Traffix Group

35 & 69-93 Hams Road, Waurn Ponds

Greater Geelong Planning Scheme Amendment C372 and Planning Permit Applications 662 & 663/2017

Traffic Engineering Evidence Statement to Planning Panels Victoria

Date of Statement: 15 August 2019
Date of Inspection: **31 July 2019**

Prepared For the Proponent: Echin Pty Ltd & Waurn Ponds Unit Trust
Instructed By: Norton Rose Fulbright

Reference: G21540A-01

IN THE MATTER OF AMENDMENT C372 TO THE GREATER GEELONG PLANNING PERMIT AND PLANNING PERMIT APPLICATIONS 662 & 663/2017 RELATING TO 35 & 69-93 HAMS ROAD, WAURN PONDS

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STATEMENT TO PLANNING PANELS VICTORIA BY JASON LEE WALSH, TRAFFIC ENGINEER

Greater Geelong Planning Scheme Amendment C372 and Planning Permit Applications 662 & 663/2017

at

35 & 69-93 Hams Road, Waurn Ponds

Our Reference: G21540A-01

Table of Contents

List of Figures

List of Tables

List of Appendices

1. Introduction

I have been instructed by Norton Rose Fulbright on behalf of Echin Pty Ltd & Waurn Ponds Unit Trust to undertake a traffic engineering assessment of Greater Geelong Planning Scheme Amendment C372 and Planning Permit Applications 662 & 663/2017 pertaining to the proposed rezoning and residential subdivision of 35 & 69-93 Hams Road, Waurn Ponds.

In the course of preparing this statement, I inspected the subject site on 31 July 2019, reviewed development plans and background material, and assessed the traffic impacts of the proposal.

My qualifications and experience to undertake the following assessment are set out in Appendix A.

2. History of Application

The proponent, Echin Pty Ltd & Waurn Ponds Unit Trust, submitted a combined Planning Scheme Amendment and Planning Permit Applications to Greater Geelong City Council in June 2017. The Amendment and permit applications propose a rezoning and multi-lot residential subdivision of the land at 35 & 69-93 Hams Road, Waurn Ponds.

The Amendment is to rezone the subject site from Farming Zone (FZ) to General Residential Zone 1 (GRZ1), and apply Design and Development Overlay Schedule 45 (DDO45).

My firm prepared a Traffic Engineering Assessment report (ref. G21540R-01F, dated 30 October 2018) that accompanied the amendment and planning permit application. I had no involvement in the application.

The Amendment and planning permit applications were placed on exhibition from 21 March to 26 April 2019.

A 164 submissions were received, with many raising concern with traffic amongst other matters.

In June 2019, Council considered the submissions and resolved to refer them to an independent Panel appointed by the Minister for Planning.

Following review of submissions, the proponent prepared a sketch revised masterplan and submitted this to Council. Changes included the removal of the medium density superlots, replacing lots less than 300m^2 with larger lots of at least 400m^2 and the provision of 30 lots that are at least 800m^2.

The proponent formalised the revised Masterplan, as revision 19, dated 24 July 2019.

My evidence is based on the revised masterplan.

3. Proposal

The proposal is for a combined Planning Scheme Amendment and Planning Permit applications for a multi-lot subdivision of land at 35 & 69-93 Hams Road, Waurn Ponds.

The Planning Scheme Amendment is to rezone the subject site from Farming Zone (FZ) to General Residential Zone 1 (GRZ1) and apply the Design and Development Overlay Schedule 45 (DDO45).

The Master Plan (dated 24/07/19) illustrates a residential subdivision for 245 lots. Nineteen lots have an abuttal to Hams Road, with the remainder accessible via construction of an internal road network, with two streets connecting to Hams Road. The connections include:

- The primary access (western access) is sited approximately midway along the site's frontage, immediately west of Champagne Court. The road is nominated with a 20 metre reservation, inclusive of a median.
- A secondary access (eastern access) is sited towards the site's eastern boundary. This road is nominated with a reservation of 16 metres.

The application proposes construction of a roundabout at the intersection of Hams Road / Ghazeepore Road / Sugargum Drive, and improvements to Hams Road.

A concept plan for the roundabout and cross section for the upgraded Hams Road are attached as Appendix B.

The proponent has also agreed to provide a contribution towards an investigation of operational improvements for Ghazeepore Road, north of Hams Road.

4. Existing Conditions

4.1. Subject Site

The subject site is irregular in shape and is located on the south side of Hams Road, immediately to the east of the Princes Freeway, as shown in the locality plan presented at Figure 1. An aerial photograph of the site and its surrounds is shown at Figure 2.

The site is largely vacant farmland, with some existing buildings in the north-western part.

The subject site is zoned 'Farming Zone (FZ)' under the Greater Geelong Planning Scheme.

Land use within the immediate vicinity of the subject site is generally residential to the north, across Hams Road, and a power terminal station abuts the northeast corner of the site. The site is flanked by the Geelong Warrnambool railway line to the south, and Princes Freeway to the west. To the east, across Ghazeepore Road is a largely developed residential estate, incorporating Waurn Ponds railway station.

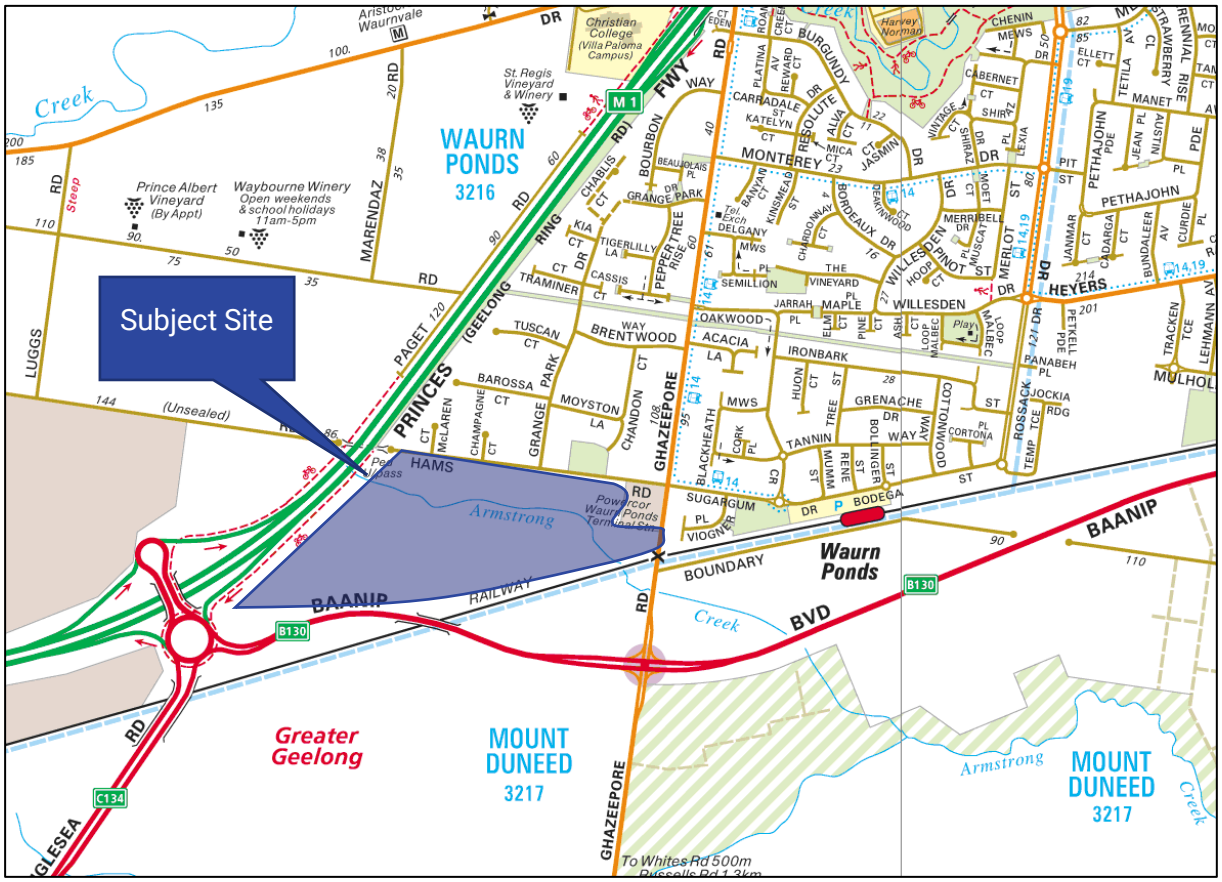

Figure 1: Locality Plan

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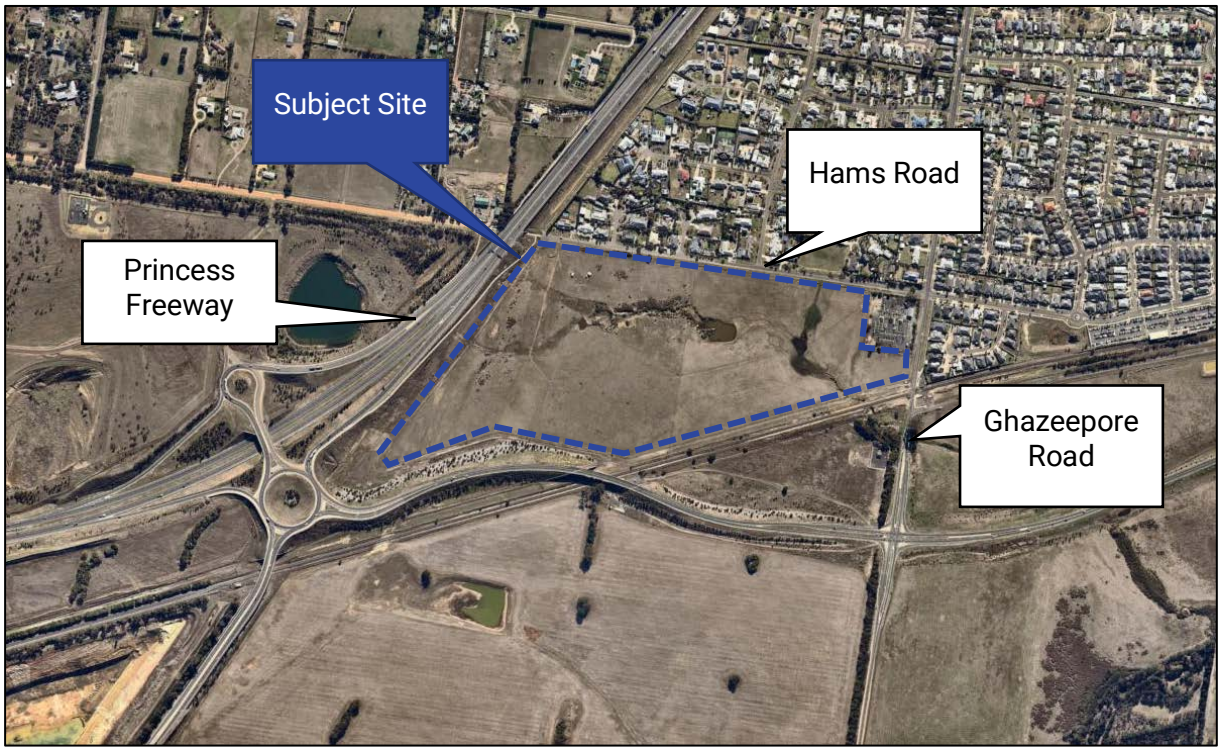


Source: Nearmap

Figure 2: Aerial Photograph

4.2. Public Transport

Waurn Ponds Railway Station is approximately 500 metres walking distance from the eastern boundary of the subject land. The railway station accommodates two services being Melbourne (Southern Cross railway Station) – Geelong, and Warrnambool – Melbourne via Colac and Geelong.

Bus Route 41 and 42 both provide a service between Geelong Station and Deakin University, via Grovedale and South Valley Road respectively. Both services stop at Waurn Ponds Station, with the nearest stop to the subject land, located on Sugargum Drive, some 200 metres to the east of the subject land.

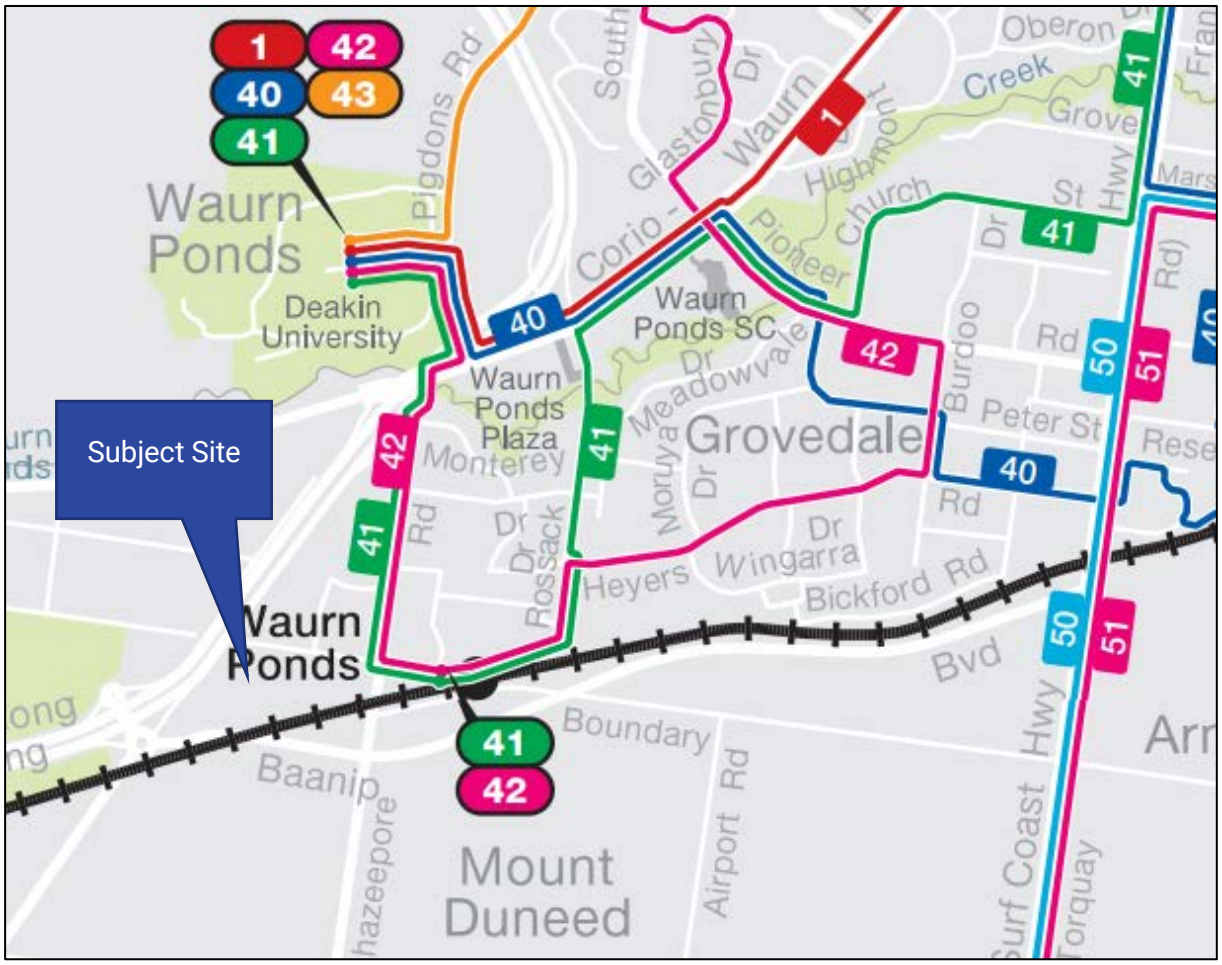


Figure 3: PTV Public Transport Map - Greater Geelong

4.2.1. Waurn Ponds Station

Waurn Ponds Station is proposed to be upgraded as part of the Regional Rail Revival program. The upgrades include:

- *A second platform on the south side of the station with shelters and seating.*
- *A new pedestrian overpass to provide access between the two platforms featuring lifts, ramps and stairs.*
- *New secure bicycle storage and bicycle hoops.*
- *Car park improvements including:*
  - *more than 90 new car parking spaces*
  - *formalising 120 existing unsealed car parking spaces*
  - *more accessible car parking spaces*
  - *new drop-off zone*
  - *new access points at both ends of the station car park.*

- *Track duplication to enable trains to pass each other.*

I understand construction will commence in 2020, with a target completion date in 2021.

4.2.2. Waurn Ponds Stabling Facility

A stabling facility is also proposed west of Waurn Ponds Station on the western side of Ghazeepore Road, as part of the delivery of the Geelong and Warrnambool line upgrades.

The works are subject to Planning Scheme Amendment (GC104), which is currently on exhibition, and has been refreed to the Government Land Standing Advisory Committee.

5. Traffic Considerations

5.1. Road Network

Hams Road is a local road managed by Council. Hams Road extends to the west for approximately 700 metres from Ghazeepore Road terminating in a court bowl arrangement at the Princes Freeway. Hams Road operates two-way with a pavement width of approximately 5 metres set within a 20 metre reservation. The northern side of the road is provided with kerb and channel, whilst the southern side is provided with a gravel verge. There are no footpaths within Hams Road.

A posted speed limit of 50km/h currently applies to Hams Road in the vicinity of the site.

Ghazeepore Road is a higher order local road managed by Council. Ghazeepore Road is aligned in a north-south direction providing a connection between Colac Road in the north and Grossmans Road in the south, albeit south of Dickins Road parts of Ghazeepore Road revert to a gravel surface.

North of Hams Road, Ghazeepore Road has a pavement width in the order of 10 metres contained by kerb and channel on both sides. Ghazeepore Road operates two-way, with kerbside parking permitted on both kerbs, although upon my site visit, I noticed some motorists choose to park on the verge rather than kerbside on the western side.

South of Hams Road, Ghazeepore Road has a pavement width of approximately 7 metres with kerb and channel on the eastern side and a gravel verge on the western side. A posted speed limit of 60km/h applies to Ghazeepore Road in the vicinity of Hams Road.

The intersection of Hams Road and Ghazeepore Road is arranged as a statutory controlled x-intersection, with Sugargum Drive forming the western leg of the intersection. Priority is afforded to Ghazeepore Road.

Figure 4 to Figure 7 illustrate views of the surrounding road network.

Figure 4: Hams Road – View west

Figure 5: Hams Road – View east

Figure 6: Ghazeepore Road – View North

Figure 7: Ghazeepore Road – View South

Baanip Boulevard, constructed in 2015, is an arterial road providing a connection between Surf Coast Highway in the east and Princes Freeway / Anglesea Road in the west.

The intersection of Baanip Boulevard and Ghazeepore Road is signalised.

5.2. Accident Review

My firm undertook a review of VicRoads Crashstats database for the last five years of available data (last updated 30th June, 2018). The crash investigation area included Hams Road and the intersection of Hams Road / Sugargum Drive / Ghazeepore Road.

The data identifies that there were no crashes recorded within the review area during this period.

5.3. Existing Traffic Volumes

My firm undertook peak period traffic counts and observations of the Hams Road / Ghazeepore Road / Sugargum Drive intersection during the following periods:

- Wednesday 8th May, 2019 - 4:30pm to 6:30pm, and
- Thursday 9th May, 2019 - 7:15am to 9:15am.

The peak hours for the overall intersection were found to occur 7:45-8:45am and 4:30-5:30pm. The recorded AM and PM peak hour volumes are shown at Figure 8.

Ghazeepore Road experienced a north bound bias in the morning peak and a south bound bias in the afternoon, as one might expect with the majority of trips towards Waurn Ponds / Geelong in the morning and returning home in the afternoon.

Based on the recorded volumes, it is estimated Ghazeepore Road (north of Hams Road) has a daily two-way volume in the order of 5,800 vehicles, whilst Hams Road has a daily two-way volume of approximately 500 vehicles.

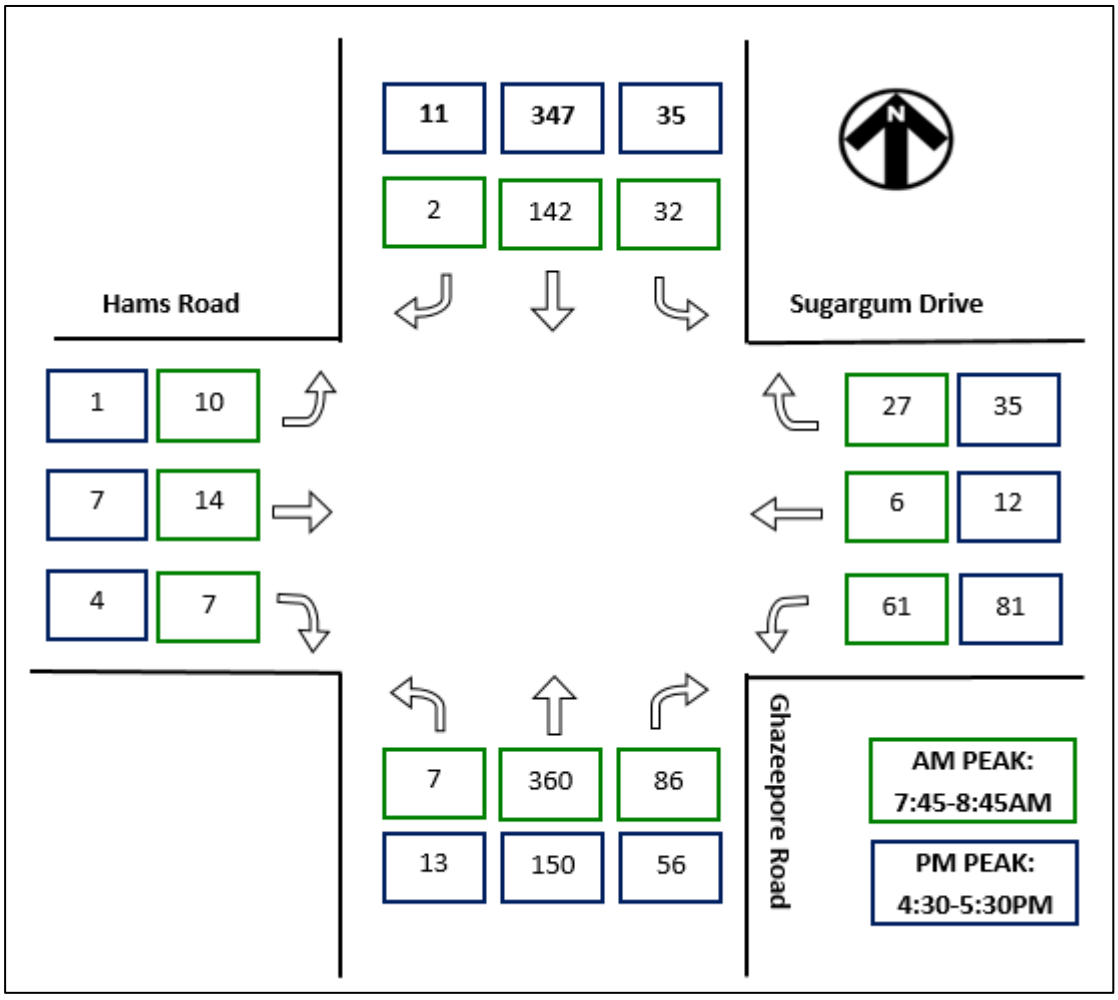


Figure 8: Hams Rd / Ghazeepore Rd / Sugargum Dr Intersection - Existing Peak Hour Traffic Volumes

Supplementing the traffic counts, I visited the site on Wednesday the 31st of July 2019, during the afternoon peak hour, and observed traffic at the intersection of Ghazeepore Road and Hams Road.

In my opinion the intersection, for the most part, operated well with motorists able to make turns safely and with very little delay and queues. In the time I was observing the intersection, there were two train arrivals, around 5:20pm and 5:55pm. There was a noticeable increase in traffic along Sugargum Drive, immediately after the train arrivals, related to passengers departing the train station car park. The later train arrival was busier and at this time, queues in Sugargum Drive did extend and motorists departing did experience some delay, albeit only lasting for 5-10 minutes.

5.4. Future Traffic Volumes – Base Case

It is typical when constructing a new intersection for the analysis to contemplate a 10 year assessment period (2029).

In this regard, I have adopted a 3% annual growth rate for through traffic volumes along Ghazeepore Road and a 2% annual growth rate for turning traffic volumes into / out of Sugargum Drive from / to Ghazeepore Road. In effect, this allows for a 30% growth in traffic volumes on Ghazeepore Road, and a 20% increase in traffic volumes on Sugargum Drive.

Figure 9 illustrates the projected 2029 base case traffic volumes.

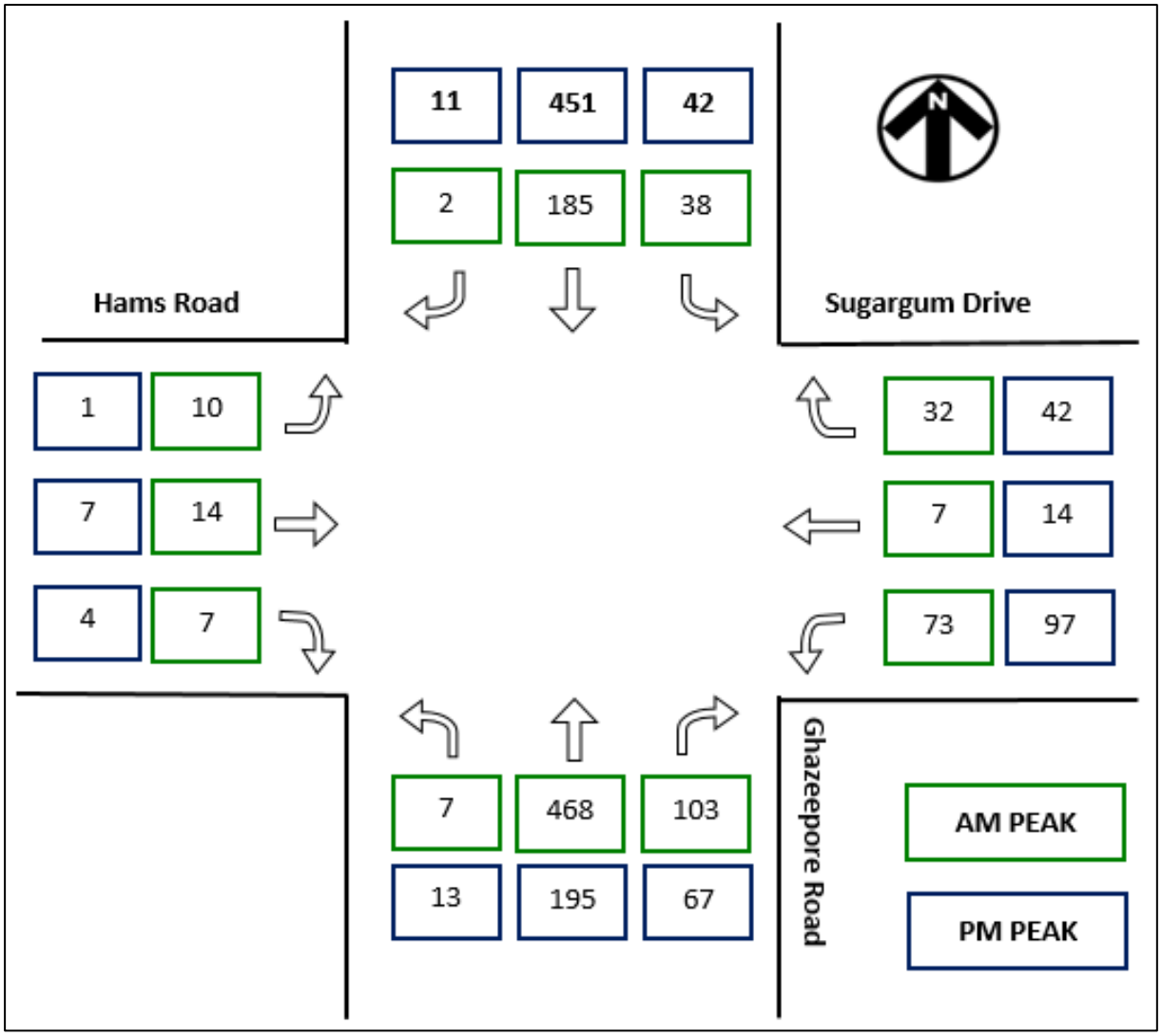


Figure 9: Hams Rd / Ghazeepore Rd / Sugargum Dr Intersection – Base Case Peak Hour Traffic Volumes

5.5. Traffic Generation

Traffic generation rates for residential dwellings vary depending on location, size of dwelling, and accessibility to services and public transport. Typically rates between 3 and 10 movements per day, inclusive of 10% of movements in peak hours, are adopted.

The application traffic report adopted a traffic generation rate of 9 movements per dwelling per day, inclusive of 0.9 movements per dwelling in peak hours. I am comfortable that this is an acceptable rate for assessment purposes, although I am of the view that it is a conservative rate given the proximity to Waurn Ponds Station.

It is therefore projected the yield of 245 dwellings will generate 2,205 movements per day, inclusive of 220 movements in peak hours.

5.6. Traffic Distribution

I have adopted the following typical entry/exit proportions for site generated residential traffic during the AM and PM peak hours:

- AM Peak Hour – 20% entry and 80% exit.
- PM Peak Hour – 60% entry and 40% exit.

I note the application traffic report adopted a 30/70 and 70/30 split for the morning and afternoon peak hours respectively. The application split or my adopted split is acceptable, however I consistently apply a 20/80 and 60/40 split, and have therefore adopted my split for the purposes of my assessment.

In consideration of the locality of the site and road network, I have also adopted the following broad distributions:

- 40% to/from the north along Ghazeepore Road.
- 40% to/from the south along Ghazeepore Road.
- 20% to/from the east along Sugargum Drive.

Figure 10 has also been prepared to illustrate the projected 2029 post development traffic volumes for the intersection of Ghazeepore Road / Sugargum Drive / Hams Road.

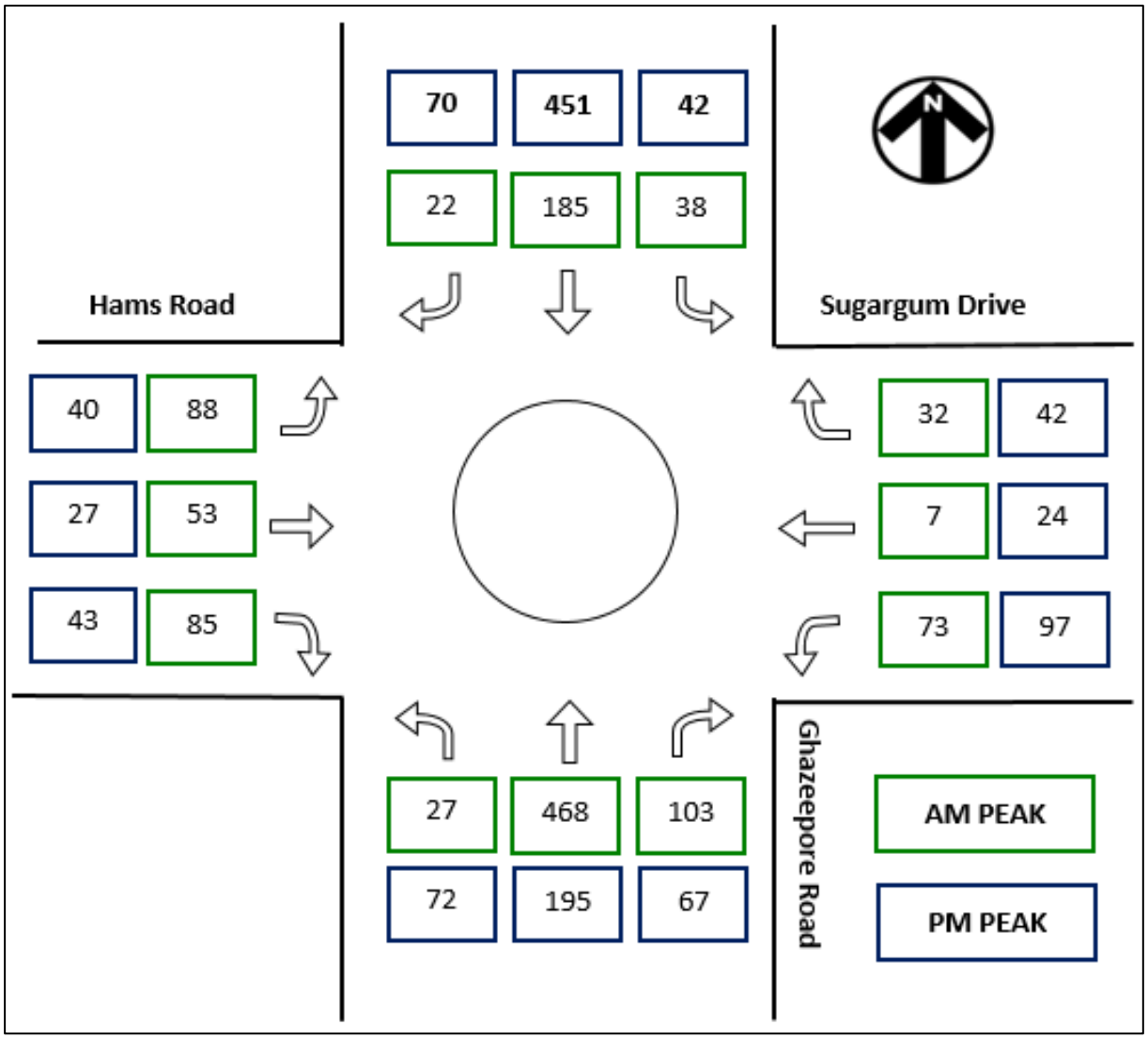


Figure 10: Hams Rd / Ghazeepore Rd / Sugargum Dr Intersection –Ultimate Peak Hour Traffic Volumes

5.7. Intersection Analysis

The application proposes to construct a roundabout at the intersection of Ghazeepore Road and Hams Road / Sugargum Drive, generally in accordance with the concept plan attached as Appendix B. I am instructed the concept design was developed in consultation with Council.

My firm has used SIDRA Intersection 8 to undertake an assessment of the performance of the roundabout for 2029.

SIDRA is a computer simulation package which assesses the operating performance of intersections. A summary of the key outputs follows:

- **Degree of Saturation (DoS)** – The ratio of traffic volume to maximum capacity for a particular turning movement. Various values of degree of saturation and their rating are shown following.

D.O.S.	Rating
Up to 0.6	Excellent
0.6 to 0.7	Very Good
0.7 to 0.8	Good
0.8 to 0.9	Fair
0.9 to 1.0	Poor
Above 1.0	Very Poor

- **Average Delay (Avg. Delay)** – The average delay in seconds for a vehicle making a particular turning movement.
- **95th Percentile Queue (95% Queue) –** The 95% percentile queue is the length in metres which 95 per cent of all observed cycle queues fall below (or 5% exceed) during the peak analysis period.

To account for existing concentrated peak times during the PM peak hour for vehicles exiting Sugargum Drive following train arrivals at Waurn Ponds Railway Station, a peak flow period of 15 minutes and peak flow factor of 0.38 has been applied to the eastern leg.

This is a conservative assessment, as I note upgrades to the Waurn Ponds Railway Station will be complete and the station will accommodate more train services. This will result in a more even distribution of patron arrivals (i.e vehicles exiting Sugargum Drive) across the hour.

Apart from the peak flow factor for the afternoon period, SIDRA default parameters have been adopted.

The results of the analysis are summarised in Table 1, with detailed outputs attached at Appendix C.

The results of the analysis show the roundabout will operate in 'excellent' and 'very good' conditions, in the AM and PM peak hours respectively, with modest queues and delays.

Table 1: Roundabout Intersection Performance – Post Development 2029

Movement	AM Peak Hour			PM Peak Hour		
	DoS	Avg. Delay (s)	95% Queue (m)	DoS	Avg. Delay (s)	95% Queue (m)
Ghazeepore Rd – Southern Leg (L)	0.47	6	28	0.37	7	18
Ghazeepore Rd – Southern Leg (T)	0.47	5	28	0.37	7	18
Ghazeepore Rd – Southern Leg (R)	0.47	8	28	0.37	10	18
Sugargum Drive (L)	0.13	7	5	0.62	14	44
Sugargum Drive (T)	0.13	7	5	0.62	14	44
Sugargum Drive (R)	0.13	10	5	0.62	17	44
Ghazeepore Rd – Northern Leg (L)	0.27	7	12	0.51	6	30
Ghazeepore Rd – Northern Leg (T)	0.27	7	12	0.51	6	30
Ghazeepore Rd – Northern Leg (R)	0.27	10	12	0.51	9	30
Hams Road (L)	0.35	10	16	0.14	8	5
Hams Road (T)	0.35	10	16	0.14	7	5
Hams Road (R)	0.35	13	16	0.14	10	5
(L) = left movement, (T) = through movement, (R) = right movement						

5.8. Sensitivity Analysis

Whilst I am comfortable with the adopted growth rate for Ghazeepore Road and Sugargum Drive, my firm has run a sensitivity analysis adopting a 50% growth for Ghazeepore Road and 30% growth for Sugargum Drive. The elevated traffic volumes were input to SIDRA and analysed. The results of the analysis are summarised in Table 2, with detailed results provided in Appendix C.

Review of the results highlight that even with the higher growth the roundabout will still operate within the 'excellent' and 'good' categories for the AM and PM peak hours respectively.

Table 2: Roundabout Intersection Performance – Post Development 2029 (Higher Growth)

Movement	AM Peak Hour			PM Peak Hour		
	DoS	Avg. Delay (s)	95% Queue (m)	DoS	Avg. Delay (s)	95% Queue (m)
Ghazeepore Rd – Southern Leg (L)	0.54	6	35	0.41	7	22
Ghazeepore Rd – Southern Leg (T)	0.54	6	35	0.41	7	22
Ghazeepore Rd – Southern Leg (R)	0.54	8	35	0.41	10	22
Sugargum Drive (L)	0.15	7	6	0.74	19	65
Sugargum Drive (T)	0.15	7	6	0.74	19	65
Sugargum Drive (R)	0.15	10	6	0.74	22	65
Ghazeepore Rd – Northern Leg (L)	0.31	7	14	0.58	7	37
Ghazeepore Rd – Northern Leg (T)	0.31	7	14	0.58	6	37
Ghazeepore Rd – Northern Leg (R)	0.31	10	14	0.58	9	37
Hams Road (L)	0.38	12	18	0.14	8	6
Hams Road (T)	0.38	11	18	0.14	8	6
Hams Road (R)	0.38	14	18	0.14	11	6
(L) = left movement, (T) = through movement, (R) = right movement						

5.9. Hams Road

The application proposes to widen and improve Hams Road, consistent with the cross section contained in Appendix B. I am instructed the cross section was developed in consultation with Council.

The cross section maintains the existing kerb and channel on the northern side of the road, whilst widening to the south to provide for a parking lane, two traffic lanes and a bicycle lane, with kerb and channel on the south side. A footpath will be constructed on the south side for the length of Hams Road.

Based on the projected development traffic, I expect the eastern end of Hams Road will experience a daily two-way volume in the order of 2,700 vehicles. At this volume, Hams Road will fall within the Planning Scheme access street level 2 category and only requires a 7 – 7.5 metre pavement.

Therefore, the proposed cross section is more than adequate to accommodate the projected traffic volumes.

6. Subdivision Layout Assessment

6.1. Road Layout

The subdivision masterplan includes a connective road network with two intersections to Hams Road.

6.2. Road Cross-Sections

The proposed road reservation widths and cross-sections are proposed generally in accordance with the requirements set out in Greater Geelong Planning Scheme and the Infrastructure Design Manual (IDM).

Cross sections for the road types proposed within the subdivision are attached within Appendix C.

6.2.1. Access Street

The standard access street cross-section proposes a 7.3 metre pavement centrally located within a 16 metre reservation. Roads such as this are identified to have an upper limit target traffic volume of 2,500 to 3,000 vehicles per day (vpd) based on the IDM and Planning Scheme respectively.

The subdivision as a whole is expected to generate around 2,200 vehicles per day, so in consideration of the road layout, and in particular the two access points to Hams Road, I do not expect that any road will carry more than 2,000 vehicles per day.

The masterplan illustrates some of the road reservations, adjacent to open space / reserves, reducing to 13 metres. The intent is simply to reduce the verge adjacent to the reserve, meaning the road pavement and pedestrian connectivity on the development side is not affected. This is relatively common practice within subdivisions.

6.3. Access for Service and Emergency Vehicles

The minimum 7.3 metre wide carriageway for the local access streets is adequate to facilitate relevant service and emergency vehicles, and is consistent with typical CFA requirements.

Three (3) court bowls are illustrated in the subdivision plans. The two court bowls within 69 – 93 Hams Road have a diameter of 21 metres, whilst the court bowl in 35 Hams Road has a diameter of 20 metres. These designs accord or exceed the IDM (20m) and CFA (16m) requirements.

6.4. Pedestrian and Cycling Access

The proposed road reservations are such that footpaths can be provided in accordance with the relevant standards and common practice. Cyclists will simply share the carriageway with other motorists along the proposed access streets.

I am comfortable that this will adequately service pedestrians and cyclists within the subdivision.

6.5. Traffic Control

Two cross-intersections are identified within the site. These should desirably be treated with a form of traffic management. Furthermore, Clause 56.06-7 of the Planning Scheme suggests it is desirable for street blocks to be no more than approximately 240 metres long in order 'to facilitate pedestrian movement and control traffic speed'.

To this end, my firm prepared Figure 11 to illustrate appropriate locations for traffic management. The actual treatment can be determined as part of detailed design in consultation with Council should a permit issue.

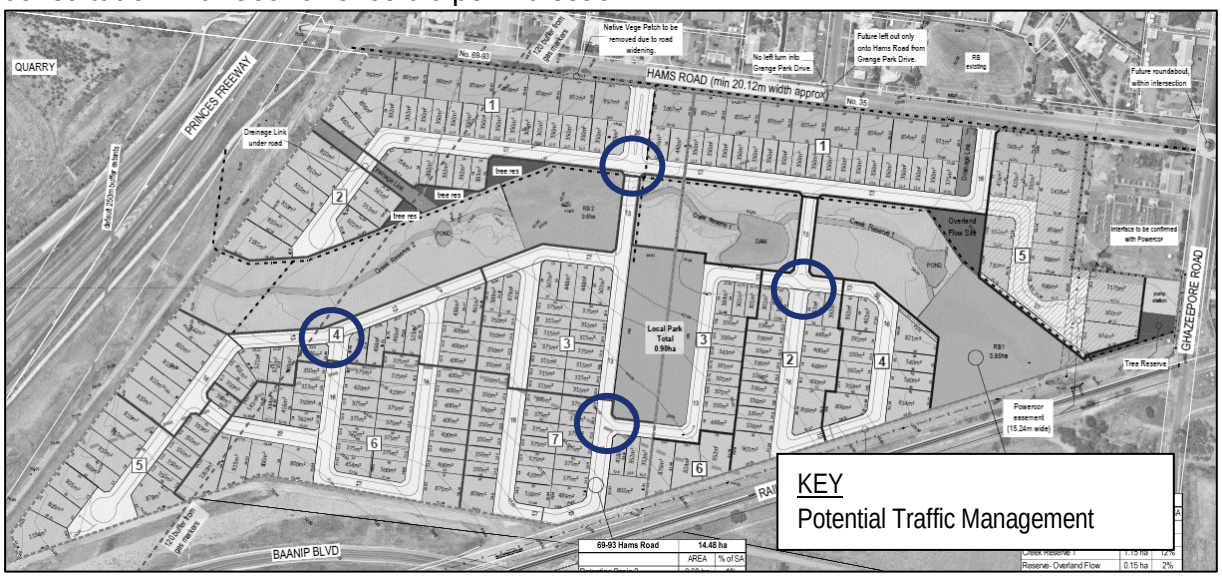


Figure 11: Potential Traffic Control Device Locations

We understand that a number of existing nearby residents have raised concern that traffic associated with the future development of the site will use existing streets, namely Grange Park Drive, to the north of the subject site in order to access the wider street network.

In an attempt to address these concerns, the applicant is willing to introduce various treatments including:

- a left turn ban to prohibit eastbound motorists from turning from Hams Road into Grange Park Drive, and
- a right turn ban to prohibit southbound motorists from turning from Grange Park Drive into Hams Road.

While I do not believe the use of Grange Park Drive would be an attractive access route for future residents of the subject site[1], the introduction of turn bans at the Hams Road/Grange Park Drive intersection as suggested would further encourage future residents to use the Ghazeepore Road/Hams Road intersection rather than potentially use Grange Park Drive.

Such treatments are not uncommon, can likely easily be implemented, will be provided at the applicant's cost, and will likely address the concerns of nearby residents.

[1] Grange Park Drive has a lower speed limit than Ghazeepore Road. It also requires motorists to potentially slow, prop and wait at an equivalent number of intersections and private driveways as the Hams Road/Ghazeepore Road route which is only a marginally longer route in terms of distance.

7. Submissions

There were over 100 submissions for the Amendment. I have read the submissions and the following provides a summary of the main traffic issues raised and my response.

- *The traffic counts are over 2 years old.*

  My evidence statement includes new traffic counts undertaken in May 2019.

- *Traffic growth of Ghazeepore Road and Sugargum Drive.*

  My assessment has allowed for 30% and 20% growth on Ghazeepore Road and Sugargum Drive respectively, and then sensitivity tested at 50% and 30% growth on Ghazeepore Road and Sugargum Drive respectively.

- *The operation of the intersection of Ghazeepore Road / Hams Road / Sugargum Drive.*

  The intersection is proposed to be constructed with a roundabout, which will better facilitate movements to / from Hams Road and Sugargum Drive. My traffic assessment demonstrates the roundabout will suitably accommodate the projected levels of development traffic, even accounting for growth on Ghazeepore Road and Sugargum Drive.

- *Ghazeepore Road is not wide enough for current traffic volumes.*

  Ghazeepore Road, north of Hams Road, has a pavement width (face of kerb to face of kerb) of approximately 10 metres, which narrows to approximately 8.5 metres for a small section being between Acacia Lane and Oakwood Crescent.

  At 10 metres, the road in effect allows for kerbside parking on both sides, leaving in the order of 5.8 metres for two-way traffic when cars are parked opposite each other, which is relatively tight and would be uncomfortable for some drivers at the posted speed limit of 60km/h. However, on my observation, on-street parking on Ghazeepore Road is relatively intermittent, and rarely do you get cars parked opposite each other, and to this end the road operates reasonably well.

  I am of the view the addition of the subdivision traffic can be accommodated by the current operation of Ghazeepore Road.

  Notwithstanding the above, I agree if Ghazeepore Road was being designed as a greenfields road, it would not be constructed with a 10 metre pavement. A more functional pavement width would be a minimum of 10.6 metres (desirably 11.6 metres) to allow for 2 x 3 metre traffic lanes and 2 x 2.3 metre parking lanes.

  I understand the operation of Ghazeepore Road is a concern that has been raised previously with Council, and in this regard the proponent has offered a contribution for Council to investigate and construct improvements.

- *Motorists will use Grange Park Drive.*

  I am of the view there will be no material benefit for residents of the proposed subdivision to utilise Grange Park Drive, as the roundabout will provide good access to Ghazeepore Road.

- *Emergency access*

  The internal road design allows for roads with a pavement width of 7.3 metres, which accords with Planning Scheme, IDM and CFA requirements.

  The subdivision provides two accesses to Hams Road, which allows for egress if one of the accesses is blocked, and if Hams Road is blocked east of the eastern access, then residents (in an emergency situation) could use Grange Park Drive to egress the area.

8. DDO Schedule & Draft Conditions

8.1. Draft DDO 45

I have reviewed the draft DDO 45 from a traffic perspective and am comfortable the design objectives and the subdivision design requirements for traffic and pedestrians are appropriate.

More specifically, I provide the following assessment of the traffic and pedestrian subdivision requirements.

- *An integrated and continuous network of safe and convenient footpaths and shared paths including a shared pathway along Hams Road and the full length of the creek reserve with connections to Hams Rd, Ghazeepore Road and the Princes Freeway path.*

  The masterplan nominates a shared path along the northern side of the creek reserve.

  In relation to a shared path along Hams Road, the masterplan nominates a shared path on the south side of Hams Road. However, the inclusion of the path was after the initial cross section for Hams Road was developed with Council. To accommodate the shared path, my firm has developed a revised cross section, attached as Appendix D. The revised section has removed the previously contemplated on-road bicycle lane, in-lieu of inclusion of the shared path.

- *Vehicle access to the site to be from Hams Road only with no direct access to Ghazeepore Road.*

  This is achieved within the proposed subdivision plan.

- *Upgrading of the intersection at Hams Road and Ghazeepore Road including a safe pedestrian and cycle crossing of Ghazeepore Road.*

  The roundabout design includes a pedestrian refuge on the southern leg, which will allow pedestrians and cyclists to stage their crossing of Ghazeepore Road.

- *Upgrading and widening of Hams Road between the Hams Road court bowl and the intersection at Ghazeepore Road.*

  This is accepted and proposed as part of the subdivision.

- *A contribution towards upgrading of Ghazeepore Road between Hams Road and Burgundy Drive. Local area traffic management treatments to discourage and minimise vehicle movements from the development into Grange Park Drive.*

  I am of the view that improvements to Ghazeepore Road, north of Hams Road, are not necessary as a result of the subdivision. Nonetheless, I am instructed the proponent does not contest this requirement.

  I do not expect there will be a material level of traffic from the subdivision that would elect to use Grange Park Drive, particularly considering the construction of the roundabout at Hams Road / Ghazeepore Road will improve accessibility to / from Hams Road. To this end, I do not believe any traffic management measures are necessary for Grange Park Drive, however similar to the improvements for Ghazeepore Road, the proponent does not contest this requirement.

8.2. Draft Conditions

I have reviewed the draft permit conditions, in relation to traffic items, for both parcels of land, and provide the following comments. I note that if no comment is presented I am comfortable with the condition.

Permit No 662/2017 – 35 Hams Road

Amended Plans

1. *Prior to the commencement of the development, three (3) copies of amended plans to the satisfaction of the Responsible Authority must be submitted to and approved by the Responsible Authority. When approved, the plans will be endorsed and will then form part of the permit. The plans must be drawn to scale with dimensions and must be generally in accordance with the plans submitted with the application but modified to show:*

    c) Road reserve boundaries and splays are sufficient to accommodate a roundabout at the internal four-legged intersection (within Stage 2).

    A roundabout is one method to treat a cross intersection, however is not the only method. In this case, I would be comfortable with a threshold treatment, and accordingly I think this condition can be deleted.

    d) A Functional Layout Plan of the proposed roundabout at the Ghazeepore Road / Hams Road / Sugargum Drive intersection must be provided, including swept path diagrams prepared by a suitably qualified Traffic Engineering consultant using recognised software to show all movements for a 12 m long bus (primary design vehicle) and a semi-trailer (secondary design vehicle).

    The standard bus length is 12.5 metres and the condition should be amended accordingly. Hams Road and Sugargum Drive are local streets, and in this regard should not be designed for semi-trailer access. To this end, I am of the opinion the semi-trailer should not be used as the checking vehicle for movements to / from Hams Road or Sugargum Drive.

    That said, I understand there is an existing resident, whom owns a 'truck and dog' vehicle, within the estate to the west of Ghazeepore Road, and uses Hams Road. The concept roundabout design was premised on this vehicle being able to continue to use the intersection.

7. *Prior to the certification of the Plan of Subdivision, amended plans to the satisfaction of the Responsible Authority must be submitted to and approved by the Responsible Authority. When approved, the plans will be endorsed and will then form part of the permit. The plans must be drawn to scale with dimensions and three copies must be provided. The plans must be generally in accordance with the Overall Subdivision Masterplan (dated 31 October 2018), but modified to show:*

   The latest Masterplan is dated 24 July 2019.

   b) *Road reserve boundaries and splays are sufficient to accommodate a roundabout a the internal four-legged intersection (within Stage 3).*

      The condition can be deleted as there is now no cross intersection in Stage 3.

   c) *Provision of an 8.0 m wide lane for the rear-loaded medium density housing products.*

      The condition can be deleted as there is no rear loaded product.

31. *Prior to the commencement of improvement works within at the Hams Road a scaled functional layout plan for the works must be prepared to the satisfaction of the Responsible Authority.*

   This condition is in effect a duplication of condition 33 and therefore can be deleted.

35. *Prior to the commencement of upgrade works to Ghazeepore Road a scaled functional layout plan for the works must be prepared to the satisfaction of the Responsible Authority. The plan must include but not be limited to:*

   a) *Asphalting*
   b) *Line marking*
   c) *Kerb and channel*
   d) *Connection to the intersection to the intersection at Hams Road*
   e) *Drainage works*
   f) *Footpaths*
   g) *Pedestrian crossings*
   h) *Signage.*

36. *Unless otherwise approved in writing prior to Statement of Compliance of Stage 2 of the subdivision hereby approved the upgrade to Ghazepoore must be completed along the length of the subdivision boundary in accordance with the endorsed plans to the satisfaction of the Responsible Authority.*

   I had understood the proponent had agreed to a contribution for investigation and construction of improvements to Ghazeepore Road, not to manage the process or construct the works.

   I maintain the view that works on Ghazeepore Road are not required as a result of this application, and accordingly the conditions (35 and 36) should be deleted, and the consent for a contribution contained within the condition requiring a 173 Agreement.

Subdivision works should not be dependent on the works in Ghazeepore Road being completed.

Permit No 663/2017 – 69 - 93 Hams Road

1. *Prior to the commencement of the development, three (3) copies of amended plans to the satisfaction of the Responsible Authority must be submitted to and approved by the Responsible Authority. When approved, the plans will be endorsed and will then form part of the permit. The plans must be drawn to scale with dimensions and must be generally in accordance with the plans submitted with the application but modified to show:*

   c) Road reserve boundaries and splays are sufficient to accommodate a roundabout at the internal four-legged intersection contained in Stage 1.

   A roundabout is one method to treat a cross intersection, however is not the only method. In this case, I would be comfortable with a threshold treatment, and accordingly I think this condition can be deleted.

7. *Prior to the certification of the Plan of Subdivision, amended plans to the satisfaction of the Responsible Authority must be submitted to and approved by the Responsible Authority. When approved, the plans will be endorsed and will then form part of the permit. The plans must be drawn to scale with dimensions and three copies must be provided. The plans must be generally in accordance with the Overall Subdivision Masterplan (dated 31 October 2018), but modified to show:*

   The latest Masterplan is dated 24 July 2019.

   b) Road reserve boundaries and splays are sufficient to accommodate a roundabout a the internal four-legged intersection (within Stage 3).

   The condition can be deleted as there is now no cross intersection in Stage 3.

   c) Provision of an 8.0 m wide lane for the rear-loaded medium density housing products.

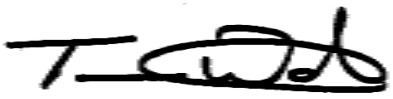
   The condition can be deleted as there is no rear loaded product.

9. Conclusions

Having undertaken a detailed traffic engineering assessment of Greater Geelong Planning Scheme Amendment C372 and Planning Permit Applications 662 & 663/2017, I am of the opinion that:

1. The proposed subdivision with a yield of 245 lots will generate in the order of 2,200 movements per day, inclusive of 220 vehicle movements in peak hours.
2. Hams Road is proposed to be improved to provide a wider pavement and kerb and channel on the south side.
3. Post development, Hams Road at the eastern end will have a daily volume in the order of 2,700 vehicles. The proposed improved Hams Road will readily accommodate this level of traffic.
4. The application proposes the construction of a roundabout at the intersection of Ghazeepore Road, Hams Road and Sugargum Drive. The roundabout will provide sufficient traffic capacity for the proposed subdivision as well as growth in traffic on Ghazeepore Road and Sugargum Drive.
5. The internal road layout of the subdivision provides for a connective network and allows access to Hams Road at two points.
6. The internal road network accords with the requirements of Clause 56.06 and the IDM.
7. The traffic components of the Draft DDO 45 are acceptable.
8. The traffic components of the draft conditions should be amended as identified in Section 8 of my statement.
9. There are no traffic engineering grounds that should prohibit the proposed rezoning and residential subdivision of 35 and 63-69 Hams Road, Waurn Ponds, subject to appropriate conditions.

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



JASON LEE WALSH
DIRECTOR
TRAFFIX GROUP
15 August 2019

Appendix A

Experience and Qualifications

Name

Jason Lee Walsh - Director, Traffix Group Pty Ltd

Address

Suite 8, 431 Burke Road

GLEN IRIS

VICTORIA 3146

Qualifications

My educational qualifications and membership of professional associations are as follows:-

- Bachelor of Civil Engineering, Monash University
- Bachelor of Science, Monash University
- Member, Victorian Planning & Environmental Law Association

Experience

I have over 20 years experience in Traffic Engineering including,

- 1995-2000 at Turnbull Fenner (now Traffix Group), including short term placements at the cities of Bayside and Whittlesea,
- 2000-2011 at Grogan Richards Pty Ltd (now Cardno),
- 2011-present at Traffix Group.

Areas of Expertise

- Car parking and Traffic.
- Traffic advice and assessment of land uses and development proposals to planning authorities, government agencies, corporations and developers (including major residential, retail, food and drink, commercial, industrial, institutional and mixed use projects).
- Preparation and presentation of evidence before VCAT and Panels.

Expertise to Prepare this Assessment

My experience and expertise over the past 20 years, including involvement with varied forms of developments, qualifies me to comment on the traffic implications of the proposed development.

Instructions

I was instructed by Norton Rose Fulbright on behalf of Echin Pty Ltd & Waurn Ponds Unit Trust to undertake a traffic engineering assessment Greater Geelong Planning Scheme Amendment C372 and Planning Permit Applications 662 & 663/2017.

Facts, Matters and Assumptions Relied Upon

- Application material, including the Traffic Engineering Assessment of October 2018, prepared by my firm.
- Overall Subdivision Masterplan (MP19), dated 24 July 2019.
- Infrastructure Design Manual (Release date 5 January 2017).
- Council Report.
- Geelong Planning Scheme.
- Australian Standard for Off-Street Parking (AS2890.1:2004)
- Australian Standard for Bicycle Parking (AS2890.3:2015).
- Submissions.
- Site inspection.
- Relevant experience.

Documents Taken into Account

See above.

Identity of Persons Undertaking Work

Jason Walsh as per the evidence statement.

Brent Chisholm (Senior Traffic Engineer, Traffix Group) assisted with preparation of the evidence report.

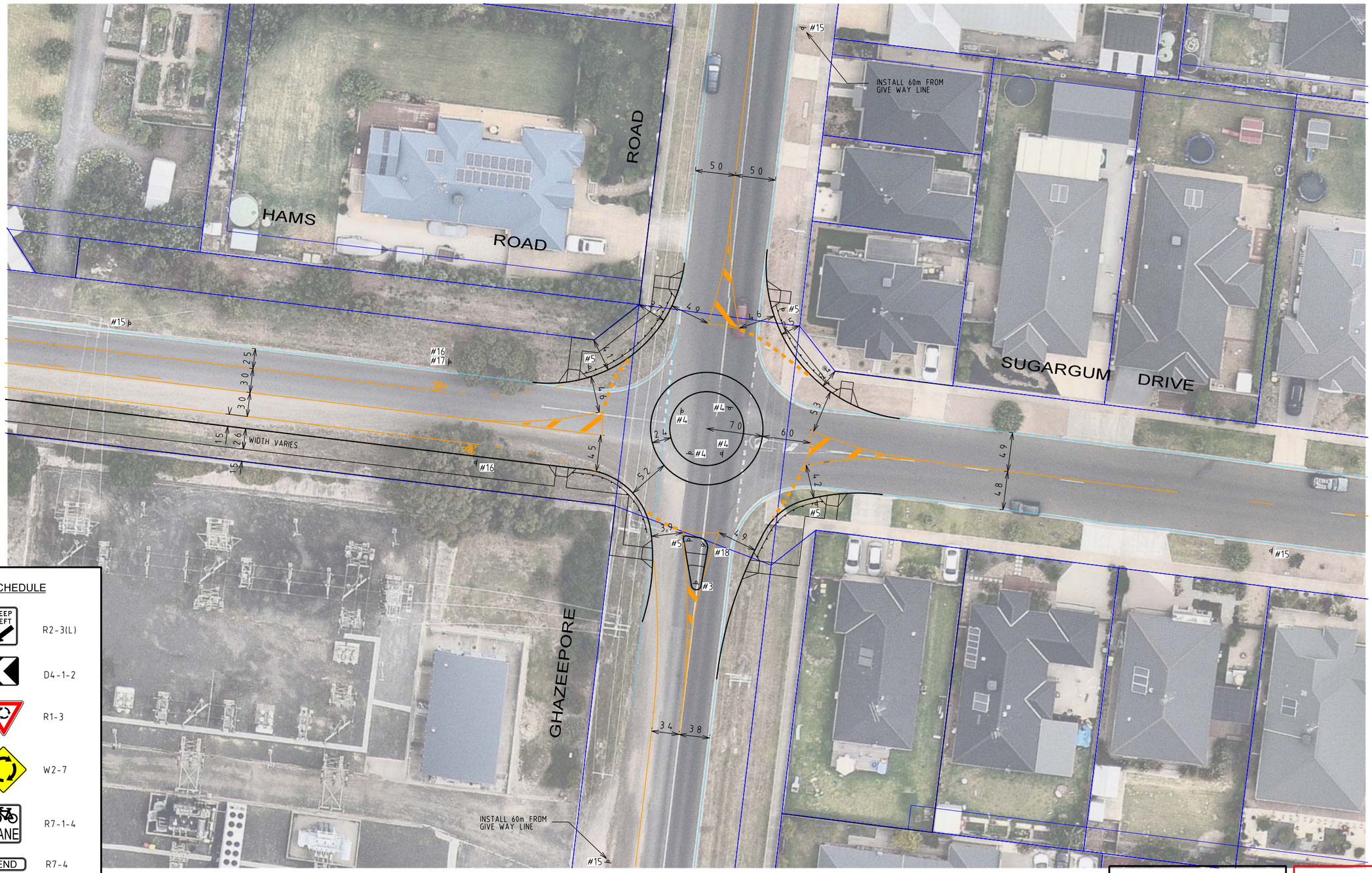
Tim Amanatidis (Traffic Engineer, Traffix Group) assisted with preparation of the evidence report.

Summary of Opinions

See Conclusions section of the evidence statement.

Appendix B

Hams Road / Ghazeepore Road Roundabout & Hams Road Cross Section



SIGN SCHEDULE

#3	KEEP LEFT	R2-3(L)
#4		D4-1-2
#5		R1-3
#15		W2-7
#16	LANE	R7-1-4
#17	END	R7-4
#18		D4-V108

MELWAY MAP REF 464 J10

PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY

WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services shown are approximate only and their exact position should be proven on site.

ISSUE	ISSUE DESCRIPTION	ISSUE DATE
A	CONCEPT LAYOUT PLAN	23 JAN 2018
B	COUNCIL COMMENTS ADDRESSED	21 FEB 2018

GENERAL NOTES
1 BASE INFORMATION FROM AERIAL PHOTOGRAPH (SOURCE NEARMAP NOV 2017)
2 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
3 LOCAL ROAD - GHAZEEPORE ROAD (SPEED ZONE 60km/h)
- HAM ROAD & SUGARGUM DRIVE (SPEED ZONE 50km/h)

PEDESTRIAN FENCING / BOLLARDS

DESIGNED
R CARBARNS 23 JAN 2018

CHECKED/APPROVED
N WOOLCOCK 23 JAN 2018

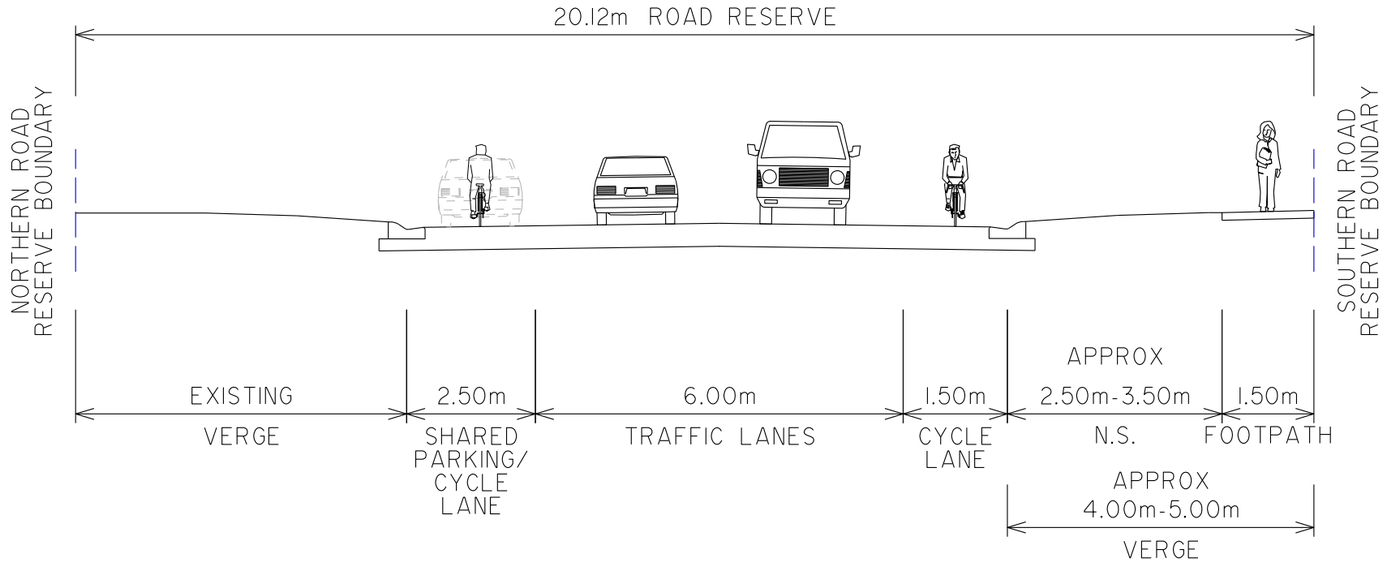
FILE NAME
G21540A-00 dgn

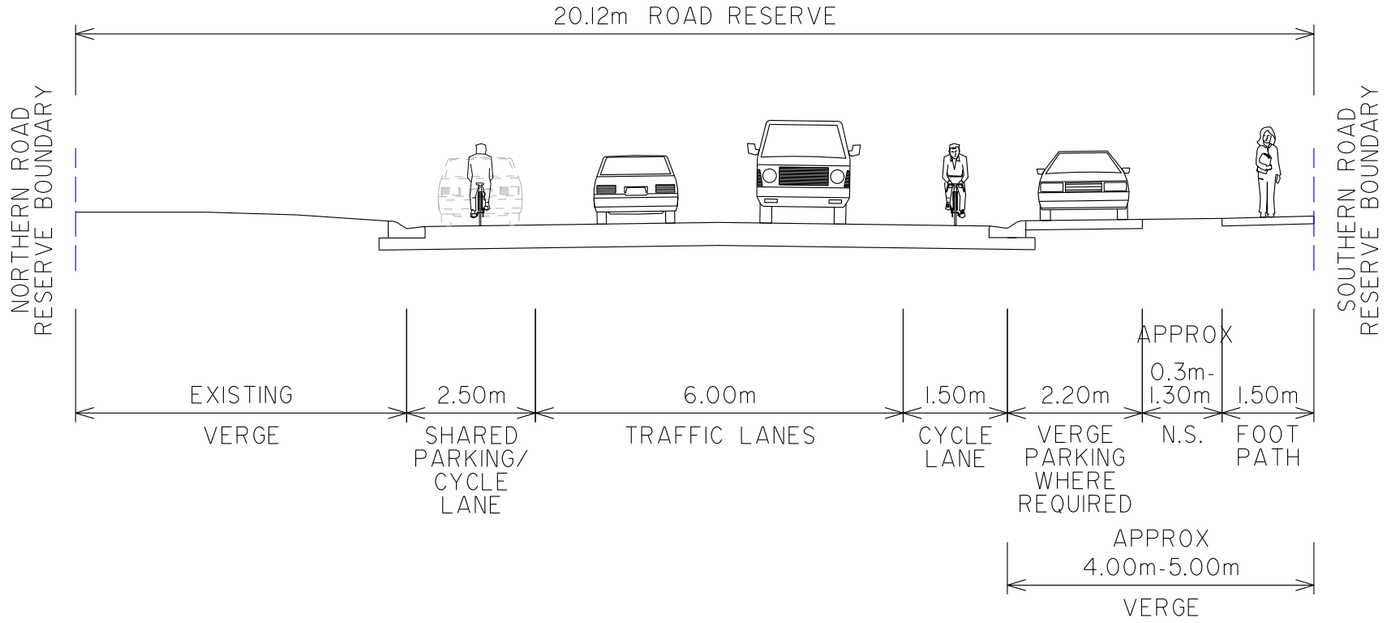
TraffixGroup
Traffic Engineers and Transport Planners
Suite 8/431 Burke Road TEL : (03) 9822-2888
GLEN IRIS VICTORIA 3146 FAX: (03) 9822-7444
www.traffixgroup.com.au

GHAZEEPORE ROAD - WAURN PONDS
HAMS ROAD - SUGARGUM DRIVE
GREATER GEELONG CITY
CONCEPT LAYOUT PLAN

SCALE 0 2.5 5 7.5 10
SHEET No.
DWG No. G21540-01

ULTIMATE
HAMS ROAD





PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY

WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services shown are approximate only and their exact position should be proven on site.

ISSUE	ISSUE DESCRIPTION	ISSUE DATE
A	TYPICAL CROSS SECTIONS - AS PER COUNCIL MEMO DATED 29/09/17	12 FEB 2018
B	UPDATED CROSS SECTIONS - AS PER COUNCIL EMAIL DATED 19/02/18	20 FEB 2018

GENERAL NOTES
1 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
2 N.S - NATURE STRIP

DESIGNED S O'KEEFE 12 FEB 2018
CHECKED/APPROVED N WOOLCOCK 12 FEB 2018
FILE NAME G21540A-00 dgn

TraffixGroup
Traffic Engineers and Transport Planners
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35 & 69-93 HAMS ROAD, WAURN PONDS
GREATER GEELONG CITY
CROSS SECTIONS

NOT TO SCALE | SHEET No. | DWG No. G21540-02

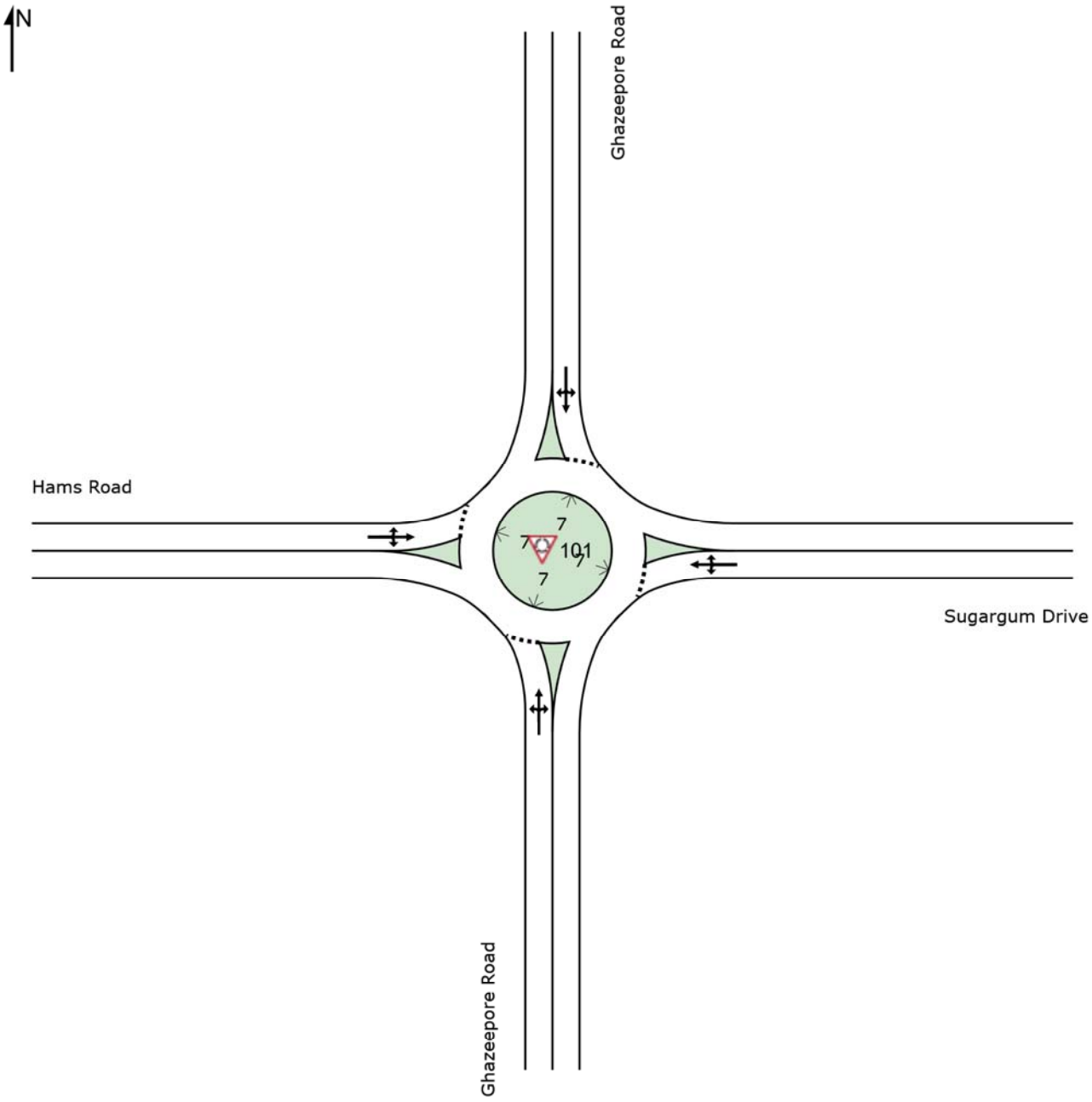
Appendix C

SIDRA Results

SITE LAYOUT

Site: 101 [Post Development AM]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Post Development AM]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Ghazeepore Road												
1	L2	28	5.0	0.473	5.6	LOS A	3.8	27.8	0.31	0.52	0.31	52.2
2	T1	493	5.0	0.473	5.4	LOS A	3.8	27.8	0.31	0.52	0.31	53.0
3	R2	108	5.0	0.473	8.2	LOS A	3.8	27.8	0.31	0.52	0.31	52.5
Approach		629	5.0	0.473	5.9	LOS A	3.8	27.8	0.31	0.52	0.31	52.9
East: Sugargum Drive												
4	L2	77	5.0	0.129	7.0	LOS A	0.7	5.0	0.50	0.66	0.50	51.4
5	T1	7	5.0	0.129	6.8	LOS A	0.7	5.0	0.50	0.66	0.50	52.2
6	R2	34	5.0	0.129	9.6	LOS A	0.7	5.0	0.50	0.66	0.50	51.7
Approach		118	5.0	0.129	7.8	LOS A	0.7	5.0	0.50	0.66	0.50	51.5
North: Ghazeepore Road												
7	L2	40	5.0	0.270	7.0	LOS A	1.6	11.8	0.51	0.63	0.51	51.6
8	T1	195	5.0	0.270	6.7	LOS A	1.6	11.8	0.51	0.63	0.51	52.4
9	R2	23	5.0	0.270	9.5	LOS A	1.6	11.8	0.51	0.63	0.51	52.0
Approach		258	5.0	0.270	7.0	LOS A	1.6	11.8	0.51	0.63	0.51	52.3
West: Hams Road												
10	L2	93	5.0	0.346	10.3	LOS B	2.2	15.7	0.76	0.86	0.76	49.0
11	T1	56	5.0	0.346	10.1	LOS B	2.2	15.7	0.76	0.86	0.76	49.7
12	R2	89	5.0	0.346	12.9	LOS B	2.2	15.7	0.76	0.86	0.76	49.3
Approach		238	5.0	0.346	11.2	LOS B	2.2	15.7	0.76	0.86	0.76	49.3
All Vehicles		1243	5.0	0.473	7.3	LOS A	3.8	27.8	0.46	0.62	0.46	51.9

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

MOVEMENT SUMMARY

Site: 101 [Post Development PM]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Ghazeepore Road												
1	L2	76	5.0	0.366	7.1	LOS A	2.5	18.1	0.57	0.66	0.57	51.3
2	T1	205	5.0	0.366	6.8	LOS A	2.5	18.1	0.57	0.66	0.57	52.1
3	R2	71	5.0	0.366	9.6	LOS A	2.5	18.1	0.57	0.66	0.57	51.7
Approach		352	5.0	0.366	7.4	LOS A	2.5	18.1	0.57	0.66	0.57	51.8
East: Sugargum Drive												
4	L2	255	5.0	0.621	14.1	LOS B	6.0	43.8	0.89	1.05	1.16	46.8
5	T1	63	5.0	0.621	13.9	LOS B	6.0	43.8	0.89	1.05	1.16	47.5
6	R2	111	5.0	0.621	16.6	LOS B	6.0	43.8	0.89	1.05	1.16	47.1
Approach		429	5.0	0.621	14.7	LOS B	6.0	43.8	0.89	1.05	1.16	47.0
North: Ghazeepore Road												
7	L2	44	5.0	0.511	6.4	LOS A	4.0	29.5	0.49	0.58	0.49	51.7
8	T1	475	5.0	0.511	6.2	LOS A	4.0	29.5	0.49	0.58	0.49	52.5
9	R2	74	5.0	0.511	9.0	LOS A	4.0	29.5	0.49	0.58	0.49	52.0
Approach		593	5.0	0.511	6.6	LOS A	4.0	29.5	0.49	0.58	0.49	52.4
West: Hams Road												
10	L2	42	5.0	0.137	7.6	LOS A	0.7	5.4	0.56	0.70	0.56	50.9
11	T1	28	5.0	0.137	7.4	LOS A	0.7	5.4	0.56	0.70	0.56	51.6
12	R2	45	5.0	0.137	10.2	LOS B	0.7	5.4	0.56	0.70	0.56	51.2
Approach		116	5.0	0.137	8.5	LOS A	0.7	5.4	0.56	0.70	0.56	51.2
All Vehicles		1489	5.0	0.621	9.3	LOS A	6.0	43.8	0.63	0.74	0.71	50.5

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

MOVEMENT SUMMARY

Site: 101 [Post Development AM - Sensitivity]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Ghazeepore Road												
1	L2	28	5.0	0.538	5.7	LOS A	4.8	35.1	0.36	0.52	0.36	52.1
2	T1	568	5.0	0.538	5.5	LOS A	4.8	35.1	0.36	0.52	0.36	52.9
3	R2	118	5.0	0.538	8.3	LOS A	4.8	35.1	0.36	0.52	0.36	52.4
Approach		715	5.0	0.538	6.0	LOS A	4.8	35.1	0.36	0.52	0.36	52.8
East: Sugargum Drive												
4	L2	83	5.0	0.145	7.3	LOS A	0.8	5.7	0.53	0.68	0.53	51.2
5	T1	8	5.0	0.145	7.1	LOS A	0.8	5.7	0.53	0.68	0.53	52.0
6	R2	37	5.0	0.145	9.8	LOS A	0.8	5.7	0.53	0.68	0.53	51.6
Approach		128	5.0	0.145	8.0	LOS A	0.8	5.7	0.53	0.68	0.53	51.4
North: Ghazeepore Road												
7	L2	44	5.0	0.309	7.1	LOS A	1.9	14.0	0.54	0.65	0.54	51.6
8	T1	224	5.0	0.309	6.9	LOS A	1.9	14.0	0.54	0.65	0.54	52.4
9	R2	23	5.0	0.309	9.7	LOS A	1.9	14.0	0.54	0.65	0.54	51.9
Approach		292	5.0	0.309	7.1	LOS A	1.9	14.0	0.54	0.65	0.54	52.2
West: Hams Road												
10	L2	93	5.0	0.383	11.6	LOS B	2.5	18.3	0.81	0.92	0.84	48.2
11	T1	56	5.0	0.383	11.4	LOS B	2.5	18.3	0.81	0.92	0.84	48.9
12	R2	89	5.0	0.383	14.2	LOS B	2.5	18.3	0.81	0.92	0.84	48.5
Approach		238	5.0	0.383	12.6	LOS B	2.5	18.3	0.81	0.92	0.84	48.5
All Vehicles		1373	5.0	0.538	7.6	LOS A	4.8	35.1	0.49	0.63	0.50	51.7

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

MOVEMENT SUMMARY

Site: 101 [Post Development PM - Sensitivity]

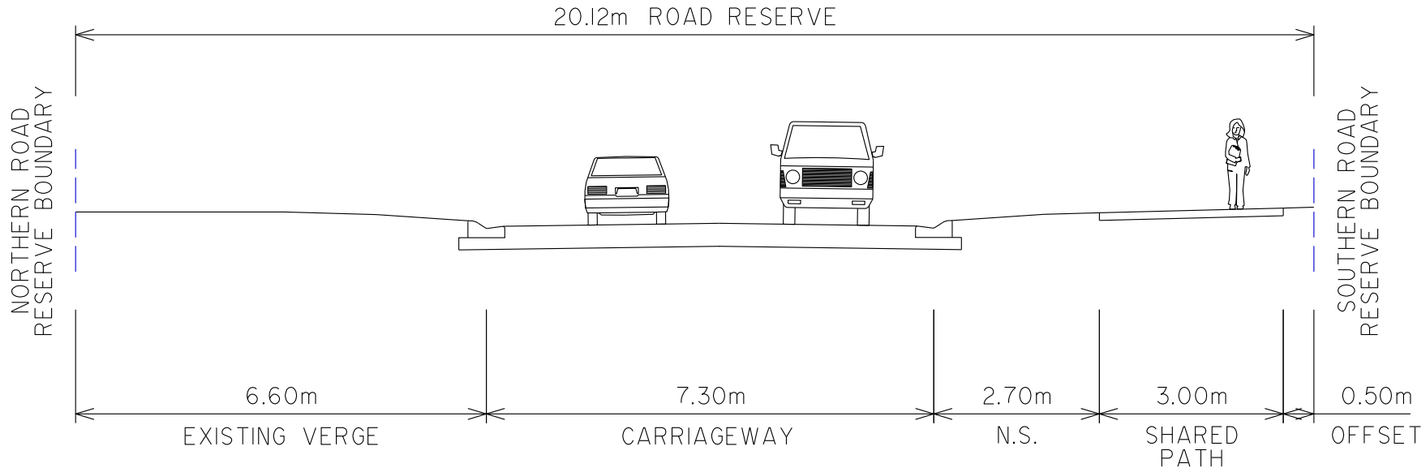
New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
South: Ghazeepore Road												
1	L2	76	5.0	0.413	7.3	LOS A	2.9	21.5	0.62	0.69	0.62	51.2
2	T1	237	5.0	0.413	7.1	LOS A	2.9	21.5	0.62	0.69	0.62	52.0
3	R2	77	5.0	0.413	9.8	LOS A	2.9	21.5	0.62	0.69	0.62	51.5
Approach		389	5.0	0.413	7.6	LOS A	2.9	21.5	0.62	0.69	0.62	51.7
East: Sugargum Drive												
4	L2	276	5.0	0.737	19.4	LOS B	8.9	64.7	0.99	1.20	1.51	43.9
5	T1	68	5.0	0.737	19.1	LOS B	8.9	64.7	0.99	1.20	1.51	44.4
6	R2	121	5.0	0.737	21.9	LOS C	8.9	64.7	0.99	1.20	1.51	44.1
Approach		466	5.0	0.737	20.0	LOS B	8.9	64.7	0.99	1.20	1.51	44.0
North: Ghazeepore Road												
7	L2	48	5.0	0.579	6.6	LOS A	5.0	36.8	0.55	0.60	0.55	51.5
8	T1	548	5.0	0.579	6.4	LOS A	5.0	36.8	0.55	0.60	0.55	52.3
9	R2	74	5.0	0.579	9.2	LOS A	5.0	36.8	0.55	0.60	0.55	51.9
Approach		671	5.0	0.579	6.7	LOS A	5.0	36.8	0.55	0.60	0.55	52.2
West: Hams Road												
10	L2	42	5.0	0.144	8.0	LOS A	0.8	5.8	0.59	0.72	0.59	50.6
11	T1	28	5.0	0.144	7.7	LOS A	0.8	5.8	0.59	0.72	0.59	51.4
12	R2	45	5.0	0.144	10.5	LOS B	0.8	5.8	0.59	0.72	0.59	50.9
Approach		116	5.0	0.144	8.9	LOS A	0.8	5.8	0.59	0.72	0.59	50.9
All Vehicles		1642	5.0	0.737	10.9	LOS B	8.9	64.7	0.69	0.80	0.84	49.4

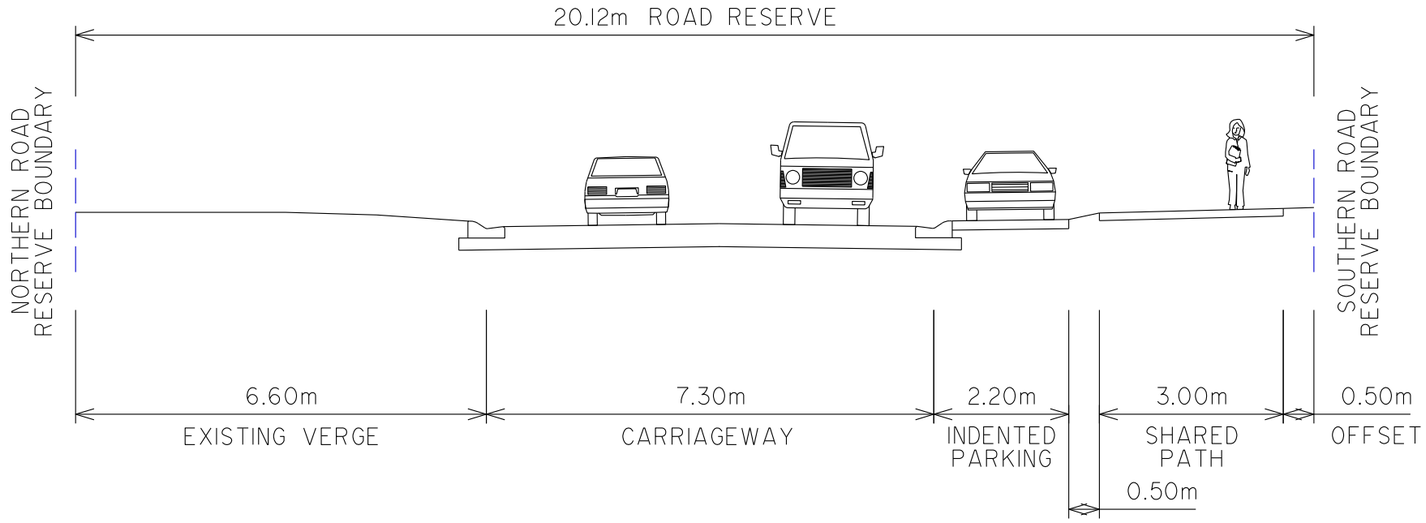
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay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

Appendix D

Revised Hams Road Cross Section



ULTIMATE
HAMS ROAD



PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY

WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services shown are approximate only and their exact position should be proven on site.

ISSUE	ISSUE DESCRIPTION	ISSUE DATE
A	TYPICAL CROSS SECTIONS - AS PER COUNCIL MEMO DATED 29/09/17	12 FEB 2018
B	UPDATED CROSS SECTIONS - AS PER COUNCIL EMAIL DATED 19/02/18	20 FEB 2018
C	AMMENDED CROSS SECTIONS	15 AUG 2019

GENERAL NOTES
1 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
2 NS - NATURE STRIP

DESIGNED S O'KEEFE 15 AUG 2019
CHECKED/APPROVED J WALSH 15 AUG 2019
FILE NAME G21540A-00 dgn

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35 & 69-93 HAMS ROAD, WAURN PONDS
GREATER GEELONG CITY
CROSS SECTIONS

NOT TO SCALE | SHEET No. | DWG No. G21540-02