 practitioners (300 sqm)
Council / Community Centre	100 sqm
Pad Site 1: Restaurant	*2,602 sqm*
Pad Site 2: Petrol Station	*1,904 sqm including a 244 sqm convenience store*

*Pad Site 1 and 2 considered as part of rezoning transport assessment only

The schedule set out in Table 6.1 is based on the plans and supporting documentation exhibited as part of the amendment.

6.2 Assessment of Traffic Impact

6.2.1 Traffic Generation

The traffic generation rates proposed as part of this assessment are provided in Table 6.2 which also includes the relevant source that the rates were obtained.

Table 6.2: Estimate of Traffic Generation

Land Use	Size	Traffic Generation Rate (movements/hour)		Source	Vehicle Movements	
		Weekday PM	Saturday Midday		Weekday PM	Saturday Midday
Supermarket	3,960 sqm	13.8/100 sqm	14.7/100 sqm	RTA Guide	546/hr	582/hr
Speciality Shops	2,030 sqm	5.6/100 sqm	10.7/100 sqm	RTA Guide	114/hr	217/hr
Medical Centre	6 practitioners	10/practitioner	10/practitioner	TraffixGroup	60/hr	60/hr

Land Use	Size	Traffic Generation Rate (movements/hour)		Source	Vehicle Movements	
		Weekday PM	Saturday Midday		Weekday PM	Saturday Midday
Council / Community Centre	100 sqm	0.5/100 sqm	0	RTA Guide	1/hr	0/hr
Pad Site 1: Restaurant	*2,602 sqm*	*100 mvts*	*100 mvts*	*RTA Guide*	*100/hr*	*100/hr*
Pad Site 2: Petrol Station	*1,904 sqm, including a 244sqm store*	*0.04 of site 0.30 of shop*	*0.04 of site 0.30 of shop*	*RTA Guide*	*149/hr*	*149/hr*
Total Movements					***970/hr***	***1,109/hr***

Table 6.2 indicates that the site when rezoned, has the potential to generate in the order of 1,000 vehicle movement in the weekday PM peak hour and 1,100 in the Saturday midday peak hour.

6.2.1 Characteristic Trip Types (Pad Sites)

An important characteristic of the traffic generation of the above uses is the different types of trips which may occur. These different trip types correspond to:

- '*Primary Trips*'
- '*Link-diverted Trips*'
- '*Non-link-diverted Trips*'.

Primary trips and *link-diverted trips* involve a vehicle either making a special trip or a modification of the route to an existing trip. *Non-link-diverted trips,* on the other hand, correspond to those trips which do not involve a diversion from the route that would otherwise have been taken, or in other words are trips generated by passing traffic. The important distinction here is that it is only *primary trips* and *link-diverted trips* which impact upon the external road network. *Non-link-diverted trips* are already present on the adjacent road network, and although these trips need to be considered in the design of access driveways, turning lanes and so on, they do not constitute additional traffic per se.

In order to account for these different trip types the following has been adopted in terms of the two pad sites at this time for assessment purposes:

- 100% of the petrol station trips are considered to be n*on-link-diverted trips*
- 35% of the restaurant trips are considered to be n*on-link-diverted trips.*

The above tries to account for the likely high proportion of vehicles accessing the petrol station and the restaurant being link and non-link diverted trips, and to a lesser extend the interplay with some of the other land uses. As such, all of the trips associated with the petrol station and 35% of the trips associated with the restaurant are not considered to be additional to what already exists on the fronting roads of Goulburn Valley Highway and Ford Street. However, they will result in additional turning movements at the intersections used to access the site.

6.2.2 Traffic Distribution and Assignment

The directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors, including the:

i configuration of the arterial road network in the immediate vicinity of the site
ii existing operation of intersections providing access between the local and arterial road network
iii distribution of households in the vicinity of the site
iv surrounding employment centres, retail centres and schools in relation to the site

v configuration of access points to the site.

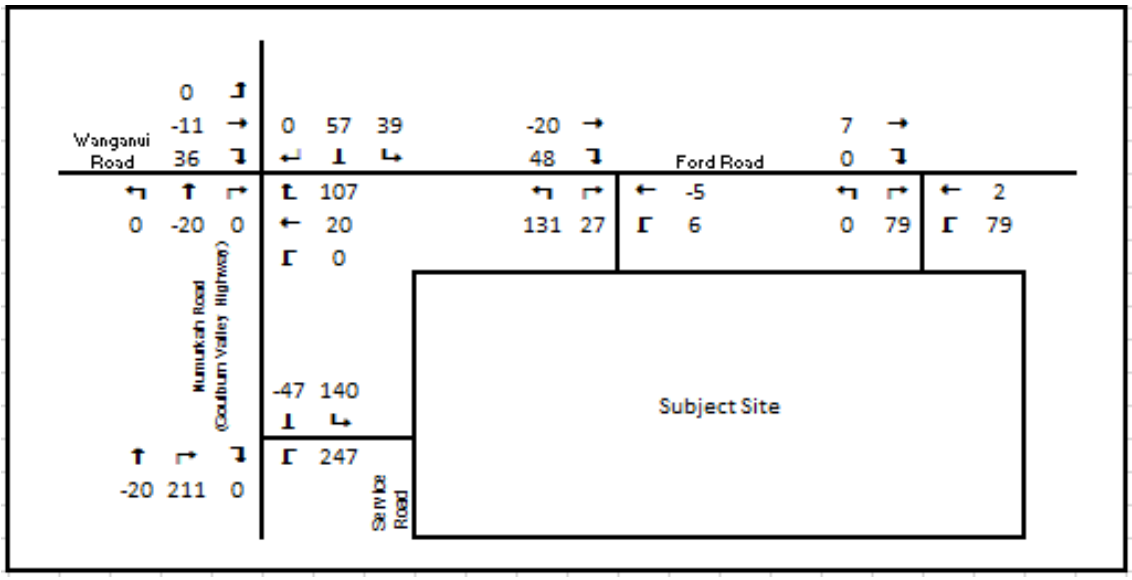
Notwithstanding the above, in this instance the directional distributions have been sourced from the MacroPlan Dimasi economic impact assessment report (dated January 2017) exhibited as part of the amendment. Based on the findings of this report, the following directional distributions have been assumed for the proposal:

- 5% to/from the west
- 22% to/from the east
- 51% to/from the south
- 22% to/from the north

In addition, the directional split of traffic (i.e. the ratio between the inbound and outbound traffic movements) will be 50:50 (industry standard) in the peak hours for each proposed land use.

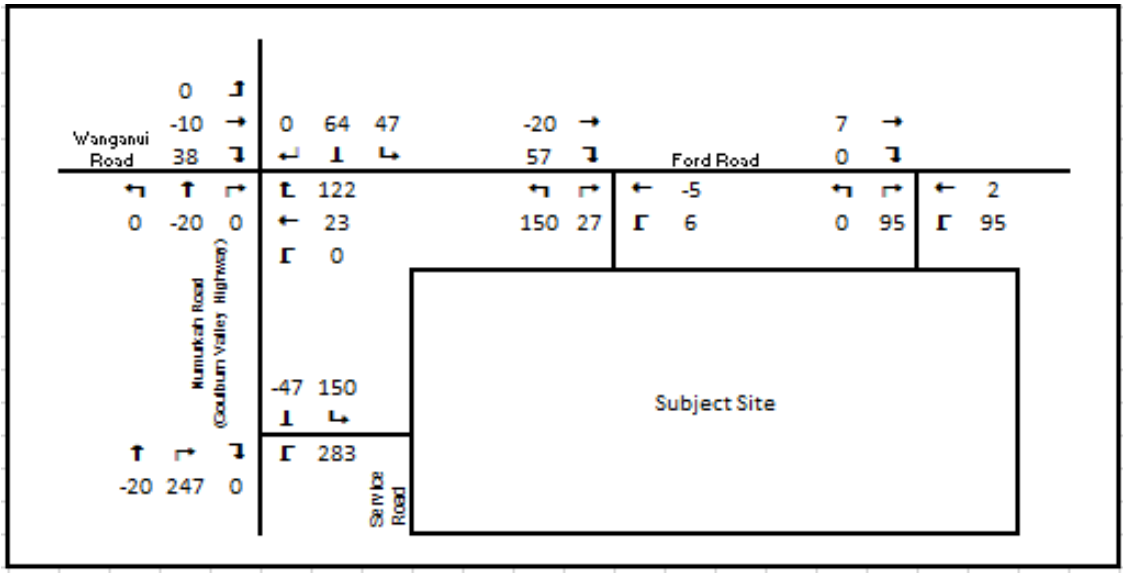
Figure 6.1 and Figure 6.2 have been prepared to show the estimated increase in turning movements in the vicinity of the subject property during a weekday PM and Saturday midday peak hours, following full site development.

Figure 6.1: Weekday PM Peak Hour Site Generated Traffic Volumes



Negative numbers relate to non-link-diverted trips

Figure 6.2: Saturday Midday Peak Hour Site Generated Traffic Volumes



Negative numbers relate to non-link-diverted trips

By adding the development traffic to the existing traffic flows we can obtain the Post-Development traffic volumes. These are outlined in Figure 6.3 and Figure 6.4.

Figure 6.3: Post-Development AM Peak Hour Traffic Volumes

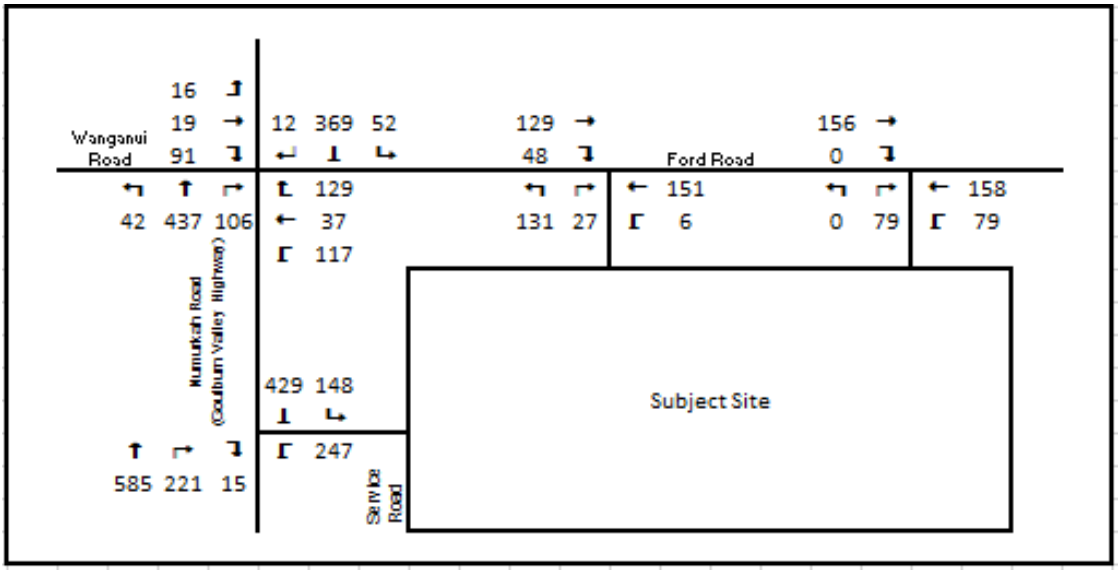
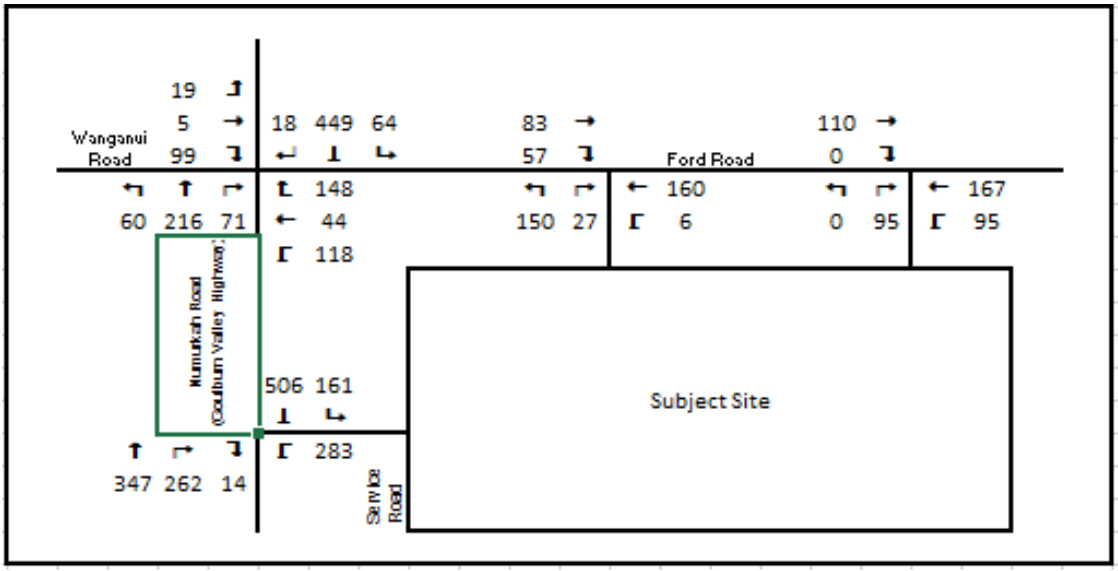


Figure 6.4: Post-Development PM Peak Hour Traffic Volumes



6.3 Traffic Impact

The traffic impact of the proposal has been completed by analysing the following intersections surrounding the site:

i Goulburn Valley Highway / Site Access Unsignalised Intersection,

ii Goulburn Valley Highway / Ford Road / Wanganui Road Intersection for the following scenarios:

- The existing unsignalised priority controlled arrangement
- A full signalisation of the existing intersection layout as per the VicRoads permit condition
- A signalisation of the intersection with the duplication of the Goulburn Valley Highway and realignment of Ford Road and Wanganui Road.

6.3.1 Goulburn Valley Highway Site Access Intersection

Existing Conditions

The operation of the Goulburn Valley Highway site access intersection has been assessed using *SIDRA INTERSECTION 7.0*[4], a computer based modelling package which calculates intersection performance.

The commonly used measure of intersection performance is referred to as the *Degree of Saturation (DOS)*. The DOS represents the flow-to-capacity ratio for the most critical movement on each leg of the intersection. For unsignalised intersections, a DOS of around 0.90 has been typically considered the 'ideal' limit, beyond which queues and delays increase disproportionately[5].

[4] Program used under license from Akcelik & Associates Pty Ltd.

[5] SIDRA INTERSECTION adopts the following criteria for Level of Service assessment:

Level of Service		Intersection Degree of Saturation (DOS)		
		Unsignalised Intersection	Signalised Intersection	Roundabout
A	Excellent	<=0.60	<=0.60	<=0.60
B	Very Good	0.60-0.70	0.60-0.70	0.60-0.70
C	Good	0.70-0.80	0.70-0.90	0.70-0.85
D	Acceptable	0.80-0.90	0.90-0.95	0.85-0.95
E	Poor	0.90-1.00	0.95-1.00	0.95-1.00
F	Very Poor	>=1.0	>=1.0	>=1.0

Table 6.3 presents a summary of the existing operation of the intersection, with full results presented in Appendix C.

Table 6.3: Goulburn Valley Highway Site Access – Existing Operating Conditions

Peak Hour	Approach	DOS	Average Delay (sec)	95th Percentile Queue (m)
Weekday PM	Goulburn Valley Hwy (South)	# 0.34	1 sec	1 m
	Goulburn Valley Hwy (North)	0.27	0 sec	0 m
Saturday Midday	Goulburn Valley Hwy (South)	0.21	1 sec	1 m
	Goulburn Valley Hwy (North)	# 0.31	0 sec	0 m

DOS – Degree of Saturation, # - Intersection DOS

Table 6.3 indicates that the Goulburn Valley Highway site access intersection currently operates well with minimal queues and delays on all approaches.

Post Development Conditions

The impact of the development traffic on the Goulburn Valley Highway site access intersection was assessed using SIDRA INTERSECTION 7.0. Table 6.4 presents a summary of the anticipated future operation of the nominated intersections following the full development of the site. Detailed results of this analysis are provided in Appendix C.

Table 6.4: Goulburn Valley Highway Site Access – Post-Development Operating Conditions

Peak Hour	Approach	DOS	Average Delay (sec)	95th Percentile Queue (m)
Weekday PM	Goulburn Valley Hwy (South)	# 0.36	3 sec	13 m
	Goulburn Valley Hwy (North)	0.24	2 sec	0 m
Saturday Midday	Goulburn Valley Hwy (South)	# 0.48	6 sec	20 m
	Goulburn Valley Hwy (North)	0.28	2 sec	0 m

DOS – Degree of Saturation, # - Intersection DOS
Note: This model is based on an existing conditions model which has not been calibrated and is only appropriate for comparative purposes to understand the extent of changes that occur in the operation of the intersection.

The calculated DOS suggest that the intersection is expected to operate with an excellent level of service following full development of the site.

6.3.2 Ford Road / Goulburn Valley Highway / Wanganui Road

Existing Conditions

The operation of the intersection of Goulburn Valley Highway / Ford Road / Wanganui Road has been assessed using *SIDRA INTERSECTION 7.0*. It is noted that the intersection has been modelled as a network with two T-intersections located in close proximity, which represents how the intersection operates in reality.

Table 6.5 presents a summary of the existing operation of the intersection, with full results presented in Appendix C.

Table 6.5: Goulburn Valley Highway / Ford Road / Wanganui Road – Existing Operating Conditions

Peak Hour	Approach	DOS	Average Delay (sec)	95th Percentile Queue (m)
Weekday PM	Goulburn Valley Hwy (South)	0.28	2 sec	4 m
	Ford Road (East)	0.28	18 sec	8 m
	Goulburn Valley Hwy (North)	0.18	0 sec	0 m
	Wanganui Road (West)	# 0.37	23 sec	12 m
Saturday Midday	Goulburn Valley Hwy (South)	0.16	2 sec	2 m
	Ford Road (East)	0.21	16 sec	5 m
	Goulburn Valley Hwy (North)	0.22	0 sec	1 m
	Wanganui Road (West)	# 0.23	15 sec	7 m

DOS – Degree of Saturation, # - Intersection DOS

Table 6.5 indicates that the intersection of Goulburn Valley Highway / Ford Road / Wanganui Road currently operates well with minimal queues and delays on all approaches.

Post Development Conditions – Unsignalised Arrangement

The impact of the site generated traffic on the intersection of Goulburn Valley Highway / Ford Road / Wanganui Road has been assessed using SIDRA Intersection 7.0.

Table 6.6 presents a summary of the anticipated future operation of the intersection following the full development of the site. Detailed results of this analysis are provided in Appendix B.

Table 6.6: Goulburn Valley Highway / Ford Road / Wanganui Road – Post-Development Intersection Operation

Peak Hour	Approach	DOS	Average Delay (sec)	95th Percentile Queue (m)
Weekday PM	Goulburn Valley Hwy (South)	0.27	2 sec	4 m
	Ford Road (East)	# 1.48	294 sec	319 m
	Goulburn Valley Hwy (North)	0.24	0 sec	0 m
	Wanganui Road (West)	0.64	37 sec	23 m
Saturday Midday	Goulburn Valley Hwy (South)	0.15	2 sec	3 m
	Ford Road (East)	# 1.17	139 sec	187 m
	Goulburn Valley Hwy (North)	0.28	0 sec	1 m
	Wanganui Road (West)	0.48	26 sec	15 m

DOS – Degree of Saturation, # - Intersection DOS
Note: This model is based on an existing conditions model which has not been calibrated and is only appropriate for comparative purposes to understand the extent of changes that occur in the operation of the intersection.

Table 6.6 indicates that the intersection of Goulburn Valley Highway / Ford Road / Wanganui Road is expected to fail under the existing arrangements. The right turn movements on the Ford Road eastern approach exceeds its theoretical capacity with an overall DOS of 1.48 during the weekday PM peak hour and 1.17 for the Saturday peak, following full development of the site (including the future pad sites). During both peak periods, this movement will experience significant queues and delays.

These SIDRA model results indicate that the intersection will fail and mitigating works will be required to upgrade the intersection to facilitate the anticipated future traffic volumes.

Post Development Conditions – Signalised Arrangement

A potential solution to signalise the existing layout of the intersection of Goulburn Valley Highway / Ford Road / Wanganui Road has been prepared and is shown in Appendix B. The layout seeks

to maintain the current staggered intersection configuration and signalises all legs of the intersection providing a safer and efficient arrangement.

A SIDRA Intersection assessment has been undertaken to determine the operation of the signalised intersection following full development of the site. The results are summarised in Table 6.7, with full results included in Appendix C.

Table 6.7: Goulburn Valley Highway / Ford Road / Wanganui Road – Post-Development Intersection Operation

Peak Hour	Approach	DOS	Average Delay (sec)	95th Percentile Queue (m)
Weekday PM	Goulburn Valley Hwy (South)	# 0.61	22 sec	91 m
	Ford Road (East)	0.60	30 sec	64 m
	Goulburn Valley Hwy (North)	0.52	19 sec	73 m
	Wanganui Road (West)	0.60	39 sec	32 m
Saturday Midday	Goulburn Valley Hwy (South)	0.37	22 sec	40 m
	Ford Road (East)	0.62	30 sec	70 m
	Goulburn Valley Hwy (North)	# 0.66	21 sec	96 m
	Wanganui Road (West)	0.59	39 sec	32 m

DOS – Degree of Saturation, # - Intersection DOS
Note: This model is based on an existing conditions model which has not been calibrated and is only appropriate for comparative purposes to understand the extent of changes that occur in the operation of the intersection.

For signalised intersections, a DOS of around 0.95 has been typically considered the 'ideal' limit, beyond which queues and delays increase disproportionately. Table 6.7 indicates that the intersection is expected to operate satisfactorily immediately following full development of the subject site. It is also noted that this arrangement does not cater for pedestrians which is appropriate given that there are no pedestrian paths connecting to this intersection.

Sensitivity Assessment – Additional Retail Development

It is understood that a planning permit for a retail development south of the subject site has been submitted to Council, located at 177-193 Numurkah Road. The proposal has the potential to provide an additional 6,000sqm of mostly supermarket floor area, which could be expected to generate up to an additional 200 vehicle movements north and south (total of 400 vehicle movements) through the Goulburn Valley Highway / Ford Road / Wanganui Road intersection.

A SIDRA Intersection assessment for the signalised intersection has been undertaken to test the operation of the intersection following full development of the subject site and the proposed development at 177-193 Numurkah Road. The results are summarised in Table 6.8, with full results included in Appendix C.

Table 6.8: Goulburn Valley Highway / Ford Road / Wanganui Road – Post-Development and Stage 2 of IGA Development Intersection Operation

Peak Hour	Approach	DOS	Average Delay (sec)	95th Percentile Queue (m)
Weekday PM	Goulburn Valley Hwy (South)	0.82	22 sec	147 m
	Ford Road (East)	# 0.83	41 sec	79 m
	Goulburn Valley Hwy (North)	0.63	15 sec	108 m
	Wanganui Road (West)	0.79	44sec	36 m
Saturday Midday	Goulburn Valley Hwy (South)	0.49	18 sec	75 m
	Ford Road (East)	0.79	37 sec	82 m
	Goulburn Valley Hwy (North)	# 0.79	20 sec	149 m
	Wanganui Road (West)	0.78	45sec	35 m

DOS – Degree of Saturation, # - Intersection DOS
Note: This model is based on an existing conditions model which has not been calibrated and is only appropriate for comparative purposes to understand the extent of changes that occur in the operation of the intersection.

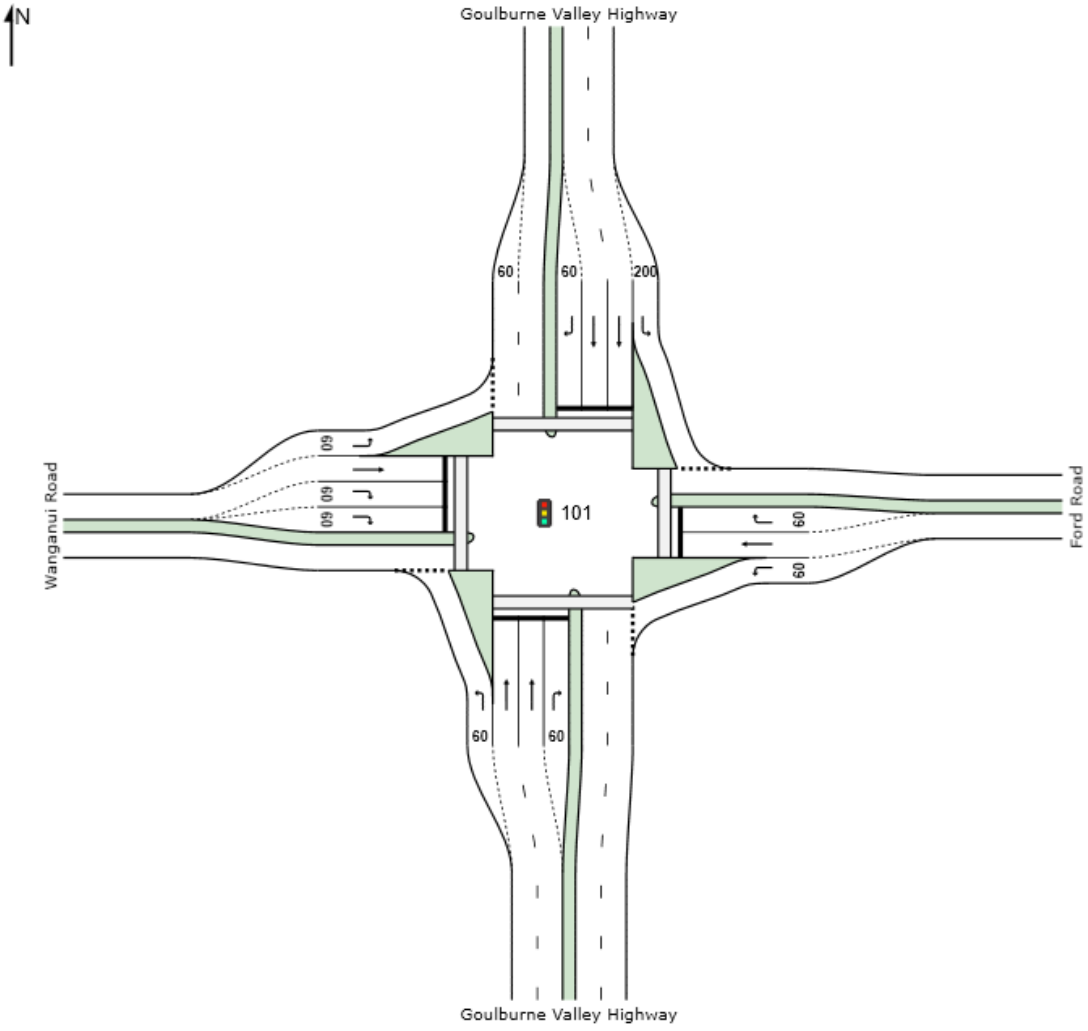
Table 6.8 indicates that the signalised intersection is expected to operate satisfactorily with any additional traffic from the south of the site.

Post Development Conditions – Ultimate Signalised Arrangement

It is understood that a concept plan is currently being prepared for the realignment of the intersection and duplication of the Goulburn Valley Highway. These works will be delivered by the state as part of the Shepparton Bypass Preparatory Works Package.

The concept plan is still pending approval however the layout is likely to include the removal of the 'stagger' arrangement and duplication of the Goulburn Valley Highway through the intersection, resulting in a more traditional layout. Figure 6.5 provides a conceptual layout of the proposed intersection in the ultimate scenario.

Figure 6.5: Goulburn Valley Highway / Ford Road / Wanganui Road - Proposed Layout of Ultimate Arrangement



A SIDRA Intersection assessment has been undertaken to determine the operation of the ultimate intersection following full development of the site. The results are summarised in Table 6.9, with full results included in Appendix C.

Table 6.9: Goulburn Valley Highway / Ford Road / Wanganui Road – Post-Development Ultimate Intersection Operation

Peak Hour	Approach	DOS	Average Delay (sec)	95th Percentile Queue (m)
Weekday PM	Goulburn Valley Hwy (South)	0.60	26 sec	70 m
	Ford Road (East)	# 0.62	25 sec	33 m
	Goulburn Valley Hwy (North)	0.35	21 sec	38 m
	Wanganui Road (West)	0.22	32 sec	11 m
Saturday Midday	Goulburn Valley Hwy (South)	0.45	25 sec	33 m
	Ford Road (East)	0.47	23 sec	35 m
	Goulburn Valley Hwy (North)	# 0.51	24 sec	51 m
	Wanganui Road (West)	0.16	29 sec	11 m

DOS – Degree of Saturation, # - Intersection DOS
Note: This model is based on an existing conditions model which has not been calibrated and is only appropriate for comparative purposes to understand the extent of changes that occur in the operation of the intersection.

Table 6.9 indicates that the ultimate intersection is expected to operate satisfactorily after the full development of the intersection. Indeed, the intersection will reduce its practical degree of saturation in the Saturday Midday Peak from 0.66 to 0.51, and generally achieve the same in the PM peak, noting that the ultimate intersection includes the provision of pedestrian movements each cycle.

It is clear that the ultimate arrangement will provide a superior operating outcome for the intersection and will consider cyclists and other road users, noting that the existing conditions do not provide adequate on-road bike lanes through the intersection ceasing at the end of the duplication (south of the intersection).

6.4 Assessment of Parking

6.4.1 Statutory Car Parking Requirements

Statutory requirements for the provision of car parking are set out in Clause 52.06 of the Greater Shepparton Planning Scheme, with parking rates specified in Table 1 to Clause 52.06-5. An assessment of the statutory parking requirements for the development proposal is set out in Table 6.10. The table specifies only the requirements for the initial proposed development and do not account for the requirements of the pad sites.

Table 6.10: Statutory Car Parking Requirements

Description	Use	Size	Statutory Parking Rate	Statutory Parking Requirement
Supermarket	Supermarket	3,960 sqm	5 spaces per 100sqm leasable floor area	198 spaces
Specialty Retail	Shop	2,030 sqm	4 spaces per 100sqm leasable floor area	81 spaces
Medical Centre	Medical Centre	6 practitioners (300 sqm)	5 spaces for the first practitioner and 3 spaces to every other practitioner	20 spaces
Council / Community Centre	Office	100 sqm	3.5 spaces per 100sqm net floor area	3 spaces
Total				**302 spaces**

The above assessment anticipates that the development proposal will create a statutory requirement for 302 spaces.

The proposed on-site parking provision of 446 car spaces will exceed the statutory parking requirement and is appropriate. There is considered to be an opportunity to share these facilities with the pad sites 1 and 2 however these will be subject to appropriate justification as part of separate town planning applications.

In addition to the statutory car parking requirements in the Planning Scheme, the Building Code of Australia (BCA) outlines requirements for the provision of car parking for people with disabilities. An assessment of the BCA disabled car parking requirements for the development proposal indicates that a total of 10 disabled parking spaces is required. The development plans only appear to include eight parking spaces for people with disabilities.

On this basis, an additional two parking spaces for people with disabilities should be accommodated within the plans based on the current proposed car parking provision. This can be required appropriate permit conditions and can be readily accommodated on site given in parking spaces provided.

6.5 Review of layout plans

I have reviewed the planning permit application plans provided and note the following:

- A signalised plan of the intersection of Ford Road / Goulburn Valley Highway / Wanganui Road has not been provided, but has now been prepared by GTA Consultants and is shown in Appendix B of this report.
- The architectural plans prepared by i2C Architects (Drawing No, 2015-050-TP08) dated 17th April 2017, show conceptually;
    - A priority controlled access point on the Goulburn Valley Highway that includes a dedicated right turn into the existing service road from the south, the construction of a new centre median and a left turn deceleration lane from the north
    - A priority controlled 't-intersection' on Ford Street which includes the construction of a left turn deceleration lane,
    - Two priority controlled intersections onto Doody Street
    - A loading area at the south east corner of the site
    - A separate loading access onto Ford Street at the eastern end of the site

A functional layout plan has also been prepared for the proposed access arrangement by Consultancy TraffixGroup (Drawing No. 19863-04E dated 24 June 2017) from the Goulburn Valley Highway. The following is noted in this regard:

- The proposed intersection layout for the Numurkah Road access point does not include an island north of the right turn from Goulbourn Valley Highway into the Numurkah Road service road to help separate the three right movements between this location and Ford Road. It is recommended that an island is included to help separate these right-turn movements given the expected increase in their use as part of this development proposal. It is noted that this is shown on the architectural plans.
- A left turn deceleration lane on Goulbourn Valley Highway for southbound vehicles has not been included on the proposed plan for this access intersection. It is recommended that this is provided so as to not significantly impact the through traffic volumes on Goulbourn Valley Highway.

In addition, it is considered appropriate for full turning movements to be available at the two access points from Ford Road. The concept layout plans include deceleration lanes for the left turn movement into both access points, as well as a widening of the eastbound carriageway along the frontage of the site to allow vehicles to pass any queued right turning vehicles (i.e. no formal right turn lanes are provided). The above arrangement is considered to be appropriate,

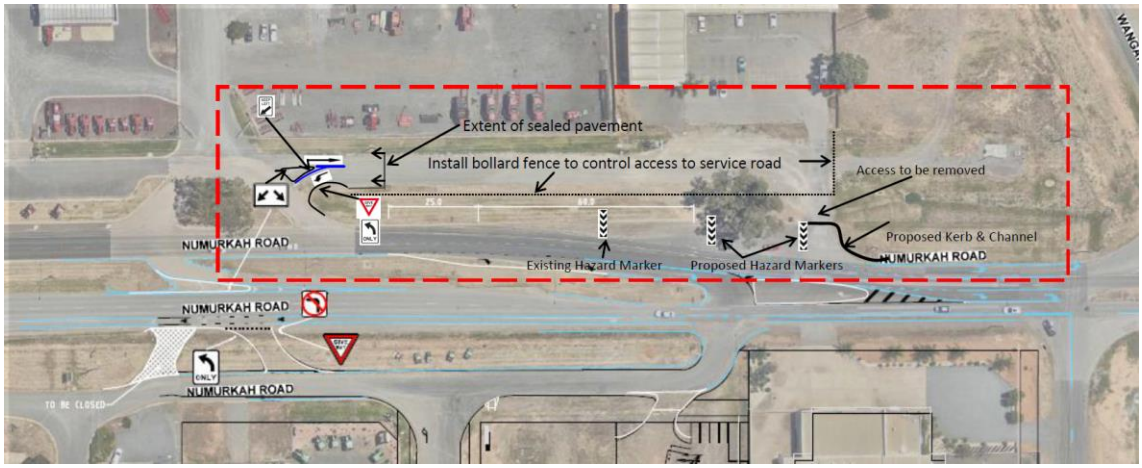
however with further development of the surrounding area, ability to provide full right turn facilities should be maintained.

236-238 Numurkah Road (Goulburn Valley Highway) Access

Currently the site located at 236-238 Numurkah Road (currently operating as a gym – Anytime Fitness) is afforded a direct access the Goulburn Valley Highway south of Wanganui Road. The introduction of a new median and the signalisation of the Ford Road / Goulburn Valley Highway / Wanganui Road intersection will result in the loss of, at a minimum, the ability for motorists to perform a right turn into and out of the site.

Consequently, vehicles wishing to travel south from the site will be required to take alternate routes via Ford Road or Wanganui Road. I have been provided a proposed concept sketch from Council (prepared by VicRoads) that recommends the installation of a treatment resulting in access provided via the existing service road, as shown in Figure 6.6.

Figure 6.6: Suggested Access Arrangements for 236-238 Numurkah Road



My review of the layout has suggested that such an arrangement would provide an alternate and appropriate outcome for motorists exiting and entering the site and is supported. It is understood that a 173 agreement has been prepared between the proponent and Council for the delivery of intersection works, however it is unclear as to whether or not these works include the delivery of the service road upgrades. Accordingly, if it is suggested that confirmation of the delivery of this arrangement be included in the permit conditions.

Car Parking Layout

I have reviewed the car parking layout and I am satisfied that it has been designed in accordance with the Planning Scheme and parking spaces for people with disabilities in accordance with the Australian Standard (AS 2890.6:2009), subject to the provision of an additional two disabled spaces.

Loading

A review of the documents provided and the swept path assessment completed by TraffixGroup demonstrates that the loading dock is suitable from both its functionality and dimensional requirements. Additional swept path assessments are recommended to demonstrate that a 19m semi-trailer can enter the site from Ford Road and exit via Doody Street to Numurkah Road.

6.6 Suitability of Amendment C193

I am satisfied that the investigations into Amendment C193 from a traffic and transport perspective will not have an adverse impact on the transport network and should proceed.

In relation to Permit Application 2016-269, I am satisfied that based on traffic and transport grounds, the permit application will not have an adverse impact on the transport network, subject to the inclusion of a condition pertaining to the delivery of the service road arrangement adjacent to 236-238 Numurkah Road.

7. Response to Submissions

7.1 Amendment C192

A number of submissions were received in relation to Amendment C192 and my review of these indicate that little resolved around the performance of the transport network. One submission was received from the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) dated 11th August 2016. The submission provided the following key points:

i Enterprise Corridor transport access recommends that an objective be in Clause 4.4 of the Design and Development Overlay for the schedule to the Activity Centre Zone,
ii Welsford Street which suggests that the precinct objectives include a corridor access strategy in Clause 5.2-2,
iii Shepparton Marketplace providing reference to the Transport Integration Act in the explanatory report, and
iv The inclusion of cycling within the Clause 4.4 of the Design and Development Overlay for the schedule to the Activity Centre Zone.

I note that items i, iii and iv have been included in the amended exhibited documentation, whilst the Welsford Street suggestion has not been included. I have reviewed these objectives and am satisfied that their inclusion will support the objectives of the Transport Integration Act, as well as the Municipal Strategic Statement.

The Welsford Street suggestion will require confirmation with VicRoads and I have no access to any documentation to support any inclusion of the objective into the Clause.

7.2 Amendment C193

I have also reviewed the submissions provided for Amendment C193 and note there are four submissions relating to traffic and transport. The submissions are set out in Table 7.1 and my response has also been included .

Table 7.1: Response to Submission (Amendment C193)

Submission No.	Concern	Response
#2 – Anytime Fitness	Concern over the impact of the loss of right turn from the site	Refer to Section 6.5 of this report.
#3 – Shepp City Fencing	Limiting Access from south only allowing northbound traffic to access.	Shepp City Fencing is afforded access via the Goulburn Valley Highway and Ford Road. Motorists will be required to take alternate trips either through the network or the site itself. The upgrade of the intersection as part of the Bypass project should consider all options for an alternate access strategy as part of the design development process.
#12 – 38-50 Ford Road	Increase in traffic on Ford Road	This is considered a broader issue as increases in traffic on Ford Road will be experienced as population and employment grow, regardless of this development.
#20 – VicRoads	Alterations to Existing Service Road	Refer to Section 6.5 of my report

8. Summary of Opinion

8.1 Summary of Opinion

Based on the analysis and discussions presented within this evidence, the following is a summary of my opinion:

i The broader Shepparton transport network currently operates well and is flexible enough to cater for increased population and retail growth.

ii The retail floor area forecasts set out in the Commercial Activity Centre Strategy will not have an adverse impact on the transport network and is supported.

iii The rezoning and development of the land located at 221-229 Numurkah Road and 10 Ford Road in Shepparton will generate up to 1,000 and 1,100 vehicle movements in a weekday PM and Saturday midday peak hour respectively.

iv The site access intersection to Goulburn Valley Highway is expected to operate satisfactorily with full site development.

v The intersection of Ford Road / Goulburn Valley Highway / Wanganui Road is expected to fail with full development of the subject site, with an anticipated Degree of Saturation of 1.67 during the weekday PM peak hour and is recommended to be signalised, which is included as part of the VicRoads permit condition.

vi The proposed access arrangements suggested by VicRoads for access to 236-238 Numurkah Road should be included as a suitably worded condition.

Accordingly, I can see no reason on traffic and parking grounds why Amendment C192, 193 and permit No 2016-269 should not be issued subject to the changes outlined in this report.

Declaration

I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance that I regard as relevant have, to my knowledge, been withheld from the Panel.

Reece Humphreys
Director

Appendix A

Reece Humphreys – Curriculum Vitae

Reece Humphreys

Director

GTAconsultants
transportation planning, design and delivery

Reece has a Bachelor of Engineering degree and over fourteen years' experience spanning transport modelling, major event planning, traffic engineering design, land use development and strategic traffic and parking impact assessments. This experience covers a mixture of tasks ranging from transport and microsimulation modelling of large scale projects in Melbourne and Sydney to transport planning, engineering analysis, and advice on projects around Australia.

Reece has active roles in industry organisations; being a member of the AITPM Vic Committee, and sitting on the National Council of Transport Modellers Network. He has completed a number of projects for VicRoads and the NSW RMS (formerly RTA) including a series of large regional transport and microsimulation models, strategic corridor modelling, SCATSIM modelling and independent model auditing. Reece has also recently assisted with planning approval for a number of high profile rezoning and development applications for large retail and residential uses in Melbourne.

In 2012 Reece was a finalist for the Engineers Australia Young Engineer of the Year Award, and he is a national committee member for the AITPM Modelling User Group.

Office

Melbourne

Qualifications

BEng (Civil)

Memberships and Affiliations

AITPM
MIEAust Member
VITM

Industry Roles

AITPM Committee Member (VIC)
AITPM National Council Transport Modellers Network (TMN)

Referee:

Chris Bright
Manager Network Development
Transport Network Development
Department of Economic Development, Jobs, Transport and Resources (DEDJTR)

Project Experience

Transport Modelling

Review of F3-M2 Corridor (NSW-RMS)

Interchange Analysis for East-West Link (VicRoads)

Development of a four-step integrated model of Albury and its surrounds (NSW-RMS)

Transport Modelling for numerous PSPs in land growth areas (in Melbourne for the Metropolitan Planning Authority) including:

- Sunbury Growth Corridor
- Northern Growth Corridor
- Lillydale Town Centre
- Donnybrook and Woodstock
- Merrifield PSP
- Beveridge and Beveridge North PSP

Webb Dock Redevelopment (Port of Melbourne Corporation)

Tamworth Traffic Study (NSW RMS)

Grafton Bridge Traffic Study (NSW RMS)

Transport Planning

Sunbury Growht Corridor (MPA)

Chandler Highway Planning Study (VicRoads)

Central Coburg 2020 Vision Simulation Modelling

Transport Planning for Essendon Fields and Essendon Airport

Traffic Engineering

Victorian Comprehensive Cancer Centre (Grocon/PCL)

Freshwater Place (Australand)

Expert Evidence

Amendment C130 – Epping Central (City of Whittlesea)

Amendment C149 – Ballarat Road, Sunshine (Onesteel Pty Ltd)

DTF Gateway 2 Review, East West Link Enabling (DTPLI/VicRoads)

602-630 Doncaster Road, VCAT (Westfield Pty Ltd)

Summerhill Road, Templestowe (Applicant)

Harvest Home Road, Wollert (Asset1 Pty Ltd)

Professional Background

2004 – Present: GTA Consultants

In his capacity as Director and National Modelling Manager Reece has developed proficiency with a number of software packages, principally VISSIM, AIMSUN and VITM, and has recently been involved in detailed SCATSIM Modelling.

He currently provides technical advice on a number of large land use development projects in Metropolitan Melbourne and across Australia.

2002 – 2004: Hyder Consulting

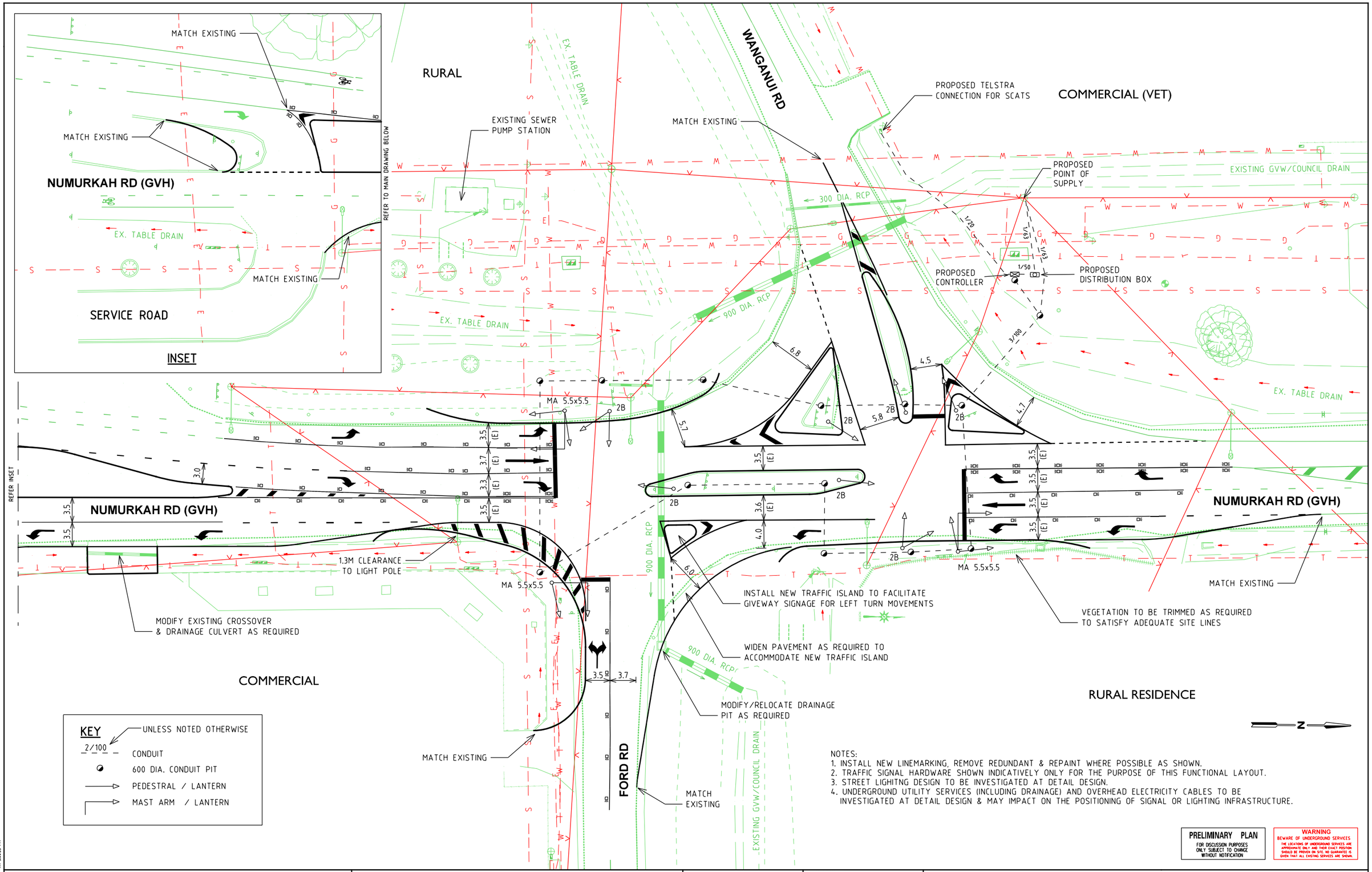
Reece produced several microsimulation models under Hyders employment, including the Dandenong Town Centre Model for the Department of Infrastructure and the West Gosford traffic model for the NSW RTA. Reece also provided traffic and transportation advice in the development of the Highpoint Shopping Centre and prepared and investigative report for VicRoads into intelligent transportation systems for pedestrians with disabilities.

2000 – 2002: Moorabool Shire Council

As a design engineer, Reece was involved in assisting the Assets Service Unit objectives by the accurate and competent performance of surveying, design, plan preparation, contract specifications, building maintenance, asset management, drafting and other duties.

Appendix B

Proposed Signalised Layout of Ford Road / Goulburn Valley Highway / Wanganui Road



NOTES:
1. INSTALL NEW LINEMARKING, REMOVE REDUNDANT & REPAINT WHERE POSSIBLE AS SHOWN.
2. TRAFFIC SIGNAL HARDWARE SHOWN INDICATIVELY ONLY FOR THE PURPOSE OF THIS FUNCTIONAL LAYOUT.
3. STREET LIGHITNG DESIGN TO BE INVESTIGATED AT DETAIL DESIGN.
4. UNDERGROUND UTILITY SERVICES (INCLUDING DRAINAGE) AND OVERHEAD ELECTRICITY CABLES TO BE INVESTIGATED AT DETAIL DESIGN & MAY IMPACT ON THE POSITIONING OF SIGNAL OR LIGHTING INFRASTRUCTURE.

PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY SUBJECT TO CHANGE WITHOUT NOTIFICATION

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

PLOTTED BY: PaulDelacca ON 10/11/2016 AT 3:00:33 PM

AMENDMENTS

ISSUE	DATE	DESCRIPTION	BY	CHK.	APP.
P1	09.11.2016	CONCEPT DESIGN REVIEW ISSUE	RA	PD	PD

GENERAL NOTES
1. ALL DIMENSIONS AND RADII ARE IN METRES AND ARE TO THE FACE OF KERB AND CHANNEL.

2. BASE INFORMATION OBTAINED FROM FEATURE SURVEY DATED 03 MAY 2016 PREPARED BY RURAL WORKS PTY LTD.
GTA CONSULTANTS DOES NOT TAKE ANY RESPONSIBILITY FOR THE ACCURACY OF THE EXISTING CONDITIONS BASE ON WHICH THE SETOUT DETAIL IS BASED.
PRIOR TO COMMENCEMENT OF CONSTRUCTION, THE EXISTING CONDITIONS INCLUDING UNDERGROUND SERVICES SHOULD BE VERIFIED ON SITE.

3. DECLARED MAIN ROAD - NUMURKAH RD (GVH) - SPEED ZONE 60KM/H - DESIGN SPEED 60KM/H
LOCAL ROAD - FORD ROAD - SPEED ZONE 60KM/H
LOCAL ROAD - WANGANUI ROAD - SPEED ZONE 80KM/H

4. DESIGN VEHICLE - 19M SEMI TRAILER

DESIGNED: R.ABRAHAM/ P. DELACCA	DESIGN CHECK:
DRAWN: R.ABRAHAM / P. DELACCA	DRAFTING CHECK:
APPROVED BY:	DATE APPROVED FOR INITIAL ISSUE: 10 NOVEMBER 2016
SCALE A1 Hor. 0 5 10 1:250	CAD FILE NO. V102560-02-P1.dgn

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CLIENT GREATER SHEPPARTON CITY COUNCIL

NUMURKAH RD (GVH) / WANGANUI RD / FORD RD INTERSECTION

FUNCTIONAL LAYOUT

DRAWING NO. V102560-02
ISSUE P1

Appendix C

SIDRA Results

MOVEMENT SUMMARY

Site: 101 [Service Road Access - Existing - Weekday PM Peak]

Numurkah Road / Service Road Access
Giveway / Yield (Two-Way)

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: Numurkah Road (South)											
2	T1	637	5.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
3	R2	11	3.0	0.040	8.9	LOS A	0.1	1.1	0.54	0.76	51.8
3u	U	16	0.0	0.040	11.4	LOS B	0.1	1.1	0.54	0.76	52.2
Approach		663	4.8	0.337	0.5	NA	0.1	1.1	0.02	0.03	78.2
North: Numurkah Road (North)											
7	L2	8	8.0	0.005	7.1	LOS A	0.0	0.0	0.00	0.63	62.7
8	T1	501	5.0	0.265	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		509	5.0	0.265	0.1	NA	0.0	0.0	0.00	0.01	79.5
All Vehicles		1173	4.9	0.337	0.3	NA	0.1	1.1	0.01	0.02	78.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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: 101 [Service Road Access - Existing - Saturday Peak]

Numurkah Road / Service Road Access
Giveway / Yield (Two-Way)

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: Numurkah Road (South)											
2	T1	386	5.0	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
3	R2	16	3.0	0.052	9.8	LOS A	0.2	1.3	0.58	0.80	51.9
3u	U	15	0.0	0.052	12.9	LOS B	0.2	1.3	0.58	0.80	52.2
Approach		417	4.7	0.205	0.8	NA	0.2	1.3	0.04	0.06	76.9
North: Numurkah Road (North)											
7	L2	12	8.0	0.007	7.1	LOS A	0.0	0.0	0.00	0.63	62.7
8	T1	582	5.0	0.308	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		594	5.1	0.308	0.2	NA	0.0	0.0	0.00	0.01	79.4
All Vehicles		1011	4.9	0.308	0.5	NA	0.2	1.3	0.02	0.03	78.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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: 101 [Service Road Access - Post Dev - Weekday PM Peak]

Numurkah Road / Service Road Access
Giveway / Yield (Two-Way)

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: Numurkah Road (South)											
2	T1	616	5.0	0.326	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
3	R2	233	3.0	0.355	11.8	LOS B	1.8	12.9	0.63	0.92	53.6
3u	U	16	0.0	0.355	13.0	LOS B	1.8	12.9	0.63	0.92	54.0
Approach		864	4.4	0.355	3.4	NA	1.8	12.9	0.18	0.26	70.0
North: Numurkah Road (North)											
7	L2	156	8.0	0.089	7.1	LOS A	0.0	0.0	0.00	0.63	62.7
8	T1	452	5.0	0.239	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		607	5.8	0.239	1.8	NA	0.0	0.0	0.00	0.16	74.6
All Vehicles		1472	4.9	0.355	2.8	NA	1.8	12.9	0.11	0.22	71.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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: 101 [Service Road Access - Post Dev - Saturday Peak]

Numurkah Road / Service Road Access
Giveway / Yield (Two-Way)

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: Numurkah Road (South)											
2	T1	365	5.0	0.193	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
3	R2	276	3.0	0.477	14.2	LOS B	2.7	19.5	0.72	1.00	51.8
3u	U	15	0.0	0.477	15.7	LOS C	2.7	19.5	0.72	1.00	52.1
Approach		656	4.0	0.477	6.3	NA	2.7	19.5	0.32	0.44	64.4
North: Numurkah Road (North)											
7	L2	169	8.0	0.096	7.1	LOS A	0.0	0.0	0.00	0.63	62.7
8	T1	533	5.0	0.282	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		702	5.7	0.282	1.7	NA	0.0	0.0	0.00	0.15	74.9
All Vehicles		1358	4.9	0.477	4.0	NA	2.7	19.5	0.15	0.29	69.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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: 101 [Existing (West T-int) - Weekday PM Peak]

Network: N101 [Existing PM Peak]

Numurkah Road / Ford Road / Wanganui Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival 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: Numurkah Road (South)													
1	L2	62	10.0	62	10.0	0.040	3.5	LOS A	0.2	1.2	0.06	0.53	58.4
2	T1	504	5.0	504	5.0	0.267	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		566	5.5	566	5.5	0.267	0.4	LOS A	0.2	1.2	0.01	0.06	76.7
North: Numurkah Road (North)													
8	T1	342	5.0	342	5.0	0.181	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
9	R2	13	6.0	13	6.0	0.013	9.0	LOS A	0.1	0.4	0.51	0.65	61.1
Approach		355	5.0	355	5.0	0.181	0.3	NA	0.1	0.4	0.02	0.02	78.3
West: Wanganui Road (West)													
10	L2	17	3.0	17	3.0	0.023	9.7	LOS A	0.1	0.5	0.48	0.70	61.5
12	R2	89	12.0	89	12.0	0.367	25.0	LOS C	1.5	11.5	0.84	0.99	38.6
Approach		106	10.6	106	10.6	0.367	22.6	LOS C	1.5	11.5	0.78	0.94	42.9
All Vehicles		1027	5.9	1027	5.9	0.367	2.7	NA	1.5	11.5	0.09	0.14	70.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 101 [Existing (East T-int) - Weekday PM Peak]

Network: N101 [Existing PM Peak]

Numurkah Road / Ford Road / Wanganui Road
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival 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: Numurkah Road (South)													
2	T1	525	5.0	525	5.0	0.278	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
3	R2	112	3.0	112	3.0	0.126	9.2	LOS A	0.5	3.6	0.49	0.73	61.8
Approach		637	4.6	637	4.6	0.278	1.6	NA	0.5	3.6	0.09	0.13	73.5
East: Ford Road (East)													
4	L2	123	1.0	123	1.0	0.164	11.5	LOS B	0.6	4.3	0.48	0.95	61.2
6	R2	41	11.0	41	11.0	0.282	37.3	LOS E	1.0	7.5	0.88	1.03	31.8
Approach		164	3.5	164	3.5	0.282	18.0	LOS C	1.0	7.5	0.58	0.97	54.0
North: Numurkah Road (North)													
7	L2	45	4.0	45	4.0	0.025	3.1	LOS A	0.0	0.0	0.00	0.55	61.3
8	T1	386	5.0	386	5.0	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		432	4.9	432	4.9	0.205	0.3	NA	0.0	0.0	0.00	0.06	77.4
All Vehicles		1233	4.6	1233	4.6	0.282	3.4	NA	1.0	7.5	0.12	0.22	69.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 101 [Existing (West T-int) - Saturday Peak]

Network: N102 [Existing Saturday Peak]

Numurkah Road / Ford Road / Wanganui Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival 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: Numurkah Road (South)													
1	L2	85	4.0	85	4.0	0.054	3.6	LOS A	0.2	1.6	0.07	0.53	61.4
2	T1	276	3.0	276	3.0	0.144	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		361	3.2	361	3.2	0.144	0.8	LOS A	0.2	1.6	0.02	0.12	74.6
North: Numurkah Road (North)													
8	T1	423	2.0	423	2.0	0.220	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
9	R2	19	8.0	19	8.0	0.014	7.9	LOS A	0.1	0.5	0.37	0.60	61.1
Approach		442	2.3	442	2.3	0.220	0.4	NA	0.1	0.5	0.02	0.03	78.0
West: Wanganui Road (West)													
10	L2	20	0.0	20	0.0	0.020	8.1	LOS A	0.1	0.5	0.34	0.62	63.8
12	R2	80	6.0	80	6.0	0.233	17.2	LOS C	0.9	6.6	0.73	0.92	46.0
Approach		100	4.8	100	4.8	0.233	15.4	LOS C	0.9	6.6	0.65	0.86	50.7
All Vehicles		903	2.9	903	2.9	0.233	2.2	NA	0.9	6.6	0.09	0.16	71.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 101 [Existing (East T-int) - Saturday Peak]

Network: N102 [Existing Saturday Peak]

Numurkah Road / Ford Road / Wanganui Road
Stop (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival 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: Numurkah Road (South)													
2	T1	312	3.0	312	3.0	0.163	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
3	R2	75	1.0	75	1.0	0.091	9.5	LOS A	0.3	2.4	0.51	0.75	62.0
Approach		386	2.6	386	2.6	0.163	1.8	NA	0.3	2.4	0.10	0.14	73.2
East: Ford Road (East)													
4	L2	124	1.0	124	1.0	0.185	12.3	LOS B	0.7	4.8	0.52	0.98	60.5
6	R2	49	4.0	49	4.0	0.211	24.3	LOS C	0.7	5.4	0.80	1.01	40.5
Approach		174	1.9	174	1.9	0.211	15.7	LOS C	0.7	5.4	0.60	0.99	55.9
North: Numurkah Road (North)													
7	L2	34	2.0	34	2.0	0.018	3.1	LOS A	0.0	0.0	0.00	0.55	62.4
8	T1	469	2.0	469	2.0	0.244	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		503	2.0	503	2.0	0.244	0.2	NA	0.0	0.0	0.00	0.04	78.4
All Vehicles		1063	2.2	1063	2.2	0.244	3.3	NA	0.7	5.4	0.13	0.23	70.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 101 [Post Dev (West T-int) - Weekday PM Peak]

Network: N101 [Post Dev - Weekday PM]

Numurkah Road / Ford Road / Wanganui Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival 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: Numurkah Road (South)													
1	L2	83	10.0	76	9.4	0.049	3.5	LOS A	0.2	1.5	0.06	0.53	58.7
2	T1	595	5.0	546	4.7	0.289	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		678	5.6	622[N1]	5.3	0.289	0.4	LOS A	0.2	1.5	0.01	0.06	76.5
North: Numurkah Road (North)													
8	T1	443	5.0	443	5.0	0.235	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
9	R2	13	6.0	13	6.0	0.013	9.2	LOS A	0.1	0.4	0.53	0.67	60.8
Approach		456	5.0	456	5.0	0.235	0.3	NA	0.1	0.4	0.01	0.02	78.6
West: Wanganui Road (West)													
10	L2	17	3.0	17	3.0	0.024	10.0	LOS B	0.1	0.6	0.50	0.72	61.1
12	R2	116	12.0	116	12.0	0.637	41.2	LOS E	3.0	23.1	0.93	1.11	28.8
Approach		133	10.9	133	10.9	0.637	37.3	LOS E	3.0	23.1	0.87	1.06	32.7
All Vehicles		1266	6.0	1211[N1]	6.2	0.637	4.4	NA	3.0	23.1	0.10	0.16	66.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 101 [Post Dev (East T-int) - Weekday PM Peak]

Network: N101 [Post Dev - Weekday PM]

Numurkah Road / Ford Road / Wanganui Road
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival 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: Numurkah Road (South)													
2	T1	504	5.0	504	5.0	0.267	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
3	R2	112	3.0	112	3.0	0.150	10.2	LOS B	0.6	4.2	0.55	0.80	60.7
Approach		616	4.6	616	4.6	0.267	1.9	NA	0.6	4.2	0.10	0.15	72.9
East: Ford Road (East)													
4	L2	123	1.0	123	1.0	0.190	12.6	LOS B	0.7	4.9	0.54	0.99	60.3
6	R2	174	11.0	174	11.0	1.482	493.6	LOS F	41.6	318.7	1.00	2.85	3.5
Approach		297	6.9	297	6.9	1.482	294.0	LOS F	41.6	318.7	0.81	2.08	7.8
North: Numurkah Road (North)													
7	L2	75	4.0	75	4.0	0.041	3.1	LOS A	0.0	0.0	0.00	0.55	61.3
8	T1	484	5.0	484	5.0	0.256	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		559	4.9	559	4.9	0.256	0.4	NA	0.0	0.0	0.00	0.07	76.8
All Vehicles		1472	5.2	1472	5.2	1.482	60.3	NA	41.6	318.7	0.21	0.51	24.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 101 [Post Dev (West T-int) - Saturday Peak]

Network: N101 [Post Dev - Saturday Midday Peak]

Numurkah Road / Ford Road / Wanganui Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	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: Numurkah Road (South)													
1	L2	109	4.0	103	4.0	0.065	3.6	LOS A	0.3	2.0	0.07	0.53	61.4
2	T1	383	3.0	361	3.0	0.189	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		493	3.2	464[N1]	3.2	0.189	0.8	LOS A	0.3	2.0	0.02	0.12	74.8
North: Numurkah Road (North)													
8	T1	540	2.0	540	2.0	0.281	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
9	R2	19	8.0	19	8.0	0.016	8.3	LOS A	0.1	0.5	0.43	0.62	60.9
Approach		559	2.2	559	2.2	0.281	0.3	NA	0.1	0.5	0.01	0.02	78.3
West: Wanganui Road (West)													
10	L2	20	0.0	20	0.0	0.022	8.5	LOS A	0.1	0.5	0.40	0.65	63.6
12	R2	111	6.0	111	6.0	0.481	28.8	LOS D	2.1	15.4	0.87	1.03	35.7
Approach		131	5.1	131	5.1	0.481	25.7	LOS D	2.1	15.4	0.80	0.97	40.3
All Vehicles		1182	2.9	1153[N1]	3.0	0.481	3.4	NA	2.1	15.4	0.10	0.17	69.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 101 [Post Dev (East T-int) - Saturday Peak]

Network: N101 [Post Dev - Saturday Midday Peak]

Numurkah Road / Ford Road / Wanganui Road
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival 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: Numurkah Road (South)													
2	T1	291	3.0	291	3.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
3	R2	75	1.0	75	1.0	0.111	10.8	LOS B	0.4	2.9	0.58	0.82	60.7
Approach		365	2.6	365	2.6	0.152	2.2	NA	0.4	2.9	0.12	0.17	72.2
East: Ford Road (East)													
4	L2	124	1.0	124	1.0	0.220	13.8	LOS B	0.8	5.7	0.59	1.00	59.2
6	R2	202	4.0	202	4.0	1.167	215.7	LOS F	25.8	186.6	1.00	2.37	7.7
Approach		326	2.9	326	2.9	1.167	138.8	LOS F	25.8	186.6	0.84	1.85	14.7
North: Numurkah Road (North)													
7	L2	73	2.0	73	2.0	0.040	3.1	LOS A	0.0	0.0	0.00	0.55	62.4
8	T1	578	2.0	578	2.0	0.300	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		651	2.0	651	2.0	0.300	0.3	NA	0.0	0.0	0.00	0.06	77.4
All Vehicles		1342	2.4	1342	2.4	1.167	34.5	NA	25.8	186.6	0.24	0.53	34.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

MOVEMENT SUMMARY

Site: 101 [Stag X-Signalised Intersection - Weekday PM]

New Site
Signals - Fixed Time Isolated Cycle Time = 70 seconds (User-Given Cycle Time)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: RoadName											
1	L2	44	0.0	0.062	20.7	LOS C	1.0	6.8	0.67	0.70	43.9
2	T1	460	0.0	0.613	19.5	LOS B	13.0	90.7	0.87	0.76	45.4
3	R2	112	0.0	0.414	31.7	LOS C	3.4	24.0	0.90	0.78	38.6
Approach		616	0.0	0.613	21.8	LOS C	13.0	90.7	0.86	0.76	43.9
East: RoadName											
4	L2	123	0.0	0.598	30.8	LOS C	9.2	64.3	0.93	0.82	39.5
5	T1	39	0.0	0.598	25.3	LOS C	9.2	64.3	0.93	0.82	40.2
6	R2	136	0.0	0.598	30.8	LOS C	9.2	64.3	0.93	0.82	39.7
Approach		298	0.0	0.598	30.1	LOS C	9.2	64.3	0.93	0.82	39.6
North: RoadName											
7	L2	55	0.0	0.077	20.8	LOS C	1.2	8.5	0.68	0.70	43.8
8	T1	388	0.0	0.517	18.6	LOS B	10.4	73.1	0.83	0.71	45.9
9	R2	13	0.0	0.055	30.9	LOS C	0.4	2.5	0.84	0.69	38.9
Approach		456	0.0	0.517	19.2	LOS B	10.4	73.1	0.81	0.71	45.4
West: RoadName											
10	L2	17	0.0	0.599	39.6	LOS D	4.6	32.4	1.00	0.81	36.1
11	T1	20	0.0	0.599	34.1	LOS C	4.6	32.4	1.00	0.81	36.7
12	R2	96	0.0	0.599	39.7	LOS D	4.6	32.4	1.00	0.81	36.2
Approach		133	0.0	0.599	38.8	LOS D	4.6	32.4	1.00	0.81	36.3
All Vehicles		1502	0.0	0.613	24.2	LOS C	13.0	90.7	0.87	0.76	42.6

Site Level of Service (LOS) Method: Delay (SIDRA). 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: 101 [Stag X-Signalised Intersection - Sat Midday]

New Site
Signals - Fixed Time Isolated Cycle Time = 70 seconds (User-Given Cycle Time)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: RoadName											
1	L2	63	0.0	0.092	21.7	LOS C	1.4	10.0	0.70	0.71	43.4
2	T1	227	0.0	0.315	17.7	LOS B	5.7	39.7	0.77	0.64	46.5
3	R2	75	0.0	0.366	35.0	LOS D	2.4	16.9	0.92	0.77	37.2
Approach		365	0.0	0.366	21.9	LOS C	5.7	39.7	0.79	0.68	43.7
East: RoadName											
4	L2	124	0.0	0.620	30.2	LOS C	10.0	70.1	0.93	0.82	39.7
5	T1	46	0.0	0.620	24.7	LOS C	10.0	70.1	0.93	0.82	40.5
6	R2	156	0.0	0.620	30.3	LOS C	10.0	70.1	0.93	0.82	39.9
Approach		326	0.0	0.620	29.5	LOS C	10.0	70.1	0.93	0.82	39.9
North: RoadName											
7	L2	67	0.0	0.098	21.7	LOS C	1.5	10.7	0.70	0.71	43.4
8	T1	473	0.0	0.655	20.6	LOS C	13.7	96.2	0.90	0.78	44.8
9	R2	19	0.0	0.053	25.4	LOS C	0.5	3.4	0.75	0.69	41.3
Approach		559	0.0	0.655	20.9	LOS C	13.7	96.2	0.87	0.77	44.5
West: RoadName											
10	L2	20	0.0	0.587	39.5	LOS D	4.5	31.5	0.99	0.80	35.9
11	T1	5	0.0	0.587	34.0	LOS C	4.5	31.5	0.99	0.80	36.5
12	R2	104	0.0	0.587	39.6	LOS D	4.5	31.5	0.99	0.80	36.1
Approach		129	0.0	0.587	39.4	LOS D	4.5	31.5	0.99	0.80	36.1
All Vehicles		1380	0.0	0.655	24.9	LOS C	13.7	96.2	0.87	0.76	42.2

Site Level of Service (LOS) Method: Delay (SIDRA). 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: 101 [Stag X-Signalised Intersection - Weekday PM + Stage 2 IGA]

New Site
Signals - Fixed Time Isolated Cycle Time = 70 seconds (User-Given Cycle Time)

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: RoadName											
1	L2	44	0.0	0.049	16.2	LOS B	0.8	5.7	0.56	0.68	46.4
2	T1	671	0.0	0.817	20.6	LOS C	20.9	146.2	0.85	0.85	44.8
3	R2	112	0.0	0.449	30.5	LOS C	3.4	23.9	0.88	0.79	39.0
Approach		826	0.0	0.817	21.7	LOS C	20.9	146.2	0.84	0.83	44.0
East: RoadName											
4	L2	123	0.0	0.828	41.3	LOS D	11.3	79.1	1.00	0.97	35.5
5	T1	39	0.0	0.828	35.8	LOS D	11.3	79.1	1.00	0.97	36.0
6	R2	136	0.0	0.828	41.3	LOS D	11.3	79.1	1.00	0.97	35.6
Approach		298	0.0	0.828	40.6	LOS D	11.3	79.1	1.00	0.97	35.6
North: RoadName											
7	L2	55	0.0	0.060	16.3	LOS B	1.0	7.1	0.57	0.69	46.3
8	T1	599	0.0	0.631	15.0	LOS B	15.5	108.2	0.81	0.72	48.1
9	R2	13	0.0	0.060	30.2	LOS C	0.4	2.5	0.82	0.69	39.2
Approach		666	0.0	0.631	15.4	LOS B	15.5	108.2	0.79	0.71	47.7
West: RoadName											
10	L2	17	0.0	0.798	45.1	LOS D	5.1	35.6	1.00	0.92	34.2
11	T1	20	0.0	0.798	39.6	LOS D	5.1	35.6	1.00	0.92	34.8
12	R2	96	0.0	0.798	45.1	LOS D	5.1	35.6	1.00	0.92	34.4
Approach		133	0.0	0.798	44.3	LOS D	5.1	35.6	1.00	0.92	34.4
All Vehicles		1923	0.0	0.828	24.0	LOS C	20.9	146.2	0.86	0.82	42.8

Site Level of Service (LOS) Method: Delay (SIDRA). 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: 101 [Stag X-Signalised Intersection - Sat Midday + Stage 2 IGA]

New Site
Signals - Fixed Time Isolated Cycle Time = 70 seconds (User-Given Cycle Time)

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: RoadName											
1	L2	63	0.0	0.074	17.6	LOS B	1.2	8.6	0.60	0.70	45.6
2	T1	438	0.0	0.489	15.0	LOS B	10.7	74.9	0.76	0.66	48.1
3	R2	75	0.0	0.418	35.6	LOS D	2.5	17.3	0.93	0.77	37.0
Approach		576	0.0	0.489	18.0	LOS B	10.7	74.9	0.77	0.68	46.0
East: RoadName											
4	L2	124	0.0	0.786	37.7	LOS D	11.7	82.2	1.00	0.93	36.7
5	T1	46	0.0	0.786	32.2	LOS C	11.7	82.2	1.00	0.93	37.4
6	R2	156	0.0	0.786	37.8	LOS D	11.7	82.2	1.00	0.93	36.9
Approach		326	0.0	0.786	37.0	LOS D	11.7	82.2	1.00	0.93	36.9
North: RoadName											
7	L2	67	0.0	0.079	17.6	LOS B	1.3	9.2	0.60	0.70	45.6
8	T1	683	0.0	0.783	20.1	LOS C	21.2	148.5	0.90	0.86	45.0
9	R2	19	0.0	0.061	24.9	LOS C	0.5	3.3	0.74	0.70	41.6
Approach		769	0.0	0.783	20.0	LOS C	21.2	148.5	0.87	0.84	45.0
West: RoadName											
10	L2	20	0.0	0.783	44.7	LOS D	4.9	34.5	1.00	0.91	34.2
11	T1	5	0.0	0.783	39.2	LOS D	4.9	34.5	1.00	0.91	34.7
12	R2	104	0.0	0.783	44.7	LOS D	4.9	34.5	1.00	0.91	34.3
Approach		129	0.0	0.783	44.5	LOS D	4.9	34.5	1.00	0.91	34.3
All Vehicles		1801	0.0	0.786	24.2	LOS C	21.2	148.5	0.87	0.81	42.6

Site Level of Service (LOS) Method: Delay (SIDRA). 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: 101 [Upraged Ult X-Signalised Intersection - Weekday PM]

New Site
Signals - Fixed Time Isolated Cycle Time = 70 seconds (User-Given Cycle Time)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Goulburne Valley Highway											
1	L2	44	0.0	0.029	6.3	LOS A	0.2	1.1	0.20	0.59	53.6
2	T1	460	0.0	0.599	23.7	LOS C	10.0	70.1	0.89	0.75	43.3
3	R2	112	0.0	0.580	40.6	LOS D	3.9	27.5	1.00	0.80	35.8
Approach		616	0.0	0.599	25.5	LOS C	10.0	70.1	0.86	0.74	42.3
East: Ford Road											
4	L2	123	0.0	0.092	7.3	LOS A	0.8	5.9	0.31	0.63	52.9
5	T1	39	0.0	0.112	27.0	LOS C	1.2	8.1	0.88	0.65	41.7
6	R2	136	0.0	0.617	39.9	LOS D	4.8	33.4	1.00	0.82	36.1
Approach		298	0.0	0.617	24.8	LOS C	4.8	33.4	0.70	0.72	42.4
North: Goulburne Valley Highway											
7	L2	55	0.0	0.039	6.7	LOS A	0.3	2.0	0.25	0.60	53.3
8	T1	388	0.0	0.354	22.5	LOS C	5.4	38.1	0.85	0.70	43.9
9	R2	13	0.0	0.066	37.7	LOS D	0.4	2.9	0.93	0.67	37.0
Approach		456	0.0	0.354	21.1	LOS C	5.4	38.1	0.78	0.69	44.6
West: Wanganui Road											
10	L2	17	0.0	0.015	9.0	LOS A	0.2	1.2	0.39	0.61	51.6
11	T1	20	0.0	0.058	26.6	LOS C	0.6	4.1	0.87	0.61	41.9
12	R2	96	0.0	0.218	37.5	LOS D	1.6	11.0	0.94	0.73	36.9
Approach		133	0.0	0.218	32.3	LOS C	1.6	11.0	0.86	0.70	39.1
All Vehicles		1502	0.0	0.617	24.6	LOS C	10.0	70.1	0.80	0.72	42.7

Site Level of Service (LOS) Method: Delay (SIDRA). 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
P1	South Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P2	East Full Crossing	53	27.5	LOS C	0.1	0.1	0.89	0.89
P3	North Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P4	West Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		211	28.9	LOS C			0.91	0.91

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: 101 [Upraged Ult X-Signalised Intersection - Sat Midday]

New Site
Signals - Fixed Time Isolated Cycle Time = 70 seconds (User-Given Cycle Time)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Goulburne Valley Highway											
1	L2	63	0.0	0.042	6.3	LOS A	0.2	1.6	0.20	0.60	53.6
2	T1	227	0.0	0.352	24.6	LOS C	4.8	33.4	0.87	0.69	42.8
3	R2	75	0.0	0.453	41.0	LOS D	2.6	18.3	0.99	0.76	35.6
Approach		365	0.0	0.453	24.8	LOS C	4.8	33.4	0.78	0.69	42.6
East: Ford Road											
4	L2	124	0.0	0.097	7.6	LOS A	0.9	6.5	0.32	0.63	52.7
5	T1	46	0.0	0.134	27.2	LOS C	1.4	9.6	0.88	0.66	41.6
6	R2	156	0.0	0.472	35.0	LOS C	5.0	35.0	0.95	0.79	37.9
Approach		326	0.0	0.472	23.4	LOS C	5.0	35.0	0.70	0.71	43.1
North: Goulburne Valley Highway											
7	L2	67	0.0	0.046	6.4	LOS A	0.3	1.9	0.22	0.60	53.5
8	T1	473	0.0	0.512	26.1	LOS C	7.3	50.8	0.92	0.76	42.1
9	R2	19	0.0	0.115	39.3	LOS D	0.6	4.4	0.95	0.69	36.4
Approach		559	0.0	0.512	24.2	LOS C	7.3	50.8	0.84	0.74	43.0
West: Wanganui Road											
10	L2	20	0.0	0.016	7.6	LOS A	0.1	1.0	0.31	0.60	52.6
11	T1	5	0.0	0.015	26.1	LOS C	0.2	1.1	0.85	0.56	42.1
12	R2	104	0.0	0.158	33.0	LOS C	1.6	10.9	0.89	0.73	38.7
Approach		129	0.0	0.158	28.8	LOS C	1.6	10.9	0.80	0.70	40.5
All Vehicles		1380	0.0	0.512	24.6	LOS C	7.3	50.8	0.79	0.72	42.6

Site Level of Service (LOS) Method: Delay (SIDRA). 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
P1	South Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P2	East Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P3	North Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P4	West Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		211	29.3	LOS C			0.92	0.92

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.

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