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The Hales Estate, Forrestfield

Prepared For:

Satterley Property Group

Satterley

Transport Impact Assessment Report



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1 INTRODUCTION

1.1 BACKGROUND

This Transport Assessment has been prepared by Donald Veal Consultants on behalf of Satterley Property Group, with regard to the proposed subdivision covered by the Forrestfield Master Plan. The subdivision is to comprise of 420 residential lots and one future strata development site (R60).

1.2 SITE LOCATION

The site lies within the Shire of Kalamunda, in the suburb of Forrestfield. It is located approximately 6km south east of Perth Airport. Major arterial roads within close proximity include Roe Highway to the northwest. **Figure 1.1** shows the location of the site in a regional context.

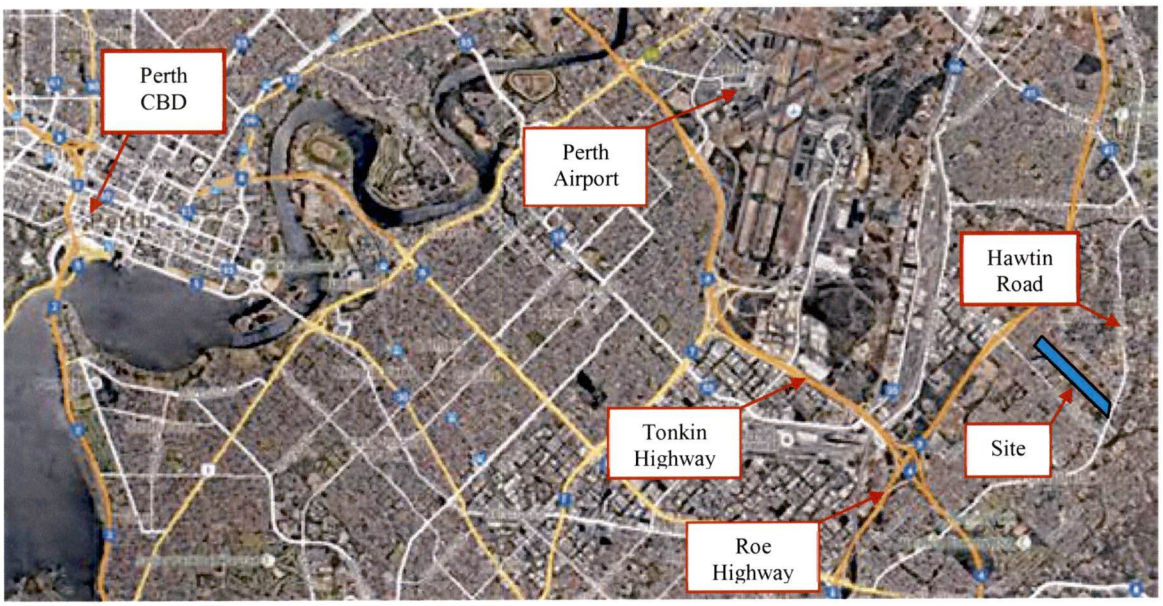


Figure 1.1: Site Location in Regional Context
Source: Nearmap

1.3 SCOPE OF ASSESSMENT

This Transport Impact Assessment has been prepared in accordance with the Western Australian Planning Commission's (WAPC's) *Transport Impact Assessment Guidelines Volume 3 Subdivision* (2016). Its intent is to provide the approving authority with sufficient traffic information to confirm that the proponent has adequately considered the traffic aspects of the development and that it would not have an adverse traffic impact on the surrounding area.

1.4 REFERENCES

The following documents are referred to in this report:

- *Liveable Neighbourhoods, Draft* 2015, WAPC and Department of Planning and Infrastructure;
- *Transport Impact Assessment Guidelines Volume 3 Subdivision,* August 2016, WAPC;
- *Transport Impact Assessment Guidelines Volume 4 Individual Developments,* August 2016, WAPC; and
- *Guide to Traffic Generating Developments,* October 2002, Roads and Traffic Authority.

2 SUBDIVISION PROPOSAL

2.1 CONTEXT

The subject area is currently undeveloped land for the most part. The site is divided into three separate sections by two distinct barriers. The north western third of the site is severed from the remainder by a stream (Crumpet Creek) running across the site more or less from east to west. The south eastern third is similarly separated but in this case by a Western Power easement, some 80m wide x 185m length, which precludes residential development. The site is mostly bounded by existing residential land uses, of varying densities. The Darling Range Sports College is located to the south west, between the subject site and Berkshire Road.

Figure 2.1 shows an aerial view of the subject site and its immediate surrounds and puts its location into a local context.

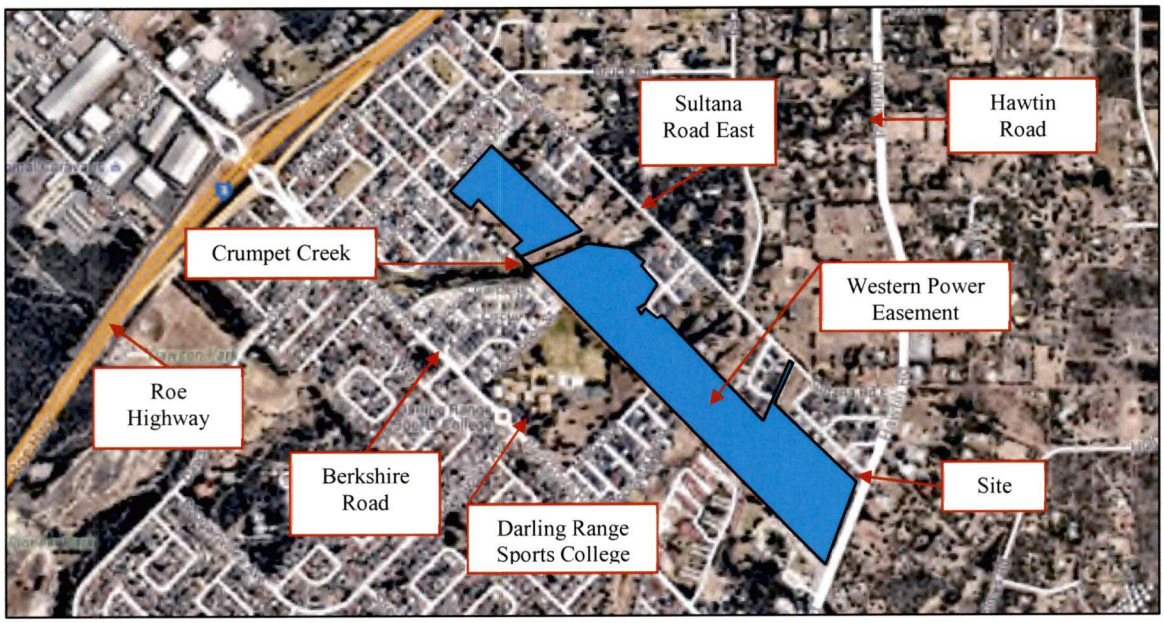


Figure 2.1: Structure Plan Location in a Local Context
Source: Nearmap

2.2 PROPOSED LAND USES

The subdivision proposes a range of residential densities, along with the requisite amount of public open spaces. The initial Development Application (DA) for Stage 1 of the development includes 91 residential lots. The ultimate number of lots at full development is anticipated to be 420 plus one future strata development site (labelled as 'Grouped Housing Site', with an estimated 46 dwellings). Therefore, the subject site has a capacity of up 466 dwellings. The average area of lots is around 395m^2 with the minimum lot size being 150m^2.

Figure 2.2 shows the latest Forrestfield Master Plan.

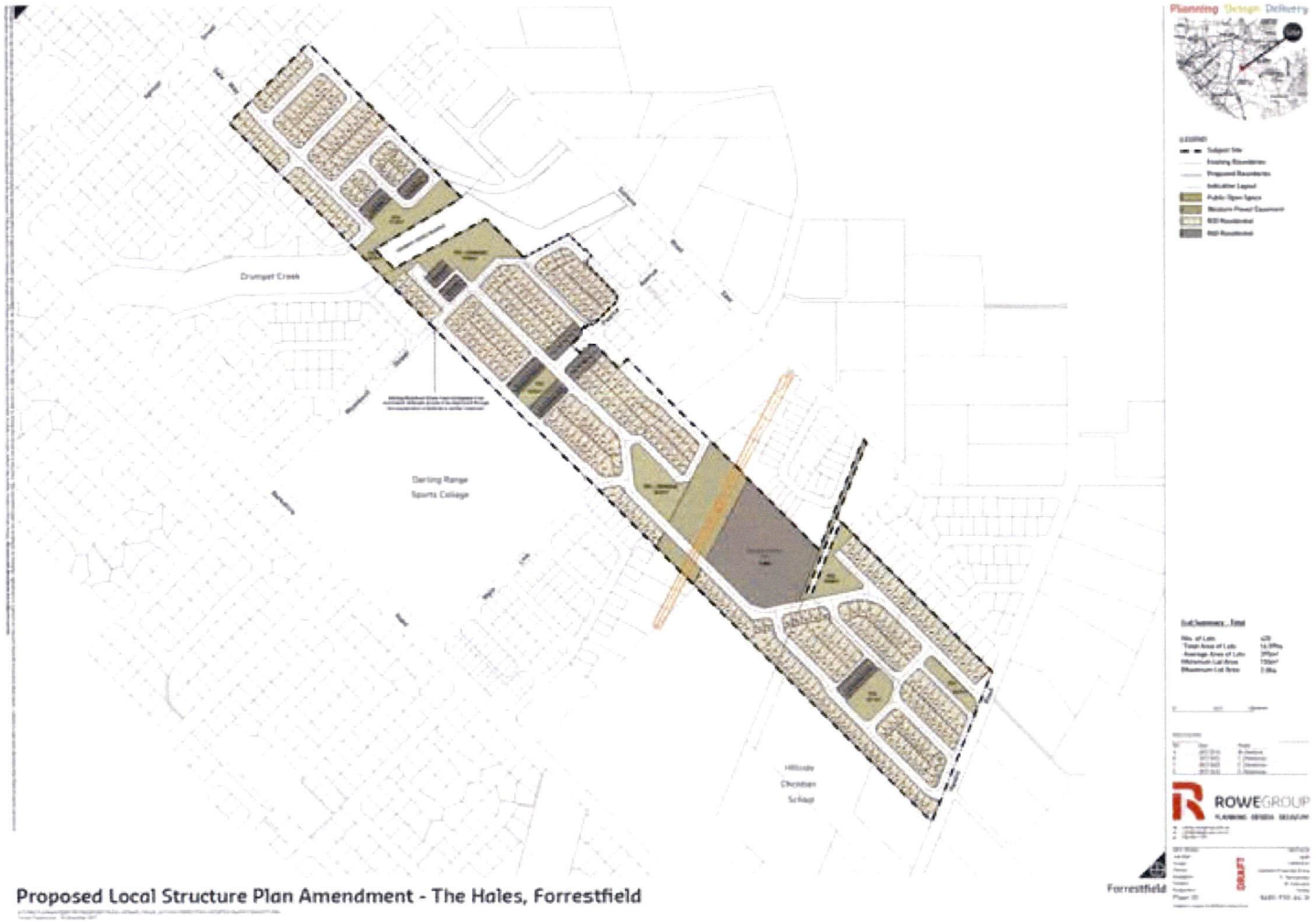


Figure 2.2: Forrestfield Master Plan *Source: Rowe Group Rev D dated 26/10/2017*

2.3 MAJOR ATTRACTORS AND GENERATORS OF TRAFFIC

The residential lots will be the main traffic generating land use within the proposed subdivision, creating commuter trips during both the morning and afternoon peak periods, as well as local trips throughout the day.

The majority of the am (and pm peak hour) commuter traffic generated by the proposed subdivision would be attracted to the major local employment centres of Kewdale and Perth Airport, as well as to those further afield such as Midland, Kenwick and Perth itself.

Such commuter traffic would be spread over a number of local roads such as Malo Link, Gala Way, Crimson Boulevard, Pearce Avenue and to a lesser extent Mandon Street, Quince Lane and Seville Road, before dissipating into the wider network via Hawtin Road, Hale Road, Sultana Road East and Berkshire Road, and onward to Roe Highway, Tonkin Highway and Orrong Road.

Other local attractors include the Darling Range Sports College immediately west of the subject site. A number of schools are located south of the subject site, such as the Forrestfield Primary School and Hillside Christian College. The Forrestfield shopping centre is also located south of the site.

There are also local attractions to the east of the subject site, such as the Kalamunda local centre and Kalamunda Senior High School.

3 EXISTING ROAD NETWORK

3.1 EXISTING ROAD INFRASTRUCTURE

Figure 3.1 illustrates the road network servicing the subject site whilst **Figure 3.2** illustrates the proposed connections to the external road network.

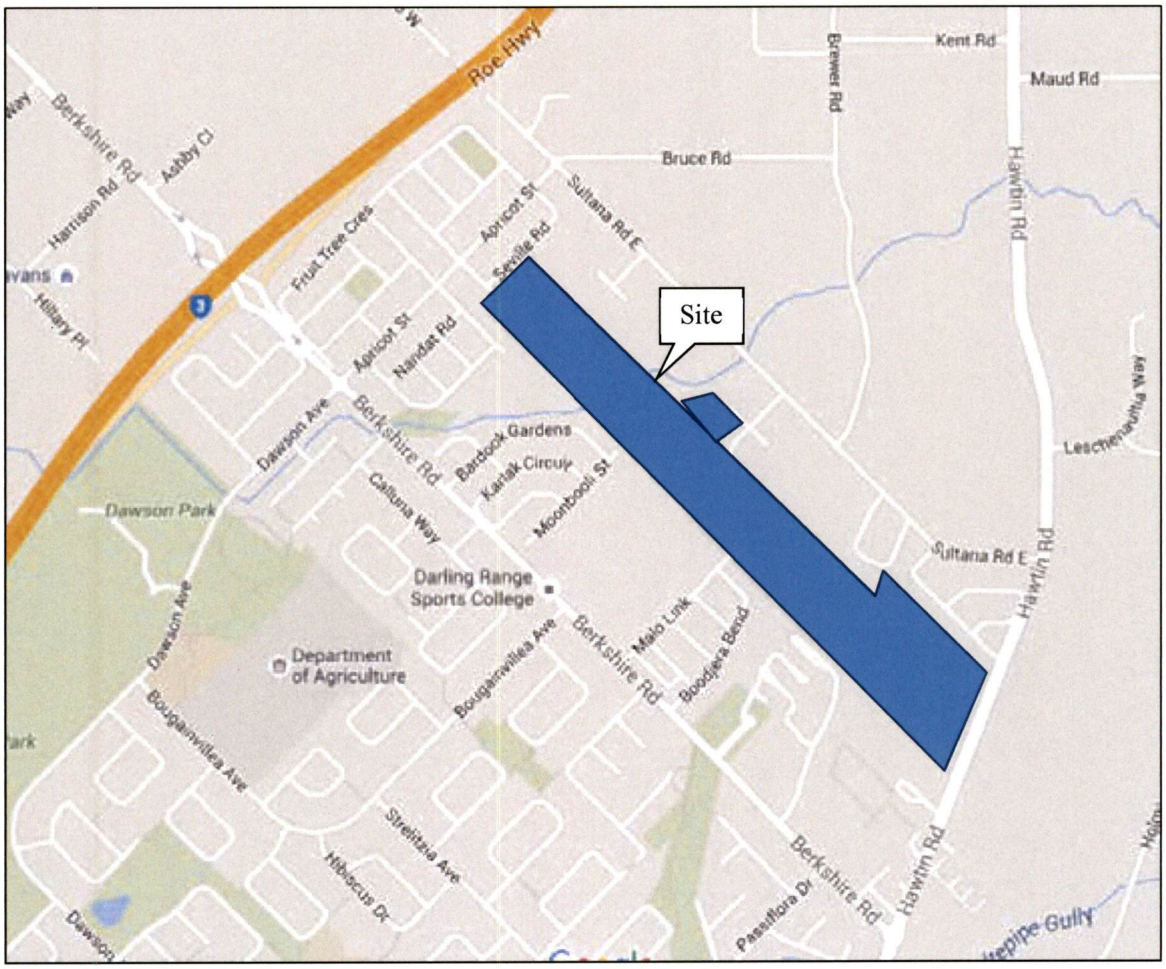


Figure 3.1: Existing Road Network
Source: Google Maps



Figure 3.2: Proposed connections into the existing road network

3.1.1 Hawtin Road

Hawtin Road is orientated in a southwest-northeast direction adjacent the site and forms the south eastern boundary of the subject site. It connects to Kalamunda Road in the north and Berkshire Road/Hale Road just to the south.

The road is constructed as an unkerbed, single carriageway with one lane in either direction (refer **Photos 1 & 2**). The approximate pavement width is 7.3m. The speed limit is 60 km/h at the development site, with a 40 km/h zone enforced between specified school hours. This latter speed limit relates to educational establishments on either side of Hawtin Road: Hillside Christian College to the northwest and Heritage College to the southeast.



Photo 1: Hawtin Road, looking east, from west of the site



Photo 2: Hawtin Road, looking west towards the proposed display village access, on the right



Photo 3: Hawtin Road, looking east to the proposed main development access location

A footpath of width approximately 2m runs on the west side of Hawtin Road to the length of the south eastern boundary of the subject site.

3.1.2 Berkshire Road

Berkshire Road runs northwest-southeast, and is constructed as a kerbed, divided carriageway with one lane in each direction. The general pavement width is 7.3m, with through lanes of approximately 3.0m in width, and a 1.3m painted median.

The road connects to Roe Highway and Dundas Road in the northwest, and Hawtin Road to the southeast. The speed limit is 60km/h, at the development site, with a 40 km/h zone enforced between specified school hours. This latter speed limit relates to the Darling Ranges Sports College.

South of Roe Highway, a path runs on the east side of Berkshire Road for the entire length to Hawtin Road. On the west side the path extends only to Bougainvillea Avenue which is around one kilometre south of Roe Highway. The widths of the paths vary between around 2.0 to 2.5m.



Photo 4: Berkshire Road with access to Darling Range Sports School on left

Source: Google Streetview

3.1.3 Sultana Road East

Sultana Road East is constructed as a mostly kerbed, two lane undivided single carriageway road with limited lane marking. It runs in a northwest-southeast orientation and provides a link from Hawtin Road to Apricot Street, with a cul-de-sac beyond.

The pavement width measures around 7.3m. A 2.2m footpath exists on the southwest side of the road adjacent to the existing residential developments. Traffic calming has been installed along the road in the form of a number of slow points. See **Photo 5**.



Photo 5: Traffic calming along Sultana Road East

3.1.4 Malo Link

Malo Link is constructed as a kerbed, two lane undivided single carriageway road with no lane markings. The pavement width is approximately 7.5m. The road runs in a northeast-southwest direction and currently terminates at the western boundary of the subject site. The link will be extended into the subject site providing a connection to Berkshire Road to the west (refer **Figure 3.2**).

A 2m footpath exists on the southeast side of the road. A row of large gum trees is set back approximately 0.5m to 1.0m from the opposite kerb-line. See **Photos 6 and 7**.

The built up area default speed limit of 50km/h applies on this road.



Photo 6: Malo Link will be extended into the subject site



Photo 7: Malo Link has a footpath down one side, with a row of large trees down the other

3.1.5 Pearce Avenue and Setosa Drive

Pearce Avenue is constructed as a kerbed, two lane undivided single carriageway road with no lane markings. The pavement width is approximately 5.8m. The road runs in a northeast-southwest direction before making a right angled bend and becoming Setosa Drive. Setosa Drive will be extended into the subject site (refer **Figure 3.2 and Photos 8 and 9**). Both roads have a 2m footpath on the developed side. The built up area default speed limit of 50km/h applies to both roads.

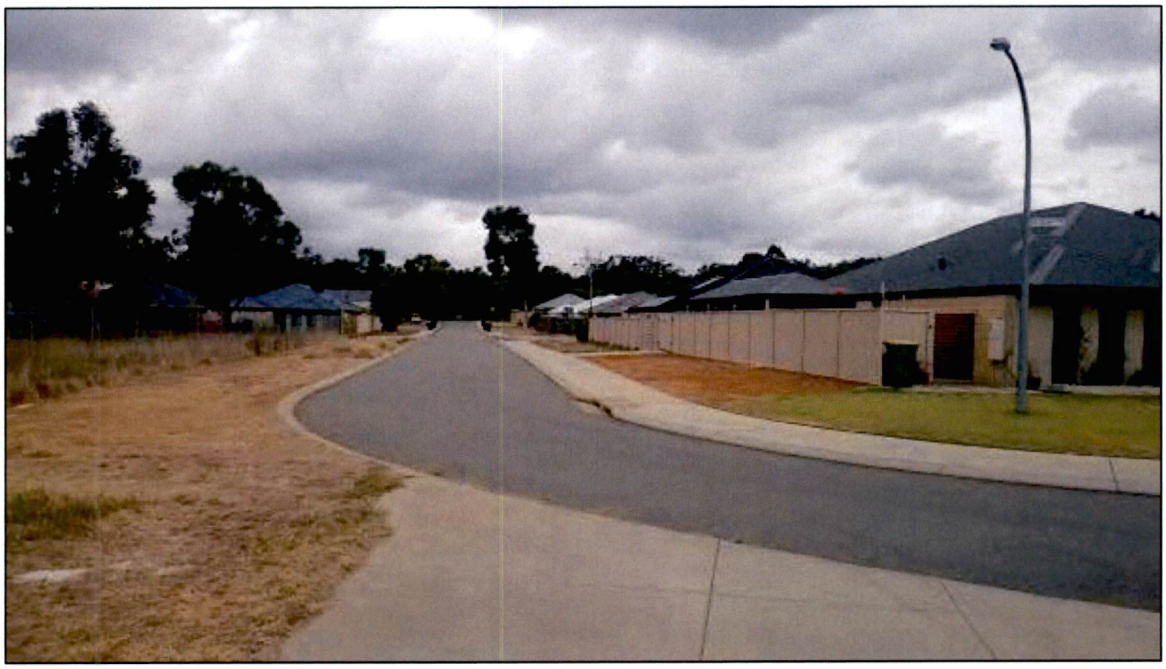


Photo 8: Pearce Avenue meets Setosa Drive at this bend



Photo 9: Setosa Drive will be extended along the boundary of the subject site

3.1.6 Lovett Drive

Lovett Drive is constructed as a kerbed, two lane undivided single carriageway road with no lane markings. The pavement width is approximately 6.0m. The road is short, at around 160m, and runs in a northwest-southeast direction and its northern end currently terminates at the boundary of the subject site. The southern end of Lovett Drive also terminates as a 'dead-end'. It presently intersects Pearce

Avenue at a four-way intersection. Lovett Drive will be extended to the north into subject site (refer **Figure 3.2 and Photo 10**). It has a footpath on the developed side.

The built up area default speed limit of 50km/h applies on this road.



Photo 10: Lovett Drive will be extended into the site

3.1.7 Gala Way

Gala Way is constructed as a kerbed, two lane undivided single carriageway road with no lane markings (see **Photo 11**). The pavement width is approximately 6.0m. The road runs in a northwest-southeast direction and currently terminates at the junction with Mandon Street north of Crumpet Creek. Footpaths are mainly on the southwest side of Gala Way south of Seville Road.

The built up area default speed limit of 50km/h applies on this road.



Photo 11: Gala Way, looking southeast

3.1.8 Quince Lane

Quince Lane is constructed as a kerbed, two lane undivided single carriageway road with pavement width of around 6m. The built up area speed limit of 50km/h applies. The road currently terminates at the northern boundary of the subject site, and provides only a short link to Seville Road. As can be seen from **Photo 12** the road has no footpaths. Quince Lane link will be extended into the subject site (refer **Figure 3.2**).



Photo 12: Quince Lane

3.1.9 Seville Road



Photo 13: Seville Road looking north east from Gala Way

Seville Road is constructed as a kerbed, two lane undivided single carriageway road with a pavement width of 6m (see **Photo 13**). The built up area default speed limit of 50km/h applies. No footpaths exist on Seville Road.

3.1.10 Mandon Street

Mandon Street is constructed as a kerbed, two lane undivided single carriageway road with no line marking (see **Photo 14**). It has a pavement width of 6m. The built up area default speed limit of 50km/h applies.



Photo 144: Side road off Mandon Street will be extended into the site

Source: Google Streetview

Mandon Street will provide two access points into the subject site. One will be an extension of Janda Way, a side road off Mandon Street, whilst the other will be an extension of Mandon Street itself (refer **Figure 3.2**). Both links connect with Gala Way.

3.2 ROAD HIERARCHY CLASSIFICATION

Figure 3.3 below shows the road hierarchy classification of the surrounding road network.

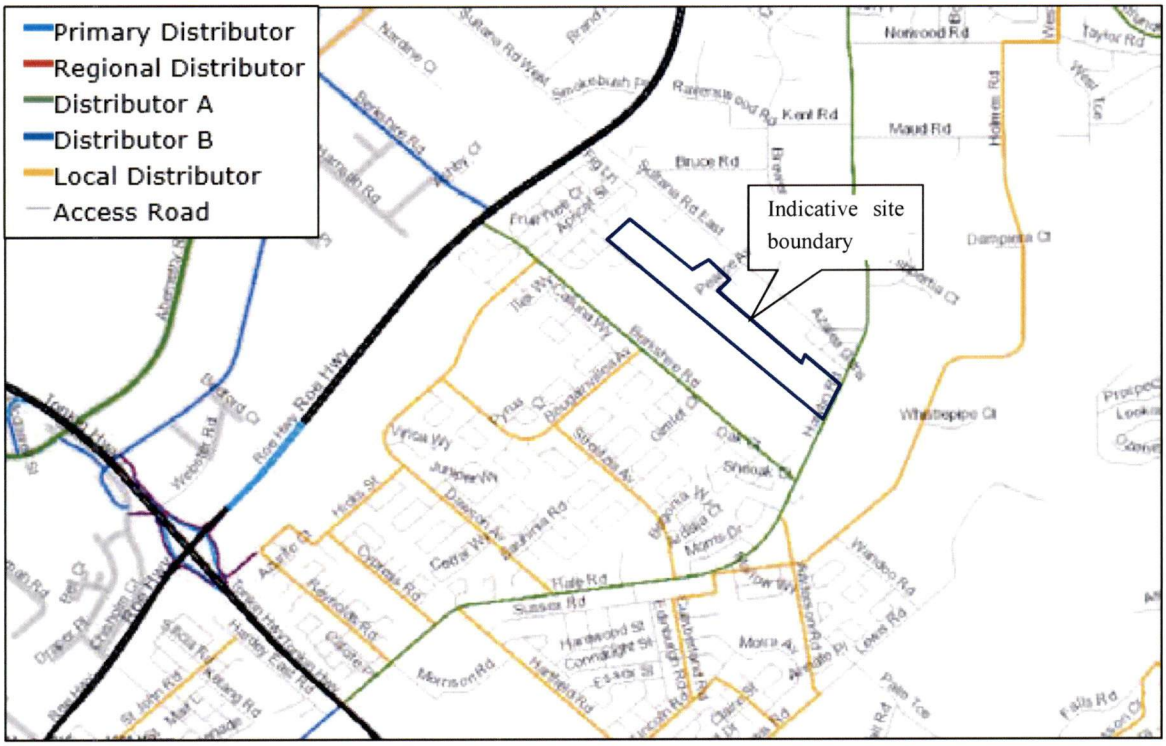


Figure 3.3: Road Hierarchy of surrounding road network

Source: Main Roads WA Functional Road Hierarchy, Road Info Mapping

As can be seen, Hawtin Road and Berkshire Road are classified as Distributor A roads under Main Roads WA's Functional Road Hierarchy. According to MRWA definitions, this classification is applied to roads which:

"Carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by local government."

The other roads currently adjacent the site, abutting the site boundary or terminating at it, are classified as *Access Roads*. These include Pearce Avenue, Mandon Street, Gala Way and Seville Road. According to MRWA definitions, this classification is applied to roads which:

"Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by the local government."

3.1 TRAFFIC VOLUMES

The latest available traffic counts for the surrounding road network were sourced from the Shire of Kalamunda. These are shown in **Table 3.1**. Full details are attached in **Appendix A**.

Table 3.1: Daily Traffic Flows for the Surrounding Road Network

Location	Date	AWT (vpd)	AM Peak		PM Peak	
			Hour	Volume	Hour	Volume
Apricot Road, south of Mandon Street	March 2014	2,386	8-9 am	187	5-6 pm	235
Sultana Road, south of Cumquat Way	Nov 2015	611	8-9 am	50	5-6 pm	61
Mandon Street, west of Nandat Road	Aug 2015	308	8-9 am	30	5-6 pm	35
Hawtin Road, south of Maud Road	July 2015	8,839	8-9 am	908	4-5 pm	904

Source: Shire of Kalamunda

3.2 DATA COLLECTION

Traffic turning counts were carried out at the key intersections around the site to establish the current operational characteristics of these locations. The counts were carried out for both the AM and PM peak periods on Wednesday 17th February 2016.

The intersections at which counts were undertaken were as follows:-

- Pearce Avenue / Sultana Road East;
- Malo Link / Berkshire Road;
- Hawtin Road / Berkshire Road; and
- Gala Way / Apricot Street.

Turning movements were counted between 7-9 am and 4-6 pm at each location. The results of the counts will be used as a basis to analyse the operational characteristics of the local intersections both under current conditions and future year scenarios. The results of the counts are attached in **Appendix B**.

3.3 CRASH HISTORY

The MRWA Crash Analysis Reporting System (CARS) was utilised to extract the latest crash data at the above sites. CARS reported no crashes for the five year period January 2012 - December 2016 for the intersections of Berkshire Road/Malo Link and Pearce Avenue/Sultana Road East.

For intersection of Berkshire Road/Hale Road/Hawtin Road, there were 11 recorded crashes for the latest five year period ending December 2016. Of these 3 required medical attention, 5 resulted in major physical damage only and the remaining 3 resulted in minor physical damage only. Of the 11 crashes, 7 were rear end collisions, with the remaining 4 comprised of Hitting an Object, Sideswiping, Head On and Right Angle crashes.

At the intersection of Gala Way/Apricot Street a single crash was recorded which resulted in major physical damage only from a right angle crash.

4 ROAD NETWORK PROPOSALS

4.1 SITE ACCESS ARRANGEMENTS

There are a number of minor residential roads around the subdivision area that currently terminate at the subject site boundary. These links will be extended into the site to provide access to the external road network.

The roads to be extended into the site will include:-

- Lovett Drive;
- Pearce Avenue;
- Setosa Drive;
- Quince Lane;
- Gala Way;
- Janda Way;
- Mandon Street and
- Malo Link.

This will result in increased traffic along the existing sections of these roads and subsequently on other roads such as Seville Road, Apricot Street, Berkshire Road and Sultana Road East. Refer to **Section 6** for further details.

The majority of the existing roads above presently terminate at the boundary of the subject site as 'dead ends' and would tie directly into proposed roads within the development. Mandon Street already ties into Gala Way at the southern end.

In addition to the extension of these existing residential roads into the subdivision as described above, there will also be a new access created (Crimson Boulevard), opening directly onto Hawtin Road. This access will be located near the south-eastern corner of the site, some 110m south of the intersection of Hawtin Road with Azalea Gardens.

4.2 INTERNAL ROAD NETWORK

4.2.1 Liveable Neighbourhood Sample Road Cross Sections

Figures 4.1 - 4.4 show sample cross sections for various categories of access roads, applicable to this development, as outlined in *Liveable Neighbourhoods* (WAPC 2015).

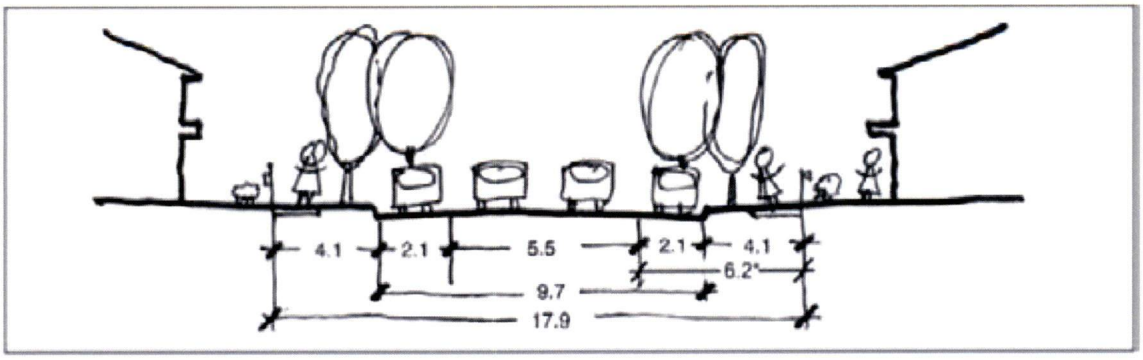


Figure 4.1: Sample Road Cross Section, Access Street B - Wider Access Street, 40km/h, <3000vpd
Source: Liveable Neighbourhoods WAPC (2009)

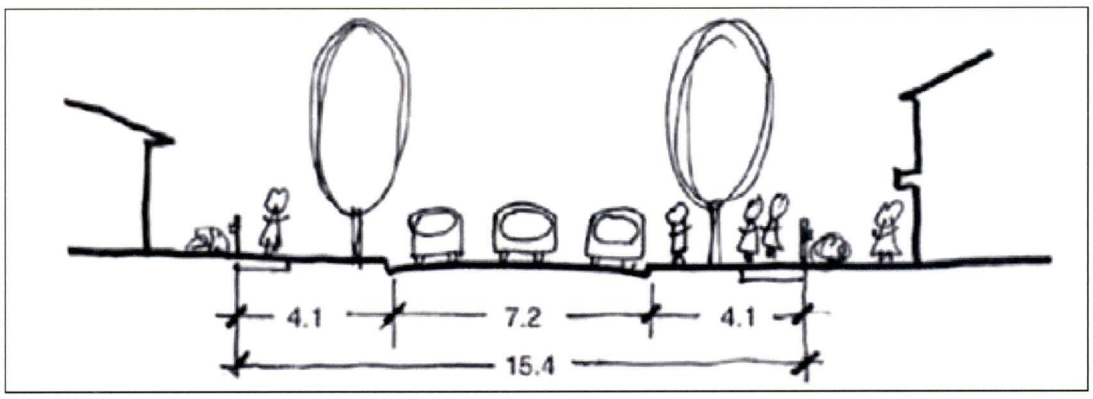


Figure 4.2: Sample Road Cross Section, Access Street C - Yield Access Street, 40km/h, <3000vpd
Source: Liveable Neighbourhoods WAPC (2009)

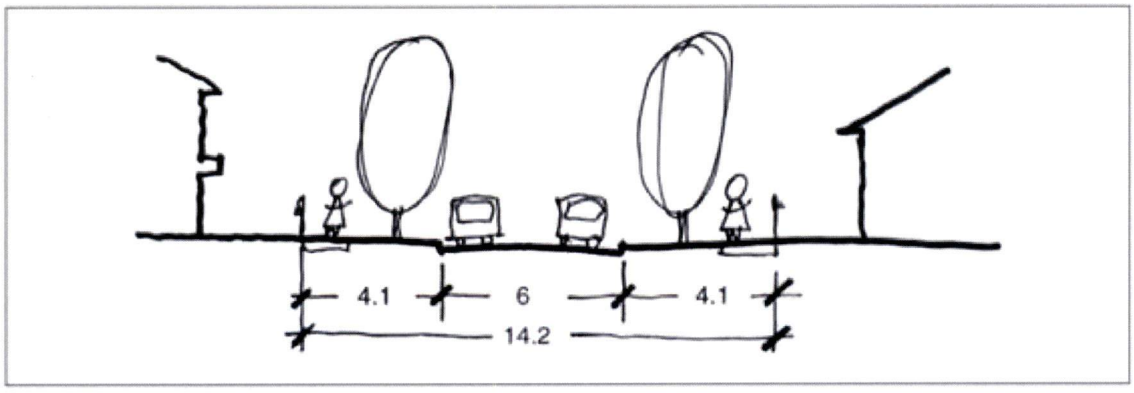


Figure 4.3: Sample Road Cross Section, Access Street D - Narrow Yield Access Street, 40km/h, <1000vpd
Source: Liveable Neighbourhoods WAPC (2009)

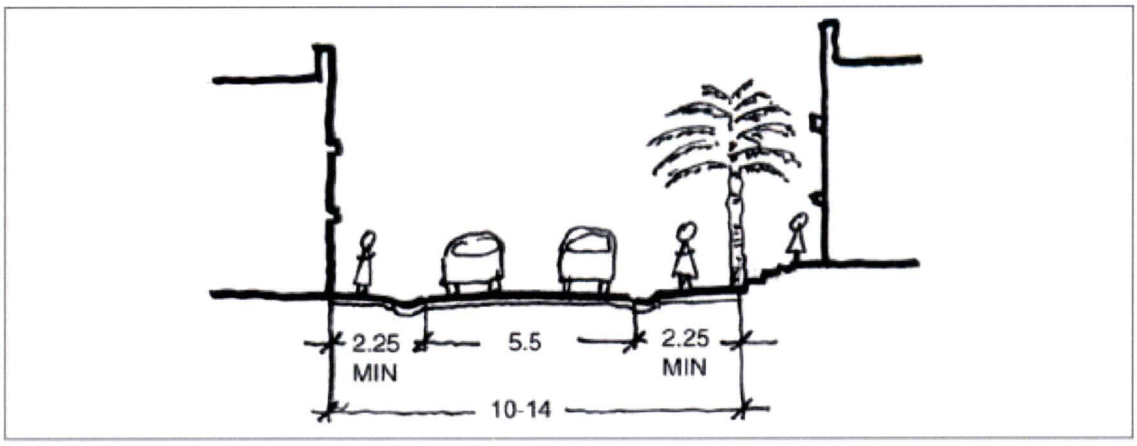


Figure 4.4: Sample Road Cross Section, Special Street - Small Town Centre Street, 30km/h, <1000vpd
Source: Liveable Neighbourhoods WAPC (2009)

4.2.2 Road Reservation Widths and Typical Cross sections

The road reserve widths proposed within the internal road network of the subject site are shown in the Proposed Road Layout Pavement Reserve Widths 6211-00-SK37 at **Appendix C2**.
All roads being extended into the subject site have road reserve widths that match and tie into the existing, comprising the following:

- 14m road reserve width to the extended Janda Way;
- 15m road reserve width to the extended Quince Way;
- 16m road reserve width to the extended Mandon Street; and
- 16m road reserve width to the extended Gala Way (north of Crumpet Creek) and
- 16.4m road reserve for Crimson Boulevard (south of Crumpet Creek).

The extension of Gala Way (north) terminates at Mandon Street north of Crumpet Creek. South of Crumpet Creek, Crimson Boulevard extends to Hawtin Road. The road effectively runs longitudinally through the centre of the subject site with priority over side roads. Its road reserve width is 16.4m which lies somewhere between *Liveable Neighbourhood's* Access Street B and C. Gala Way (north) has been constructed with a pavement width of 7.2m and its cross section reflects the typical standard access street, as shown in **Figure 4.2** - Access Street C, and can carry volumes up to 3,000vpd. These routes do not have cycle lanes or bus lanes. Cycle lanes are not likely to be required along the extended Gala Way. *Liveable Neighbourhood* suggests on roads with volumes less than 3,000vpd, cycling should generally be on street shared with cars. Consultation with the Public Transport Authority (PTA), see section 8, revealed that it is unlikely that Gala Way will be a bus route. ***On street parking may not be required along the length of the extended Gala Way but is recommended in the vicinity of the POS north of Seville Road and the future strata development site.***

The existing length of Gala Way just south of Apricot Street has a 6m pavement width (refer section 3.1) while the extension to Crumpet Creek has been constructed to 7.2m. Crimson Boulevard between Crumpet Creek and Hawtin Road is expected to carry about 1000 vpd (refer **Figure 5.1**) including through- traffic (refer Section 5.3). The forecast volumes on Crimson Boulevard are expected to be

approximately 1000vpd. It is therefore recommended that a 7.2m pavement (Access Street C, <3000vpd) is allowed for Crimson Boulevard. The total road reserve width proposed is 16.4m which will easily accommodate the forecast growth to the year 2030.

The majority of the remaining roads within the subject site have a pavement width of 6m with varying road reserve widths depending on their location (eg alongside POS or laneways). This cross section is mostly consistent with **Figure 4.3** - Access Street D, which can carry up to 1,000vpd.

Road reserve widths within the strata site in the 'Grouped Housing Site' should be at 12m as per the R-Code Amendments 2015 - refer Cl 5.3.5 C5.7. The road network within these strata sites may be classified as a Special Street - Small Town Centre (**Figure 4.4**).

Road reserve widths are further reduced to 6m at laneways, with the road reserve width widening to 9m at the Mews to cater for on-street parking. Laneways are located throughout the subject site behind cottage lots (near POS). The Mews are located at the southern boundary of the subject site near Hawtin Road.

The proposed speed limit is 50km/h on all roads within the development, as per the requirement for built up areas. It should be noted however that the target speed as defined by *Liveable Neighbourhoods* with respect to most of the cross sections is 40km/h. The strata site has a target speed of 30km/h.

4.2.3 Intersection controls

The majority of the intersections within the proposed internal road network are indicated on the subdivision drawings as being T- intersections; the exceptions being the following cross roads and as illustrated in **Figure 4.5**:

- Gala Way/Janda Way;
- Pearce Avenue/Setosa Drive; and
- Crimson Boulevard)/Laneway 1.

Liveable Neighbourhood permits the use of four-way intersections for a limited proportion of intersections within a development.

In low volume access street to access street junctions, such as at Pearce Avenue/Setosa Drive, four ways may be used where total volumes through the intersection are less than 2,000vpd (*Liveable Neighbourhoods-refer R62).* The intersection of Pearce Avenue/Setosa Drive would serve the traffic generated from dwellings in its immediate vicinity with a small volume of east-west movements. The link corresponding to Pearce Avenue in the traffic generation exercise (at section 5.2) estimates around 455vpd on Pearce Avenue. Setosa Drive would carry considerably less than that so the 2000vpd threshold is unlikely to be threatened. Similar analysis can be applied to the other four-way intersections.

Liveable Neighbourhoods also advises the lengths on the minor streets to be less than 160m. Pearce Street is taken to have the priority. The north western leg (Setosa Drive) is around 300m in length. However approach speeds should be slow as the approach is around 130m, measured from the curve (at lot 127). The south eastern leg (Setosa Drive) is around 220m. ***Threshold treatments such as different pavement treatments on the minor leg (Setosa Drive) are proposed to ensure all drivers are aware which road has the priority.*** With this treatment, the four-way control at this location is considered satisfactory.



Figure 4.5: Four-ways proposed within the subject site

The leg lengths on each approach satisfy the recommended 160m approach length. The leg of Janda Way from the southwest is around 60m and around 110m from the northeast. ***Threshold treatments have been applied at the intersection of Gala Way/Janda Way and should also be applied to the Pearce Avenue/Setosa Drive intersection and the Crimson Boulevard/Laneway 1 intersection.***

4.2.4 Speed controls

The straight lengths of Crimson Boulevard are at times too long and can lead to speeding through the site. *Liveable Neighbourhoods Table 6* recommends a desirable straight length of 130m for Access Street C for a target speed of 40km/h.

A raised intersection plateau is proposed at the intersection of Crimson Boulevard/Pearce **Avenue** to 'break up' the 280m straight stretch in the middle portion of the subject site. ***A second raised plateau is to be located along Crimson Boulevard at the Western Power easement to slow traffic down on the 260m straight stretch.***

A raised intersection plateau has already been constructed at the intersection of Gala Way and the new intersection south of Janda Way.

5 TRAFFIC GENERATION, DISTRIBUTION AND ASSIGNMENT

5.1 TRAFFIC GENERATION

In order to determine the traffic generation for the proposed development, trip generation rates for the residential lots were sourced from the *Guide to Trip Generating Developments*, NSW Road Traffic Authority (2002). The breakdown of inbound and outbound trips for the peak hours has been taken from those suggested in the Western Australia Planning Commission (WAPC) *Transport Impact Assessment Guidelines (2016) Volume 3.*

As described in section 2.2 the number of lots at full development is anticipated to be 420 and, with the strata development site, has the capacity of up 466 dwellings. The daily trip generation for the residential development has been taken as 9 trips per dwelling. The proposed development is therefore estimated to generate 4,194 trips per day, including up to 368 trips during the peak hour. **Table 5.1** outlines the daily and peak hour trip generations used in this analysis.

Table 5.1: Traffic Generation rates used

FORECAST UNITS	Rate per UNIT		Peak Hour Distribution (WAPC)				FORECAST Trips per Peak Hour & Daily				
DWELLINGS	Source	Daily	AM in	AM out	PM in	PM out	AM in	AM out	PM in	PM out	Daily
466	RTA	9	0.2	0.6	0.5	0.3	93	280	233	140	4194
							368		368		

5.2 DISTRIBUTION AND ASSIGNMENT

The development site was divided into six zones. Each zone was then given a trip directional distribution to the north, south, west and east considering likely attractors. In this analysis, the following distributions were used:

- 45% of trips to the north and west towards the Perth CBD, Kewdale and Kenwick employment hubs and the Perth Airport;
- 25% of trips to the southwest towards local schools and Forrestfield Shopping Centre;
- 15% of the trips to the northeast towards Midland; and
- 15% to the east towards Kalamunda.

The product of the lot yield for each zone and the trip assignment exercise results in the forecast design flows generated by the development.

Figures 5.1 and 5.2 show the additional daily and peak hour traffic respectively, for the external and internal networks.

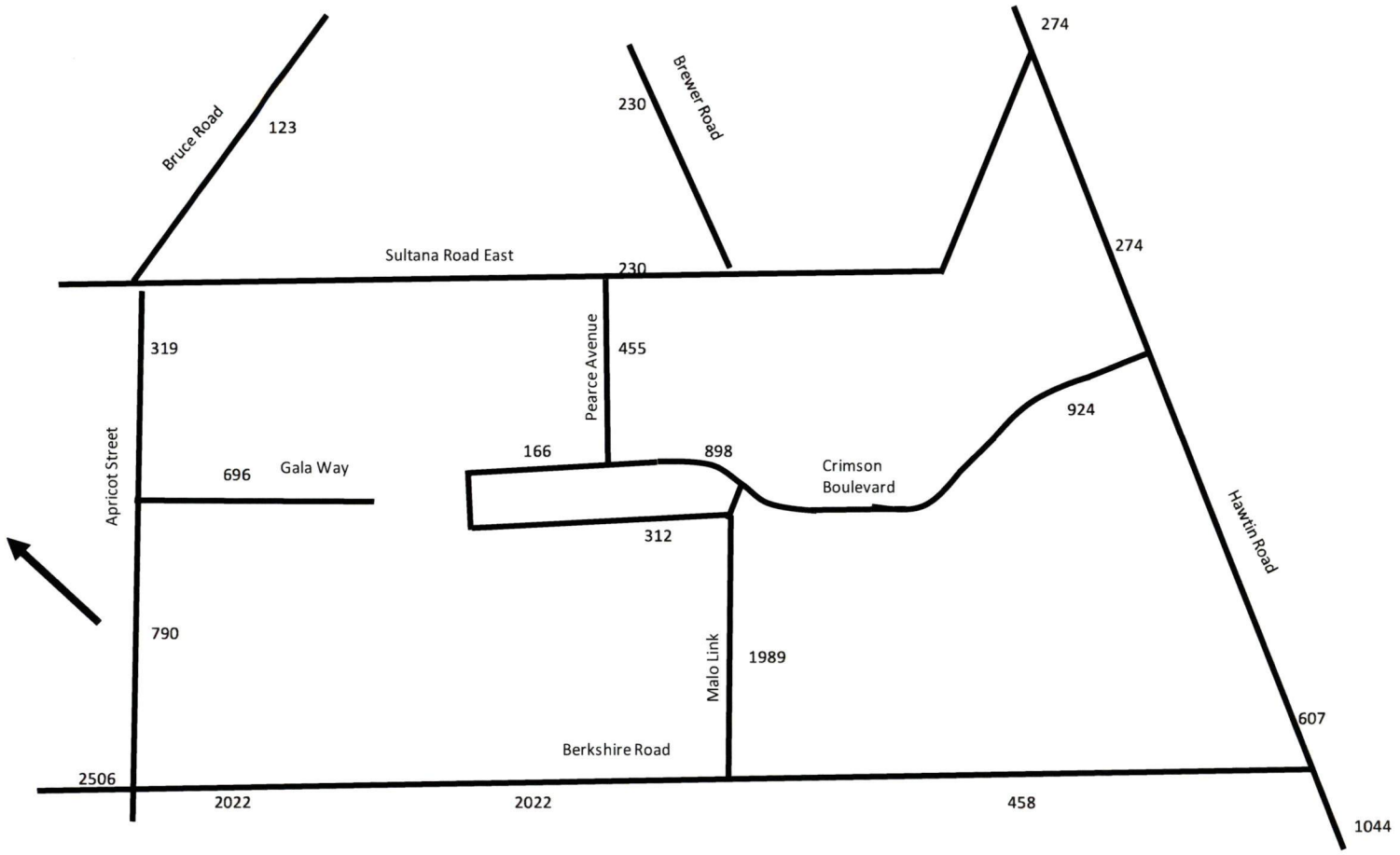


Figure 5.1: Forecast daily additional trips from the development

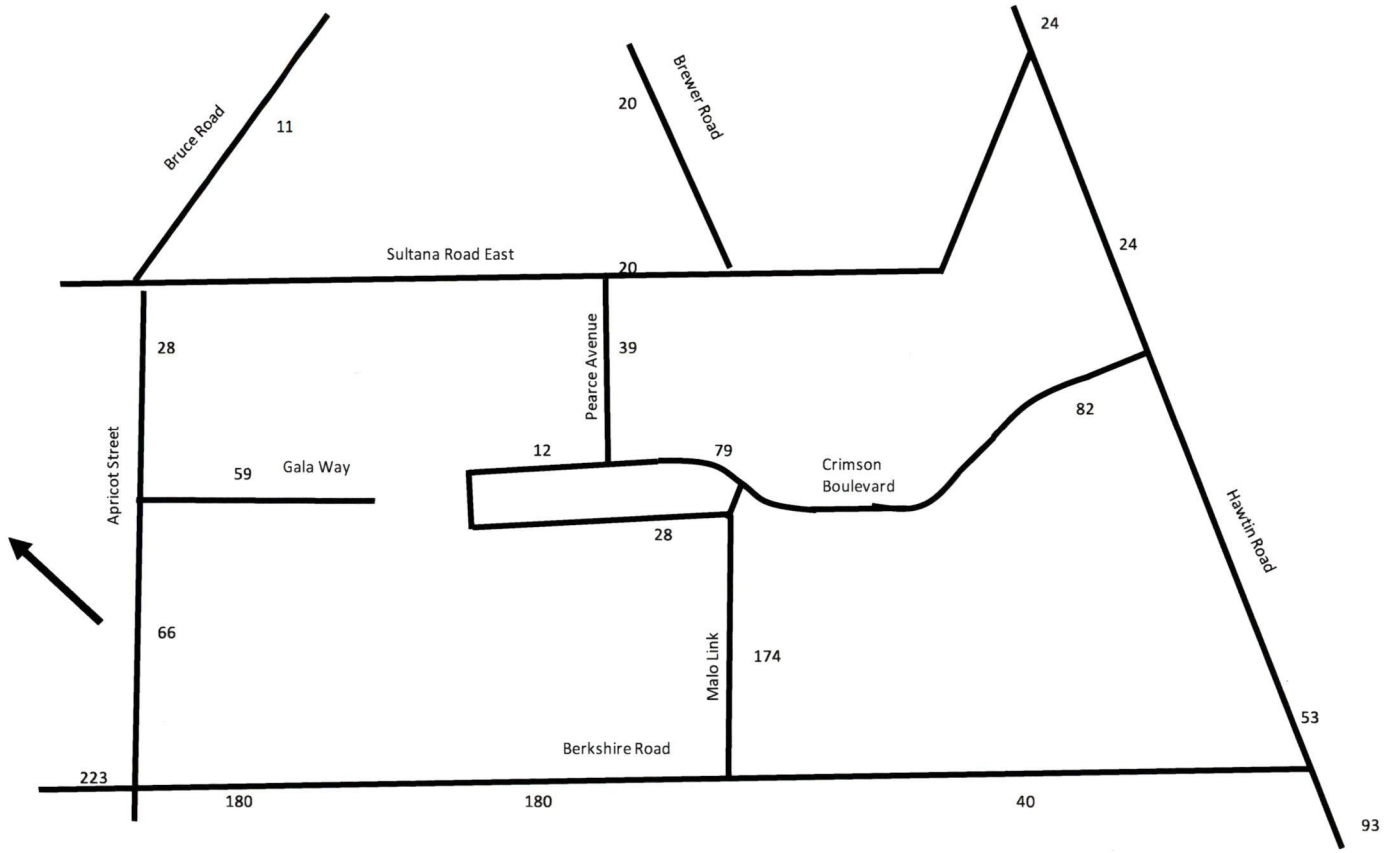


Figure 5.2: Forecast additional peak hour trips from the development

5.3 NON SUBDIVISION TRAFFIC

The road network through the proposed subdivision is not continuous. There is no northwest to southeast link due to the discontinuity at Crumpet Creek. Similarly the northeast to southwest link (via Pearce Street and Malo Link is convoluted. Berkshire Road provides a good northwest to southeast link and Hawtin Road and Apricot Street provide good northeast to southwest links. It is considered unlikely therefore that any significant volumes of traffic from adjacent development will use the proposed subdivision roads.

6 ANALYSIS OF TRANSPORT IMPACT

6.1 ASSESSMENT SCENARIOS

The current intention is for the development to be completed in eight stages. Stage 1 of the development (north of Crumpet Creek) was the subject of a separate development application in 2016 and is already complete. Based on recent aerial photography (December 2017) almost half of the lots have completed or partially completed houses on them. This transport assessment has been undertaken assuming full development of the whole site, including Stage 1. The remaining seven stages are expected to be completed by 2020.For the purpose of this analysis, the opening year will be 2020. The analysis is undertaken both at opening and ten years after, being 2030. The staging of the development will result in a slower build-up of traffic, and the need for any identified network improvements being delayed.

6.2 MID BLOCK CAPACITY

The subdivision is expected to generate an average of approximately 4,194 vpd in total and this traffic will be distributed over several accesses. According to *Liveable Neighbourhoods, (WAPC 2015),* the indicative maximum volume of traffic suitable for an access street varies from 3,000 vpd based on a pavement width of at least 7.2m to 1,000 vpd based on a pavement width of 5.5-6m.

6.2.1 Internal links

The forecast (additional) daily volumes on internal links from the subject site, as shown in **Figure 5.1,** indicate that maximum additional volumes will be in the order of 1,989vpd - this being on Malo Link. Other internal roads within the subject site would have volumes of around 1,000vpd or less and would operate within their capacity based on their proposed 6m pavement width.

6.2.2 Hawtin Road

Figure 5.1 shows Hawtin Road is anticipated to carry an additional 607 vpd due to the proposed development. Hawtin Road is classified as a District Distributor A and as such can carry over 8,000 vpd. The equivalent road classification for this route in *Liveable Neighbourhoods 2015* is an Integrator B (two lanes outside centres) and has the theoretical capacity of up to 15,000 vpd. Volumes on Hawtin Road (refer **Table 3.1**) are around 8,839 vpd (July 2015) and the development trips represent an additional 7% of existing volumes. The total volume on Hawtin Road with the development traffic is estimated to be 9,500 vpd and would be within the route's theoretical capacity.

6.2.1 Berkshire Road

Figure 5.1 above shows Berkshire Road is anticipated to carry an additional 2020 vpd due to the proposed development. Berkshire Road is classified as a District Distributor A and as such can carry over 8,000vpd. The equivalent road classification in *Liveable Neighbourhoods 2015* is an Integrator B (two lanes outside centres) and has the theoretical capacity of up to 15,000vpd. The data collected at the intersection of Berkshire Road/Hawtin Road (refer section 3.4) shows total volumes of 516 vph in the AM peak and 430 vph in the PM peak on the Berkshire Road approach. Assuming a 10% peak

hour factor, the road is estimated to carry 5,160 vpd. The total volume on Berkshire Road with the development traffic is estimated to be 7,200 vpd and is therefore within the route's theoretical capacity.

6.2.2 Sultana Road East

Figure 5.1 above shows Sultana Road East is anticipated to carry an additional 230 vpd due to the proposed development. Sultana Road East is classified as an Access Road and as such can carry up to a maximum of 3,000 vpd. Volumes on Sultana Road East (refer **Table 3.1**) are around 611 vpd (November 2015). The total volume on Sultana Road East with the development traffic is estimated to be 850 vpd and therefore the road has sufficient capacity to cater for the increase.

6.2.3 Malo Link

Figure 5.1 above shows Malo Link is anticipated to carry an additional 1989 vpd due to the proposed development. Malo Link is classified as an Access Road and as such can carry up to a maximum of 3,000vpd. The data collected at the intersection of Berkshire Road/Malo Link (refer section 3.4) show total volumes of 30 vph in the AM peak and 24 vph in the PM peak on the Malo Link approach. The estimated corresponding daily volumes on this road are 300 vpd. The total volume on Malo Link with the development traffic is estimated to be 2300 vpd which is below the road's theoretical capacity.

6.2.4 Apricot Street

Figure 5.1 above shows Apricot Street is anticipated to carry an additional 790 vpd due to the proposed development. Apricot Road is presently classified as an Access Road and as such can carry up to a maximum of 3,000vpd. **Table 3.1** shows that Apricot Street carries around 2,386 vpd (March 2014). The data collected at the intersection of Apricot Street/Gala Way (refer section 3.4) show total volumes of 213 vph in the AM peak and 222 vph in the PM peak on the Apricot Street southwest approach. Assuming a 10% peak hour factor, the road is estimated to carry 2,220 vpd. The total volume on Apricot Street Road, using the 2016 traffic flows, with the development traffic is estimated to be 3,010 vpd, which is close to the theoretical capacity of an Access Road.

However, the route does connect to Berkshire Road - a District Distributor, and as such is more suited to be classified as a Local Distributor. Under MRWA's Functional Hierarchy, Local Distributors 'connect access roads to higher order Distributors' and have a maximum desirable volume of 6,000 vpd. Traffic and speed on Apricot Street is presently managed with roundabouts at Berkshire Road, Gala Way and Sultana Road East. These existing traffic management measures should ensure the increase in volume due to the additional trips from the proposed development, does not adversely impact flow on the road. Furthermore, section 6.3.5 shows the existing roundabout at Apricot Street/Cherrytree Road/Gala Way can cope with the additional flows from the subject site.

6.3 INTERSECTION ANALYSIS

6.3.1 Intersections internal to the development

Austroads *Guide to Traffic Management* provides advice on the capacity of unsignalised intersections. For minor roads where there are relatively low volumes of turning traffic, capacity considerations are usually not significant and capacity analysis is unnecessary. Intersection volumes, below which capacity analysis is unnecessary, are indicated in **Table 6.1**. It is seen that for a two lane major road, when the flow on the major road is 650 vehicles per hour (vph), the crossroads would easily accommodate up to 100 vph.

Reference to **Table 6.1,** and the peak hour volumes in **Figure 5.2,** shows that there is sufficient capacity at the proposed intersections within the development. Minor and major road peak hour volumes are well below 100vph, except for Malo Link at 175vph which is still well below the 650 vpd threshold.

Table 6.1: Intersection Volumes below which Capacity Analysis is unnecessary (Austroads 2009)

Type of road	Light cross and turning volumes maximum design hour volumes (vehicles per hour (two way))		
Four lane major road	1000	1500	2000
Crossroads	100	50	25
Two lane major road	400	500	650
Crossroads	250	200	100

6.3.2 SIDRA

Where necessary, the SIDRA v6.1 computer software package has been used to analyse the intersections affected by the impacts of the proposed subdivision. SIDRA is an intersection-modelling tool commonly used by traffic engineers for all types of intersection analysis.

SIDRA Inputs

The analysis of respective intersections was undertaken for the year 2020 when all stages are anticipated to be completed and plus ten years, 2030. In absence of MRWA forecast model volumes in the area, a 2% per annum growth has been applied to 2016 through traffic on the major roads. Volumes were factored by a flat rate of 1.0824 to 2020 and 1.395 to 2030.

For the respective intersections the AM and PM peak volumes estimated, from **Figure 5.2** and peak hour distribution factors in **Table 5.1**, were added to the existing intersections or flows from recent counts conducted (attached **Appendix B**). Turning splits were then allocated and based roughly on the distributions assumed in Section 5.2.

The percentage of heavy vehicles was taken from the recent counts undertaken. With the exception of Hawtin Road/Crimson Boulevard), which is a new intersection, all intersections were analysed using existing intersection layouts.

SIDRA Outputs

SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

Degree of Saturation: is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.

Level of Service (LoS): is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).

Average Delay: is the average of all travel time delays for vehicles passing through the intersection.

95% Queue: is the queue length below which 95% of all observed queue lengths fall.

The results of the SIDRA for the following intersections show that the additional flow on the surrounding road network from the proposed subdivision will not impact their operational performances. For reporting purposes, only the 'Movement Performance' summaries for each peak period in 2030 are shown in **Appendix D**.

6.3.3 Hawtin Road/Crimson Boulevard

The intersection analysed for the intersection of Hawtin Road and Crimson Boulevard is shown in **Figure 6.1** and the forecast volumes are detailed in **Table 6.2** and **Table 6.3** for the AM and PM peak, respectively. The Movement Performance summary outputs for the 2030 AM and PM peak are shown in **Table D1** and **Table D2** in **Appendix D**.

The results of the SIDRA analysis for the proposed intersection Hawtin Road/Crimson Boulevard using the forecast volumes, show that the majority of movements are at a LoS of A. This is with the exception of the right turn out of Crimson Boulevard, which operates at a LoS C and LoS B in the 2030 AM and PM peak, respectively. The average delay of any movement is less than or equal to 16 seconds, and well under the threshold of 35 seconds for a priority controlled intersection, as outlined in the WAPC Transport Impact Assessment Guidelines *Volume 4 Individual Developments* 2016.

Table 6.2: Hawtin Road/Crimson Boulevard AM Peak Forecast Volumes

		Dev turning volumes	Existing 2016	Forecast		Forecast plus dev	
				2020	2030	2020	2030
Crimson Boulevard (W)	Left	18	-	-	-	18	18
	Right	43	-	-	-	43	43
Hawtin Rd (N)	Thru	0	473	512	624	512	624
	Right	6	-	-	-	6	6
Hawtin Rd (S)	Left	13	-	-	-	13	13
	Thru	0	416	450	549	450	549
Total		81	889	962	1173	1043	1254

Table 6.3: Hawtin Road/Crimson Boulevard PM peak Forecast Volumes

		Dev turning volumes	Existing 2016	Forecast		Forecast plus dev	
				2020	2030	2020	2030
Crimson Boulevard (W)	Left	9	-	-	-	9	9
	Right	22	-	-	-	22	22
Hawtin Rd (N)	Thru	0	401	434	529	434	529
	Right	15	-	-	-	15	15
Hawtin Rd (S)	Left	34	-	-	-	34	34
	Thru	0	450	487	594	487	594
Total		80	851	921	1123	1001	1202

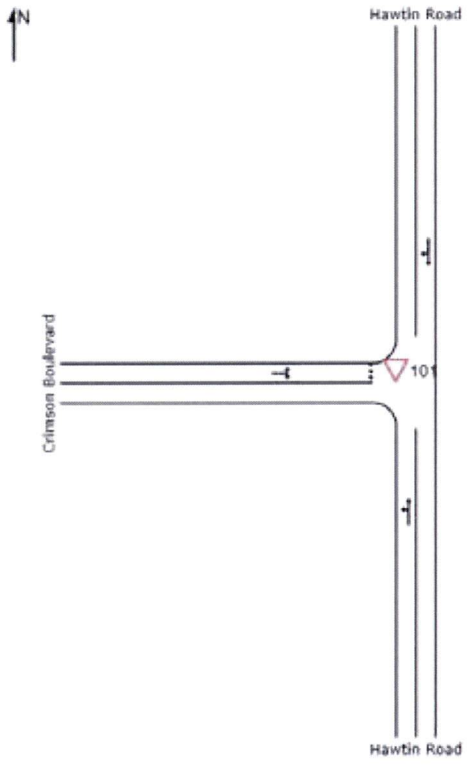


Figure 6.1: Hawtin Road/Crimson Boulevard Layout

6.3.4 Sultana Road East and Pearce Avenue

The February 2016 counts undertaken at this intersection attached in **Appendix B** show that the junction is not busy. Flow on Sultana Road East is less than 70 vph in any peak period. Traffic flow on Pearce Avenue is less than 20 vph in any peak period. **Figure 5.2** show that volumes on both Sultana Road East and Pearce Avenue will increase by no more than 40 vph in any peak period. The estimated additional trips from the proposed development are not expected to impact this intersection.

6.3.5 Apricot Street / Gala Way / Cherrytree Road

Gala Way is to be extended into the subject site. The forecast volumes at Apricot Street/Gala Way/Cherrytree Road are detailed in **Table 6.4** and **Table 6.5** for the AM and PM peak, respectively. The results of the SIDRA analysis for the existing roundabout at Apricot Street/Gala Way/Cherrytree Road, with the additional forecast volumes from the development, show that roundabout would operate at a LoS A in both peak periods 2020 and 2030. The Movement Performance summary outputs for 2030 are shown in **Table D3** and **Table D4** in **Appendix D.**

Table 6.4: Apricot Street/Gala Way/Cherrytree Road AM peak Forecast Volumes

		Dev turning volumes	Existing 2016	Forecast		Forecast plus dev	
				2020	2030	2020	2030
Gala Way (S)	Left	107	-	-	-	42	42
	Thru	0	-	-	-	0	0
	Right	2	-	-	-	2	2
Apricot St (E)	Left	6	0	0	0	6	6
	Thru	0	106	115	140	115	140
	Right	0	1	1	1	1	1
Cherrytree Rd (N)	Left	-	3	3	3	3	3
	Thru	-	1	1	1	1	1
	Right	-	28	28	28	28	28
Apricot St (W)	Left	0	10	10	10	10	10
	Thru	0	50	54	66	54	66
	Right	17	3	3	3	29	20
Total		67	202	215	252	281	381

6.3.6 Berkshire Road and Malo Link

With the extension of Malo Link into the subject site, subdivision traffic will traverse Malo Link to access Berkshire Road. A SIDRA analysis was undertaken using the existing layout of Berkshire Road/Malo Link with the additional forecast volumes from the development. The forecast volumes at Berkshire Road and Malo Link are detailed in **Table 6.6** and **Table 6.7** for the AM and PM peak, respectively.

The analysis returned a LoS of A in both peak periods in 2020 and 2030. The Movement Performance summary outputs for 2030 are shown in **Table D5** and **Table D6** in **Appendix D**.

Table 6.5: Apricot Street/Gala Way/Cherrytree Road PM peak Forecast Volumes

		Dev turning volumes	Existing 2016	Forecast		Forecast plus dev	
				2020	2030	2020	2030
Gala Way (S)	Left	22	-	-	-	22	22
	Thru	0	-	-	-	0	0
	Right	1	-	-	-	1	1
Apricot St (E)	Left	14	0	0	0	14	14
	Thru	0	62	67	82	67	82
	Right	0	0	0	0	0	0
Cherrytree Rd (N)	Left	-	0	0	0	0	0
	Thru	-	0	0	0	0	0
	Right	-	15	15	15	15	15
Apricot St (W)	Left	0	18	18	18	18	18
	Thru	0	116	126	153	126	153
	Right	46	10	10	10	56	56
Total		146	221	236	278	382	424

Table 6.6: Berkshire Road and Malo Link AM peak Forecast Volumes

		Dev turning volumes	Existing 2016	Forecast		Forecast plus dev	
				2020	2030	2020	2030
Berkshire Rd (S)	Thru	0	251	272	331	272	331
	Right	10	2	2	2	12	12
Malo Link Rd (E)	Left	33	6	6	6	39	39
	Right	98	14	14	14	112	112
Berkshire Rd (N)	Left	45	8	8	8	53	53
	Thru	0	208	225	274	225	274
Total		186	489	527	636	712	821

Table 6.7 Berkshire Road and Malo Link PM peak Forecast Volumes

		Dev turning volumes	Existing 2016	Forecast		Forecast plus dev	
				2020	2030	2020	2030
Berkshire Rd (S)	Thru	0	156	169	206	169	206
	Right	26	2	2	2	28	28
Malo Link Rd (E)	Left	17	2	2	2	19	19
	Right	50	9	9	9	59	59
Berkshire Rd (N)	Left	113	11	11	11	124	124
	Thru	0	236	255	311	255	311
Total		205	416	448	541	653	746

6.3.7 Berkshire Road and Hawtin Road

The forecast volumes at Berkshire Road and Hawtin Road are detailed in **Table 6.8** and **Table 6.9** for the AM and PM peak, respectively.

The results of the SIDRA analysis for the roundabout at Berkshire Road/Hawtin Road, with forecast volumes from the proposed development added, show that the roundabout operates at an overall LoS A with no movements worse than LoS B in both peak periods 2020 and 2030. The Movement Performance summary outputs for 2030 are shown in **Table D7** and **Table D8** in **Appendix D.**

Table 6.8: Berkshire Road and Hawtin Road AM peak Forecast Volumes

		Dev turning volumes	Existing 2016	Forecast		Forecast plus dev	
				2020	2030	2020	2030
Berkshire Rd (N)	Left	0	86	93	113	93	113
	Right	30	186	201	245	231	275
Hawtin Rd (E)	Thru	40	396	429	523	468	562
	Right	0	77	83	102	83	102
Hawtin Rd (W)	Left	9	167	181	220	190	230
	Thru	14	330	357	435	371	449
Total		93	1242	1344	1639	1437	1732

Table 6.9: Berkshire Road and Hawtin Road PM peak Forecast Volumes

		Dev turning volumes	Existing 2016	Forecast		Forecast plus dev	
				2020	2030	2020	2030
Berkshire Rd (N)	Left	2	66	71	87	73	89
	Right	14	180	195	238	209	251
Hawtin Rd (E)	Thru	20	350	379	462	399	482
	Right	0	51	55	67	55	67
Hawtin Rd (W)	Left	20	133	144	175	164	196
	Thru	38	384	416	507	453	544
Total		94	1164	1260	1536	1354	1630

7 SUSTAINABLE TRANSPORT

7.1 EXISTING PUBLIC TRANSPORT ACCESS

A number of Transperth Bus routes currently exist in the vicinity of the site. These include route 286, 287, 288 and 294. These routes are shown in **Figure 7.1**. Bus routes 286, 287 and 288 traverse between Perth and Maida Vale via Belmont Forum, Forrestfield and Maida Vale via Belmont Forum and Forrestfield. Route 294 traverses between Midland Gate and Westfield Carousel via Forrestfield.

The bus services to the city are located on Apricot Street, Berkshire Road and Hawtin Road. The lots to the north of Crumpet Creek (Stage 1), lots along the south western boundary of the subject site, and lots south of the future strata development site are within 400m straight line distance to these roads. Walking distance to the bus stops would however be longer. The remainder of the lots in the subdivision are less accessible to public transport.

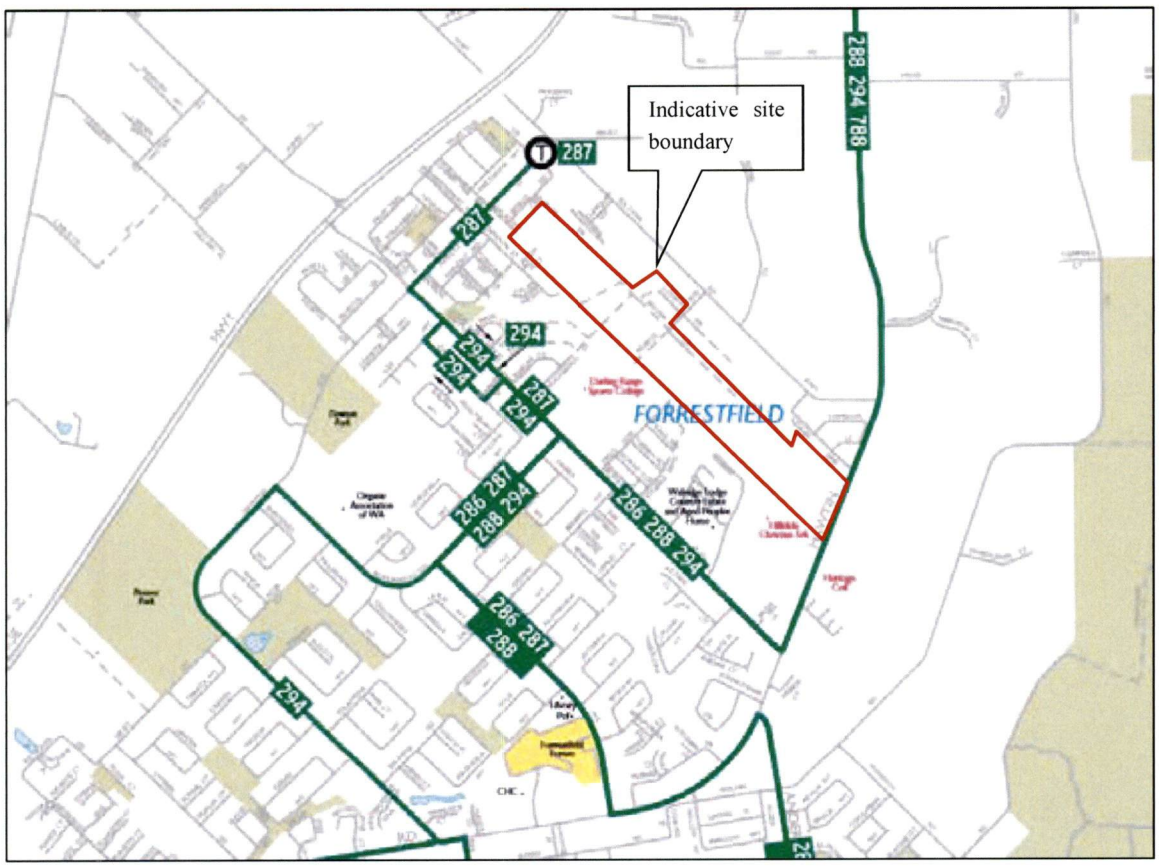


Figure 7.1: Current bus routes in the vicinity of the site

Source: Google maps/Transperth

7.2 PROPOSED PUBLIC TRANSPORT FACILITIES

Consultation with the PTA has revealed that there are no plans for bus routes to operate within the subject site, refer to **Appendix E** for email correspondence. There is a possibility for the bus route to be extended to Sultana Road East in the future. This would provide some accessibility to public transport to those lots along the north eastern boundary of the subject site.

7.3 EXISTING PEDESTRIAN AND CYCLE ACCESS FACILITIES

No paths exist within the subject site.

7.4 PROPOSED PEDESTRIAN AND CYCLE ACCESS FACILITIES

The proposed path network within the subject site is shown in Drawing 6211-00-SK36 at **Appendix C**. All roads are proposed to have at least one footpath 1.8m wide on one side of the street.

Crimson Boulevard will have a 1.8m wide DUP on both sides of the side of the street to the 1.8m footpath. This provides the pedestrian link to bus services on Hawtin Road.

The proposed DUP on the south west side of the Gala Way will cross to the north east side just south of Seville Road and run along this side of the existing Gala Way to Seville Road. This provides a pedestrian link outside of the Development to the bus services on Apricot Street.

In addition to the proposed 1.8m footpath on the west side of extended Pearce Avenue, a DUP is also proposed on the east side which ties into the existing 2.1m path link to Sultana Road East.

The new road on the south western boundary of the subject site abutting the Darling Range Sports College will also have 1.8m paths on both sides of the road. This caters for the higher than normal foot traffic anticipated in the vicinity of the educational facility.

Liveable Neighbourhood suggests *'in residential areas where projected forecast volume is less than 3,000 vehicles per day, cycling should generally be on street shared with cars'*. Forecast volumes, as discussed in Section 5.2, reveal that no flows on the internal road network will exceed 3,000 vpd. Hence, on-street cycle lanes are not proposed within the internal road network.

8 SUMMARY AND RECOMMENDATIONS

8.1 SUMMARY

The subdivision covered by the 'Forrestfield Master Plan' is to comprise some 420 residential lots, plus a future strata development site, with the capacity to house 466 dwellings. The site is located off Hawtin Road in the suburb of Forrestfield within the Shire of Kalamunda. The development of the subject site is proposed to be undertaken in eight stages, with full development by 2020.

The proposed development is estimated to generate 4,194 trips per day, including up to 373 trips during the peak hour. This commuter traffic would be spread over a number of local roads such as Malo Link, Gala Way, Crimson Boulevard, Pearce Avenue and to a lesser extent Mandon Street, Quince Lane and Seville Road, before dissipating into the wider network via Hawtin Road, Hale Road, Sultana Road East and Berkshire Road, and onward to Roe Highway, Tonkin Highway and Orrong Road.

A trip distribution and assignment exercise was undertaken to model where the additional volumes will be dispersed considering likely attractors in the area. Movements to/from the north and west towards the Perth CBD, Perth Airport and employment hubs of Kewdale and Kenwick were considered to attract the majority of trips. There are also trips to the southwest towards local schools and the Forrestfield shopping centre. A lesser proportion were trips to the northeast to Midland and east towards Kalamunda.

Adverse impact to the surrounding road network from additional volumes from the proposed development is not envisaged. Increases in volumes on Hawtin Road, Berkshire Road, Sultana Road East and Malo Link are within the respective theoretical capacity of each road. Volumes on Apricot Street are anticipated to increase to 3010 vpd from 2,220 vpd at full development. Although the route is currently classified as an Access Road under Main Road's Functional Hierarchy and ideally should carry up to 3,000vpd, its ultimate function after development of the surrounding area is more a Local Distributor. Local Distributors connect access roads to higher order Distributors and have a maximum desirable volume of 6,000vpd. Traffic and speed on Apricot Street is presently managed with roundabouts at Berkshire Road, Gala Way and Sultana Road East. These existing traffic management measures should ensure the increase in volume, due to the additional trips from the proposed development, does not adversely impact flow, speed or safety on the road.

Analysis of the external intersections, including the new access into the subdivision - Hawtin Road/Crimson Boulevard was undertaken to ascertain the impact of the additional trips. The SIDRA results show that the new access, Sultana Road East/Pearce Avenue, Apricot Street/Gala Way/Cherrytree Road, , Berkshire Road/Malo Link and Berkshire Road/Hawtin Road are not adversely impacted by the additional volumes. All intersections operate at a satisfactory LoS, with no movements worse than C, in 2020 opening and the plus ten year scenario in 2030.

A comprehensive footpath network, shown in Drawing 6211-00-SK36 at **Appendix C**, is proposed for the subject site with at least a 1.8m footpath on all roads within the development.

8.2 RECOMMENDATIONS WITHIN THE DEVELOPMENT SITE

1. Gala Way and Crimson Boulevard to have a 7.2m pavement width, all other internal roads within the subject site to have a pavement width of 6m as shown in Drawing 6211-00-SK37 and 8485_FIG64D at **Appendix C**;
2. Allow on-street parking on the Gala Way and Crimson Boulevard and other roads in the vicinity of the future strata development site, cottage lots and POS. Road reserve widths within the strata development site (tagged 'Grouped Housing Site') should be at 12m as per the R-Code Amendments 2015 - refer Cl 5.3.5 C5.7;
3. At proposed four way intersections at Crimson Boulevard/Laneway 1, and Pearce Avenue/Setosa Drive, provide threshold treatments such as different pavement treatments on the minor legs; and
4. Provide traffic calming to long straight stretches of road namely, provide raised intersection plateaux at T-junction on Crimson Boulevard/Pearce Avenue, and a raised plateau on Crimson Boulevard at the Western Power easement.

APPENDIX A: TRAFFIC DATA

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-18 -- English (ENA)

Datasets:

Site:	**[APRICOT ST -0052] 56 m South of MANDON ST <50>**
Attribute:	FORRESTFIELD
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 0
Survey Duration:	12:00 Monday, 10 March 2014 => 9:32 Tuesday, 25 March 2014,
Zone:	
File:	APRICOT ST -005225Mar2014.EC0 (Plus)
Identifier:	EA45EKEW MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**12:00 Monday, 10 March 2014 => 9:32 Tuesday, 25 March 2014 (14.8978)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = North
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 35593 / 35645 (99.85%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-18
Site: APRICOT ST -0052.0.1NS
Description: **56 m South of MANDON ST <50>**
Filter time: **12:00 Monday, 10 March 2014 => 9:32 Tuesday, 25 March 2014**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	1 - 7
Hour									
0000-0100	4.5	6.0	9.5	12.5	11.5	29.0	36.0	8.5	14.9
0100-0200	1.0	1.3	7.0	9.5	5.0	10.5	18.5	4.5	7.1
0200-0300	3.0	1.7	5.5	4.5	5.0	8.5	18.0	3.7	6.3
0300-0400	5.0	4.3	6.0	8.0	6.5	11.0	6.5	5.8	6.6
0400-0500	18.5	15.3	20.0	18.5	17.5	16.0	9.5	17.7	16.4
0500-0600	78.0	49.0	76.5	71.5	74.5	27.5	10.5	68.0	54.9
0600-0700	149.0	97.3	158.0	141.5	148.0	51.5	30.0	135.0	109.9
0700-0800	176.0	125.7	189.5	168.0	165.0	81.5	51.0	161.3	135.9
0800-0900	**202.0**	**141.0**	**199.0**	**197.0**	**196.5**	136.0	98.0	**182.9**	**165.3**
0900-1000	119.5	74.3	114.5	134.5	113.5	163.5	140.0	107.9	119.6
1000-1100	97.5	101.0	84.5	98.0	117.5	177.0	169.5	99.7	120.7
1100-1200	110.0	95.0	108.5	116.5	114.5	**193.5**	**177.5**	108.9	130.8
1200-1300	112.0	110.5	108.0	125.5	139.0	195.5	183.0	118.4	137.3
1300-1400	104.0	113.5	99.0	92.0	124.5	**217.5**	162.5	106.4	128.7
1400-1500	132.3	147.5	149.0	147.5	175.5	179.5	**185.5**	148.7	157.7
1500-1600	156.3	220.0	213.0	229.0	227.0	178.0	161.0	204.3	195.0
1600-1700	137.7	217.5	213.5	213.5	202.5	189.5	181.0	191.5	189.9
1700-1800	**163.7**	**252.5**	**226.5**	**244.5**	**285.5**	177.5	181.0	**228.1**	**215.1**
1800-1900	131.3	168.0	201.5	209.0	234.0	161.0	125.0	183.5	172.7
1900-2000	69.0	119.0	115.0	138.0	144.5	118.0	101.5	112.7	111.9
2000-2100	50.0	80.5	85.0	104.0	98.0	79.0	67.0	80.5	78.5
2100-2200	29.7	57.5	62.0	72.5	65.5	66.0	41.5	54.9	54.6
2200-2300	17.0	32.0	39.0	37.0	60.5	65.0	23.5	35.3	37.7
2300-2400	5.7	18.5	18.0	18.5	36.5	49.5	16.5	18.2	22.1
Totals									
0700-1900	1642.3	1766.5	1906.5	1975.0	2095.0	2050.0	1815.0	1841.6	1868.7
0600-2200	1940.0	2120.8	2326.5	2431.0	2551.0	2364.5	2055.0	2224.7	2223.6
0600-0000	1962.7	2171.3	2383.5	2486.5	2648.0	2479.0	2095.0	2278.1	2283.4
0000-0000	2072.7	2249.0	2508.0	2611.0	2768.0	2581.5	2194.0	2386.4	2389.6
AM Peak	0800	0800	0800	0800	0800	1100	1100		
	202.0	141.0	199.0	197.0	196.5	193.5	177.5		
PM Peak	1700	1700	1700	1700	1700	1300	1400		
	163.7	252.5	226.5	244.5	285.5	217.5	185.5		

* - No data.

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-16 -- English (ENA)

Datasets:

Site:	**[HAWTIN RD -(0004)] 300 m South of MAUD RD <60>**
Attribute:	MAIDAVALE
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 0
Survey Duration:	15:00 Tuesday, 23 June 2015 => 10:37 Wednesday, 1 July 2015,
Zone:	
File:	HAWTIN RD -(0004)01Jul2015.EC0 (Plus)
Identifier:	EA45EKEW MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**15:00 Tuesday, 23 June 2015 => 10:37 Wednesday, 1 July 2015 (7.81771)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = North
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 66468 / 66490 (99.97%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-16
Site: HAWTIN RD -(0004).0.1NS
Description: **300 m South of MAUD RD <60>**
Filter time: **15:00 Tuesday, 23 June 2015 => 10:37 Wednesday, 1 July 2015**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	1 - 7
Hour									
0000-0100	13.0	24.0	22.5	28.0	26.0	51.0	66.0	22.7	31.6
0100-0200	8.0	9.0	8.5	16.0	8.0	26.0	44.0	9.7	16.0
0200-0300	6.0	7.0	8.5	14.0	10.0	16.0	30.0	9.0	12.5
0300-0400	9.0	7.0	17.0	15.0	14.0	14.0	21.0	13.2	14.3
0400-0500	32.0	42.0	31.0	19.0	20.0	28.0	15.0	29.2	27.3
0500-0600	146.0	153.0	138.0	138.0	140.0	69.0	27.0	142.2	118.6
0600-0700	352.0	325.0	327.0	345.0	315.0	132.0	72.0	331.8	274.4
0700-0800	633.0	590.0	634.0	606.0	601.0	282.0	165.0	616.3	518.1
0800-0900	766.0	808.0	752.0	743.0	736.0	471.0	315.0	759.5	667.9
0900-1000	527.0	592.0	327.0	547.0	558.0	670.0	447.0	479.7	499.4
1000-1100	484.0	461.0	262.5	545.0	541.0	807.0	558.0	426.0	490.1
1100-1200	525.0	538.0	463.0	499.0	553.0	933.0	587.0	515.6	585.4
1200-1300	485.0	551.0	525.0	516.0	555.0	893.0	575.0	526.4	585.7
1300-1400	481.0	514.0	491.0	481.0	505.0	847.0	565.0	494.4	554.9
1400-1500	568.0	631.0	610.0	570.0	700.0	850.0	543.0	615.8	638.9
1500-1600	839.0	895.0	865.0	864.0	913.0	665.0	494.0	878.5	803.8
1600-1700	888.0	907.5	940.0	873.0	867.0	649.0	529.0	897.2	820.1
1700-1800	716.0	830.5	850.0	815.0	839.0	599.0	520.0	813.5	750.0
1800-1900	375.0	501.5	461.0	512.0	530.0	397.0	358.0	480.2	454.5
1900-2000	263.0	324.0	297.0	365.0	362.0	271.0	159.0	322.5	295.6
2000-2100	180.0	181.0	211.0	212.0	224.0	188.0	129.0	198.2	188.3
2100-2200	105.0	141.0	135.0	131.0	178.0	140.0	80.0	138.5	131.4
2200-2300	47.0	67.5	73.0	85.0	128.0	119.0	47.0	78.0	79.3
2300-2400	25.0	30.5	37.0	42.0	84.0	101.0	20.0	41.5	46.3
Totals									
0700-1900	7287.0	7819.5	7180.5	7571.0	7898.0	8063.0	5656.0	7503.0	7368.7
0600-2200	8187.0	8790.5	8150.5	8624.0	8977.0	8794.0	6096.0	8494.0	8258.4
0600-0000	8259.0	8888.5	8260.5	8751.0	9189.0	9014.0	6163.0	8613.5	8383.9
0000-0000	8473.0	9130.5	8486.0	8981.0	9407.0	9218.0	6366.0	8839.4	8604.1
AM Peak	0800	0800	0800	0800	0800	1100	1100		
	766.0	808.0	752.0	743.0	736.0	933.0	587.0		
PM Peak	1600	1600	1600	1600	1500	1200	1200		
	888.0	907.5	940.0	873.0	913.0	893.0	575.0		

* - No data.

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-19 -- English (ENA)

Datasets:

Site:	**[MANDON ST -(1094)] 33 m West of NANDAT RD<50>**
Attribute:	FORRESTFIELD
Direction:	6 - West bound A>B, East bound B>A. **Lane:** 0
Survey Duration:	12:00 Monday, 10 August 2015 => 13:44 Tuesday, 18 August 2015,
Zone:	
File:	MANDON ST -(1094)18Aug2015.EC0 (Plus)
Identifier:	JM12PA3T MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**12:00 Monday, 10 August 2015 => 13:44 Tuesday, 18 August 2015**
(8.07258)	
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = East
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 2461 / 2469 (99.68%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-19
Site: MANDON ST -(1094).0.1WE
Description: **33 m West of NANDAT RD<50>**
Filter time: **12:00 Monday, 10 August 2015 => 13:44 Tuesday, 18 August 2015**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	1.0	0.0	3.0	4.0	0.0	4.0	4.0	1.3	2.0
0100-0200	0.0	1.0	1.0	0.0	0.0	1.0	2.0	0.5	0.8
0200-0300	1.0	0.5	2.0	0.0	0.0	2.0	0.0	0.7	0.8
0300-0400	2.0	2.5	3.0	2.0	2.0	3.0	2.0	2.3	2.4
0400-0500	3.0	4.0	2.0	5.0	2.0	2.0	0.0	3.3	2.8
0500-0600	9.0	9.5	10.0	9.0	10.0	2.0	3.0	9.5	7.8
0600-0700	14.0	13.5	6.0	8.0	12.0	4.0	4.0	11.2	9.4
0700-0800	18.0	12.5	15.0	20.0	16.0	9.0	3.0	15.7	13.3
0800-0900	**34.0**	**27.5**	**28.0**	**31.0**	**31.0**	13.0	11.0	**29.8**	**25.4**
0900-1000	17.0	16.5	15.0	17.0	13.0	25.0	25.0	15.8	18.1
1000-1100	22.0	13.5	6.0	18.0	15.0	23.0	15.0	14.7	15.8
1100-1200	14.0	15.5	9.0	13.0	14.0	**28.0**	**27.0**	13.5	17.0
1200-1300	11.5	13.0	14.0	10.0	16.0	28.0	14.0	12.7	14.6
1300-1400	16.0	10.5	9.0	3.0	20.0	22.0	19.0	12.1	14.0
1400-1500	22.0	21.0	21.0	21.0	20.0	28.0	**25.0**	21.2	22.5
1500-1600	**33.0**	32.0	27.0	31.0	38.0	28.0	21.0	32.3	30.4
1600-1700	29.0	20.0	25.0	25.0	40.0	25.0	17.0	28.0	26.3
1700-1800	30.0	**32.0**	**31.0**	**38.0**	**40.0**	**34.0**	15.0	**33.5**	**31.3**
1800-1900	20.5	22.0	20.0	23.0	28.0	24.0	17.0	22.3	21.9
1900-2000	9.5	10.0	18.0	10.0	7.0	11.0	9.0	10.7	10.5
2000-2100	4.5	11.0	4.0	10.0	10.0	11.0	4.0	7.3	7.4
2100-2200	3.5	1.0	4.0	5.0	8.0	4.0	8.0	4.2	4.6
2200-2300	3.0	2.0	2.0	5.0	7.0	6.0	3.0	3.7	3.9
2300-2400	1.0	3.0	0.0	3.0	4.0	0.0	1.0	2.0	1.6
Totals									
0700-1900	267.0	236.0	220.0	250.0	291.0	287.0	209.0	251.7	250.3
0600-2200	298.5	271.5	252.0	283.0	328.0	317.0	234.0	285.0	282.2
0600-0000	302.5	276.5	254.0	291.0	339.0	323.0	238.0	290.7	287.7
0000-0000	318.5	294.0	275.0	311.0	353.0	337.0	249.0	308.4	304.1
AM Peak	0800	0800	0800	0800	0800	1100	1100		
	34.0	27.5	28.0	31.0	31.0	28.0	27.0		
PM Peak	1500	1700	1700	1700	1700	1700	1400		
	33.0	32.0	31.0	38.0	40.0	34.0	25.0		

* - No data.

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MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-20 -- English (ENA)

Datasets:

Site:	**[SULTANA RD E-0048] 61 m South of CUMQUAT WAY <50>**
Attribute:	FORRESTFIELD
Direction:	7 - North bound A>B, South bound B>A. **Lane:** 0
Survey Duration:	15:00 Thursday, 12 November 2015 => 11:01 Thursday, 26 November 2015,
Zone:	
File:	SULTANA RD E-004826Nov2015.EC0 (Plus)
Identifier:	EA90MK90 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.05)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**15:00 Thursday, 12 November 2015 => 11:01 Thursday, 26 November 2015**
(13.8345)	
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	North, East, South, West (bound), P = North
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 7915 / 7921 (99.92%)

Weekly Vehicle Counts (Virtual Week)

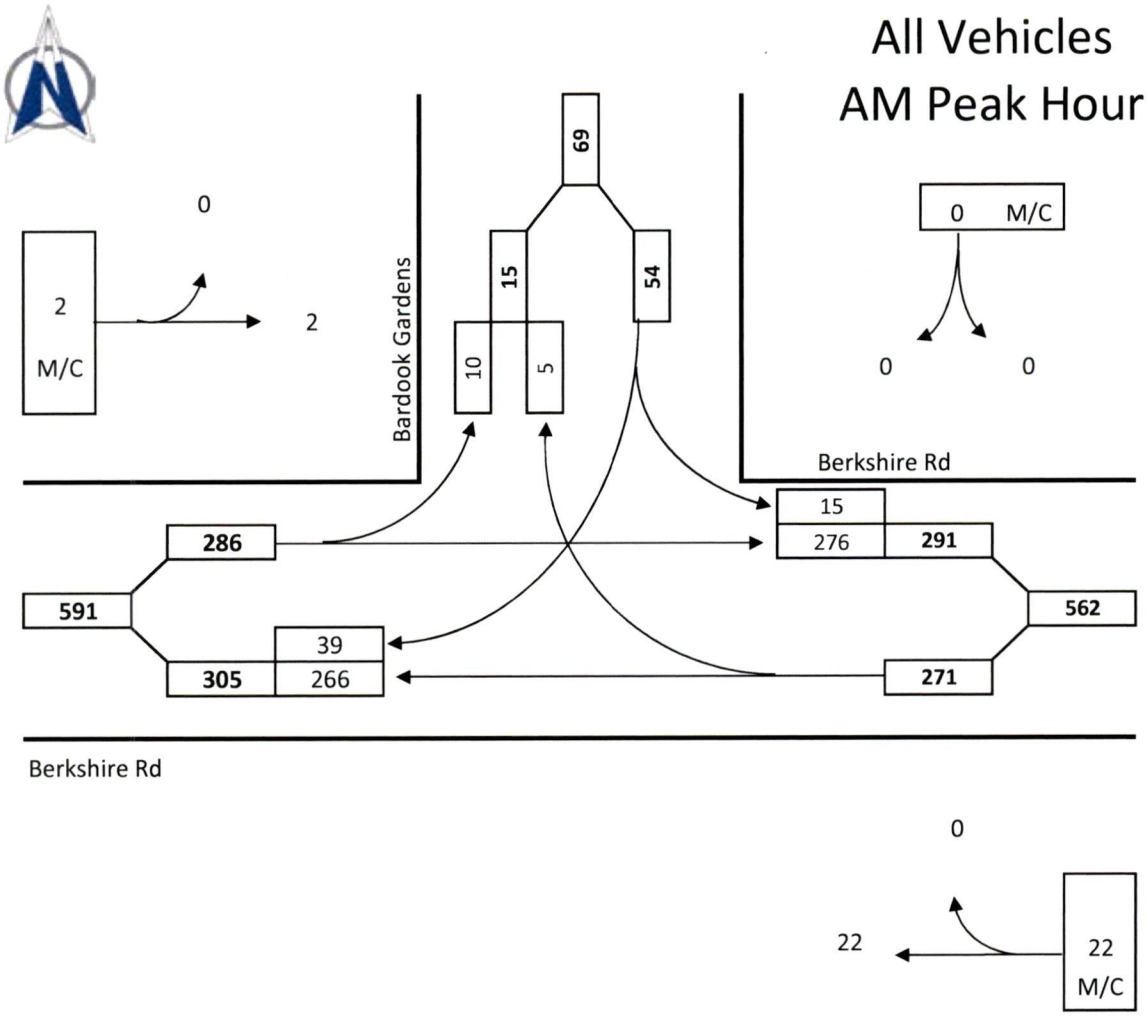
VirtWeeklyVehicle-20
Site: SULTANA RD E-0048.0.1NS
Description: **61 m South of CUMQUAT WAY <50>**
Filter time: **15:00 Thursday, 12 November 2015 => 11:01 Thursday, 26 November 2015**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	1 - 7
Hour									
0000-0100	2.5	1.5	2.0	3.0	5.0	3.0	6.0	2.8	3.3
0100-0200	0.0	0.5	2.0	1.0	0.5	5.0	4.0	0.8	1.9
0200-0300	2.0	1.0	4.0	0.0	2.5	3.5	2.5	1.9	2.2
0300-0400	0.0	1.0	1.0	2.5	0.0	1.5	1.5	0.9	1.1
0400-0500	3.0	5.5	1.5	5.0	1.0	1.0	1.0	3.2	2.6
0500-0600	20.0	16.0	17.5	17.5	21.0	9.0	2.5	18.4	14.8
0600-0700	28.0	32.0	36.5	34.5	30.5	11.5	8.5	32.3	25.9
0700-0800	**42.0**	40.0	44.5	41.0	**48.5**	22.5	12.5	43.2	35.9
0800-0900	41.0	**51.5**	**48.5**	**51.5**	44.0	34.5	16.5	**47.3**	**41.1**
0900-1000	31.0	28.0	23.0	27.0	26.5	41.5	23.5	27.1	28.6
1000-1100	22.0	21.0	32.5	15.5	27.0	**45.0**	24.5	23.6	26.8
1100-1200	31.0	30.5	22.5	11.5	29.0	42.0	**28.5**	24.9	27.9
1200-1300	24.0	21.5	27.0	26.0	26.0	38.5	33.0	24.8	28.2
1300-1400	27.5	26.0	21.5	34.0	38.0	36.5	30.5	28.9	30.3
1400-1500	34.5	35.0	43.0	27.0	34.5	37.0	29.5	35.7	34.9
1500-1600	53.5	50.5	**59.5**	49.0	54.0	31.0	29.0	53.3	46.6
1600-1700	42.0	49.5	57.5	49.5	50.5	35.0	27.0	49.8	44.4
1700-1800	**57.5**	**65.0**	58.0	**55.5**	**69.5**	**39.5**	**34.5**	**61.1**	**54.2**
1800-1900	38.0	42.0	47.0	52.0	46.5	32.5	28.0	45.1	40.9
1900-2000	26.0	29.0	26.5	28.0	33.5	24.0	24.5	28.6	27.4
2000-2100	18.5	33.5	24.0	24.0	28.0	13.5	11.5	25.6	21.9
2100-2200	11.5	19.0	17.5	22.5	17.5	13.5	15.5	17.6	16.7
2200-2300	6.5	8.0	11.0	11.5	13.0	10.5	3.5	10.0	9.1
2300-2400	3.5	4.5	5.5	3.0	8.5	12.5	1.0	5.0	5.5
Totals									
0700-1900	444.0	460.5	484.5	439.5	494.0	435.5	317.0	464.7	439.7
0600-2200	528.0	574.0	589.0	548.5	603.5	498.0	377.0	568.8	531.6
0600-0000	538.0	586.5	605.5	563.0	625.0	521.0	381.5	583.8	546.2
0000-0000	565.5	612.0	633.5	592.0	655.0	544.0	399.0	611.8	572.0
AM Peak	0700	0800	0800	0800	0700	1000	1100		
	42.0	51.5	48.5	51.5	48.5	45.0	28.5		
PM Peak	1700	1700	1500	1700	1700	1700	1700		
	57.5	65.0	59.5	55.5	69.5	39.5	34.5		

* - No data.

APPENDIX B: TURNING COUNTS

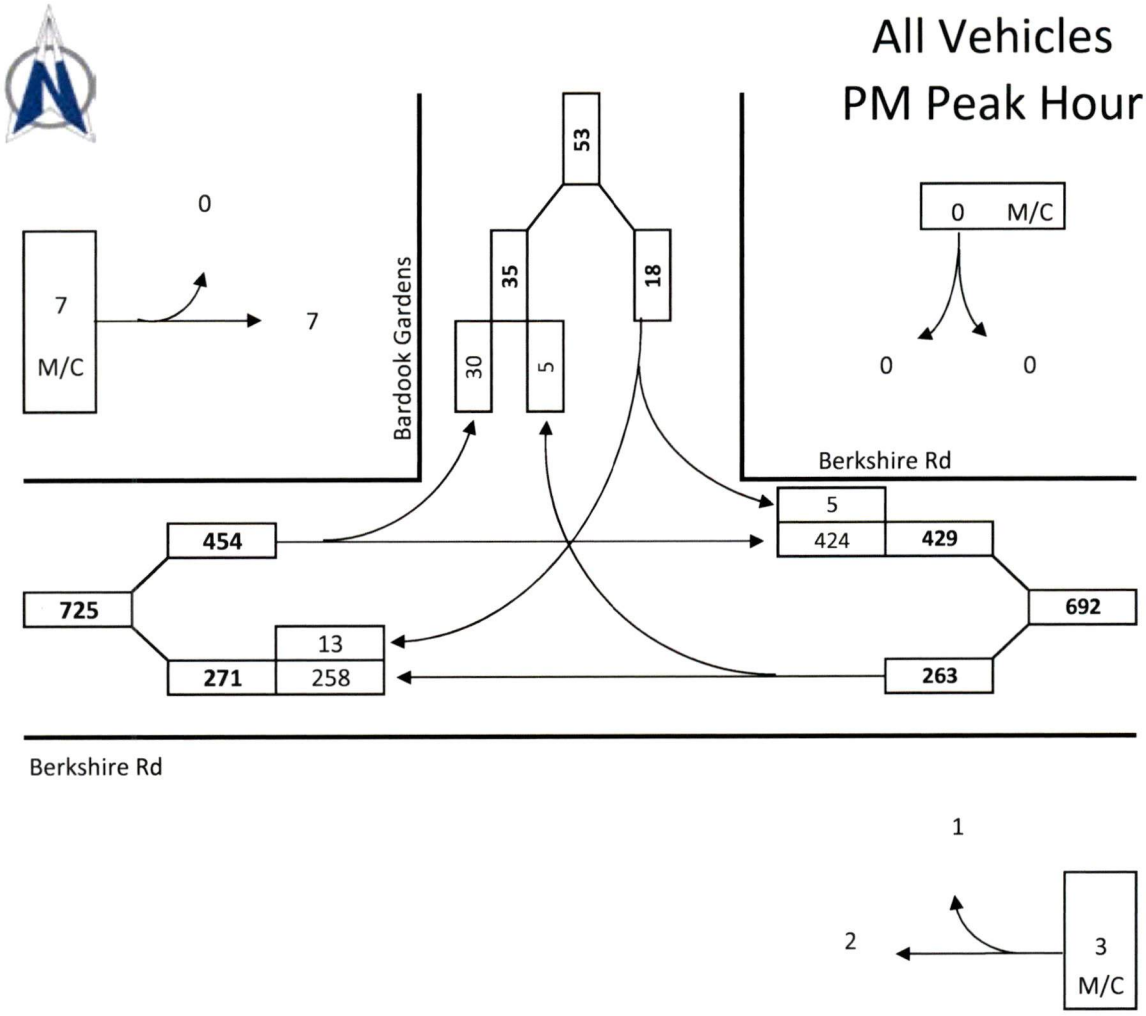
Satterley Property Group	Day Wednesday	Date 17/02/2016	Weather Sunny
Vehicle Volumes	**Location** Bardook Gardens & Berkshire Rd		**Suburb** Forrestfield
Lovett Dr Hawtin Rd TIA			
Site 1	**Job No.** Z461	**Intersection Type:** 3 - Way	
Donald Veal Consultants	**Duration:**	0745 - 0845	



Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	15	0	39	**54**
From E	5	0	0	266	**271**
From S	0	0	0	0	**0**
From W	10	276	0	0	**286**
Total	**15**	**291**	**0**	**305**	**611**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	**0**
From E	0	0	0	22	**22**
From S	0	0	0	0	**0**
From W	0	2	0	0	**2**
Total	**0**	**2**	**0**	**22**	**24**

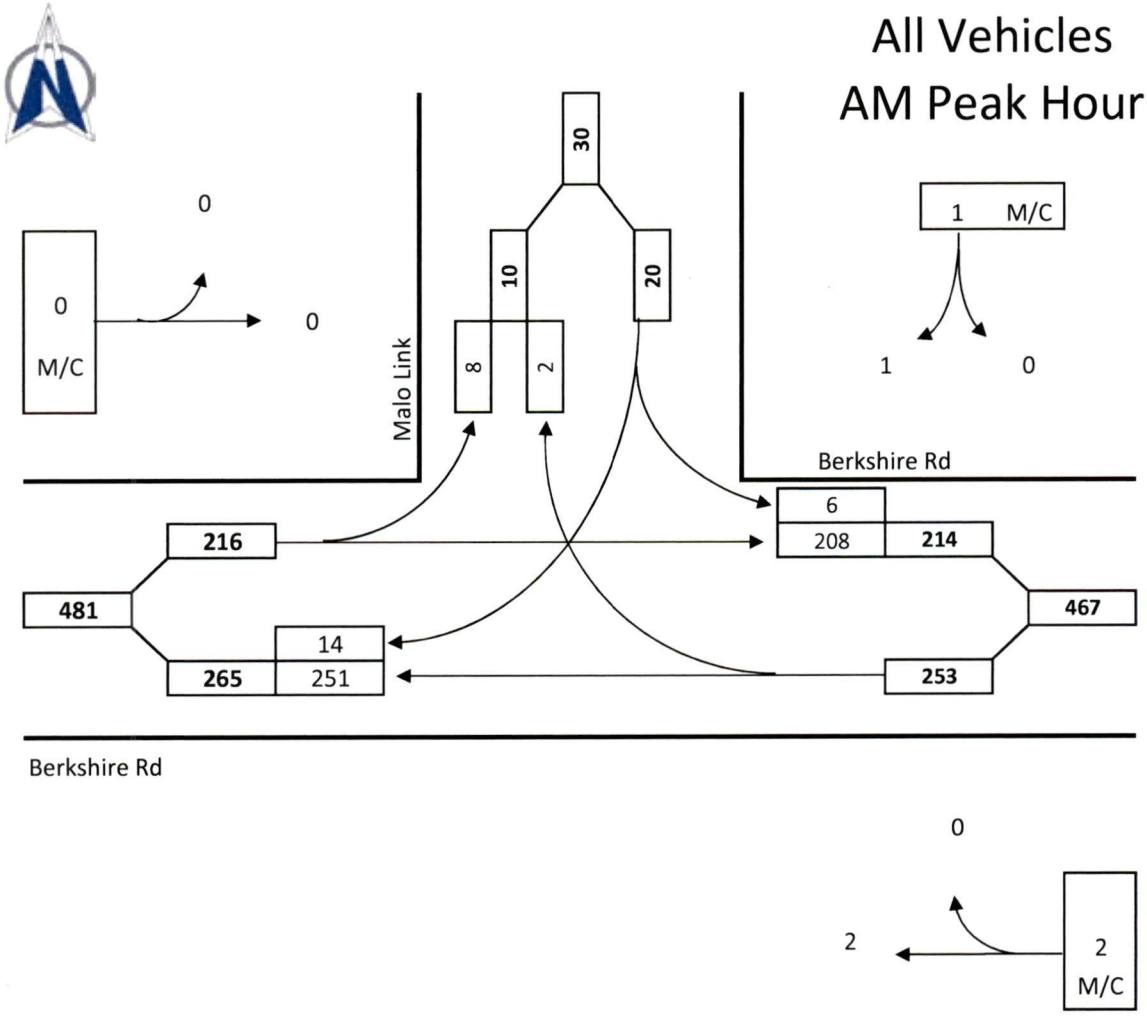
Satterley Property Group	Day Wednesday	Date 17/02/2016	Weather Sunny
Vehicle Volumes	**Location** Bardook Gardens & Berkshire Rd		**Suburb** Forrestfield
Lovett Dr Hawtin Rd TIA			
Site 1	**Job No.** Z461	**Intersection Type:** 3 - Way	
Donald Veal Consultants	**Duration:**	1645 - 1745	



Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	5	0	13	**18**
From E	5	0	0	258	**263**
From S	0	0	0	0	**0**
From W	30	424	0	0	**454**
Total	**35**	**429**	**0**	**271**	**735**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	**0**
From E	1	0	0	2	**3**
From S	0	0	0	0	**0**
From W	0	7	0	0	**7**
Total	**1**	**7**	**0**	**2**	**10**

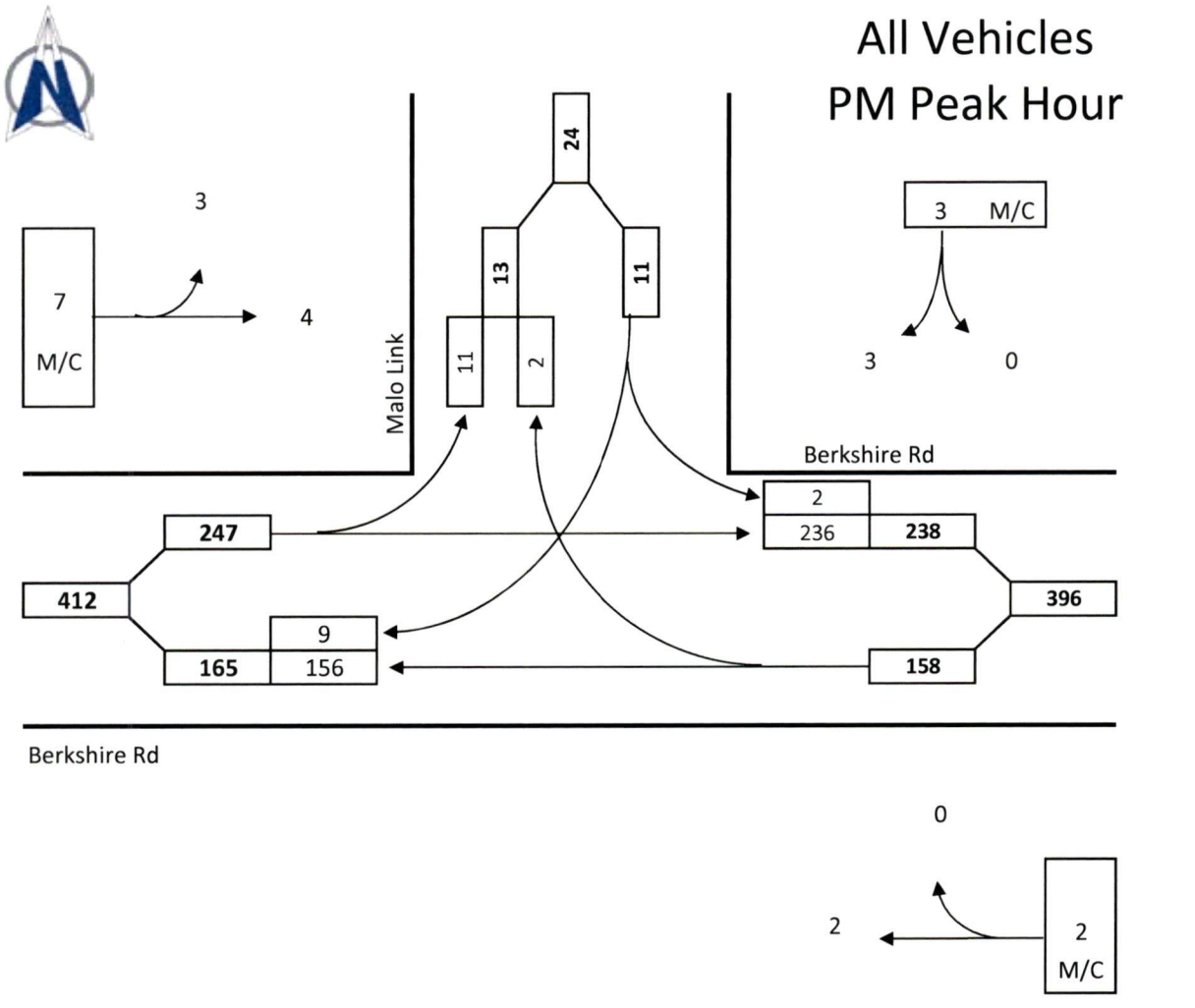
Satterley Property Group	Day	Date	Weather
	Wednesday	17/02/2016	Sunny
Vehicle Volumes	**Location**		**Suburb**
Lovett Dr Hawtin Rd TIA	Malo Link & Berkshire Rd		Forrestfield
Site 2	**Job No.**	**Intersection Type:**	
Donald Veal Consultants	Z461	3 - Way	
	Duration:	0745 - 0845	



Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	6	0	14	**20**
From E	2	0	0	251	**253**
From S	0	0	0	0	**0**
From W	8	208	0	0	**216**
Total	**10**	**214**	**0**	**265**	**489**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	1	**1**
From E	0	0	0	2	**2**
From S	0	0	0	0	**0**
From W	0	0	0	0	**0**
Total	**0**	**0**	**0**	**3**	**3**

Satterley Property Group	Day Wednesday	Date 17/02/2016	Weather Sunny
Vehicle Volumes **Lovett Dr Hawtin Rd TIA**	**Location** Malo Link & Berkshire Rd		**Suburb** Forrestfield
Site 2 **Donald Veal Consultants**	**Job No.** Z461	**Intersection Type:** 3 - Way	
	Duration:	1645 - 1745	

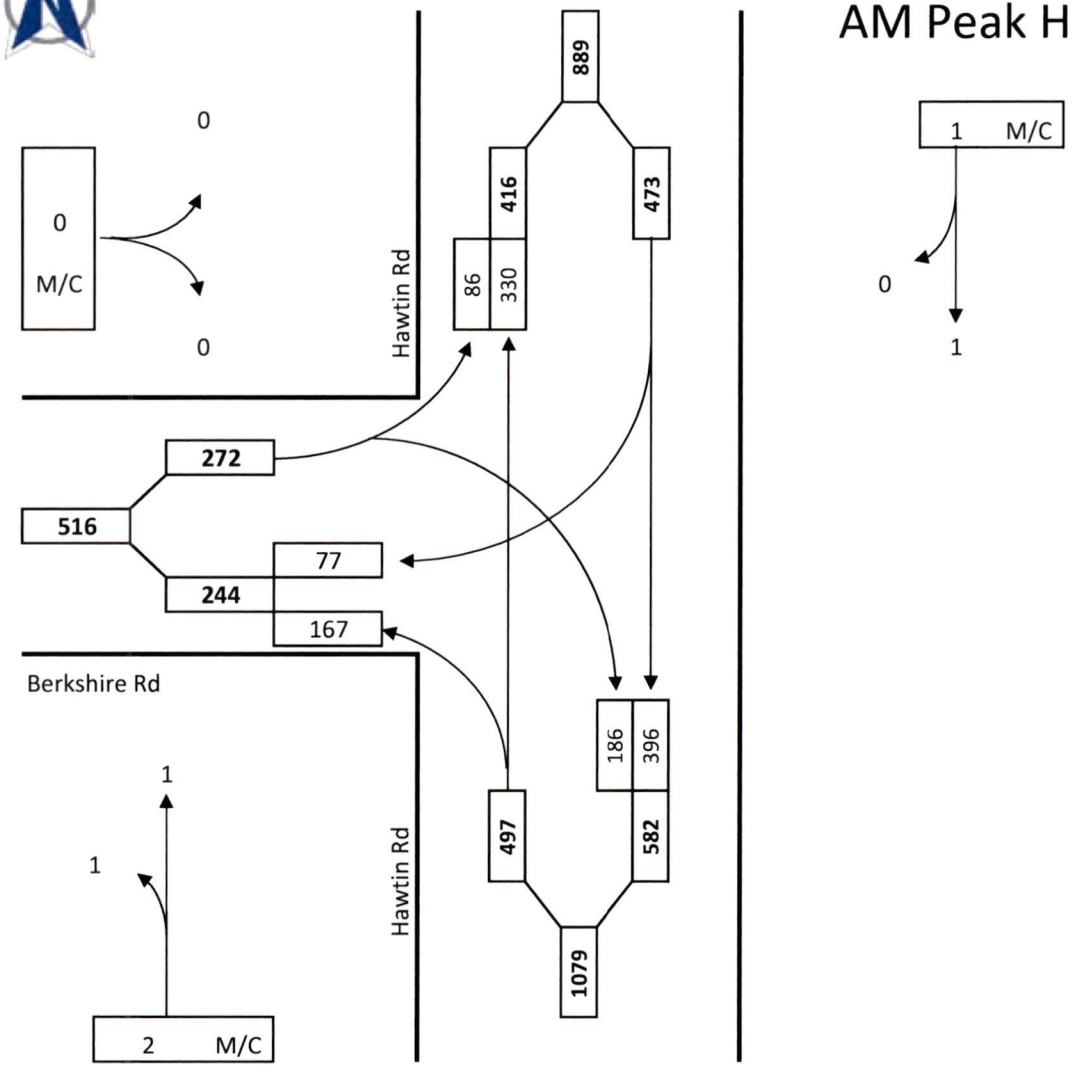


Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	2	0	9	**11**
From E	2	0	0	156	**158**
From S	0	0	0	0	**0**
From W	11	236	0	0	**247**
Total	**13**	**238**	**0**	**165**	**416**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	3	**3**
From E	0	0	0	2	**2**
From S	0	0	0	0	**0**
From W	3	4	0	0	**7**
Total	**3**	**4**	**0**	**5**	**12**

Satterley Property Group	Day Wednesday	Date 17/02/2016	Weather Sunny
Vehicle Volumes	**Location**		**Suburb**
Lovett Dr Hawtin Rd TIA	Hawtin Rd & Berkshire Rd		Forrestfield
Site 3	**Job No.**	**Intersection Type:**	
Donald Veal Consultants	Z461	3 - Way	
	Duration:	0745 - 0845	

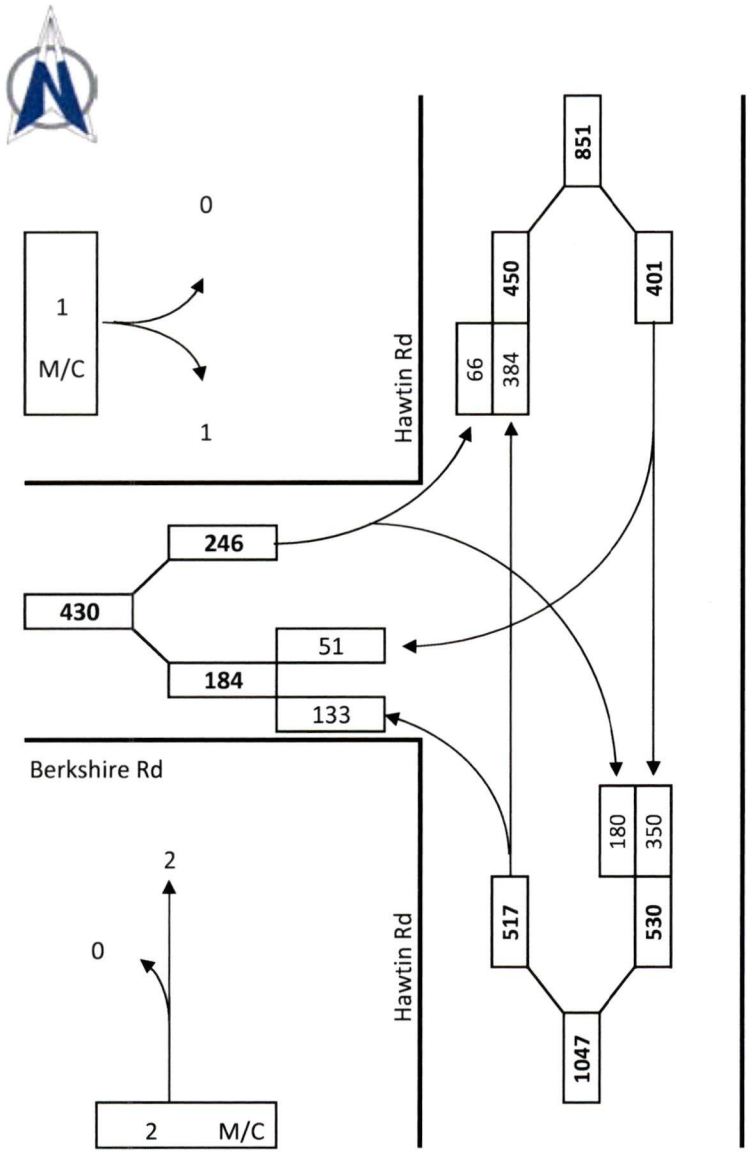
All Vehicles
AM Peak Hour



Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	396	77	**473**
From E	0	0	0	0	**0**
From S	330	0	0	167	**497**
From W	86	0	186	0	**272**
Total	**416**	**0**	**582**	**244**	**1242**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	1	0	**1**
From E	0	0	0	0	**0**
From S	1	0	0	1	**2**
From W	0	0	0	0	**0**
Total	**1**	**0**	**1**	**1**	**3**

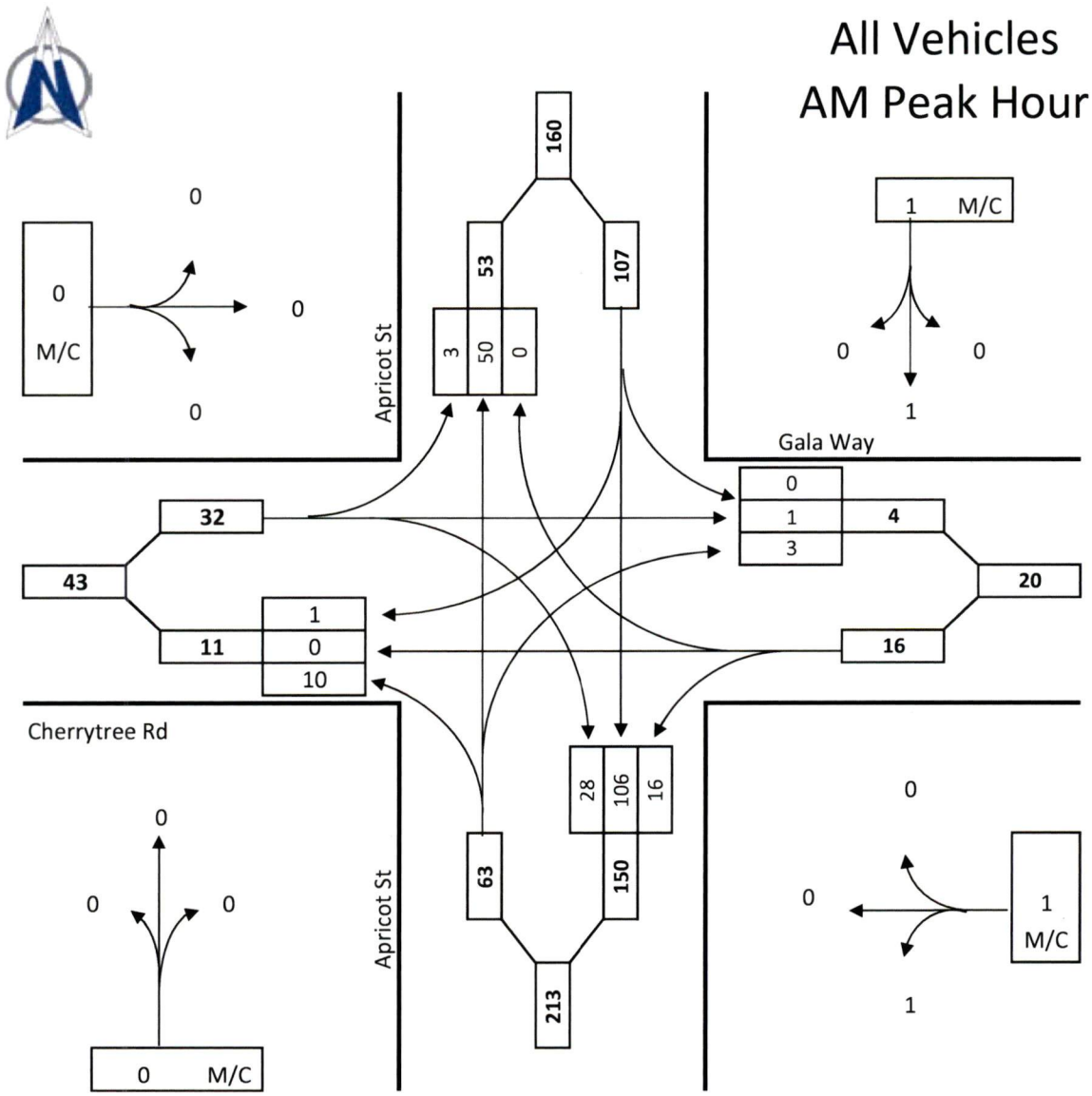
Satterley Property Group	Day Wednesday	Date 17/02/2016	Weather Sunny
Vehicle Volumes	**Location**		**Suburb**
Lovett Dr Hawtin Rd TIA	Hawtin Rd & Berkshire Rd		Forrestfield
Site 3	**Job No.**	**Intersection Type:**	
Donald Veal Consultants	Z461	3 - Way	
	Duration:	1645 - 1745	



Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	350	51	**401**
From E	0	0	0	0	**0**
From S	384	0	0	133	**517**
From W	66	0	180	0	**246**
Total	**450**	**0**	**530**	**184**	**1164**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	6	1	**7**
From E	0	0	0	0	**0**
From S	2	0	0	0	**2**
From W	0	0	1	0	**1**
Total	**2**	**0**	**7**	**1**	**10**

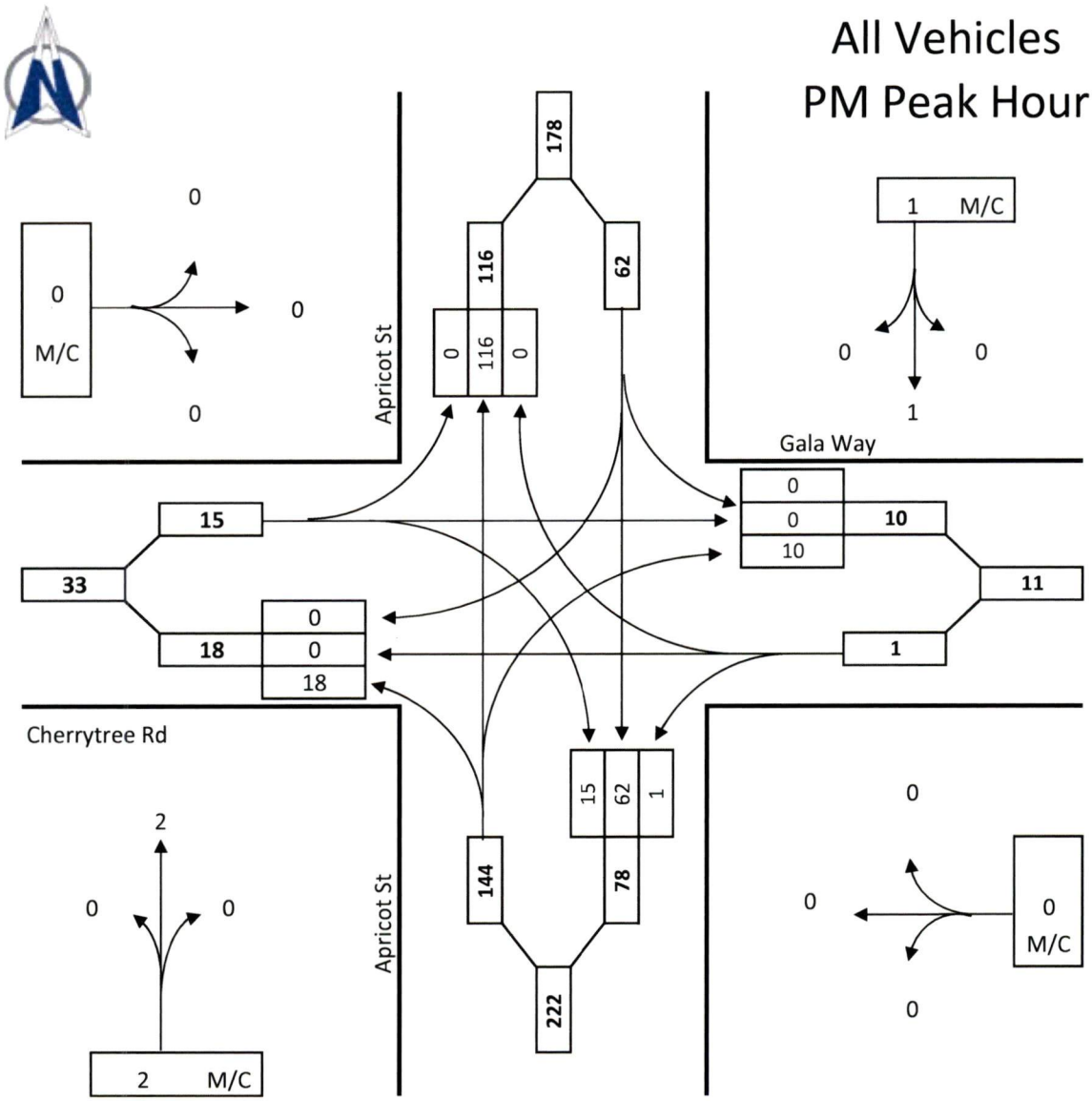
Satterley Property Group	Day Wednesday	Date 17/02/2016	Weather Sunny
Vehicle Volumes	**Location**		**Suburb**
Lovett Dr Hawtin Rd TIA	Apricot St, Gala Way & Cherrytree Rd		Forrestfield
Site 4	**Job No.**	**Intersection Type:**	
Donald Veal Consultants	Z461	4 - Way	
	Duration:	0745 - 0845	



Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	106	1	**107**
From E	0	0	16	0	**16**
From S	50	3	0	10	**63**
From W	3	1	28	0	**32**
Total	**53**	**4**	**150**	**11**	**218**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	1	0	**1**
From E	0	0	1	0	**1**
From S	0	0	0	0	**0**
From W	0	0	0	0	**0**
Total	**0**	**0**	**2**	**0**	**2**

Satterley Property Group	Day	Date	Weather
	Wednesday	17/02/2016	Sunny
Vehicle Volumes	**Location**		**Suburb**
Lovett Dr Hawtin Rd TIA	Apricot St, Gala Way & Cherrytree Rd		Forrestfield
Site 4	**Job No.**	**Intersection Type:**	
Donald Veal Consultants	Z461	4 - Way	
	Duration:	1645 - 1745	

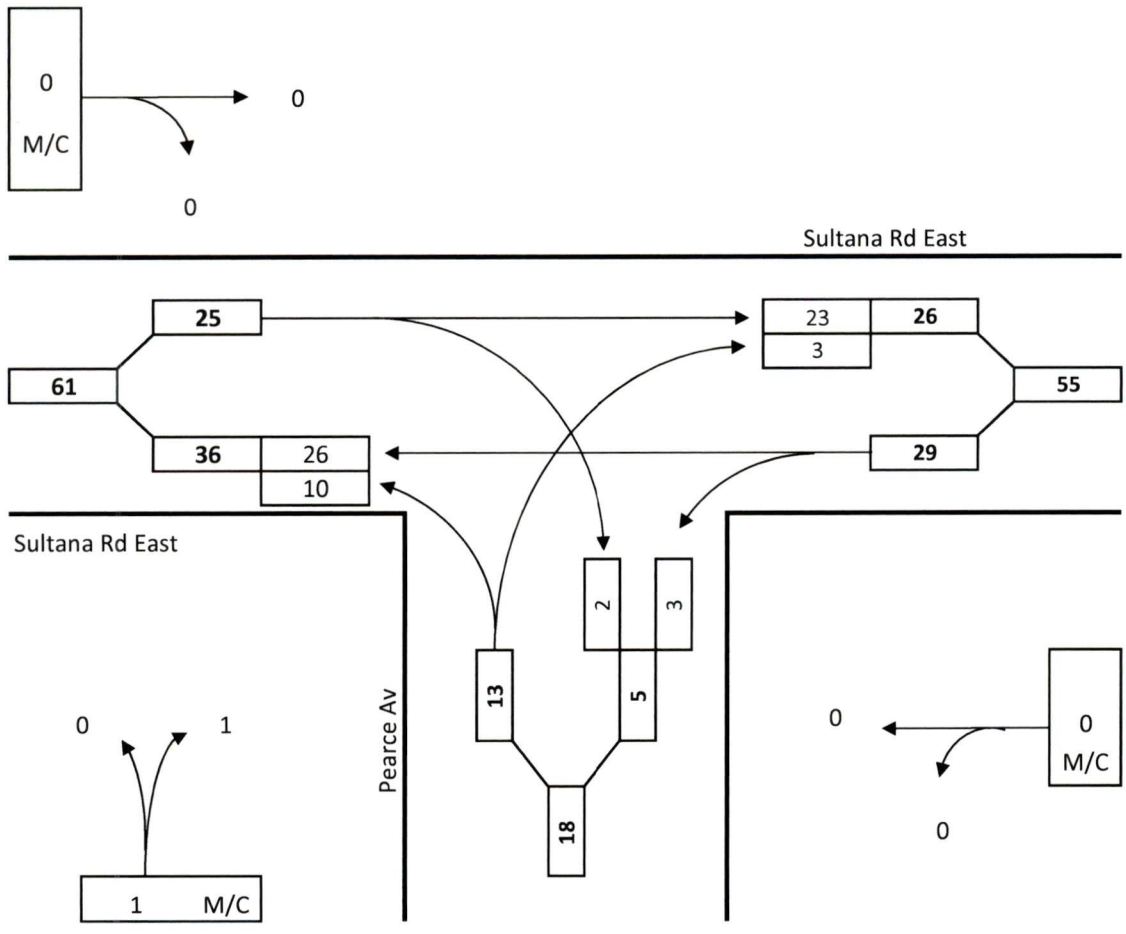


Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	62	0	**62**
From E	0	0	1	0	**1**
From S	116	10	0	18	**144**
From W	0	0	15	0	**15**
Total	**116**	**10**	**78**	**18**	**222**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	1	0	**1**
From E	0	0	0	0	**0**
From S	2	0	0	0	**2**
From W	0	0	0	0	**0**
Total	**2**	**0**	**1**	**0**	**3**

Satterley Property Group	Day	Date	Weather
	Wednesday	17/02/2016	Sunny
Vehicle Volumes	**Location**		**Suburb**
Lovett Dr Hawtin Rd TIA	Pearce Av & Sultana Rd East		Forrestfield
Site 5	**Job No.**	**Intersection Type:**	
Donald Veal Consultants	Z461	3 - Way	
	Duration:	0745 - 0845	

All Vehicles
AM Peak Hour

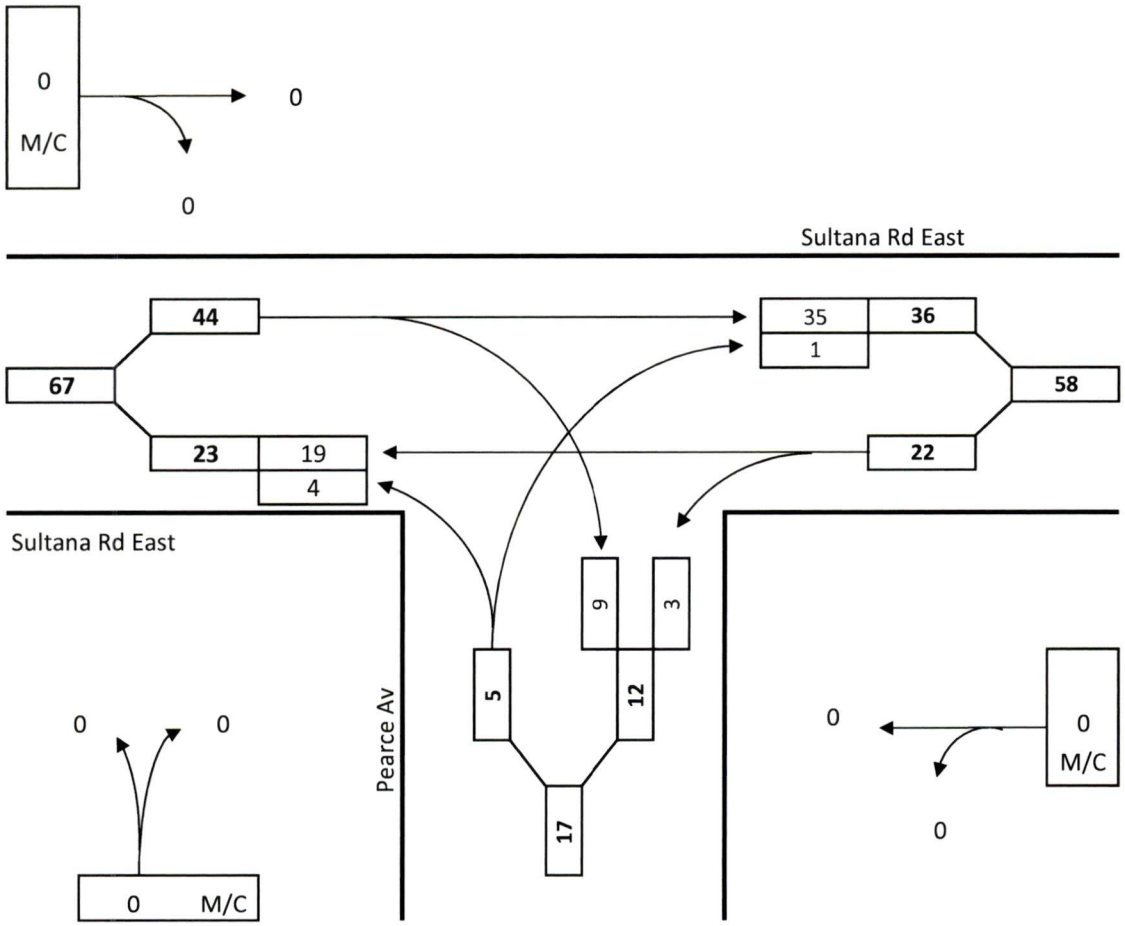


Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	**0**
From E	0	0	3	26	**29**
From S	0	3	0	10	**13**
From W	0	23	2	0	**25**
Total	**0**	**26**	**5**	**36**	**67**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	**0**
From E	0	0	0	0	**0**
From S	0	1	0	0	**1**
From W	0	0	0	0	**0**
Total	**0**	**1**	**0**	**0**	**1**

Satterley Property Group	Day Wednesday	Date 17/02/2016	Weather Sunny
Vehicle Volumes **Lovett Dr Hawtin Rd TIA**	**Location** Pearce Av & Sultana Rd East		**Suburb** Forrestfield
Site 5 **Donald Veal Consultants**	**Job No.** Z461	**Intersection Type:** 3 - Way	
	Duration:	1645 - 1745	

All Vehicles
PM Peak Hour

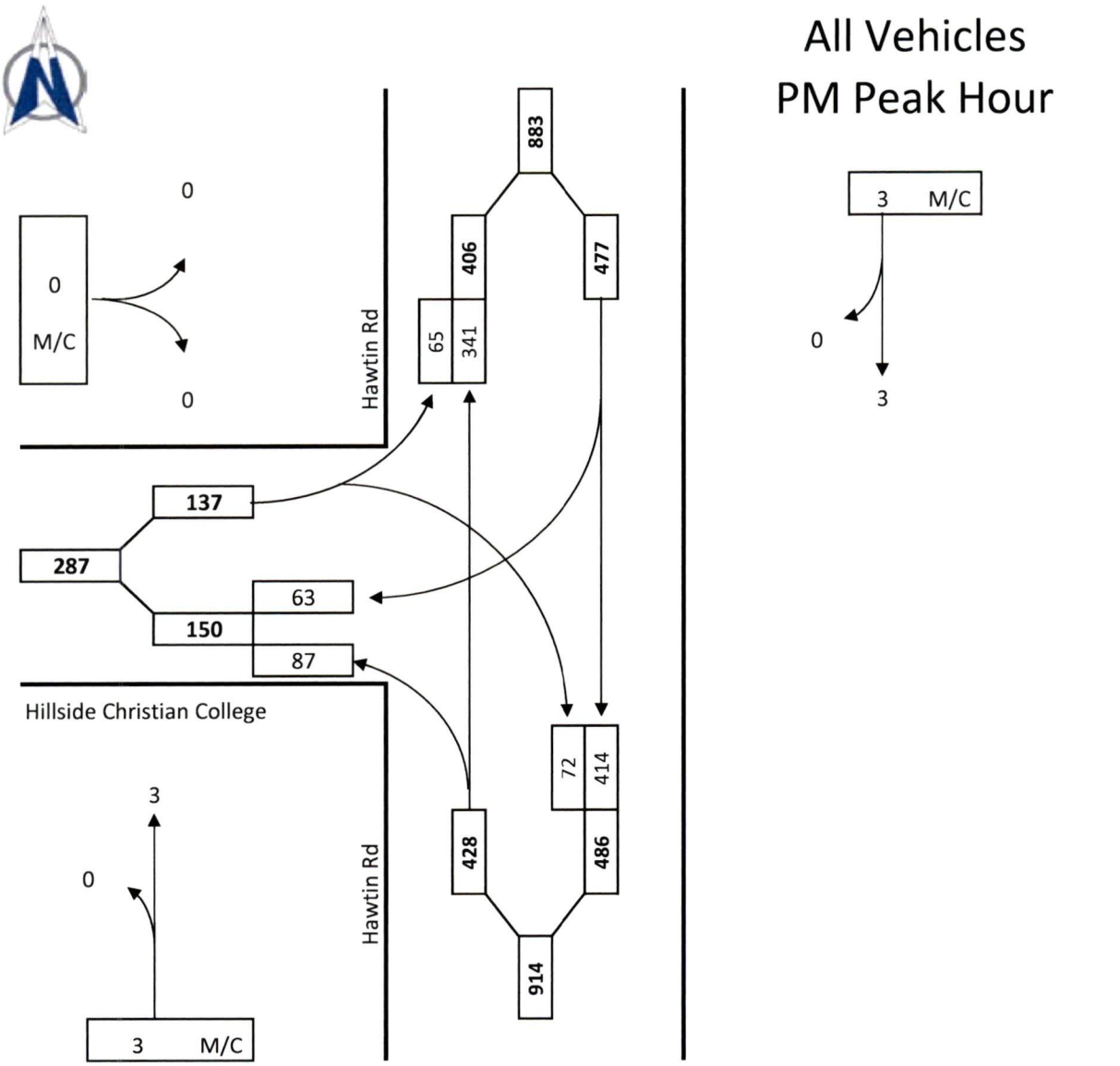


Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	**0**
From E	0	0	3	19	**22**
From S	0	1	0	4	**5**
From W	0	35	9	0	**44**
Total	**0**	**36**	**12**	**23**	**71**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	0	0	**0**
From E	0	0	0	0	**0**
From S	0	0	0	0	**0**
From W	0	0	0	0	**0**
Total	**0**	**0**	**0**	**0**	**0**

Satterley Property Group	Day Wednesday	Date 17/02/2016	Weather Sunny
Vehicle Volumes **Lovett Dr Hawtin Rd TIA**	**Location** Hawtin Rd & Hillside Christian College		**Suburb** Forrestfield
Site 3 **Donald Veal Consultants**	**Job No.** Z461	**Intersection Type:** 3 - Way	
	Duration:	1430 - 1600	

All Vehicles
PM Peak Hour



Vehicles Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	414	63	**477**
From E	0	0	0	0	**0**
From S	341	0	0	87	**428**
From W	65	0	72	0	**137**
Total	**406**	**0**	**486**	**150**	**1042**

M/C Entering Intersection					
Count	To N	To E	To S	To W	Total
From N	0	0	3	0	**3**
From E	0	0	0	0	**0**
From S	3	0	0	0	**3**
From W	0	0	0	0	**0**
Total	**3**	**0**	**3**	**0**	**6**

APPENDIX C: SUBDIVISION DRAWINGS

DWG 8485-FIG64D
DWG 6211-00-SK36 REV A
DWG 6211-00-SK37 REV A



Planning Design Delivery



LEGEND

- Subject Site
- Existing Boundaries
- Proposed Boundaries
- Indicative Layout
- Public Open Space
- Western Power Easement
- R30 Residential
- R60 Residential

Lot Summary - Total

No. of Lots	420
Total Area of Lots	16.59ha
Average Area of Lots	395m²
Minimum Lot Area	150m²
Maximum Lot Area	2.0ha

REVISIONS

Rev.	Date	Drawn
A	2017.10.10	W. Clements
B	2017.10.24	F. Chesterman
C	2017.10.25	F. Chesterman
D	2017.10.26	F. Chesterman

ROWEGROUP
PLANNING DESIGN DELIVERY

Date Drawn	2017.10.10
Job Ref	8485
Scale	1:2500 @ A1
Client	Satterley Property Group
Designer	F. Chesterman
Drawn	W. Clements
Projection	PCG94
Plan ID	8485-FIG-64-D

DRAFT

Proposed Local Structure Plan Amendment - The Hales, Forrestfield

Forrestfield



REV	DATE	DRN	CKD	APP	AMENDMENT
A	05.02.18	WBR	-	-	ISSUED FOR APPROVAL

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Street Address: 9/17 Level 2) 431 Roberts Road, Subiaco WA 6008
T: (08) 9422 5800 F: (08) 9422 5821 E: admin@cossills.com.au

CLIENT: SATTERLEY PROPERTY GROUP

PROJECT: THE HALES ESTATE, FORRESTFIELD

TITLE: PROPOSED ROAD LAYOUT PAVEMENT AND RESERVE WIDTHS

APPROVED: CHECK PRINT

DESIGNED:

SCALE: 1:2000

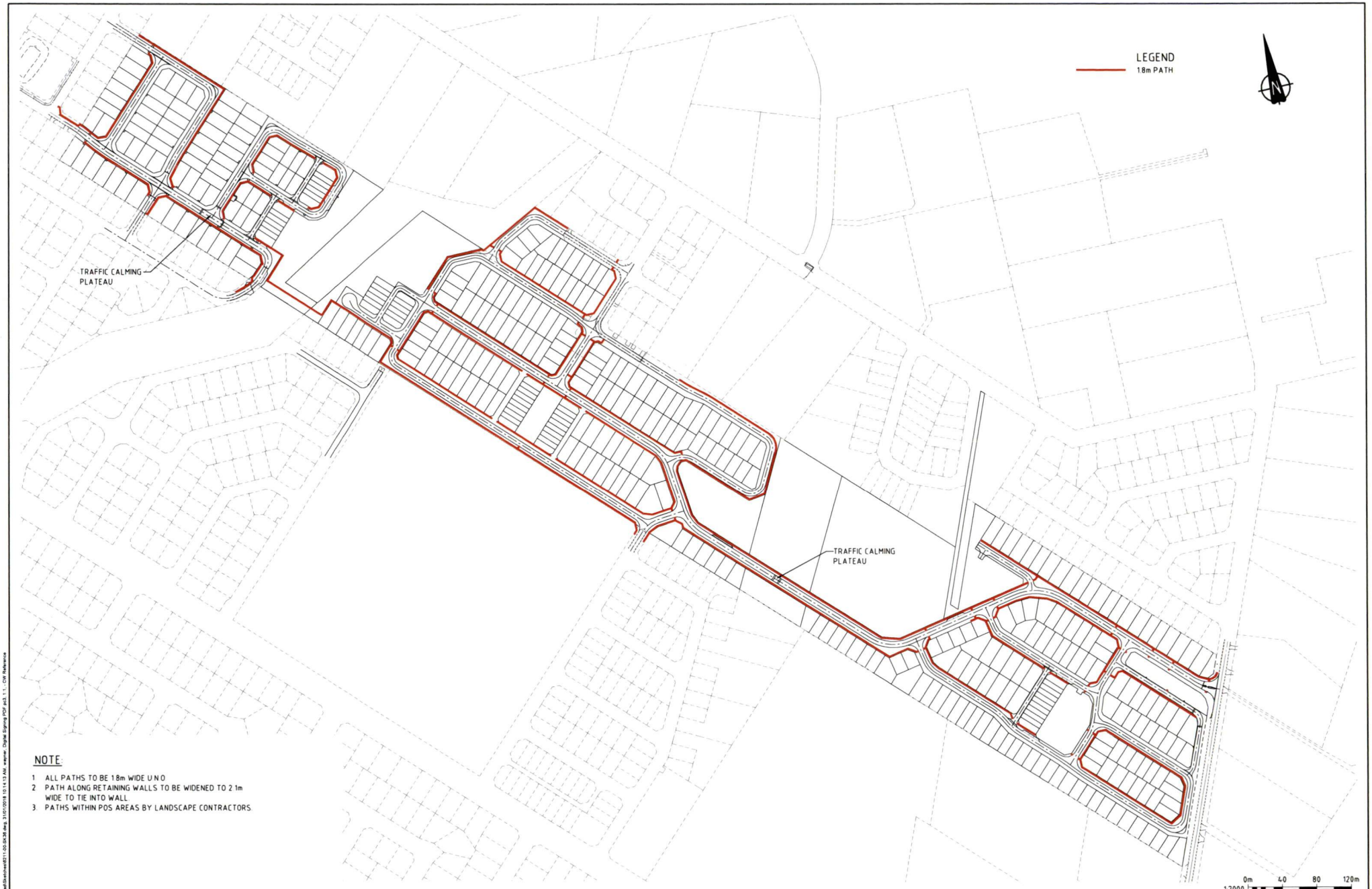
WAPC No.

DRAWING No.: 6211-00-SK37

REVISION: A

ORIGINAL SIZE: A1

P:\6211 Forrestfield SPO\6211-00\Acad\Sketches\6211-00-SK37.dwg, 05/02/2018 9:42:58 PM, wagner, Digital Signing PDF pc3, 1:1, , CW Reference



NOTE:

1. ALL PATHS TO BE 1.8m WIDE U.N.O.
2. PATH ALONG RETAINING WALLS TO BE WIDENED TO 2.1m WIDE TO TIE INTO WALL.
3. PATHS WITHIN POS AREAS BY LANDSCAPE CONTRACTORS.

REV.	DATE	DRN	CKD	APP	AMENDMENT
A	31.01.18	WBR	-	-	ISSUED FOR APPROVAL

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CLIENT: SATTERLEY PROPERTY GROUP

PROJECT: THE HALES ESTATE, FORRESTFIELD

TITLE: PROPOSED ROAD LAYOUT

APPROVED | DESIGNED

SCALE: 1:2000

WAPC No.

DRAWING No.: 6211-00-SK36

REVISION: A

ORIGINAL SIZE: A1

P:\6211 Forrestfield SPO\6211_00\Asset\Sketches\6211-00-SK36.dwg 31/01/2018 10:14:13 AM warner Digital Signing PDF pc3 1:1 - CW Reference

APPENDIX D: 2030 PEAK SIDRA RESULTS

Table D1: Hawtin Road/Crimson Boulevard AM peak 2030

MOVEMENT SUMMARY

Site: 101 [Hawtin Road & Crimson Blvd 2030 AM Peak]

New Site
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: Hawtin Road											
1	L2	14	0.0	0.304	5.6	LOS A	0.0	0.0	0.00	0.01	58.2
2	T1	578	2.0	0.304	0.0	LOS A	0.0	0.0	0.00	0.01	59.8
Approach		592	2.0	0.304	0.2	NA	0.0	0.0	0.00	0.01	59.8
North: Hawtin Road											
8	T1	657	4.0	0.349	0.1	LOS A	0.1	0.9	0.02	0.01	59.8
9	R2	6	0.0	0.349	9.5	LOS A	0.1	0.9	0.02	0.01	53.4
Approach		663	4.0	0.349	0.2	NA	0.1	0.9	0.02	0.01	59.8
West: Crimson Boulevard											
10	L2	19	0.0	0.179	7.1	LOS A	0.6	3.9	0.74	0.87	44.5
12	R2	45	0.0	0.179	16.0	LOS C	0.6	3.9	0.74	0.87	44.1
Approach		64	0.0	0.179	13.4	LOS B	0.6	3.9	0.74	0.87	44.2
All Vehicles		1319	2.9	0.349	0.8	NA	0.6	3.9	0.05	0.05	58.8

Table D2: Hawtin Road/Crimson Boulevard PM peak 2030

MOVEMENT SUMMARY

Site: 101 [Hawtin Road & Crimson Blvd 2030 PM Peak]

New Site
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: Hawtin Road											
1	L2	36	0.0	0.341	5.6	LOS A	0.0	0.0	0.00	0.03	58.0
2	T1	625	2.0	0.341	0.0	LOS A	0.0	0.0	0.00	0.03	59.6
Approach		661	1.9	0.341	0.3	NA	0.0	0.0	0.00	0.03	59.5
North: Hawtin Road											
8	T1	557	1.0	0.303	0.3	LOS A	0.3	2.2	0.06	0.02	59.5
9	R2	16	0.0	0.303	10.0	LOS A	0.3	2.2	0.06	0.02	53.1
Approach		573	1.0	0.303	0.5	NA	0.3	2.2	0.06	0.02	59.3
West: Crimson Boulevard											
10	L2	9	0.0	0.086	7.3	LOS A	0.3	1.8	0.72	0.85	45.0
12	R2	23	0.0	0.086	14.6	LOS B	0.3	1.8	0.72	0.85	44.6
Approach		33	0.0	0.086	12.5	LOS B	0.3	1.8	0.72	0.85	44.7
All Vehicles		1266	1.4	0.341	0.7	NA	0.3	2.2	0.05	0.05	58.9

Table D3: Apricot Street/Gala Way/Cherrytree Road AM peak 2030

MOVEMENT SUMMARY

Site: 102 [Apricot Street/Gala Way 2030 AM Peak]

Existing Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Gala Way											
1	L2	44	0.0	0.043	4.5	LOS A	0.2	1.4	0.34	0.51	46.2
2	T1	1	0.0	0.043	4.5	LOS A	0.2	1.4	0.34	0.51	47.0
3	R2	2	0.0	0.043	7.7	LOS A	0.2	1.4	0.34	0.51	46.9
Approach		47	0.0	0.043	4.7	LOS A	0.2	1.4	0.34	0.51	46.3
East: Apricot Street											
4	L2	6	0.0	0.121	3.9	LOS A	0.6	4.6	0.18	0.41	46.6
5	T1	147	7.0	0.121	3.9	LOS A	0.6	4.6	0.18	0.41	47.3
6	R2	1	0.0	0.121	7.1	LOS A	0.6	4.6	0.18	0.41	47.2
Approach		155	6.7	0.121	3.9	LOS A	0.6	4.6	0.18	0.41	47.3
North: Cherrytree Road											
7	L2	3	0.0	0.028	4.1	LOS A	0.1	0.9	0.23	0.56	45.0
8	T1	1	0.0	0.028	4.0	LOS A	0.1	0.9	0.23	0.56	45.8
9	R2	29	0.0	0.028	7.5	LOS A	0.1	0.9	0.23	0.56	45.6
Approach		34	0.0	0.028	6.9	LOS A	0.1	0.9	0.23	0.56	45.6
West: Apricot Street											
10	L2	11	0.0	0.065	3.6	LOS A	0.3	2.3	0.04	0.47	46.6
11	T1	69	0.0	0.065	3.6	LOS A	0.3	2.3	0.04	0.47	47.4
12	R2	21	0.0	0.065	6.9	LOS A	0.3	2.3	0.04	0.47	47.2
Approach		101	0.0	0.065	4.3	LOS A	0.3	2.3	0.04	0.47	47.3
All Vehicles		337	3.1	0.121	4.4	LOS A	0.6	4.6	0.16	0.46	47.0

Table D4: Apricot Street/Gala Way/Cherrytree Road PM peak 2030

MOVEMENT SUMMARY

Site: 102 [Apricot Street/Gala Way 2030 PM Peak]

Existing Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Gala Way											
1	L2	23	0.0	0.021	4.1	LOS A	0.1	0.7	0.25	0.48	46.4
2	T1	1	0.0	0.021	4.1	LOS A	0.1	0.7	0.25	0.48	47.2
3	R2	1	0.0	0.021	7.3	LOS A	0.1	0.7	0.25	0.48	47.1
Approach		25	0.0	0.021	4.2	LOS A	0.1	0.7	0.25	0.48	46.5
East: Apricot Street											
4	L2	15	0.0	0.084	4.0	LOS A	0.4	2.8	0.22	0.43	46.4
5	T1	86	0.0	0.084	4.0	LOS A	0.4	2.8	0.22	0.43	47.2
6	R2	1	0.0	0.084	7.3	LOS A	0.4	2.8	0.22	0.43	47.1
Approach		102	0.0	0.084	4.0	LOS A	0.4	2.8	0.22	0.43	47.1
North: Cherrytree Road											
7	L2	1	0.0	0.017	4.7	LOS A	0.1	0.5	0.37	0.59	44.7
8	T1	1	0.0	0.017	4.7	LOS A	0.1	0.5	0.37	0.59	45.5
9	R2	16	0.0	0.017	8.0	LOS A	0.1	0.5	0.37	0.59	45.3
Approach		18	0.0	0.017	7.6	LOS A	0.1	0.5	0.37	0.59	45.3
West: Apricot Street											
10	L2	19	5.5	0.153	3.7	LOS A	0.8	6.3	0.03	0.48	46.5
11	T1	161	8.0	0.153	3.7	LOS A	0.8	6.3	0.03	0.48	47.3
12	R2	59	20.0	0.153	7.0	LOS A	0.8	6.3	0.03	0.48	46.9
Approach		239	10.8	0.153	4.5	LOS A	0.8	6.3	0.03	0.48	47.2
All Vehicles		384	6.7	0.153	4.5	LOS A	0.8	6.3	0.11	0.47	47.0

Table D5: Berkshire Road and Malo Link AM peak 2030

MOVEMENT SUMMARY

Site: 103 [Berkshire Road/Malo Link 2030 AM Peak]

Existing Site
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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Berkshire Road											
2	T1	348	3.0	0.192	0.1	LOS A	0.1	0.9	0.04	0.02	59.6
3	R2	13	0.0	0.192	6.9	LOS A	0.1	0.9	0.04	0.02	53.1
Approach		361	2.9	0.192	0.3	NA	0.1	0.9	0.04	0.02	59.4
East: Malo Link											
4	L2	41	0.0	0.213	5.6	LOS A	0.8	5.3	0.49	0.74	47.8
6	R2	118	0.0	0.213	8.4	LOS A	0.8	5.3	0.49	0.74	47.4
Approach		159	0.0	0.213	7.7	LOS A	0.8	5.3	0.49	0.74	47.5
North: Berkshire Road											
7	L2	56	0.0	0.180	5.6	LOS A	0.0	0.0	0.00	0.10	57.5
8	T1	288	2.5	0.180	0.0	LOS A	0.0	0.0	0.00	0.10	59.1
Approach		344	2.1	0.180	0.9	NA	0.0	0.0	0.00	0.10	58.8
All Vehicles		864	2.0	0.213	1.9	NA	0.8	5.3	0.11	0.18	56.5

Table D6: Berkshire Road and Malo Link PM peak 2030

MOVEMENT SUMMARY

Site: 103 [Berkshire Road/Malo Link 2030 PM Peak]

Existing Site
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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Berkshire Road											
2	T1	217	2.5	0.140	0.4	LOS A	0.3	2.2	0.16	0.08	58.7
3	R2	29	0.0	0.140	7.6	LOS A	0.3	2.2	0.16	0.08	52.4
Approach		246	2.2	0.140	1.3	NA	0.3	2.2	0.16	0.08	57.8
East: Malo Link											
4	L2	20	0.0	0.109	5.7	LOS A	0.4	2.6	0.47	0.72	48.0
6	R2	62	0.0	0.109	7.9	LOS A	0.4	2.6	0.47	0.72	47.6
Approach		82	0.0	0.109	7.4	LOS A	0.4	2.6	0.47	0.72	47.7
North: Berkshire Road											
7	L2	131	27.0	0.254	5.9	LOS A	0.0	0.0	0.00	0.17	55.9
8	T1	327	2.0	0.254	0.0	LOS A	0.0	0.0	0.00	0.17	58.7
Approach		458	9.1	0.254	1.7	NA	0.0	0.0	0.00	0.17	57.9
All Vehicles		786	6.0	0.254	2.2	NA	0.4	2.6	0.10	0.20	56.6

Table D7: Berkshire Road and Hawtin Road AM peak 2030

MOVEMENT SUMMARY

Site: 105 [Berkshire Road/Hawtin Road 2030 AM Peak]

Existing Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Hawtin Road											
5	T1	592	3.0	0.687	8.7	LOS A	8.0	57.8	0.83	0.79	51.9
6	R2	107	9.0	0.687	12.7	LOS B	8.0	57.8	0.83	0.79	51.4
Approach		699	3.9	0.687	9.3	LOS A	8.0	57.8	0.83	0.79	51.8
North: Berkshire Road											
7	L2	119	3.5	0.482	8.4	LOS A	3.6	26.2	0.76	0.84	49.7
9	R2	289	3.0	0.482	12.4	LOS B	3.6	26.2	0.76	0.84	50.4
Approach		408	3.1	0.482	11.2	LOS B	3.6	26.2	0.76	0.84	50.2
West: Hawtin Road											
10	L2	242	2.5	0.554	5.2	LOS A	5.4	39.0	0.50	0.52	52.7
11	T1	473	3.0	0.554	5.4	LOS A	5.4	39.0	0.50	0.52	53.8
Approach		715	2.8	0.554	5.4	LOS A	5.4	39.0	0.50	0.52	53.4
All Vehicles		1822	3.3	0.687	8.2	LOS A	8.0	57.8	0.68	0.70	52.1

Table D8: Berkshire Road and Hawtin Road PM peak 2030

MOVEMENT SUMMARY

Site: 105 [Berkshire Road/Hawtin Road 2030 PM Peak]

Existing Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Hawtin Road											
5	T1	507	0.5	0.549	6.6	LOS A	4.7	33.0	0.69	0.67	52.7
6	R2	71	8.0	0.549	10.6	LOS B	4.7	33.0	0.69	0.67	52.1
Approach		578	1.4	0.549	7.1	LOS A	4.7	33.0	0.69	0.67	52.6
North: Berkshire Road											
7	L2	94	6.0	0.451	9.2	LOS A	3.3	23.2	0.78	0.87	49.1
9	R2	264	1.0	0.451	13.0	LOS B	3.3	23.2	0.78	0.87	50.0
Approach		358	2.3	0.451	12.0	LOS B	3.3	23.2	0.78	0.87	49.7
West: Hawtin Road											
10	L2	206	1.5	0.556	4.8	LOS A	5.6	39.4	0.40	0.47	53.1
11	T1	573	1.0	0.556	5.1	LOS A	5.6	39.4	0.40	0.47	54.2
Approach		779	1.1	0.556	5.0	LOS A	5.6	39.4	0.40	0.47	53.9
All Vehicles		1715	1.5	0.556	7.2	LOS A	5.6	39.4	0.58	0.62	52.6

APPENDIX E: PTA CORRESPONDENCE

Giau Trang

From: Aaron Pereira [aaronp@cosweb.com.au]
Sent: Tuesday, March 8, 2016 11:03 AM
To: Giau.Trang@dvcworld.com
Cc: Jacqueline de Meyrick (jacquelined@satterley.com.au); Samuel Jeanes; Avril Thomson
Subject: 6211-00 Forrestfield - Bus routes

Follow Up Flag: Follow up
Flag Status: Completed

Hi Giau,

Please note the advice received from the PTA below.

I have also requested advice from the Shire in regards to road reserve widths and will chase this up over the next few days.

Kind regards

Aaron Pereira
Project Engineer

Cossill & Webley
CONSULTING ENGINEERS

T (08) 9422 5800 | M 0422 529 837 | E aaronp@cosweb.com.au
Street Address: B12, 431 Roberts Road, Subiaco WA 6008 | Mailing Address: PO Box 680, Subiaco WA 6904

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From: Cox, Simon [mailto:Simon.Cox@pta.wa.gov.au]
Sent: Tuesday, 8 March 2016 10:42 AM
To: Aaron Pereira
Subject: RE: 6211-00 Forrestfield - Bus routes

Hi Aaron,

I can confirm that Transperth have no plans to operate through the attached concept area.

Buses will operate along Berkshire Rd, Hawtin Rd and Apricot St. There is a small chance, buses may operate along Suntana Rd East however this has not been 100% finalised.

I trust information assists.

Kind regards,

Simon Cox | Network & System Planner | Transperth Service Development

Public Transport Authority WA | PO Box 8125, Perth Business Centre, WA, 6849
Ph: +61 (8) 9326 3971 | M: 044 887 0668 | Fax: +61 (8) 9326 2487 | eMail: simon.cox@pta.wa.gov.au

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From: Aaron Pereira [mailto:aaronp@cosweb.com.au]
Sent: Tuesday, March 08, 2016 10:29 AM
To: Cox, Simon
Cc: Samuel Jeanes
Subject: 6211-00 Forrestfield - Bus routes

Hi Simon,

Thanks for the conversation earlier this morning. As discussed please find attached the proposed plan of subdivision for the site at Forrestfield. We understand there are existing bus routes on Berkshire road and Hawtin road. Can you please let me know whether there will be any future proposed bus routes through our subdivision and which roads these bus routes are likely to follow.

Kind regards

Aaron Pereira
Project Engineer

Cossill & Webley
CONSULTING ENGINEERS

T (08) 9422 5800 | M 0422 529 837 | E aaronp@cosweb.com.au
Street Address: B12, 431 Roberts Road, Subiaco WA 6008 | Mailing Address: PO Box 680, Subiaco WA 6904

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