53 Munro Road, Pokeno

Proposed Plan Change

Integrated Transportation Assessment Report

2 July 2018

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EXECUTIVE SUMMARY

Commute Transportation Consultants (Commute) has been engaged by Birch Surveyors Limited to prepare an Integrated Transport Assessment (ITA) for a proposed submission to the Waikato District Plan (District Plan) review to rezone a large portion of land located at 53 Munro Road in Pokeno (referred to as the 'subject site').

The site comprises approximately 160 hectares (ha) of land and currently accommodates several dwellings; the remainder of the site consists of farmland. With reference to the District Plan, the site is zoned currently as 'Rural'. The proposal intends to change the existing zoning of the site to residential to allow for the development of a 1137 lot residential subdivision comprising some 1350 dwellings, and associated neighbourhood centre . A hierarchy of roads will be provided to support the development and will connect to the existing road network via five intersections.

Proposed development

Based on the assessments undertaken in this report, it is concluded that:

- The proposed residential zoned land is compatible with the neighbouring zones (Residential 2 zone to the east and southeast and 'Rural Zone' to the west and south);
- The site, with the mitigation measures identified, has good accessibility to various transport modes: walking, cycling, bus and private vehicle;
- Provided the upgrades to intersections are implemented, the effects of the proposed increase in vehicles are expected to be minor with all surrounding roads and intersections capable of accommodating site generated traffic; and
- the potential residential development under the proposed Residential 2 zoning is consistent with, and encourages key regional and district transport policies.

In addition, future upgrades to the existing intersections are planned to occur as a result of the Pokeno Structure Plan development. The upgrades proposed as part of this proposal will improve the walking and cycling provisions within Pokeno and is likely to encourage the use of alternative modes

of travel to and from the site. Accordingly, it is concluded that the proposal is acceptable from a transport planning perspective.

1 INTRODUCTION

Commute Transportation Specialists has prepared an Integrated Transport Assessment (ITA) for a proposed submission to the Waikato District Plan (District Plan) review to rezone a large portion of land located at 53 Munro Road in Pokeno. The existing site, comprising some 160 ha of land, is currently zoned as 'Rural' under the District Plan and the proposal intends to rezone this portion of land to 'Residential' zoning to allow for the development of some 1137 lots (to be provided in three stages) and associated neighbourhood centre to support the growth in Pokeno.

A hierarchy of roads are proposed as part of the residential development and will have five connections to the existing road network.

The subject site currently consists of several dwellings, with access provided off Munro Road or Helenslee Road.

The key transportation considerations for this proposal are:

- The accessibility of the site to the various modes of transport; and
- The ability of the surrounding road network to safely and efficiently support the proposed development.

These and other transportation issues will be addressed in this report. Figure 1-1 shows the subject site in relation to the surrounding road network.

Figure 1-1: Site in relation to the surrounding road network

2 EXISTING ENVIRONMENT

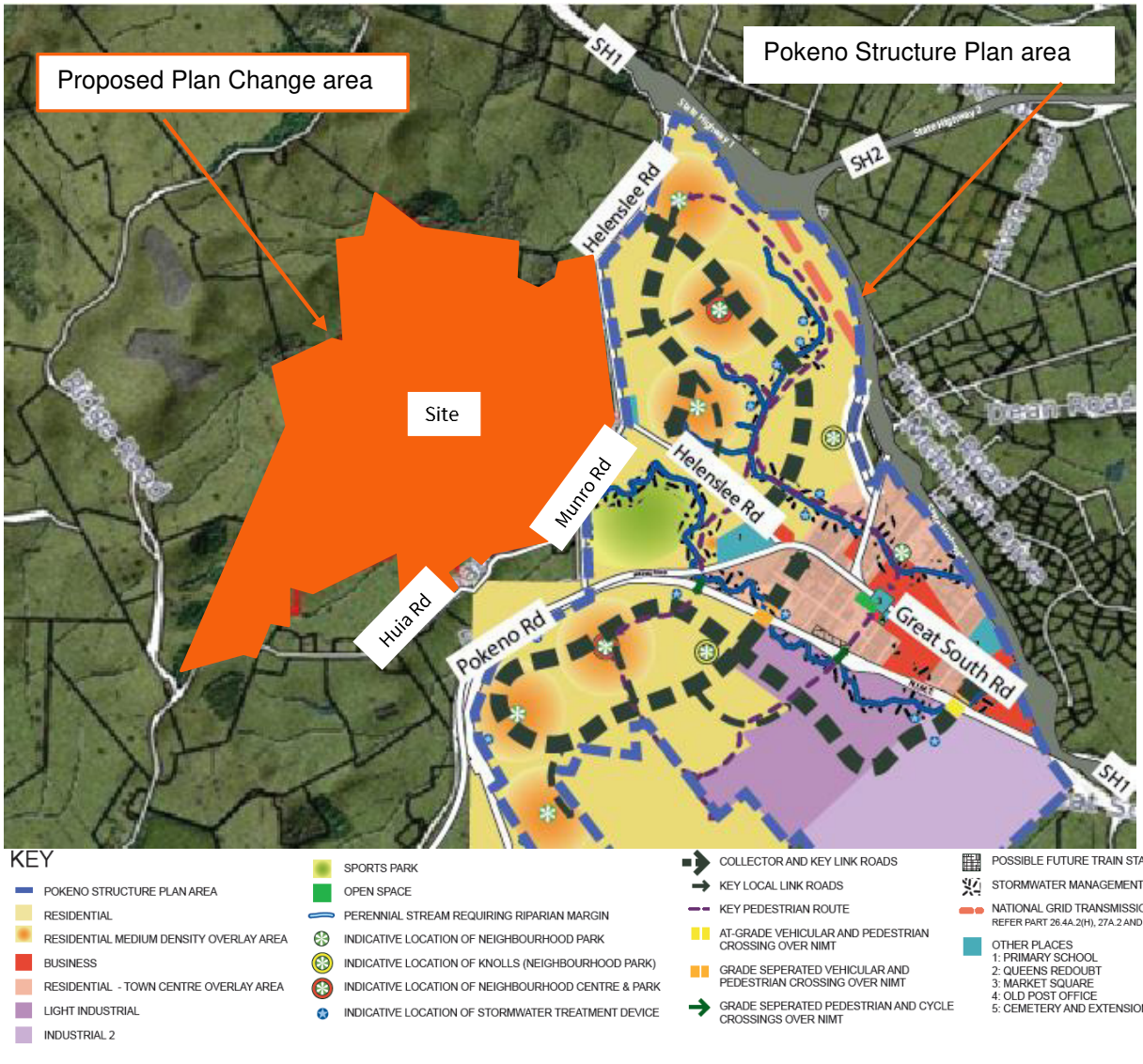
2.1 SITE LOCATION

As outlined in Figure 2-1 below, the site is located at 53 Munro Road in Pokeno. It is located approximately 53km south of Auckland, and 72km north of Hamilton, therefore is still in a commutable distance from both these cities. Pokeno is located directly west of the State Highway 1 (SH1) motorway, and southwest of the SH2 motorway. The Tuakau town centre is located west of the site via Pokeno Road.

The site is zoned as 'Rural' under the Waikato District Plan (District Plan) and currently caters for several dwellings. The neighbouring site zoning varies in each direction, with the land to the east and southeast of the site zoned as Residential 2. West, north and southwest of the site, the land is zoned as Rural (similar to the subject site).

Figure 2-1 shows the site in relation to the surrounding area and Pokeno Structure Plan (PSP).

Figure 2-1: Site Location



As shown above, the site is located directly west of the PSP boundary. The PSP provides a comprehensive framework for the staged growth of the Pokeno village into a town. The structure plan sets out the future zoning in the area allowing for various residential, industrial and business activity surrounding the existing town centre.

2.2 ROAD NETWORK

The site is bounded by Huia Road to the south, and Helenslee Road and Munro Road to the east. To the north and west of the site, the neighbouring sites are zoned as 'Rural'. Directly east and south of the site consists of 'Residential 2' and 'Recreation' zones.

It is noted that the development of the PSP area will require new and upgraded roading infrastructure including at nearby intersections to cater for the increase in traffic volumes.

2.2.1 MUNRO ROAD

Adjacent to the site, Munro Road provides a single lane in both direction with no centreline or edge line markings. Munro Road has a road reserve width of some 20 m, including a carriageway of approximately 6.0 m. Near the vicinity of the site, Munro Road has unsealed shoulders of varying width and grassed berms. Munro Road connects to Helenslee Road to the north and Pokeno Road to the south and is bounded by 'Residential 2' zoned land on the east side and 'Rural' zoned land to the west. A one-way bridge is located on Munro Road just north of the intersection with Huia Road (as shown in Photograph 1 below).

With reference to the One Road Network Classification (ONRC), Munro Road is classified as a secondary collector road. The purpose of a secondary collector road is to '*provide a secondary distributor/ collector function, linking local areas of population and economic sites and may be the only route available within this local area'.* No pedestrian footpaths are provided on either side of Munro Road.

On the 2nd April 2018 the speed limit on Munro Road changed from 100 km/hr to 60 km.hr[1].

Photograph 1 shows the existing layout of Munro Road looking south from the intersection with Helenslee Road.

As shown in Photograph 1, a one-way bridge is located directly north of the Huia Road/ Munro Road intersection, with priority given to southbound traffic.

[1] https://www.waikatodistrict.govt.nz/your-council/public-consultations/past-consultations/speed-limit-review

Photograph 1: Munro Road (looking north towards Helenslee Road)

2.2.2 HELENSLEE ROAD

Helenslee Road provides a single traffic lane in each direction (separated by a centreline), connecting to Razorback Road to the north and Pokeno Road to the south. Helenslee Road has a road reserve width of some 20.1 m and a sealed carriageway of approximately 7.0 m. Primarily were residential development has occurred, a pedestrian footpath is provided along the eastern side of Helenslee Road. Additionally, intermittent on-street parking is permitted on both sides of the road. A flush median is provided along sections of Helenslee Road to facilitate right turn movements into Mark Ball Drive, Hill Park Dr and an unnamed road (near the intersection with Munro Road).

On the 2nd April 2018 the speed limit on Munro Road changed from 100 km/hr to 60 km.hr[2].

Photograph 2 shows the existing layout of Helenslee Road looking north near the intersection with Munro Road.

[2] https://www.waikatodistrict.govt.nz/your-council/public-consultations/past-consultations/speed-limit-review

Photograph 2: Helenslee Road (north)

2.2.3 HUIA ROAD

Huia Road is located adjacent to the southern boundary of the site and allows for two way movement (no edge line or centreline markings). Huia Road connects to Munro Road to the east and Ridge Road to the west. Huia Road has a road reserve width of some 20.5 m and a carriageway width of approximately 6.1 m. Similar to Munro Road, Huia Road comprises of unsealed shoulders of varying width (either side) and grassed berms.

No formal pedestrian footpaths are provided on either side of Huia Road, however the shoulder appears to have adequate width to cater for pedestrians.

With the new speed limit changes, it is anticipated that Huia Road will have a speed limit of 60 km/hr.

Photograph 3 shows the existing layout of Huia Road looking southwest from the intersection with Munro Road.

Photograph 3: Huia Road

2.2.4 POKENO ROAD

Pokeno Road is a two-lane road (separated by a centreline), connecting to Whangarata Road to the west and Great South Road to the east. Close to the site (near intersection with Munro Road), Pokeno Road has a road reserve width of some 41.5 m and a sealed carriageway width of approximately 7.6 m. Towards the eastern end of Pokeno Road (near intersection with Helenslee Road), the road reserve width is of some 20.1m with a sealed carriageway width of approximately 6.1m. East of the Pokeno School, a pedestrian footpath and intermittent kerbside parking is provided along the southern side of Pokeno Road only.

On the 2nd April 2018 the speed limit along Pokeno Road (between 100 m west of Munro Road to existing 70 km/hr/ 100 km/hr change) changed from 100 km/hr to 80 km.hr[3]. East of this, the speed limit changes to 50 km/hr.

Photograph 4 shows the existing layout of Pokeno Road looking east near the intersection with Munro Road.

[3] https://www.waikatodistrict.govt.nz/your-council/public-consultations/past-consultations/speed-limit-review

Photograph 4: Pokeno Road

2.2.5 POKENO ROAD/ MUNRO ROAD INTERSECTION

The Pokeno Road/ Munro Road intersection is give way controlled, with priority to traffic along Pokeno Road. Munro Road connects to the intersection with Pokeno Road at an acute approach angle from the north. Currently, the intersection provides no dedicated turning lanes/ slips lanes or additional shoulder width therefore vehicles turning right into Munro Road would obstruct through movement along Pokeno Road. This intersection is identified as a gateway, in need of treatment, in the PSP.

2.2.6 HELENSLEE ROAD/ MUNRO ROAD INTERSECTION

The Helenslee Road/ Munro Road intersection is located adjacent to the site and is controlled by a give-way intersection with priority given to traffic along Helenslee Road. Helenslee Road makes up the north and south leg of the intersection with Munro Road connecting to it from a southwest approach. This intersection is identified as a gateway, in need of treatment, in the PSP.

2.3 ACCESSIBILITY

2.3.1 PRIVATE VEHICLES

The site is well located with regards to vehicle connections to the wider Auckland and Hamilton Regions with Auckland located just 52km north of the site and Hamilton located 72 km south. Helenslee Road provides a link to the SH1 (northbound) Razorback Road interchange which is located approximately 1.6 km (2-minute drive) north from the site. The Munro Road, Pokeno Road and Great South Road link connects to the SH1 northbound Great South Road interchange, which is located south of the SH1 Razorback Road Interchange as well as the SH2 interchange. The SH1 Great South Road interchange is located approximately 2.0 km (3-minute drive) east from the site. The SH1 southbound interchange is some 2.2 km (5-minute drive) south-east from the site and can be accessed of Great South Road.

SH1 and SH2 allow for easy access to major cities such as Auckland, Hamilton and Tauranga, in which commuters are likely to travel to. The site is some 52 km (51-minute drive) from Auckland, 74 km (1-hour drive) from Hamilton and 152.0 km (2-hour drive) from Tauranga.

During peak times, travel times between the site and major cities vary and are sensitive to SH1 / SH2 motorway flows and the associated demands at the interchanges.

2.3.2 EXISTING PUBLIC TRANSPORT SERVICES

The closest bus stops are located on Great South Road (Pokeno Centre), approximately 1.6 km (21-minute walk) from the site, where currently one bus route passes this stop (Route 44). Additionally, a pair of bus stops are located approximately 1.8 km (23-minute walk) from the site, where the InterCity Bus Route passes. Commuters can use these bus services as a means to travel to major cities across North Island.

Given the location of the site, residents are likely to commute to Pokeno, Auckland or Hamilton. While no public transport facilities are provided between the site and Pokeno town centre, several services are provided between the Pokeno town centre and Auckland and Hamilton. The following intercity routes operate during the weekday and connect to these areas.

Table 1: Existing Bus Routes

Bus Route	Route Description	Frequency
44	Hamilton Transport Centre to Pukekohe	Runs Alternate Thursdays. Only AM services (9.20, 9.35, 10.15, 10.40, 10.55, 11.20).
44	Pukekohe to Hamilton Transport Centre	Runs Alternate Thursdays. Only PM services (2.30, 3.00, 3.20, 3.45, 4.15, 4.30).
InterCity Link	Hamilton to/from Auckland Express (8:00am only)	Monday to Friday
InterCity	Auckland to/from New Plymouth, Rotorua, Palmerston North, Gisborne or Hastings (all pass via Hamilton)	Monday to Sunday (various times throughout the day)

As shown above, there are limited transport options available for commuters. With the development of the Pokeno village estate to be implemented over the next 20 years, including both residential and an employment zone, and limited other modes of transport available, this will likely lead to a higher number of volumes on the already congested state highway road network.

2.4 WALKING

Footpaths are provided on the southern end of Pokeno Road as it enters the Pokeno town centre. As developments are established in alignment with the Pokeno Structure Plan, roads will be upgraded and pedestrian connectivity between the site and Pokeno Town Centre will be improved. In this case, Helenslee Road, adjacent to the residential development as part of the PSP, provides a pedestrian footpath along the eastern side of the road between Gateshead Road and Hill Park Drive.

The Austroads Guide to Traffic Engineering Practice Part 13 – Pedestrians indicates that the practical walking distance for non-recreational walking trips is in the order of 1.5 km. Using the practical walking distance of 1.5 km and the 15th percentile walking speed of a typical fit, healthy adult of 1.3 m/s, gives a journey time of some 20 minutes. This is in line with New Zealand data in the Pedestrian Planning and Design Guide, which states that for walking trips, half are more than 10 minutes and 18% are more than 20 minutes.

The primary catchment area for pedestrians has therefore been based on a 1.5 km radius of the centre of the site as shown in Figure 2-2.

Figure 2-2: Walking Catchment

As shown above, the Pokeno Centre, Pokeno School and the major bus stops are located within walking distance of the site. Overall, the site is considered to be fairly well connected to neighbouring activities, however will require upgrades/ additional routes as part of the site development.

2.5 CYCLING

There are currently no dedicated cycle facilities on Helenslee Road, Munro Road or Pokeno Road near the vicinity of the site. As part of the proposed development, a comprehensive network of cycle facilities is proposed within the site and along Helenslee Road between the northern entrance and Pokeno Road.

2.6 TRAFFIC VOLUMES

Daily link volumes have been extracted from the Pokeno Intersection Assessment report[4] (dated 2016) for Pokeno Road, Munro Road and Helenslee Road and are provided in Table 2 below. The peak hour has been estimated to be 10% of the daily volume; this is also outlined in Table 2.

Table 2: Traffic Volumes within Pokeno (vehicles per day)

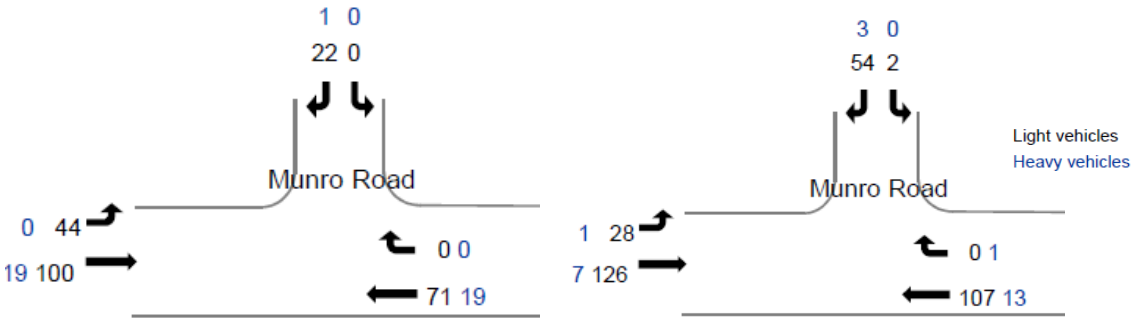
Road	Location	Date	Daily volume	Peak Hour (estimate)
Pokeno Road	Between Ford Road and Helenslee Road	2015	3000 vpd	300 vph
Munro Road	Between Pokeno Road and Huia Road	2014	900 vpd	90 vph
Helenslee Road	Between Munro Road and SH1 overbridge	2014	1500 vpd	150 vph
Helenslee Road	Between Munro Road and Gateshead Road	2015	1500 vpd	150 vph

In addition, survey data has been extracted from the Pokeno Intersection Assessment report. These surveys were undertaken between 7:30am – 8:30am and 4:45pm to 5:45pm on the 26th November 2016 at the following intersections:

- Pokeno Road/ Munro Road intersection;
- Pokeno Road/ Helenslee Road intersection;
- Pokeno Road/ Great South Road intersection; and
- Great South Road/ SH1 NB on-ramp intersection.

The results of the surveys are shown in Figure 2-3 to Figure 2-6 below.

Figure 2-3: Munro Road/ Pokeno Road survey volumes November 2016 (AM and PM)



[4] Provided by WDC as written in the Pokeno Intersection Assessment 2016 by BECA

Figure 2-4: Helenslee Road/ Pokeno Road survey results November 2016 (AM and PM)

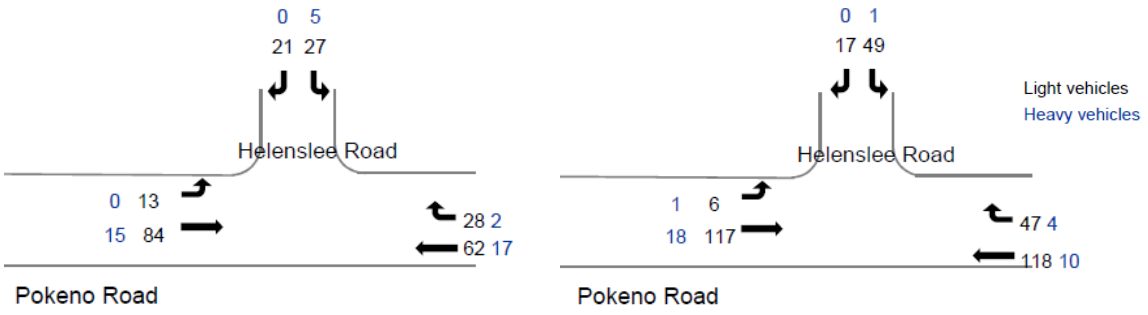


Figure 2-5: Great South Road/ SH1 NB on-ramp survey volumes November 2016 (AM and PM)

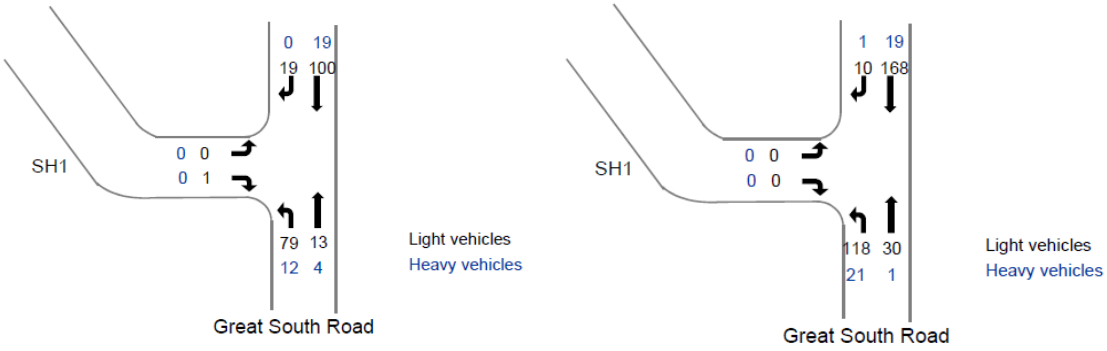
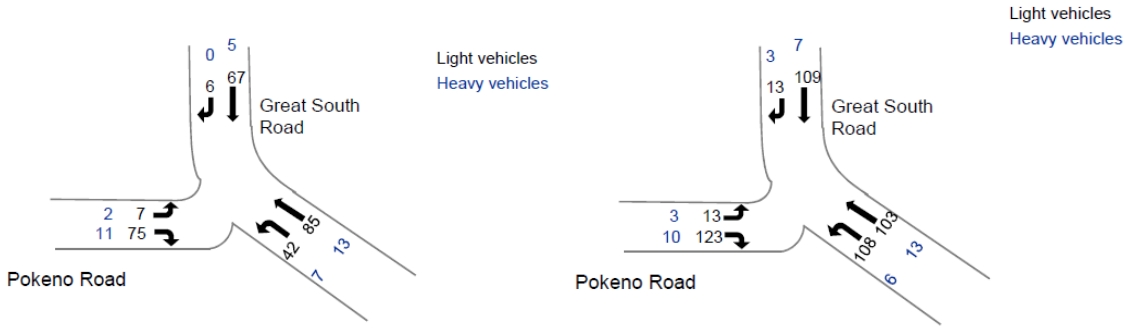


Figure 2-6: Great South Road/ Pokeno Road survey volumes November 2016 (AM and PM)



As shown above, the majority traffic volumes at the surveyed intersections are considered to be low.

The surrounding area is still developing and at the completion of the Pokeno Structure Plan, and other consented developments in Pokeno, the traffic volumes in this area are likely to increase significantly from that existing.

2.7 ROAD SAFETY

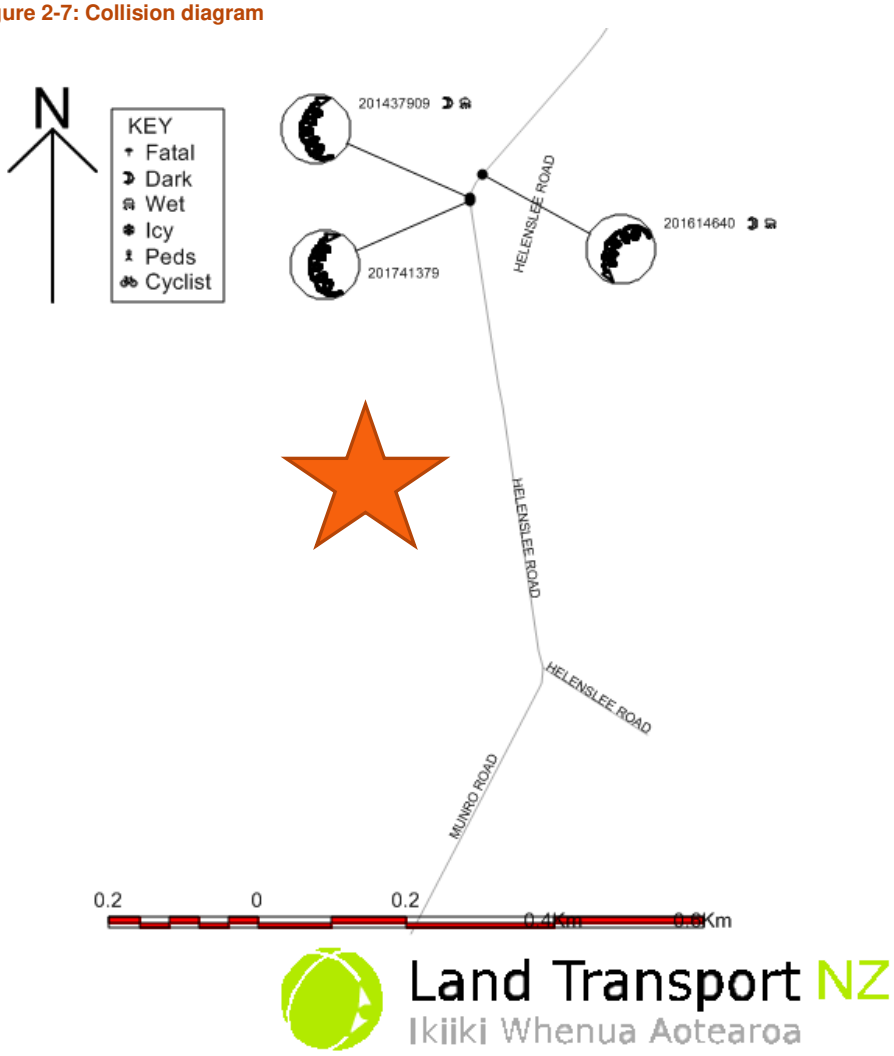
A search of the road safety record using the New Zealand Transport Agency (NZTA) Crash Analysis System (CAS) has been carried out to identify all reported crashes near the site during the five-year

period from 2013 to 2017 as well as all available data in 2018. The study focused on all reported crashes reported on Helenslee Road, Munro Road and Huia Road within the vicinity of the site as well as the intersections of Munro Road / Huia Road and Munro Road/ Helenslee Road.

A total of three crashes were reported within the study area, of which all were located along Helenslee Road. The three crashes occurred just north of the plan change area, of which one crash resulted in one minor injury due to loss of control when turning (alcohol being a contributing factor). The remaining crashes were non-injury and resulted from loss of control when turning and swerving to avoid animal.

A collision diagram of the surrounding area is provided in Figure 2-7 below.

Figure 2-7: Collision diagram



As can be seen above, there are a small number of crashes reported within the study area and specifically none on Munro Road or Helenslee Road (relating to vehicle movements to or from the site). Therefore, from the assessment of the crash history, there is no indication of any existing significant safety concerns and on the provision that all recommendations outlined in this report are implemented, the proposed zone change is unlikely to exacerbate this situation in any way (provided the upgraded roads/ intersections are designed appropriately). It is noted that all three crashes recorded at on the same corner and are all loss of control crashes. The proposal will urbanise this area and will likely reduce the occurrence of loss of control crashes.

3 PROPOSED DEVELOPMENT

3.1 OVERVIEW

It is proposed to rezone the land located at 53 Munro Road in Pokeno. The subject site is currently zoned as 'Rural' in the Waikato District Plan (District Plan) and the proposal intends to rezone the land to Residential zone to allow for the development of a 1137-lot residential subdivision comprising some 1350 dwellings. The development is expected to be established in three stages.

The intent of the proposal is to include the proposed site, in the Waikato Council's District Wide Review that will be notified July this year.

A preliminary master plan has been developed for the site (provided for in **Appendix A**). The plan indicates the proposed road network to be constructed within the development.

As part of the proposal, a hierarchy of roads are proposed (on-site) to support the development and will have five connections to the existing road network. This includes two connections on Helenslee Road, one onto Munro Road, one at the intersection of Munro Road/ Helenslee Road and one on Huia Road.

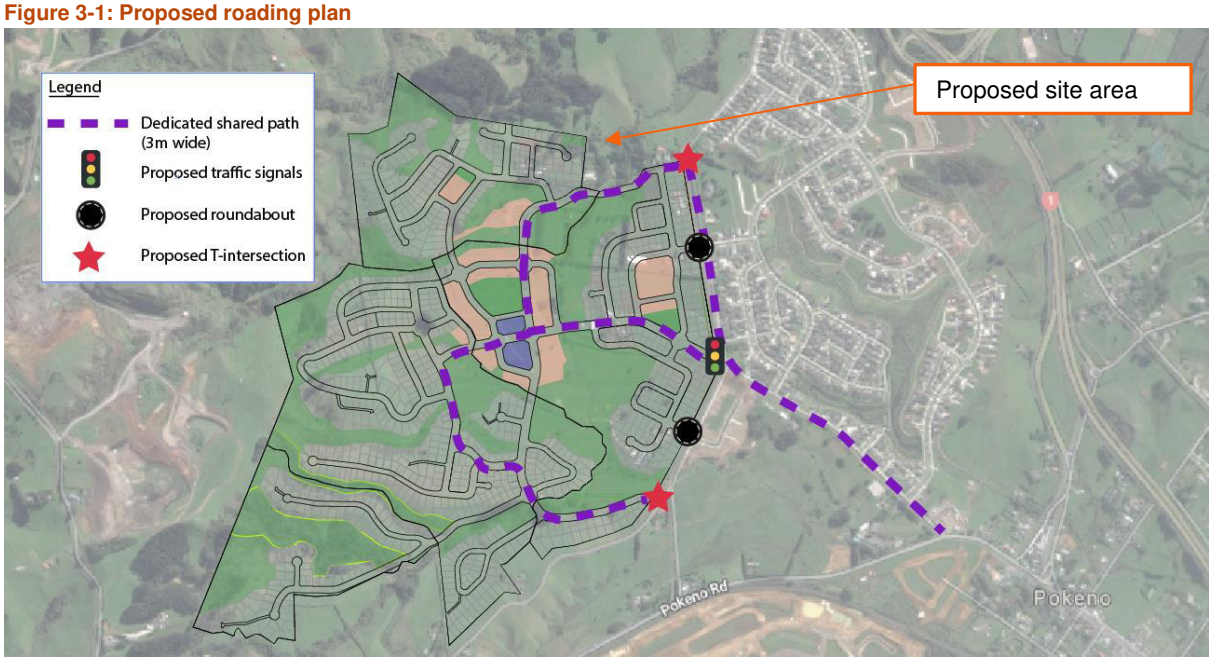
As part of the proposal, upgrades to the following priority-controlled intersections are proposed to support the increase in traffic volumes on the existing road network (outlined in figure 3-2);

- Helenslee Road/ Munro Road – signals;
- Helenslee Road/ Gateshead Road – roundabout; and
- Helenslee Road/ side road – roundabout.

Figure 3-1 below shows the location of the five connections proposed to the existing road network in relation to the site boundary and surrounding road network.

A shared path will also be provided within and near the development and is outlined in Figure 3-1 below.

Figure 3-1: Proposed roading plan



4 PROPOSED ROAD NETWORK

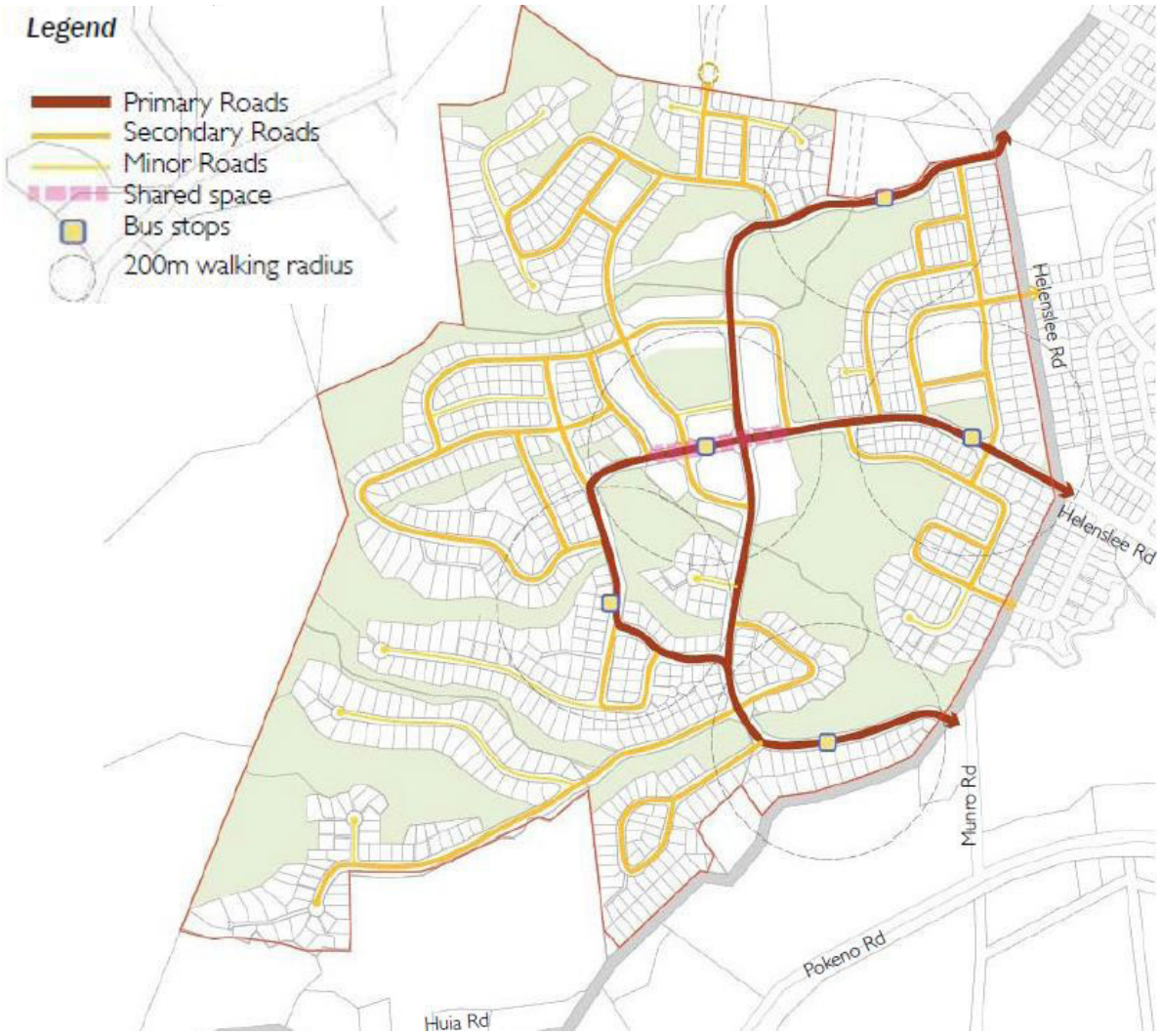
As part of the development, a series of local and collector roads will be constructed to provide access to the individual properties (outlined in Figure 4-1 below). The proposed road network will form the intersections with the following existing roads;

- Helenslee Road;
- Helenslee Road/ Gateshead Crescent;
- Helenslee Road/ Munro Road intersection;
- Munro Road; and
- Huia Road.

Figure 4-1 shows the proposed local and collector roads within the development.

The major connection between the site and the existing roading network will be at the Munro Road / Helenslee Road intersection. This intersection is currently priority controlled where vehicles on Helenslee Road have priority. The proposal intends for this connection point to be signalised as a high volume of vehicles, pedestrians and cyclists are likely to enter/exit the site through this intersection (towards the Pokeno town centre and SH1 southbound on-ramp via Great South Road respectively).

Figure 4-1: Proposed road hierarchy (Source: Pokeno West Plan Change – Urban Design Report 2018)



The following sections assess the road details for the proposed public roads in relation to the relevant standards namely The Franklin Engineering Code of Practise, Austroads Guide and NZS4404:2010.

4.1.1 NZS4404:2010 CHAPTER 3: ROAD DESIGN

Chapter 3 of the Franklin Engineering Code of Practise outlines the requirements for the design of roads. Specifically, section 3.2.3 of this standard refers to NZS 4404:2010 (Section 3.3) for matters pertaining to carriageway, road and formation widths.

Table 3.2 of NZS4404:2010 outlines the requirements for carriageways serving different land uses within different areas. The following should be provided for an urban road;

Serving 1 to 200 dwellings (local road – 2000 vpd)

- 30 km/hr target speed limit;
- 15 m minimum road width;
- 12.5% maximum gradient (minimum of 0.4%);
- 1.5 m pedestrian footpath (one side) or 1.5 m (both sides) where more than 20 dwellings or more than 100 m in length;
- Parking may occur in the movement lane or be separated and recessed;
- Cyclists – shared (in movement lane); and
- 5.5 – 5.7 movement lane (excluding shoulder).

Serving 200 to 800 lots the following dimensions should be provided (Connector/ collector road – 8000 vpd):

- 50 km/hr target speed limit;
- 23 m minimum road width;
- 10% maximum gradient (minimum of 0.4%);
- 2.5 m pedestrian footpath (both side), separated from the carriageway;
- Parking preferred separate and recessed;
- Separate provision for cycling where local authority define cycle route; and
- 2 x 4.2 movement lane (excluding shoulder).

Figure 4-2 shows the recommended layout.

Figure 4-2: NZ4404:2010 - Figure E22 and E23 road reserve layout

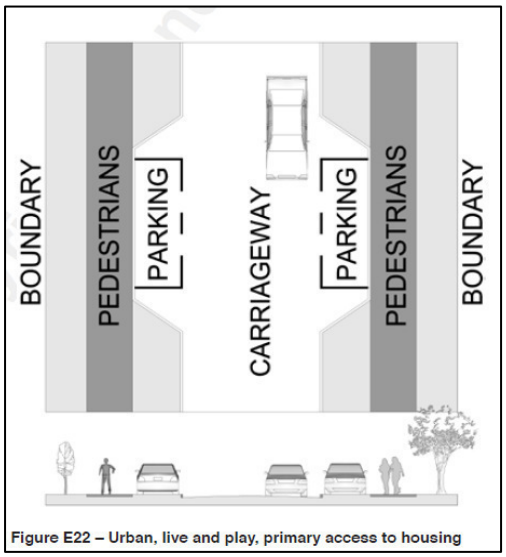


Figure E22 – Urban, live and play, primary access to housing

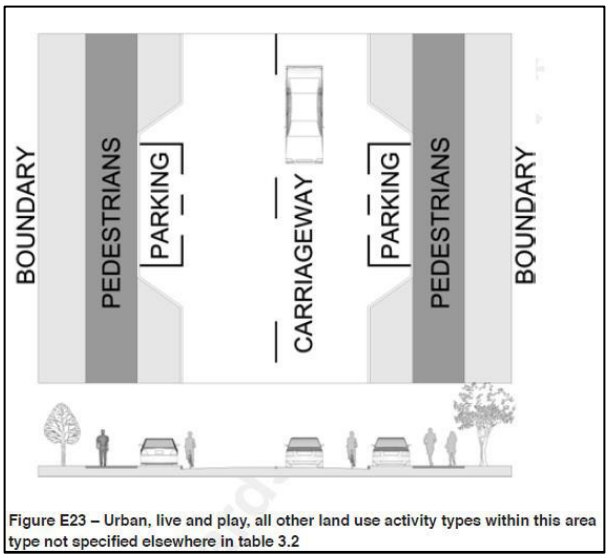


Figure E23 – Urban, live and play, all other land use activity types within this area type not specified elsewhere in table 3.2

4.1.2 PROPOSED PRIMARY (COLLECTOR) ROADS

All new primary collector roads are proposed to provide a 25 m road reserve. The details included in the road reserve is as follows:

- 2 x 3.5 m lane (either way);
- 3.0 m flush median;
- 2.3 m parking or berm (both sides;
- 1.2 m front berm (both sides);
- 1.8 m footpath (one side);
- 3.0 m shared path (one side) including 1.5 m footpath and cycle path respectively; and
- 1.6 m back berm (both sides).

Secondary collector roads proposed provide a 20 m road reserve comprising of the following:

- 2 x 3.0 m lane (either way);
- 0.4 m flush median;
- 2.2m parking or berm (both sides;
- 1.2 m front berm (both sides);
- 1.8 m footpath (one side);
- 1.6 m back berm (both sides).

Therefore, the proposed collector road will provide a 14.6 m carriageway, including 2.3 m parking bays on both sides along its length. The carriageway width allows for a future public transport route (7.0m wide). A 3.0m shared footpath (which can be used by cyclists/ pedestrians) is provided on one side of the road on the collector road (new) and a pedestrian footpath along the other side of the road.

Vehicle crossings for driveways should avoid being on collector roads (including proposed and existing) and over the shared path on the collector road (new). Where shared access lots/lanes cross footpaths, the footpath surface will be continued across the driveway to highlight legal footpath user right-of-way.

Figure 4-3 and Figure 4-4 show the overall cross-section with and without parking bays.

Figure 4-3: Primary Collector Road (new –parking bays)

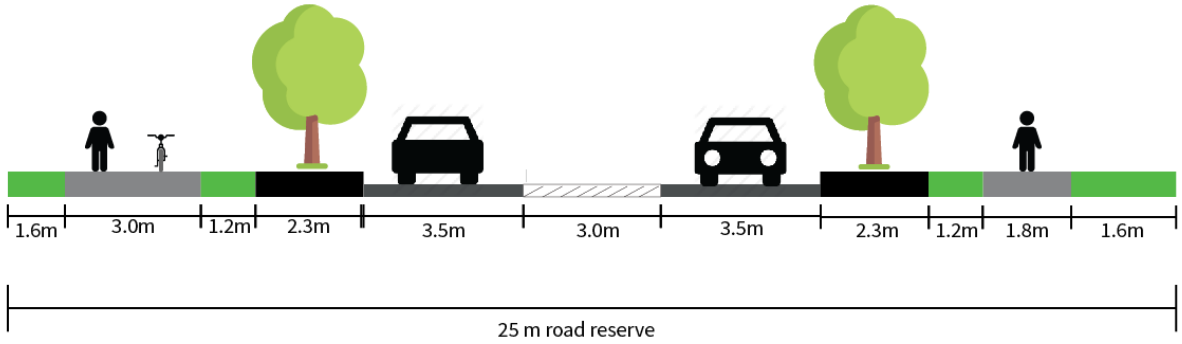
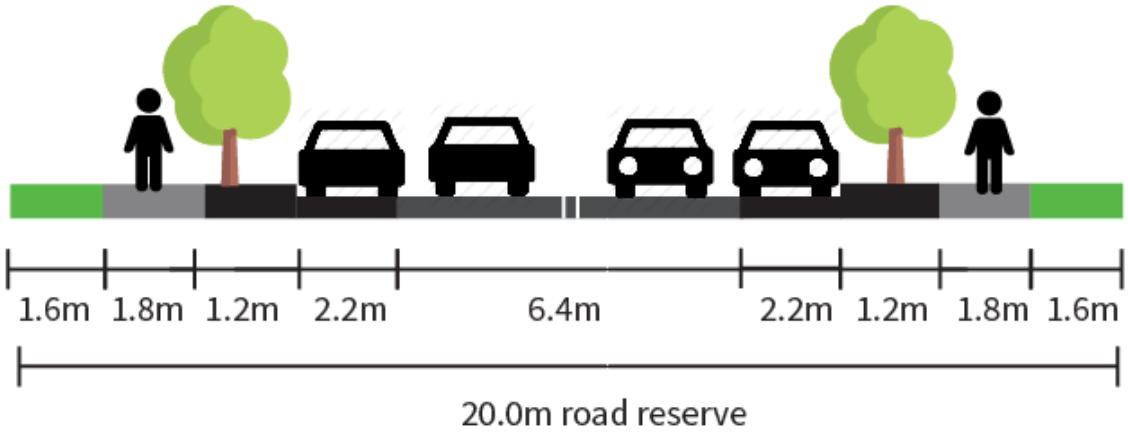


Figure 4-4: Secondary Collector road (new - no shared path)



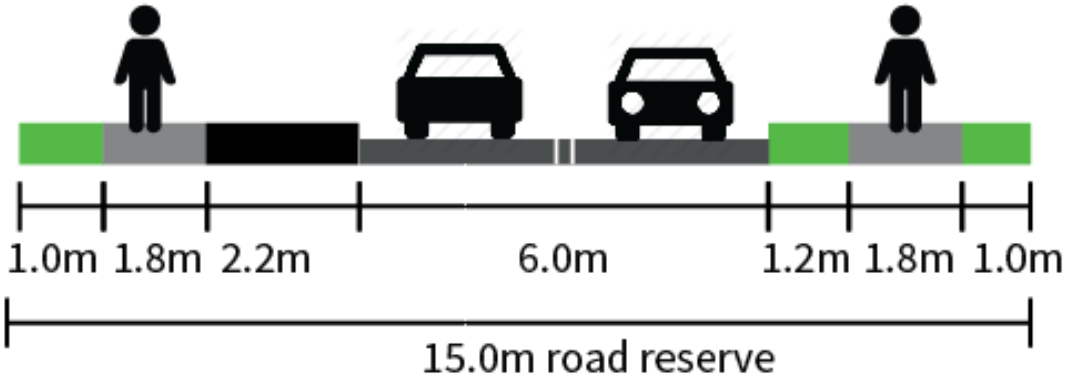
4.1.3 LOCAL ROADS

All new local roads will comprise a 15 m road reserve with the following included:

15 m road reserve

- 6.0 m carriageway (3.0 m lanes);
- 2.2 m front berm (both sides);
- 1.8 m footpath (both sides);
- 1.0 m back berm (both sides).

Figure 4-5: Local road (new) - 20.0 m road reserve



Where driveways cross footpaths, the footpath surface should be continued across the driveway to highlight legal footpath user right-of-way.

The combination of relatively narrow carriageways and side friction from on-street parking and residential driveways will create a low speed (40km/hr) environment appropriate for a residential area.

The lane widths and footpath dimensions that are proposed typically comply with NZS4404 road design guidelines. These are considered appropriate.

5 POKENO INTERSECTION ASSESSMENT REPORT

The Pokeno Intersection Assessment report sets out an assessment of the capacity of the existing intersection layouts in Pokeno to cater for the future traffic volumes anticipated for the year 2022 and 2040. The report recommends upgrades to key intersections within Pokeno, from a give-way control to roundabout or signals.

Figure 5-1 shows the planned upgrades, outlined in the Pokeno Intersection Assessment report, and Figure 5-2 shows the upgrades proposed as part of the proposed development.

Figure 5-1: Planned intersection upgrades (Source: Pokeno Intersection Assessment report)

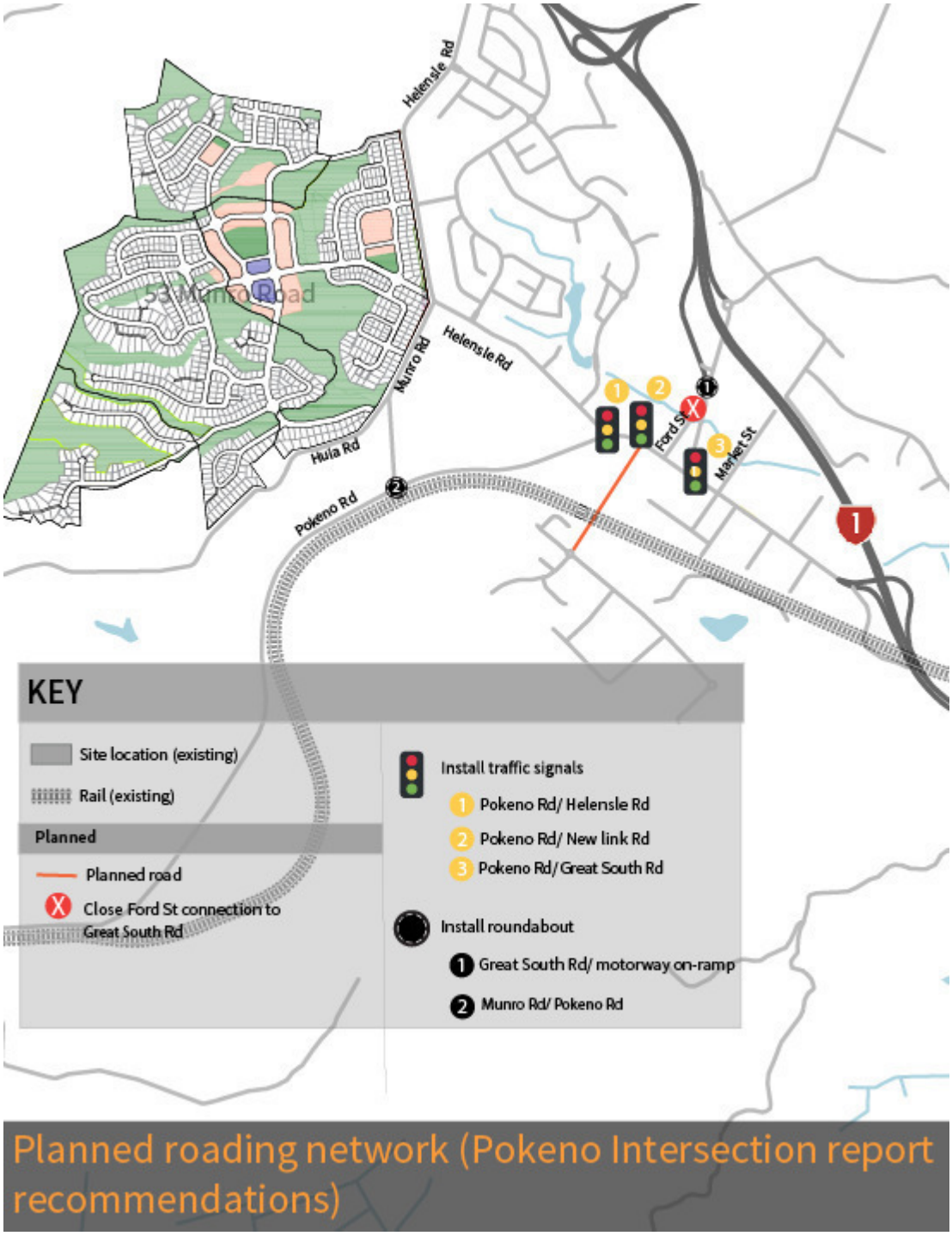
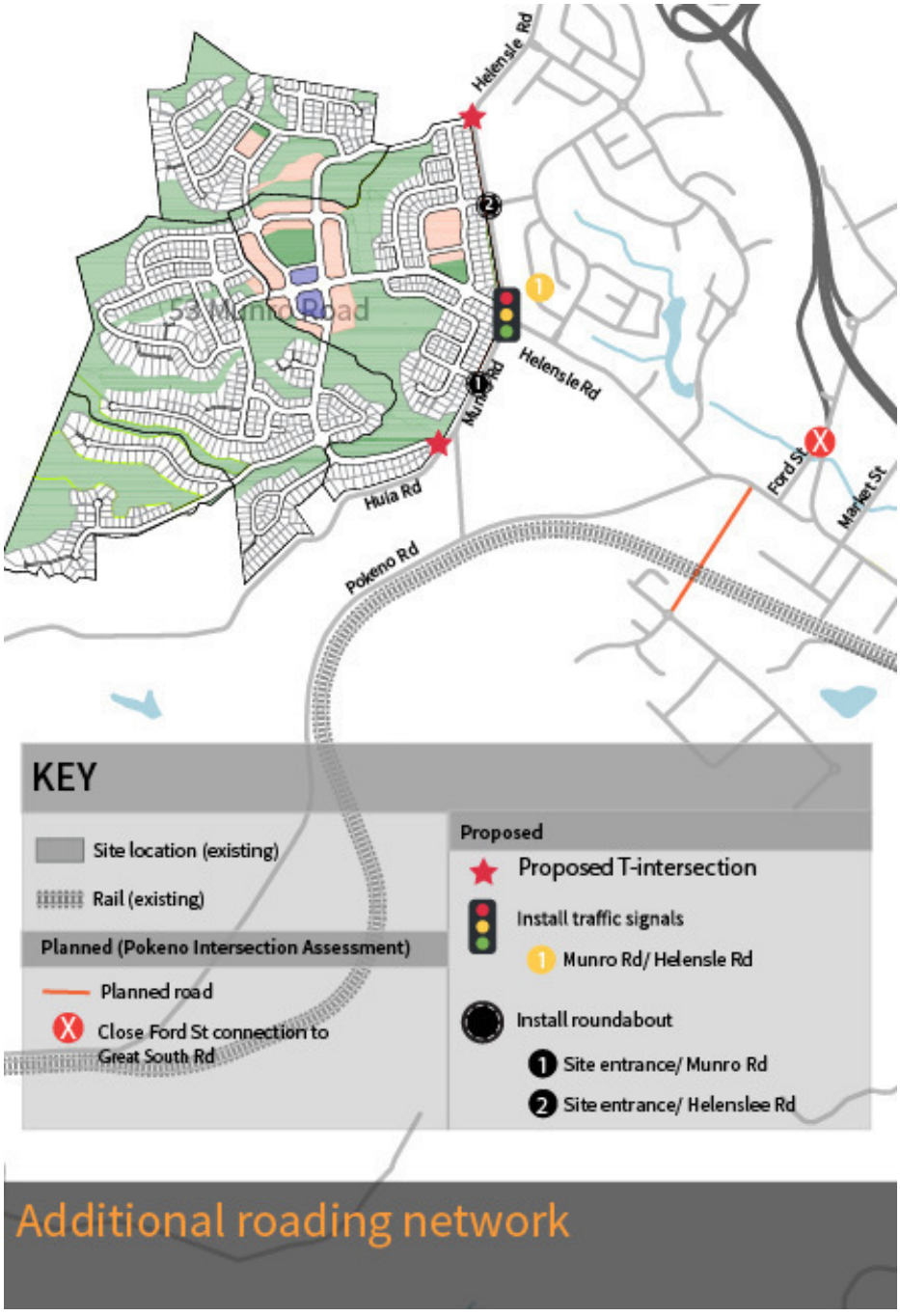


Figure 5-2: Additional intersection upgrades



6 CYCLING PROVISION

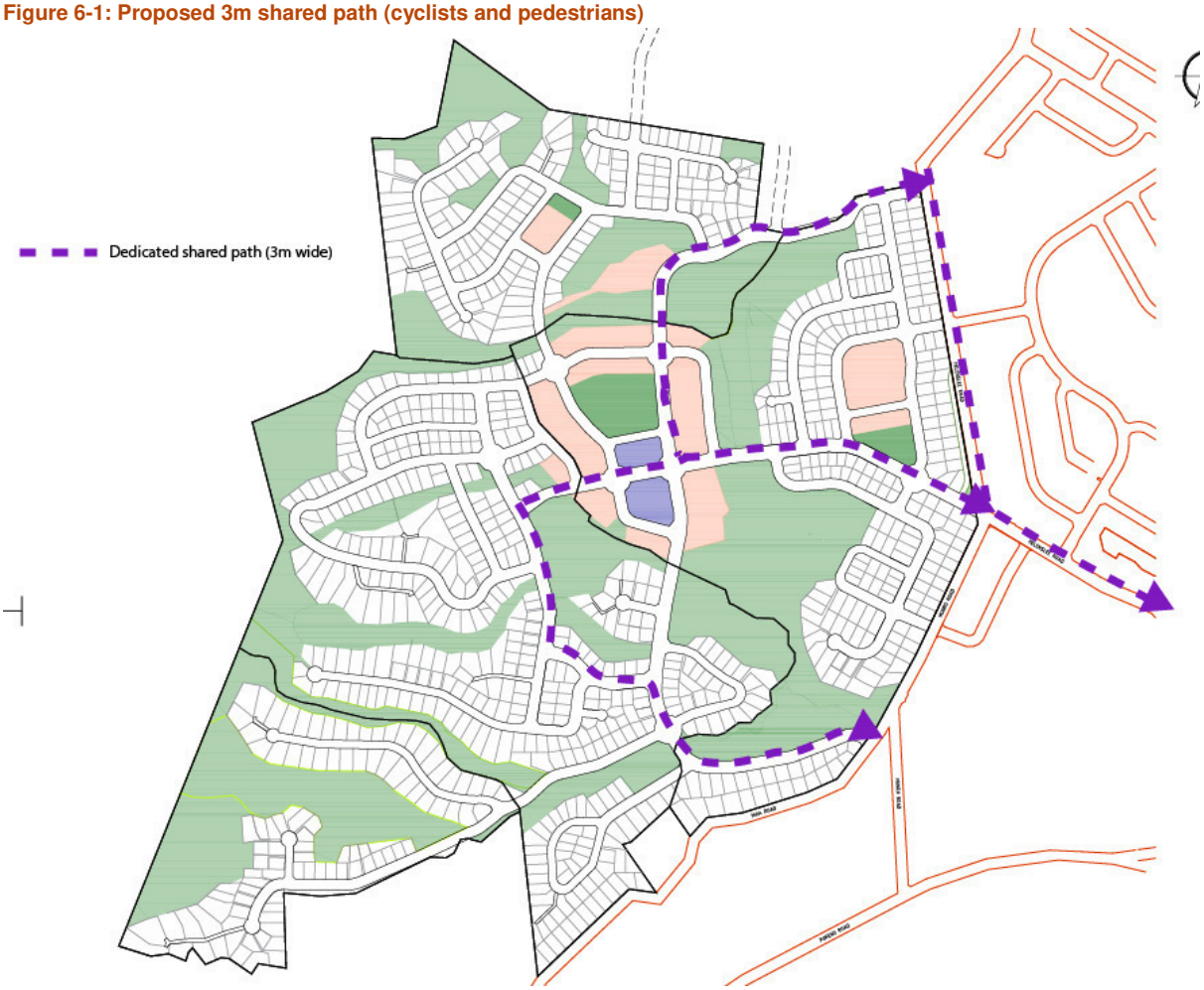
A comprehensive cycling network will serve the site. The proposed cycling provisions include:

- Shared off-road (3m) path along the proposed collector road network (along one-side) which connects to the existing road network (i.e. Helenslee Road, Huia Road and Munro Road).
- Shared off-road 3m cycle path along Helenslee Road (east side) from the northern boundary of the site to the intersection with Pokeno Road.

Given the level of residential development along this route, specifically a large portion of the structure plan residential developments located directly east of the site, this is likely to encourage residents to other modes of transport when travelling to and from the Pokeno centre and local school.

Figure 6-1 outlines the cycling provisions included as part of the development (dashed purple line).

Figure 6-1: Proposed 3m shared path (cyclists and pedestrians)



7 TRIP GENERATION

7.1 GUIDELINES

The RTA Guide[5] provides traffic generation rates that are considered to be appropriately applied to the potential residential facility at 53 Munro Road in Pokeno.

The potential residential units were assessed and is most similar to in concept / location of a 'dwelling house'. As such, the RTA Guide predicts a peak hour trip rate of 0.85 trips / dwelling and daily trip rate of 9.0 trips / dwelling.

[5] The Roads and Traffic Authority of New South Wales – Guide to Traffic Generating Developments (RTA)

7.2 PROPOSED LEVEL OF GENERATION

7.2.1 RESIDENTIAL COMPONENT

The likely trip generation for the site is defined as follows:

Table 3: Additional traffic generation

Activity	RTA Rate	Number / GFA	Peak Hour Vehicle Trips	Daily Vehicle Trips
Dwelling house	*'0.85 trips / dwelling for peak hour & 9.0 trips / dwelling for daily trips'*	1350 x lots	1147	12,150

As shown above, the proposed development is likely to generate in the order of 1,147 trips during the peak hour and 12,150 trips daily.

7.2.2 NEIGHBOURHOOD CENTRE

The neighbourhood centre proposed as part of the potential development will be located within the centre of the residential development. As such, it is considered that these shops will typically cater for the surrounding residential dwellings and is not likely to generate additional vehicle movements external to the site and therefore has not been assessed within the following sections.

7.3 EXISTING TRAFFIC VOLUMES

As outlined in Section 2.6 of this report, traffic volumes (undertaken in November 2016) were extracted from the Pokeno Intersection Assessment report for the following key intersections:

- Pokeno Road/ Munro Road;
- Pokeno Road/ Helenslee Road;
- Pokeno Road/ Great South Road;
- Great South Road/ SH1 NB on-ramp.

Of note, for the purpose of this assessment, the surveyed volumes were distributed to the wider network, based on the existing land-use, to determine the level of traffic volumes at the intersections near the site. **Appendix B** sets out the survey results including the estimated traffic volumes at intersections within proximity of the site.

7.4 POKENO INTERSECTION ASSESSMENT VOLUMES

The PSP paramics model volumes were used to inform the PSP and have been accepted by the Waikato District Council and are considered the best available flows to determine the future demand at key intersections within Pokeno. Since the development of the existing PSP paramics model, several changes have occurred to the roading environment which are likely to alter the direction of travel for traffic volumes. These changes include:

- The closure of the Ford Street connection onto Great South Road;
- The North Island Main Trunk (NIMT) crossing was modelled on High Street, not McLean Street;
- Hill Park Drive now connects to Helenslee Road rather than Pokeno Road.

As such, the traffic volumes have been redistributed to cater for the above changes and are outlined in the Pokeno Intersection Assessment report. Of note, that report has also identified an additional two developments, comprising a total of some 430 dwellings, which have been added to the PSP volumes; both developments are expected to be 50% completed by 2022 and fully completed by 2040 respectively.

Therefore, for the purpose of this assessment, the total existing traffic volumes (referred to as the 'base volumes') for the year 2022 are the sum of the following;

- 2016 survey results undertaken by BECA in November 2016 (outlined in section 5.2 of this report);
- PSP 2022 paramics model volumes[6];
- Two new developments (total 430 dwellings).

Appendix C provides the base volumes predicted for the years 2022 and 2040.

8 NETWORK ANALYSIS

8.1 GENERAL

The Pokeno Intersection Assessment report provides indicative intersection forms for the years 2022 and 2040 for existing intersections within Pokeno. This assessment has been undertaken using the PSP 2022 paramics model volumes, existing surveyed volumes and additional development traffic, and is provide in Table 4 below.

[6] Extracted from the Pokeno Intersection Report prepared by the Waikato District Council/ BECA Ltd;

Table 4: Traffic volumes extracted from the Pokeno Intersection Report for the year 2022 and 2040

Table 6: Modelled Daily Traffic Flows

Modelled Approach VPD	Approach					Warrant
2016	N	E	S	W	Total	
Pokeno Road / Munro Road	400	1,100	-	1,600	3,100	Give-way
Pokeno Road / Helenslee Road	600	1,400	-	1,300	3,300	Give-way
Pokeno Road / McLean Street	-	-	-	-	0	Give-way
Pokeno Road / Great South Road	1,100	-	1,900	1,200	4,200	Give-way
Great South Road / SH1 NB On-Ramp	1,700	-	1,400	5	3,100	Give-way
½ Development, 2022	N	E	S	W	Total	
Pokeno Road / Munro Road	800	2,900	-	3,500	7,200	Give-way / Roundabout
Pokeno Road / Helenslee Road	1800	4,100	-	2,900	8,800	Signals/Roundabout
Pokeno Road / McLean Street	-	4,900	2,700	3,500	11,100	Signals/Roundabout
Pokeno Road / Great South Road	5,700	-	5,100	5,300	16,100	Signals/Roundabout
Great South Road / SH1 NB On-Ramp	3,700	100	6,000	0	9,800	Signals/Roundabout
Full Development, 2040	N	E	S	W	Total	
Pokeno Road / Munro Road	1,100	4,800	-	5,300	11,200	Give-way / Roundabout
Pokeno Road / Helenslee Road	3,000	6,700	-	4,600	14,300	Signals/Roundabout
Pokeno Road / McLean Street	-	9,900	5,400	7,100	22,400	Signals/Roundabout
Pokeno Road / Great South Road	10,400	-	8,400	9,400	28,200	Signals/Roundabout
Great South Road / SH1 NB On-Ramp	5,600	200	11,100	0	16,900	Signals/Roundabout

As shown above, all the intersections (potentially excluding the Pokeno Road/ Munro Road intersection) will require some form of mitigation by the year 2022. Of note, no detailed designs of these intersection are available.

As such, the following sections assess the intersection layouts required to cater for the future development volumes (planned and proposed) for the year 2022 and 2040. It is noted that the recommended intersection layouts outlined in this report are indicative only and subject to change of demand.

In this regard, a SIDRA intersection analysis has been undertaken (on the surrounding road network) to determine the intersection performance as a result of the predicted traffic volumes for the years 2022 and 2040. The five new intersections (Intersection A – D & F as shown in Figure 8-1 below) proposed by the development will be assessed. Furthermore, the key surrounding (existing) intersections have been included in this assessment;

- (E) Huia Road / Munro Road;
- (G) Pokeno Road / Munro Road;
- (H) Helenslee Road / Pokeno Road;
- (I) Pokeno Road / McLean Street (planned new intersection).
- (J) Pokeno Road / Great South Road; and
- (K) Great South Road / SH1 On-ramp.

Figure 8-1 sets out the location of each intersection in relation to the surrounding environment

Figure 8-1: Intersections

8.2 TRIP DISTRIBUTION / MODEL GENERATION

8.2.1.1 PROPOSED DEVELOPMENT DISTRIBUTION ASSUMPTIONS

All trips associated with the 1,350 dwellings have been added to the existing road network.

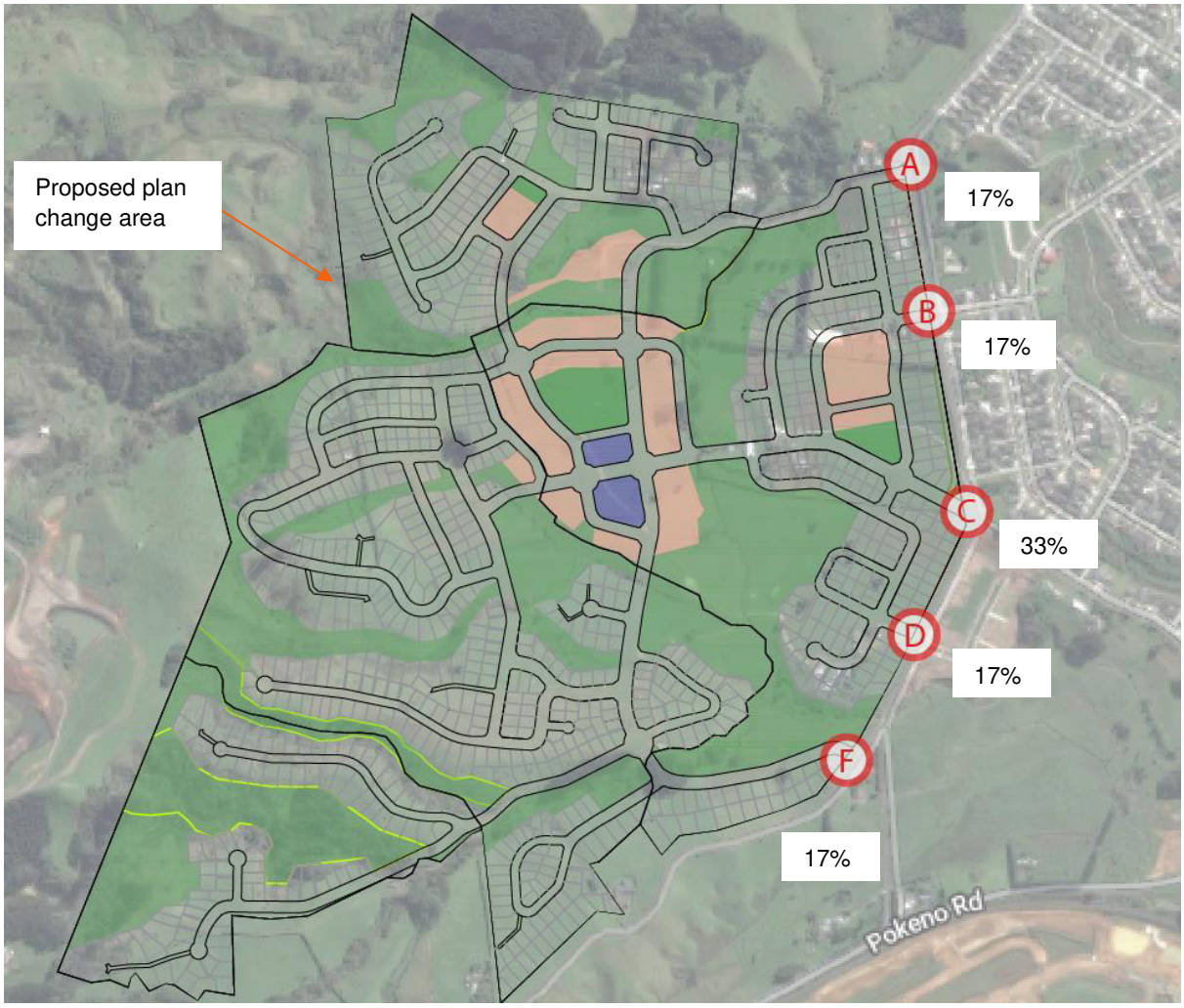
The RTA guide suggests that 80% of the trips by a residential development during the morning peak hour are exit movements and 20% are entry movements with the reverse occurring during the evening peak hour. Therefore, a total of 918 egress movements are expected during the morning peak hour (230 ingress movements).

Vehicle movements to and from the site (during the morning and evening peak hour) via the five proposed intersections, are assumed to be distributed as shown in Table 5 and Figure 8-2 below.

Table 5: Distribution of vehicle movements between intersections

Intersection	Distribution of vehicle movements
Int A	17%
Int B	17%
Int C	33%
Int D	17%
Int F	17%

Figure 8-2: Proposed new intersections connecting to development



Traffic distribution rates from the Pokeno Intersection Assessment report were calibrated to represent the directional vehicle movement proportions to and from Auckland, Pokeno and Waikato (west) during the AM and PM peak hours respectively. These rates were used in the PSP paramics model, specifically for the residential area on Helenslee Road, and are summarised in Table 6 and Table 7 below.

Table 6: AM peak

Direction	Auckland	Pokeno	Waikato	TOTAL
In from	26%	47%	26%	100%
Out to	36%	52%	12%	100%

Table 7: PM peak

Direction	Auckland	Pokeno	Waikato	TOTAL
In from	42%	41%	17%	100%
Out to	34%	39%	27%	100%

As can be seen above, during the morning peak hour the majority of commuters are expected to travel to Pokeno and Auckland with a small proportion of residents expected to commute to the wider Waikato region.

The direction of the vehicle movements and the route that commuters were likely to take was determined according to their destinations (Auckland, Pokeno and Waikato). When distributing traffic at each of the proposed intersections, the following assumptions were made:

- For trips to and from Auckland
  - Vehicles are expected to use the northern SH1 off-ramp when entering the site therefore will approach the site from the north;
  - Similarly, vehicles exiting to Auckland will utilise the northern on-ramp and therefore will travel north on Helenslee Drive.
- For trips to and from Hamilton and the Pokeno town centre;
  - All vehicles leaving the site will head south along Helenslee Road or Munro Road towards the town centre or SH1 southbound on-ramp (vice versa for vehicle movements into the site).
- For trips to and from Waikato (west);
  - All vehicles leaving the site will head south along Munro Road towards Pokeno Road with the reverse occurring for vehicles entering the site from west.

In summary, the trips generated by the potential residential development at the site comprising of some 1,350 dwellings can be distributed accordingly to the inbound/ outbound percentage (80% / 20% split) to estimate the number of vehicles travelling into and out of the site for each morning and afternoon peak hours. The directional proportions provided by BECA (shown in Table 6 and Table 7) can then be used to determine the actual number of trips to and from Auckland, Pokeno and Waikato during the morning and afternoon peak hours, which are shown in Table 8 and Table 9 below.

Table 8: AM peak trips

Direction	Auckland	Pokeno	Waikato	TOTAL
In from	60	108	60	228 trips
Out to	330	477	110	917 trips

Table 9: PM peak trips

Direction	Auckland	Pokeno	Waikato	TOTAL
In from	385	376	156	917 trips
Out to	78	88	62	228 trips

As shown above, the morning peak hour vehicle movement consists of a total of 228 inbound movements and 917 outbound movements with the reverse occurring during the evening peak hour.

8.2.1.2 ADDITIONAL TRAFFIC MOVEMENTS

Appendix D provides the estimated development traffic movements, at the proposed intersections and surrounding existing intersections, generated by the potential residential development at the site.

8.2.1.3 PROPOSED TRAFFIC MOVEMENTS

Appendix E sets out the predicted traffic volumes (proposed and planned) during the morning and evening peak for the year 2022 and 2040 respectively.

Of note, for the purpose of this assessment, the traffic volumes have been assessed for years 2022 and 2040. The level of the potential residential development expected to be established for the year 2022 and 2040 are as follows:

- Scenario 2022: base volumes plus 70% of the proposed development;
- Scenario 2040: base volumes plus 100% of the proposed development.

9 ASSESSMENT OF EFFECTS

9.1 ASSESSMENT METHODOLOGY

The traffic effects of the indicative development have been assessed using the traffic modelling software SIDRA Intersection.

The results presented in this report include the Degree of Saturation, which is a measure of available capacity and the Level of Service ("LOS), which is a generalised function of delay. For signal-controlled intersections, a Degree of Saturation less than 0.9 is considered acceptable. LOS A and B are very good and indicative of free-flow conditions; C is good; D is acceptable; and E and F are indicative of congestion and unstable conditions.

As noted, this assessment assesses the intersection layout required to cater for the impact of the potential residential development on the surrounding road network and if the additional volumes trigger a change to the intersection form than that recommended in the Pokeno Intersection Assessment report. As noted, the recommended intersection layouts outlined in this report are indicative only and subject to change of demand.

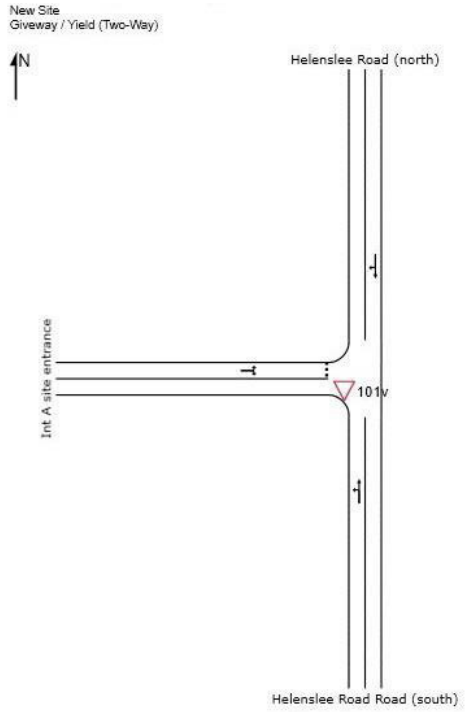
9.2 INT A - SITE ENTRANCE/ HELENSLEE ROAD (PROPOSED INTERSECTION)

9.2.1 RECOMMENDED LAYOUT

This is a new intersection that will be established as part of the potential residential subdivision and as such no layout is outlined in the Pokeno Intersection Assessment report.

This intersection will be give-way controlled with priority to traffic along Helenslee Road. The layout of the intersection is set out in Figure 9-1 below.

Figure 9-1: Intersection A recommended layout (indicative)



9.2.2 SIDRA MODELLING RESULTS

The intersection performance for the year 2022 and 2040 is summarised in Table 10 and Table 11 below.

Table 10: Intersection A am movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.22 (0.305)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.22 (0.305)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
North: Helenslee Road	TH	0.173 (0.269)	0.1 (0.1)	LOS A (A)	0.03 (1.0)
	RT	0.173 (0.269)	7.4 (9.0)	LOS A (A)	0.03 (1.0)
West: Site entrance	LT	0.142 (0.302)	7.1 (8.9)	LOS A (A)	3.4 (8.0)
	RT	0.142 (0.302)	9.6 (14.9)	LOS A (B)	3.4 (8.0)
Intersection performance		0.220 (0.305)	1.2 (1.7)	NA	3.4 (8.0)

Table 11: Intersection A PM movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.169 (0.244)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.169 (0.244)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
North: Helenslee Road	TH	0.304 (0.419)	0.2 (0.5)	LOS A (A)	3.1 (7.7)
	RT	0.304 (0.419)	7.0 (8.6)	LOS A (A)	3.1 (7.7)
West: Site entrance	LT	0.040 (0.091)	6.4 (6.9)	LOS A (A)	0.9 (1.9)
	RT	0.040 (0.091)	10.5 (15.7)	LOS B (C)	0.9 (1.9)
Intersection performance		0.304 (0.419)	1.0 (1.5)	NA	3.1 (7.7)

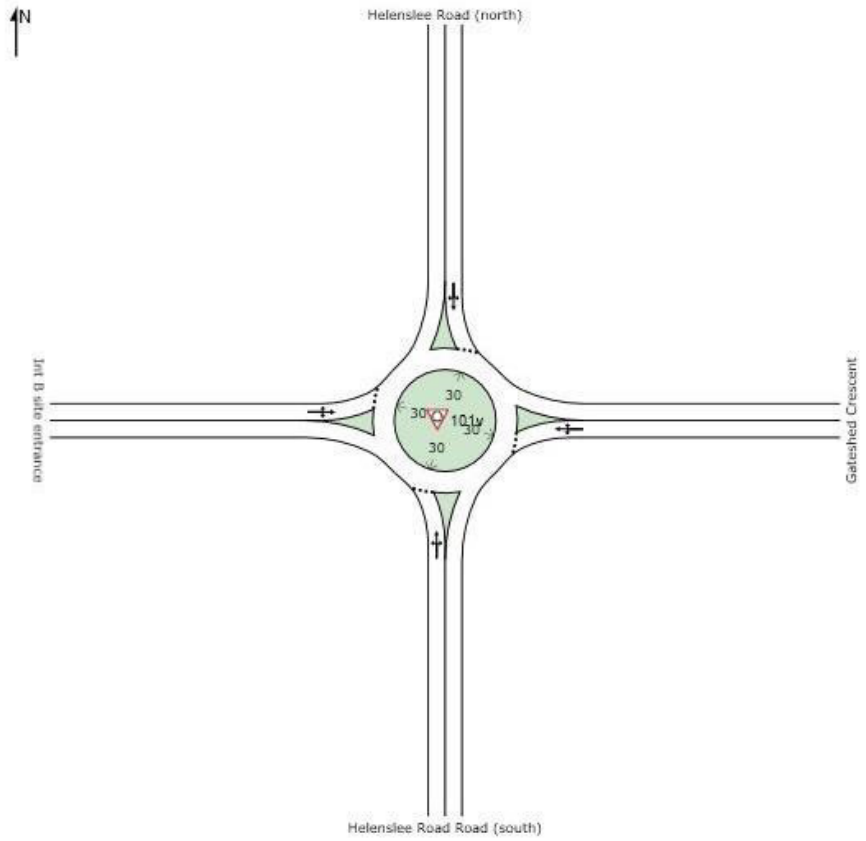
As shown above, the intersection continues to work acceptably for both years (2022 and 2040). All movements operate at overall LOS A – B in 2022, with the right turn movement from the site approach changing to LOS C in 2040 (PM). The maximum average delay increases from 9.6 seconds (2022) to 14.9 seconds (2040) during the morning peak hour, and from 10.5 seconds to 15.7 seconds during the evening peak hour. The maximum 95%tile queue in both years is under 10 m. Therefore, based on the potential traffic volumes at this intersection, the proposed layout is considered adequate to cater for the predicted traffic volumes in 2022 and 2040.

9.3 INT B - SITE ENTRANCE/ HELENSLEE ROAD/ GATESHEAD CRESCENT (PROPOSED CROSS INTERSECTION)

9.3.1 RECOMMENDED LAYOUT

The existing intersection (T-intersection) is give-way controlled. As a result of the proposal, the proposed road connecting to this intersection (from the site) will form a cross intersection. Therefore, the proposal intends to establish a roundabout (as shown in Figure 9-2 below) to mitigate any safety concerns of a cross-road intersection.

Figure 9-2: Proposed intersection layout



9.3.2 MODELLING RESULTS

Intersection B is to be a single lane roundabout. The performance of the intersection for the year 2022 and 2040 is summarised in Table 12 and Table 13 below.

Table 12: Intersection B AM movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.276 (0.391)	3.6 (3.8)	LOS A (A)	14.9 (24.6)
	TH	0.276 (0.391)	3.4 (3.6)	LOS A (A)	14.9 (24.6)
	RT	0.276 (0.391)	9.3 (.5)	LOS A (A)	14.9 (24.6)
Gateshead Crescent	LT	0.110 (0.197)	6.1 (8.2)	LOS A (A)	4.6 (9.2)
	TH	0.110 (0.197)	5.8 (8.0)	LOS A (A)	4.6 (9.2)
	RT	0.110 (0.197)	11.8 (13.9)	LOS B (B)	4.6 (9.2)

North: Helenslee Road	LT	0.285 (0.451)	3.9 (4.3)	LOS A (A)	14.8 (28.3)
	TH	0.285 (0.451)	3.7 (4.1)	LOS A (A)	14.8 (28.3)
	RT	0.285 (0.451)	9.6 (10.0)	LOS A (A)	14.8 (28.3)
West: Site entrance	LT	0.107 (0.177)	5.9 (7.3)	LOS A (A)	4.4 (7.9)
	TH	0.107 (0.177)	5.7 (7.1)	LOS A (A)	4.4 (7.9)
	RT	0.107 (0.177)	11.6 (13.0)	LOS B (B)	4.4 (7.9)
Intersection performance (total)		**0.285 (0.451)**	**4.7 (5.3)**	**LOS A (A)**	**14.9 (28.3)**

Table 13: Int B 2040 PM movement summary

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.292 (0.432)	3.7 (3.9)	LOS A (A)	14.9 (26.5)
	TH	0. 292 (0. 432)	3.4 (3.7)	LOS A (A)	14.9 (26.5)
	RT	0. 292 (0. 432)	9.4 (9.6)	LOS A (A)	14.9 (26.5)
Gateshead Crescent	LT	0.031 (0.055)	6.6 (8.3)	LOS A (A)	1.3 (2.5)
	TH	0.031 (0.055)	6.3 (8.1)	LOS A (A)	1.3 (2.5)
	RT	0.031 (0.055)	12.2 (14.0)	LOS B (B)	1.3 (2.5)
North: Helenslee Road	LT	0.404 (0.566)	3.9 (4.4)	LOS A (A)	22.7 (39.4)
	TH	0. 404 ((0.566)	3.7 (4.1)	LOS A (A)	22.7 (39.4)
	RT	0. 404 ((0.566)	9.6 (10.1)	LOS A (B)	22.7 (39.4)
West: Site entrance	LT	0.026 (0.044)	5.4 (6.6)	LOS A (A)	1.0 (1.9)
	TH	0. 026 (0. 044)	5.2 (6.3)	LOS A (A)	1.0 (1.9)
	RT	0. 026 (0. 044)	11.1 (12.3)	LOS B (B)	1.0 (1.9)

Intersection performance (total)	**0.404 (0.566)**	**4.4 (4.9)**	**LOS A (A)**	**22.7 (39.4)**

As shown above, the intersection continues to work acceptably in both years (LOS A). The right turn from Gateshead Crescent experiences the highest average delay; 11.8 seconds to 13.9 seconds in the morning peak hour and from 12.2 seconds to 14.0 seconds in the evening peak hour. In 2022, Helenslee Road (both approaches) experience the higher 95%tile queues during the morning and afternoon peak (approximately 15 – 20 m). This increases to some 20 – 30 m in 2040.

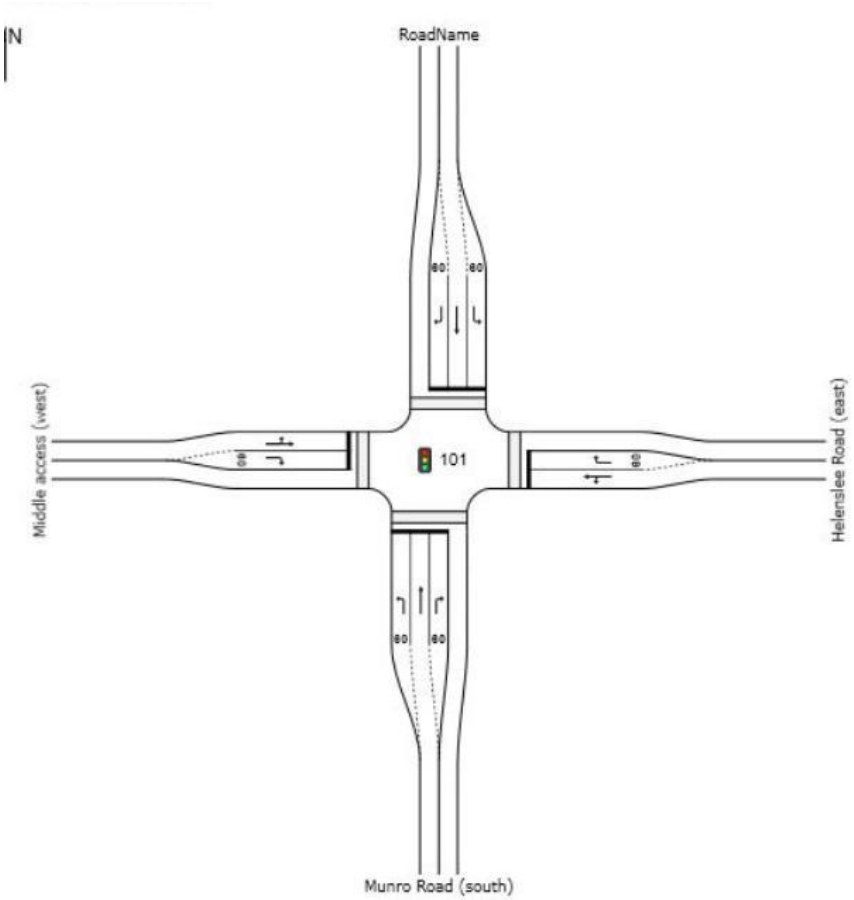
As such, a single lane roundabout intersection is considered adequate to cater for the predicted future traffic demands (planned and proposed) in 2022 and 2040.

9.4 INT C – SITE ENTRANCE/ HELENSLEE ROAD/ MUNRO ROAD (PROPOSED CROSS INTERSECTION)

The proposed Helenslee Road / Munro Road intersection is currently a give-way controlled intersection with priority to traffic along Helenslee Road. Of note, this intersection is not mentioned within the Pokeno Intersection Assessment report.

A new collector road will connect directly from the site to this intersection (west approach) thereby forming a cross road intersection. The proposal intends to signalise this intersection comprising a diamond phasing sequence. A traffic signal is considered appropriate in this location due to the high volumes of pedestrians and cyclists anticipated.

Figure 9-3: Proposed intersection layout



The performance of the intersection for the years 2022 and 2040 (AM and PM) are outlined in Table 14 and Table 15 below.

Table 14: Intersection C AM movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Munro Road	LT	0.058 (0.060)	25.2 (25.6)	LOS C (C)	4.1 (6.8)
	TH	0.432 (0. 410)	21.9 (22.9)	LOS C C)	36.0 (56.5)
	RT	0.188 (0. 321)	34.2 (46.3)	LOS C (D)	7.1 (12.6)
East: Helenslee Road	LT	0.114 (0.128)	31.4 (37.2)	LOS C (D)	5.6 (9.7)
	TH	0.114 (0.128)	25.8 (31.6)	LOS C (C)	5.6 (9.7)
	RT	0.652 (0.909)	34.9 (56.4)	LOS C (E)	34.7 (78.9)
North: Helenslee Road	LT	0.740 (0.881)	31.6 (44.3)	LOS C (D)	67.9 (157.6)
	TH	0. 289 (0.295)	21.0 (21.9)	LOS C (C)	23.1 (38.9)
	RT	0. 076 (0.141)	33.5 (45.3)	LOS C (D)	2.8 (5.4)
West: Site entrance	LT	0.722 (0.845)	36.0 (48.3)	LOS D (D)	40.7 (81.4)
	TH	0. 722 (0.845)	30.4 (42.7)	LOS C (D)	40.7 (81.4)
	RT	0. 101 (0.141)	31.4 (39.5)	LOS C (D)	4.8 (9.0)
Intersection performance		**0.740 (0.909)**	**29.1 (39.3)**	**LOS C (LOS D)**	**67.9 (157.6)**

Table 15: Intersection C PM movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.097 (0.126)	27.3 (30.1)	LOS C C)	6.2 (10.0)
	TH	0. 563 (0. 736)	24.4 (30.5)	LOS C (C)	42.9 (75.3)
	RT	0. 117 (0. 192)	33.8 (39.9)	LOS C (D)	4.4 (7.3)
	LT	0.329 (0.446)	31.5 (35.8)	LOS C (D)	18.7 (31.2)

East: Helenslee Road	TH	0.329 (0.446)	25.9 (30.2)	LOS C (C)	18.7 (31.2)
	RT	0.763 (0.446)	36.2 (42.6)	LOS D (D)	47.8 (86.7)
North: Helenslee Road	LT	0.464 (0.575)	29.5 (33.2)	LOS C (C)	32.9 (51.3)
	TH	0. 705 (0.861)	26.5 (37.1)	LOS C (D)	57.8 (100.4)
	RT	0. 475 (0.794)	35.5 (45.4)	LOS D (D)	18.7 (34.4)
West: Site entrance	LT	0.133 (0.182)	30.5 (34.2)	LOS C (C)	7.1 (11.8)
	TH	0. 133 (0.182)	24.9 (28.6)	LOS C (C)	7.1 (11.8)
	RT	0. 051 (0.053)	30.0 (30.4)	LOS C (C)	2.6 (3.9)
Intersection performance		**0.763 (0.861)**	**29.2 (36.0)**	**LOS C (LOS D)**	**57.8 (100.4)**

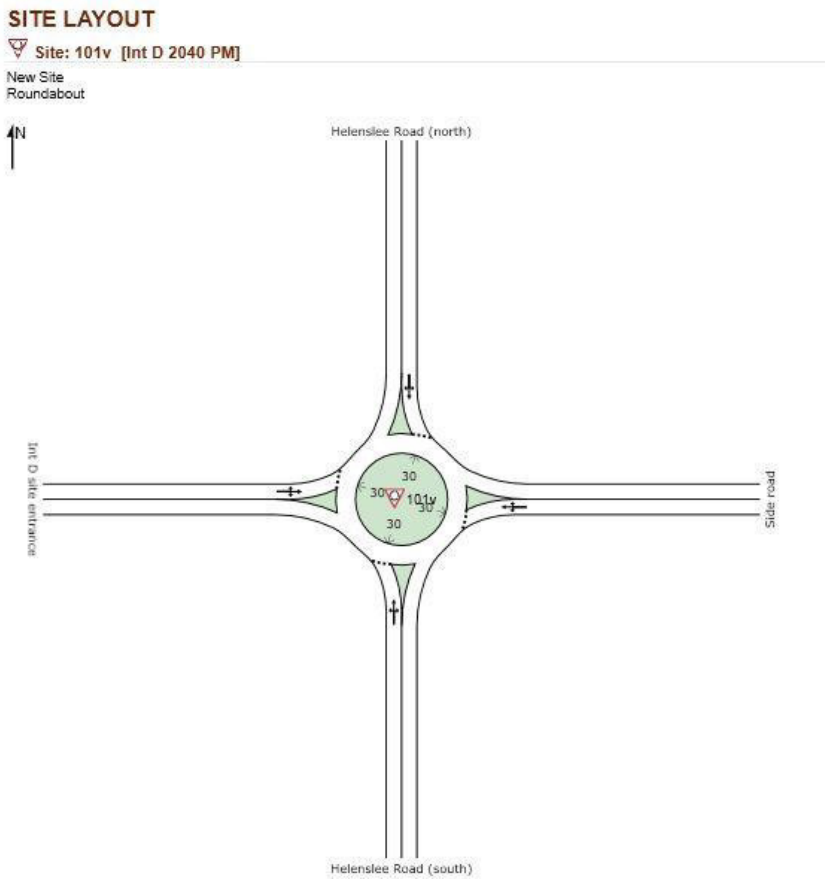
As shown above, the majority of movements operate at an acceptable level of service for 2022 with a maximum degree of saturation of 0.763 at the right turn on Helenslee Road (east) and a LOS C during the morning peak and LOS D in the evening peak. This is less than 0.9 and is therefore considered acceptable.

In 2040 the maximum degree of saturation for this movement increases to 0.909, reducing to LOS E in the morning peak. This is still considered acceptable given that it relates to a turning movement. The left turn movement on the northern approach (Helenslee Road) experiences the maximum 95%tile back of queue of 67.9m in 2022 (morning peak) and 157.6m in 2040. Overall, the intersection is expected to perform well in 2022 and experience strain in 2040 with the maximum degree of saturation for the all approaches performing at 0.909 during the morning peak.

9.5 INT D – SITE ENTRANCE/ MUNRO ROAD

The existing layout of this intersection is a T-intersection (with neighbouring subdivision currently under construction). As part of the development, a new road is proposed to connect, from the west, to this intersection thereby forming a cross road intersection. As such, it is proposed to establish a single lane roundabout at this intersection to mitigate any safety hazards relating to cross – road intersections. This intersection is not mentioned within the Pokeno Intersection Assessment report. Figure 9-4 shows the proposed layout of the intersection.

Figure 9-4: Intersection D proposed layout



The expected performance of the intersection for the years 2022 and 2040 (AM and PM) are outlined in Table 16 and Table 17 below.

Table 16: Intersection D AM movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.150 (0.202)	3.7 (3.8)	LOS A (A)	6.7 (9.6)
	TH	0.150 (0.202)	3.4 (3.6)	LOS A (A)	6.7 (9.6)
	RT	0.150 (0.202)	9.4 (9.5)	LOS A (A)	6.7 (9.6)
East: Side Road	LT	0.090 (0.139)	4.5 (5.1)	LOS A (A)	3.6 (5.8)
	TH	0.090 (0.139)	4.3 (4.9)	LOS A (A)	3.6 (5.8)
	RT	0.090 (0.139)	10.2 (10.8)	LOS B (B)	3.6 (5.8)
	LT	0.121 (0.178)	3.8 (4.0)	LOS A (A)	5.2 (8.2)

North: Helenslee Road	TH	0.121 (0.178)	3.5 (3.7)	LOS A (A)	5.2 (8.2)
	RT	0.121 (0.178)	9.5 (9.7)	LOS A (A)	5.2 (8.2)
West: Site entrance	LT	0.093 (0.141)	4.7 (5.3)	LOS A (A)	3.7 (5.9)
	TH	0.093 (0.141)	4.5 (5.0)	LOS A (A)	3.7 (5.9)
	RT	0.093 (0.141)	10.4 (11.0)	LOS B (B)	3.7 (5.9)
Intersection performance		**0.15 (0.202)**	**5.2 (5.6)**	**LOS A (A)**	**6.7 (9.6)**

Table 17: Intersection D PM movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.201 (0.290)	3.7 (3.9)	LOS A (A)	9.1 (14.5)
	TH	0.201 (0.290)	3.5 (3.7)	LOS A (A)	9.1 (14.5)
	RT	0.201 (0.290)	9.4 (9.6)	LOS A (A)	9.1 (14.5)
East: Side Road	LT	0.024 (0.038)	4.7 (5.2)	LOS A (A)	0.9 (1.5)
	TH	0.024 (0.038)	4.5 (5.0)	LOS A (A)	0.9 (1.5)
	RT	0.024 (0.038)	10.4 (10.9)	LOS B (B)	0.9 (1.5)
North: Helenslee Road	LT	0.215 (0.293)	3.7 (4.0)	LOS A (A)	9.8 (14.6)
	TH	0.215 (0.293)	3.5 (3.7)	LOS A (A)	9.8 (14.6)
	RT	0.215 (0.293)	9.4 (9.7)	LOS A (A)	9.8 (14.6)
West: Site entrance	LT	0.023 (0.038)	4.6 (5.2)	LOS A (A)	0.9 (1.5)
	TH	0.023 (0.038)	4.4 (4.9)	LOS A (A)	0.9 (1.5)
	RT	0.023 (0.038)	10.3 (10.9)	LOS B (B)	0.9 (1.5)
Intersection performance		**0.215 (0.293)**	**4.8 (5.1)**	**LOS A (A)**	**9.8 (14.6)**

As shown above, the intersection continues to work acceptably in both 2022 and 2040. From 2022 to 2040, the intersection continues to operate at overall LOS A with the maximum average delay increase from 5.2 seconds to 5.6 seconds (morning peak). The maximum queue increases by 5 m.

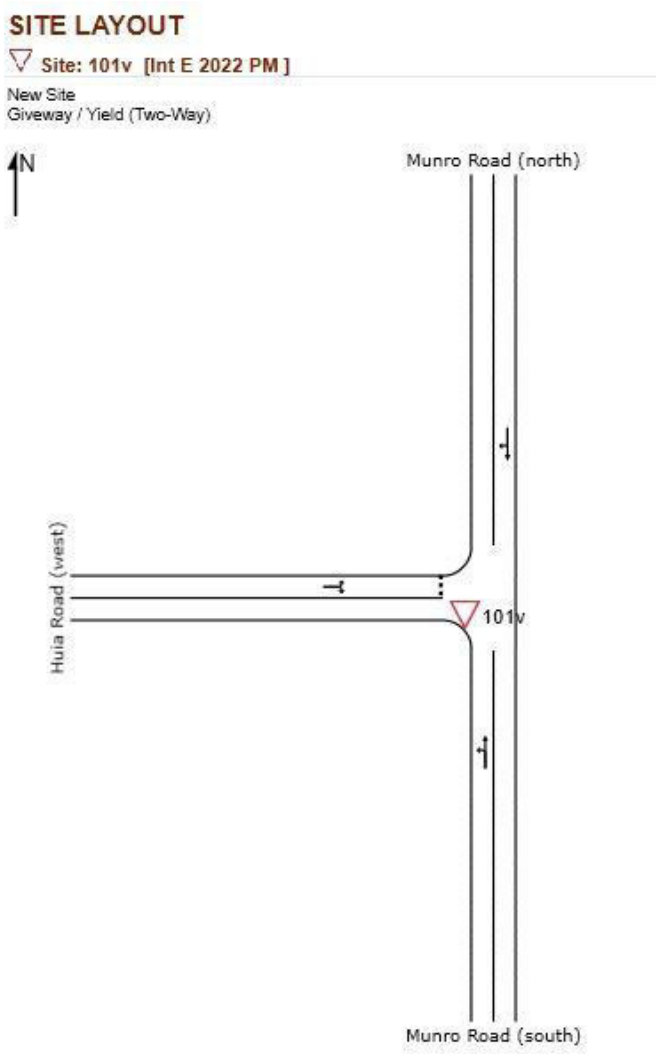
Overall, a single lane roundabout for this intersection is considered adequate to accommodate the predicted traffic volumes in 2022 and 2040.

9.6 INT E – HUIA ROAD/ MUNRO ROAD (EXISTING INTERSECTION)

The existing Huia Road/ Munro Road intersection is a priority-controlled intersection with priority afforded to traffic along Munro Road. This intersection does not connect directly to the site, however it does serve as the only access, via the existing road network, to the southernmost access (Intersection F) on Huia Road. This intersection is not mentioned within the Pokeno Intersection Assessment report. As such, modelling has been undertaken using the existing layout (give-way controlled) to determine when an upgrade is warranted.

Figure 9-5 sets out the existing layout of this intersection.

Figure 9-5: Huia Road/ Munro Road existing intersection layout



The intersection performance for each year (2022 and 2040) is summarised in Table 18 and Table 19 below.

Table 18: Intersection E AM movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.095 (0.121)	5.5(5.6)	LOS A (A)	0.0 (0.0)
	TH	0.095 (0.121)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
North: Helenslee Road	TH	0.099 (0.140)	0.0 (0.1)	LOS A (A)	0.5 (0.7)
	LT	0.099 (0.140)	6.1 (6.3)	LOS A (A)	0.5 (0.7)
West: Huia Road	LT	0.098 (0.155)	6.0 (6.2)	LOS A (A)	2.4 (3.9)
	RT	0.098 (0.155)	6.9 (7.7)	LOS A (A)	2.4 (3.9)
Intersection Performance (overall)		**0.099 (0.155)**	**1.9 (2.1)**	**N/A**	**2.4 (3.9)**

Table 19: Intersection E PM movement summary 2022 (2040)

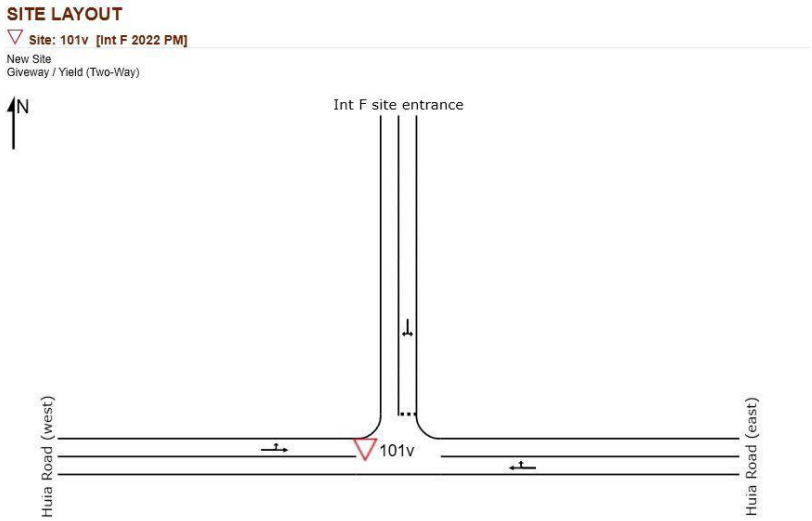
Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Helenslee Road	LT	0.146 (0.205)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.146 (0.205)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
North: Helenslee Road	TH	0.139 (0.188)	0.3 (0.6)	LOS A (A)	2.5 (4.2)
	LT	0.139 (0.188)	6.5 (7.2)	LOS A(A)	2.5 (4.2)
West: Huia Road	LT	0.027 (0.047)	6.2 (6.5)	LOS A (A)	0.6 (1.1)
	RT	0.027 (0.047)	7.5 (8.7)	LOS A (A)	0.6 (1.1)
Intersection performance		**0.146 (0.205)**	**1.6 (1.9)**	**N/A**	**2.5 (4.2)**

As shown above, the intersection is expected to operate at an acceptable level for the year 2022 and 2040. From 2022 to 2040, the overall intersection average delay increases from 1.9 seconds to 2.1 seconds in the morning peak and 1.6 seconds to 1.9 seconds in the afternoon peak. The maximum queue increases by some 2 m. Overall, the modelling results indicate that no mitigation is required at this intersection even with the additional vehicle movements as part of the potential residential development. It is however noted that this intersection is located in close proximity to a one-lane bridge on Munro Road (see Photograph 1 previously)

9.7 INT F – SITE ENTRANCE/ HUIA ROAD (PROPOSED INTERSECTION)

This intersection is proposed to connect the potential residential development directly to Huia Road. A local road is proposed to connect to Huia Road from the north forming a T-intersection. A give-way control intersection is recommended as shown in Figure 9-6.

Figure 9-6: Intersection F proposed layout



The intersection performance for each year (2022 and 2040) is summarised in Table 20 and Table 21 below.

Table 20: Intersection F AM movement summary results 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Huia Road	TH	0.019 (0.026)	0.0 (0.0)	LOS A (A)	0.6 (0.8)
	RT	0.019 (0.026)	5.5 (5.5)	LOS A (A)	0.6 (0.8)
North: Site entrance	LT	0.065 (0.0.092)	5.5 (5.5)	LOS A (A)	1.9 (2.7)
	RT	0.065 (0.092)	5.6 (5.6)	LOS A (A)	1.9 (2.7)
West: Huia Road	LT	0.001 (0.001)	5.5 (5.5)	LOS A (A)	0.0 (0.0)
	TH	0.001 (0.001)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
Intersection performance		**0.065 (0.092)**	**5.2 (5.2)**	**NA**	**1.9 (2.7)**

Table 21: Intersection F PM movement summary results 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Huia Road	TH	0.062 (0.088)	0.0 (0.0)	LOS A (A)	2.1 (3.0)
	RT	0.062 (0.088)	5.5 (5.5)	LOS A (A)	2.1 (3.0)
North: Site entrance	LT	0.017 (0.023)	5.5 (5.5)	LOS A (A)	0.5 (0.7)
	RT	0.017 (0.093)	5.8 (6.0)	LOS A (A)	0.5 (0.7)
West: Huia Road	LT	0.001 (0.001)	5.5 (5.5)	LOS A (A)	0.0 (0.0)
	TH	0.001 (0.001)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
Intersection performance		**0.062 (0.088)**	**5.1 (5.2)**	**NA**	**2.1 (3.0)**

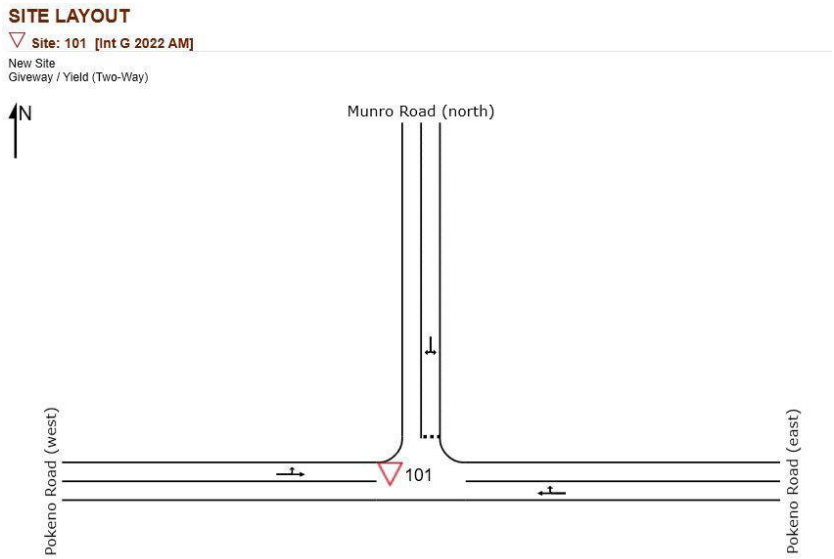
As shown above, the intersection is expected to operate at an acceptable level of service for the year 2022 and 2040. In 2040, the maximum average delay is 6.0 seconds and occurs during the evening peak (at the site entrance) with a maximum 95%tile back of queue of less than one car. As such, the recommended intersection layout is considered to perform well and is considered to be adequate to cater for the predicted traffic volumes in 2022 and 2040.

9.8 INT G – MUNRO ROAD/ POKENO ROAD (EXISTING INTERSECTION)

The existing Munro Road / Pokeno Road intersection is a give-way controlled intersection with priority afforded to traffic along Pokeno Road. The Pokeno Intersection Assessment report indicates that this intersection warrants a give-way control (existing) or roundabout by the year 2022 and 2040.

This intersection is mentioned within the Pokeno Intersection Assessment report which indicates that this intersection may warrant a roundabout by the year 2022 or 2040. In this regard, the intersection has been initially assessed using the existing layout (give-way) with upgrades made if required. Figure 9-7 sets out the layout of the existing intersection.

Figure 9-7: Intersection G AM existing layout



The intersection performance for each year (2022 and 2040) is summarised in Table 10 and Table 11.

Table 22: Intersection G AM movement summary results 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Pokeno Road	TH	0.199 (0.3)	0.2 (0.5)	LOS A (A)	1.3 (3.3)
	RT	0.199 (0.3)	8.4 (11.3)	LOS A (B)	1.3 (3.3)
North: Munro Road	LT	0.398 (0.9)	8.3 (28.1)	LOS A (D)	13.0 (64.8)
	RT	0.398 (0.9)	12.6 (39.1)	LOS B (E)	13.0 (64.8)
West: Pokeno Road	LT	0.296 (0.401)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.296 (0.401)	0.0 (0.1)	LOS A (A)	0.0 (0.0)
Intersection performance (overall)		**0.398 (0.900)**	**3.3 (8.6)**	**NA**	**13.0 (64.8)**

Table 23: Intersection G PM Movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Pokeno Road	TH	0.286 (0.448)	0.6 (1.9)	LOS A (A)	4.6 (14.1)
	RT	0.286 (0.448)	9.6 (15.0)	LOS A (C)	4.6 (14.1)

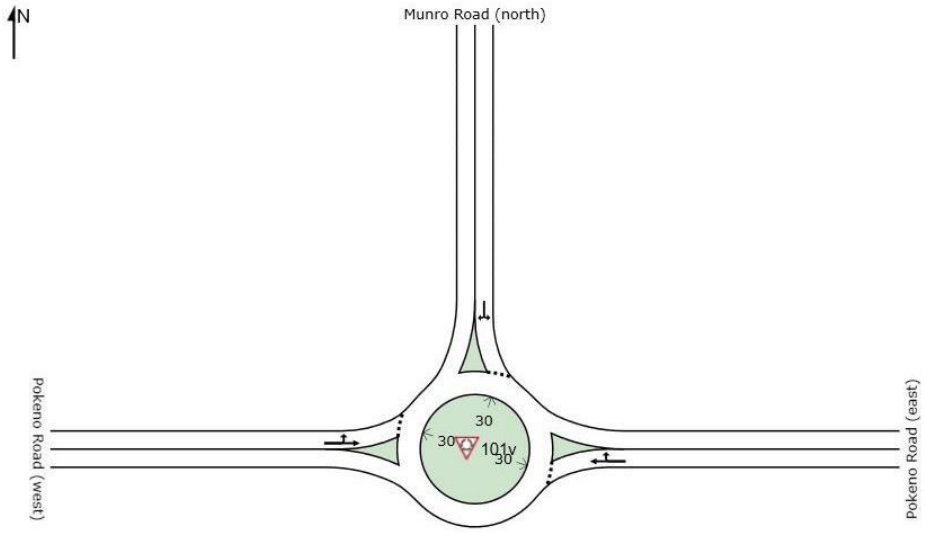
North: Munro Road	LT	0.516 (1.337)	10.0 (327.7)	LOS A (F)	16.5 (361.8)
	RT	0.516 (1.337)	16.7 (341.1)	LOS C (F)	16.5 (361.8)
West: Pokeno Road	LT	0.338 (0.464)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.338 (0.464)	0.0 (0.1)	LOS A (A)	0.0 (0.0)
Intersection performance (overall)		**0.516 (1.337)**	**3.9 (52.7)**	**NA**	**16.5 (361.8)**

As shown above, the intersection is expected to perform at an acceptable level of service for the year 2022 for both the morning and afternoon peak hour. In 2040, this intersection is expected to experience significant delays, in particular the Munro Road approach experiences a maximum delay of 341.1 seconds. As such, the predicted increase in traffic volumes from 2022 to 2040 is expected to reduce the level of service of this approach from LOS A and C to LOS F (both turning movements). The overall degree of saturation of the intersection declines from 0.516 in 2022 to 1.337 (over capacity) therefore the modelling results indicate that some mitigation is required at this intersection prior to 2040.

9.8.1 MITIGATION

As noted, the Pokeno Intersection Assessment report indicates that a roundabout may be warranted at this intersection for the year 2022 or 2040. Therefore, a roundabout layout has been used to model the traffic volumes in 2040 and is outlined in Figure 9-8 below.

Figure 9-8: Intersection G roundabout layout



The predicted intersection performance for each year 2040 is summarised in Table 24 below.

Table 24: Intersection G roundabout layout 2040 am (pm)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Pokeno Road	TH	0.477 (0.660)	4.9 (6.1)	LOS A (A)	29.8 (53.6)
	RT	0.477 (0.660)	10.9 (12.1)	LOS B (B)	29.8 (53.6)
North: Munro Road	LT	0.429 (0.358)	8.0 (8.0)	LOS A (A)	21.7 (18.0)
	RT	0.429 (0.358)	13.7 (13.7)	LOS B (B)	21.7 (18.0)
West: Pokeno Road	LT	0.467 (0.584)	3.5 (3.9)	LOS A (A)	34.2 (51.0)
	TH	0.467 (0.584)	3.3 (3.6)	LOS A (A)	34.2 (51.0)
Intersection performance		**0.477 (0.660)**	**5.7 (6.2)**	**LOS A (A)**	**34.2 (53.6)**

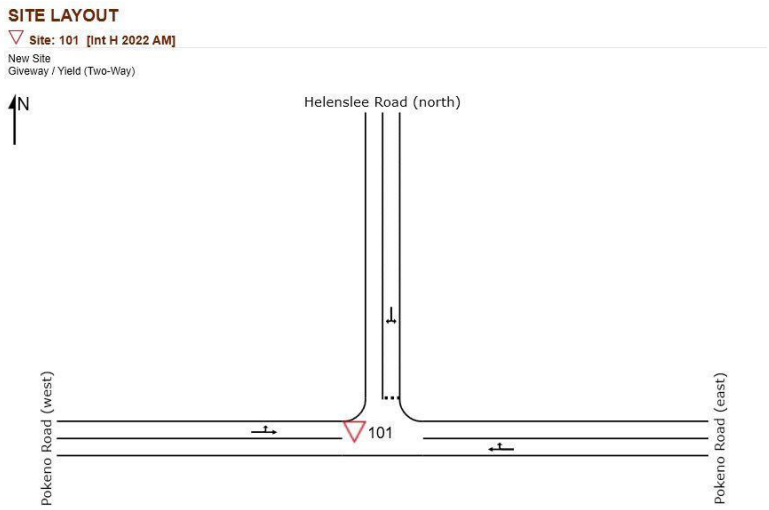
As shown above, the lanes operate at an acceptable level of service with a maximum average delay of 13.7 seconds in the afternoon peak and maximum 95%tile back of queue of 53.6 m (8 vehicles).

In summary, the existing intersection is expected to perform at an acceptable level of service in 2022, however, in 2040 the predicted traffic volumes (including potential and planned) is expected to reduce the performance of the intersection to LOS F on several approaches. Therefore, it is recommended that a single lane roundabout be established at this intersection prior to 2040. Given the length of the queue, consideration should be given to providing dedicated turning lanes for all approaches to reduce the queue lengths and delays. As noted, the Pokeno Intersection Assessment report also indicates that a roundabout may be warranted at this intersection for the year 2022 or 2040.

9.9 INT H – HELENSLEE ROAD/ POKENO ROAD (EXISTING INTERSECTION)

The Helenslee Road/ Pokeno Road intersection is existing and controlled by a give-way intersection. The Pokeno Intersection Assessment report states that a signal/ roundabout intersection form is warranted for the 2022 and 2040 at the Helenslee Road/ Pokeno Road intersection. In this regard, the existing layout of the intersection has been used to model the 2022 and 2040 predicted traffic volumes with upgraded made if required. Figure 9-9 shows the existing layout of the intersection.

Figure 9-9: Intersection H existing layout



The predicted intersection performance for the year 2022 and 2044 has been set out in Table 25 and Table 26 below.

Table 25: Intersection H AM intersection performance 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Pokeno Road	TH	0.352 (0.614)	1.9 (5.9)	LOS A (A)	15.7 (48.6)
	RT	0.352 (0.614)	8.6 (13.6)	LOS A (B)	15.7 (48.6)
North: Helenslee Road	LT	0.572 (1.255)	9.9 (247.9)	LOS A (F)	29.9 (787)
	RT	0.572 (1.255)	17.5 (268.7)	LOS C (F)	29.9 (787)
West: Pokeno Road	LT	0.263 (0.376)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.263 (0.376)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
Intersection performance (overall)		**0.572 (1.255)**	**5.1 (88.3)**	**NA**	**29.9 (787)**

Table 26: Intersection H PM Intersection performance 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Pokeno Road	TH	0.650 (1.095)	4.3 (99.4)	LOS A (F)	59.1 (718.5)
	RT	0.650 (1.095)	11.0 (16.5)	LOS B (F)	59.1 (718.5)

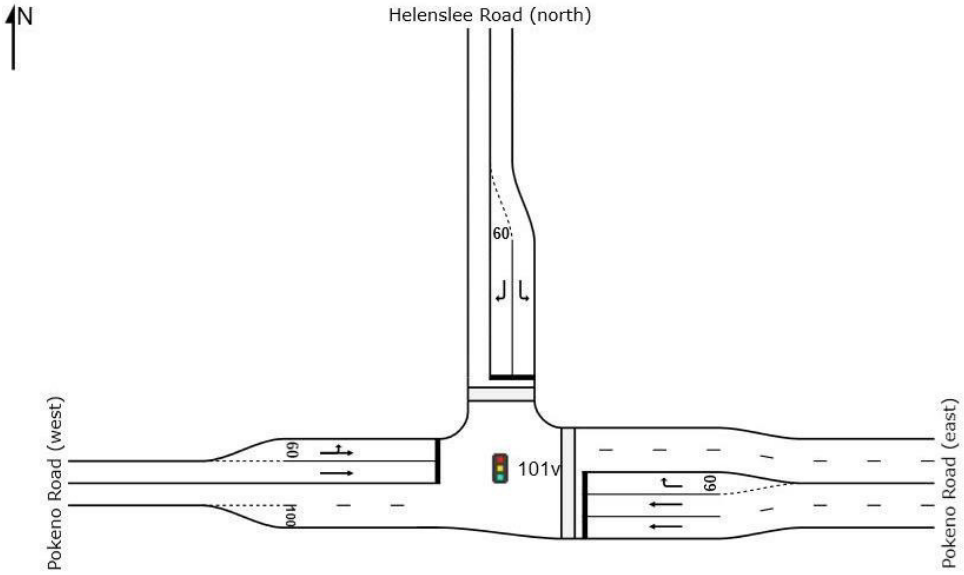
North: Helenslee Road	LT	0.396 (1.482)	8.8 (465.1)	LOS A (F)	13.2 (533.6)
	RT	0.396 (1.482)	27.9 (560.4)	LOS D (F)	13.2 (533.6)
West: Pokeno Road	LT	0.251 (0.343)	5.6 (5.6)	LOS A (A)	0.0 (0.0)
	TH	0.251 (0.343)	0.0 (0.0)	LOS A (A)	0.0 (0.0)
Intersection performance (overall)		**0.650 (1.482)**	**5.8 (126.1)**	**NA**	**59.1 (718.5)**

As shown above, the intersection performs at an acceptable LOS in the morning and afternoon peak hour in 2022 (LOS A – D). The modelling shows that the performance of the intersection significantly declines by the year 2040 with delays of up to 268.7 seconds in the morning peak and 560.4 seconds in the evening peak. In this regard, the existing intersection layout is considered appropriate to cater for the predicted 2022 volumes however will be required to change to a roundabout or signal control prior to the year 2040. It is noted, that given the level of development expected to occur on Helenslee Road (planned and potential), additional turning treatment should be provided by 2022 to facilitate movements to and from Helenslee Road.

9.9.1 MITIGATION

In this regard, an at-grade signalised intersection has been used to model the traffic volumes predicted in 2040 as shown in Figure 9-10 below. The movement summary (am/pm) is provided in Table 27 below.

Figure 9-10: Intersection H signalised intersection layout



The results of the intersection performance for the years 2022 and 2044 has been set out in Table 27 below.

Table 27: Intersection H movement summary 2040 am (pm)

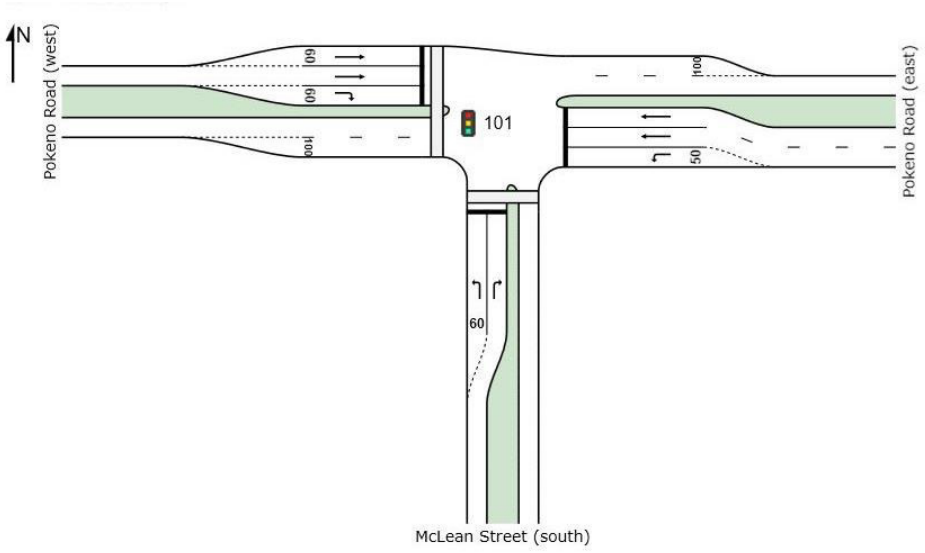
Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Pokeno Road	TH	0.311 (0.399)	5.2 (4.6)	LOS A (A)	25.2 (48.3)
	RT	0.547 (0.765)	13.9 (19.7)	LOS B (B)	21.2 (83.8)
North: Helenslee Road	LT	0.826 (0.285)	20.9 (12.8)	LOS C (B)	109.6 (31.9)
	RT	0.212 (0.140)	22.8 (31.5)	LOS C (C)	7.6 (6.9)
West: Pokeno Road	LT	0.826 (0.730)	26.6 (30.4)	LOS C (C)	59.4 (69.1)
	TH	0.826 (0.730)	21.1 (25.2)	LOS C (C)	59.4 (69.1)
Intersection performance (overall)		**0.826(0.765)**	**16.8(15.6)**	**LOS B (B)**	**109.6 (83.8)**

As shown above, the intersection is expected to perform at an acceptable LOS (LOS A – C). The maximum average delay is 26.6 seconds in the morning peak and 31.5 seconds (evening peak).

Overall, the modelling results agree with the recommendations outlined in the Pokeno Intersection Assessment report to provide signals at this intersection. Provided that the recommended layout is used at this intersection, the modelling results show that the intersection can accommodate the predicted volumes for the year 2040.

9.10 INT I – MCLEAN STREET/ POKENO ROAD (PLANNED)

This intersection is yet to be formed. The Pokeno Intersection Assessment report indicates that traffic signals or a roundabout is recommended for this planned intersection by 2022. Given the level of traffic volumes expected at this intersection, the following layout has been modelled for the year 2022.



The proposed McLean Road / Pokeno Road intersection is to be signalised. The intersection performance for each year (2022 and 2040) is summarised in Table 28 and Table 29.

Table 28: Intersection I AM movement summary results 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: McLean Road	LT	0.104 (0.183)	11.4 (11.5)	LOS B (B)	7.2 (16.2)
	RT	0.489 (0.819)	24.0 (32.6)	LOS C (C)	18.8 (54.1)
East: Pokeno Road	LT	0.220 (0.513)	11.8 (14.8)	LOS B (B)	16.1 (56.3)
	TH	0.710 (0.814)	17.7 (25.9)	LOS B (C)	40.4 (62.0)
West: Site entrance	TH	0.444 (0.448)	5.6 (6.5)	LOS A (A)	40.0 (50.2)
	RT	0.628 (0.713)	23.1 (16.2)	LOS C (B)	32.5 (48.6)
Intersection performance (overall)		**0.710 (0.819)**	**13.0 (15.9)**	**LOS B (B)**	**40.4 (62.0)**

Table 29: Intersection I PM movement summary results 2022 (2040)

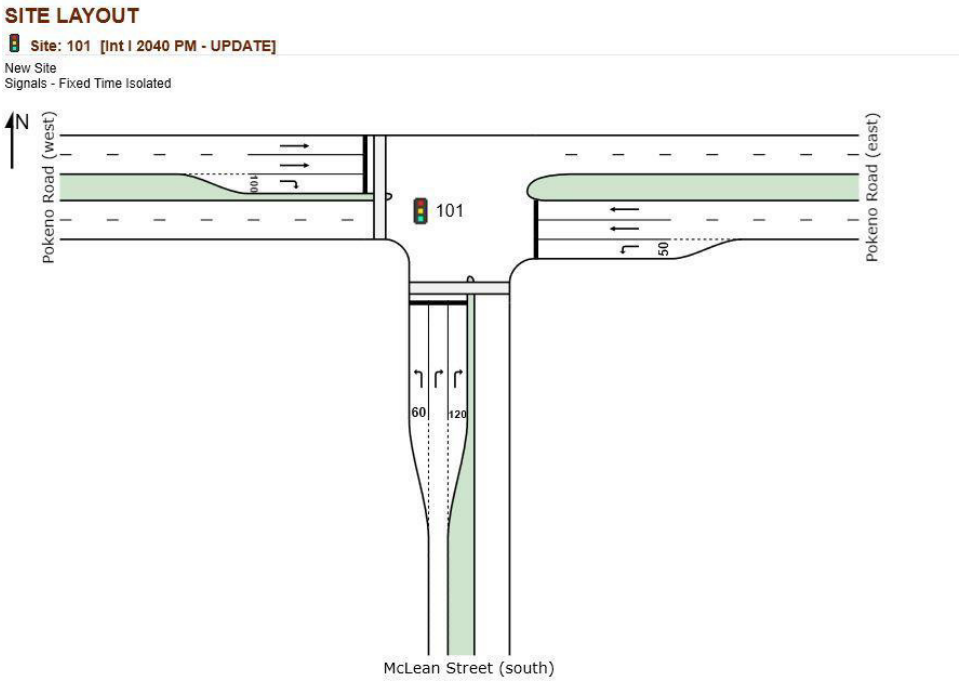
Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: McLean Road	LT	0.201 (0.322)	16.3 (29.2)	LOS B (C)	17.0 (90)
	RT	0.751 (0.981)	30.8 (99.3)	LOS C (F)	41.6 (299)
East: Pokeno Road	LT	0.124 (0.203)	9.3 (9.1)	LOS A (A)	9.8 (35.2)
	TH	0.821 (0.970)	18.3 (80.1)	LOS B (F)	107.3 (522.8)
West: Site entrance	TH	0.319 (0.336)	5.2 (17.8)	LOS A (B)	31.8 (100.4)
	RT	0.264 (0.800)	15.1 (62.3)	LOS B (E)	8.2 (85.0)
Intersection performance		**0.821 (0.981)**	**15.1 (56.9)**	**LOS B (LOS E)**	**107.3 (522.8)**

As shown above, the intersection is expected to perform at an acceptable level of service during the morning and afternoon peak in 2022 and morning peak (2040). The modelling results indicate that the intersection performance declines during the evening peak in 2040 with the majority of approaches performing at LOS F.

9.10.1 MITIGATION

Based on the above assessment, additional lanes have been provided at the approaches (where necessary) to cater for the predicted traffic volumes in 2040 as shown in Figure 9-11 below.

Figure 9-11: Intersection H - McLean Street/ Pokeno Road updated layout



It is noted that the intersection report outlines a high number of turning movements occurring left in and right out from this intersection. South of this intersection, the area is zoned as a mix of residential and business in the PSP therefore this is considered acceptable. Table 30 outlines the predicted intersection performance for the McLean Road/ Pokeno Road intersection for the year 2040 (with additional lanes).

Table 30: Intersection J Predicted intersection performance movement summary results am (pm)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: McLean Road	LT	0.187 (0.508)	19.9 (41.5)	LOS B (D)	38.7 (100.4)
	RT	0.491 (0.679)	57.3 (56.3)	LOS E (E)	53.1 (91.5)
East: Pokeno Road	LT	0.675 (0.214)	27.1 (9.7)	LOS C (A)	130.7 (34.1)
	TH	0.605 (0.705)	35.4 (19.3)	LOS D (B)	133.3 (228.0)
West: Site entrance	TH	0.347 (0.269)	5.3 (6.3)	LOS A (A)	69.2 (53.3)
	RT	0.560 (0.690)	24.9 (35.3)	LOS C (D)	94.3 (61.9)

Intersection performance	**0.675 (0.705)**	**23.5 (23.5)**	**LOS C (C)**	**133.3 (228.0)**

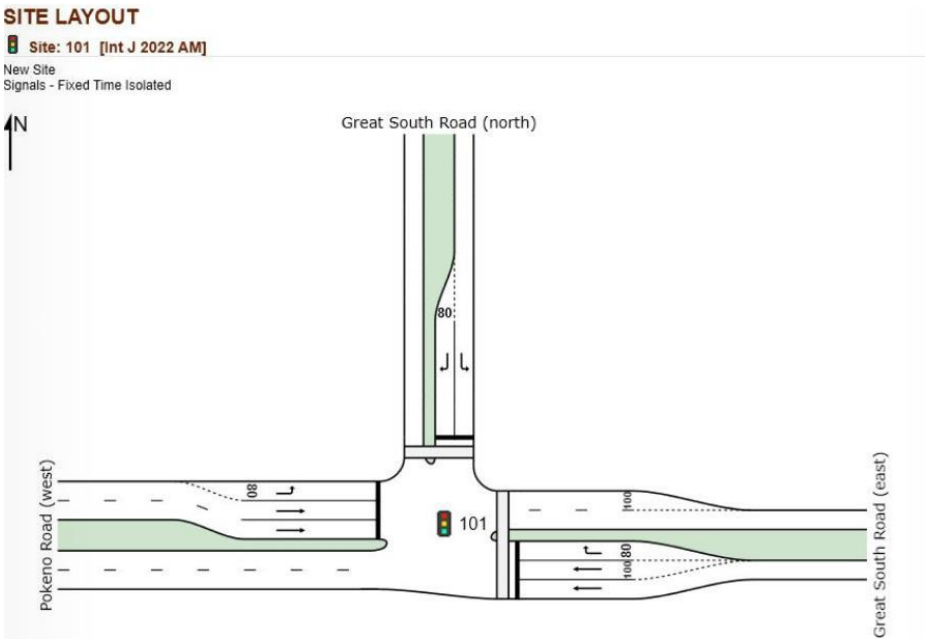
As shown above, the majority of the approaches perform at an acceptable level of service (A – D) during the morning and evening peak hour, with the exception of the right turn movement from the southern approach performing at LOS E. For both these movements the degree of saturation is below 0.9 and is therefore at an acceptable. Overall, the amended layout is considered adequate to cater for the predicted traffic volumes (planned and potential) in 2040. It is noted that the phasing time with nearby intersections should be synced to improve the performance of this intersection and reduce delays and congestion.

9.11 INT J – GREAT SOUTH ROAD/ POKENO ROAD

This intersection currently operates as a give-way control intersection.

The Pokeno Intersection Assessment report identifies that this intersection warrants a roundabout or signals by the year 2022 or 2040. In this regard, a signalised intersection layout has been used to model the traffic volumes for the years 2022 and 2040 and is shown in Figure 9-12 below.

Figure 9-12: Intersection J proposed intersection layout



The intersection performance for each year (2022 and 2040) is summarised in Table 31 and

Table 32.

Table 31: Intersection J AM movement summary results 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Great	TH	0.153 (0.235)	7.9 (30.2)	LOS A (C)	14.0 (62.3)
	RT	0.632 (1.102)	18.3 (161.9)	LOS B (F)	27.7 (235.8)

South Road					
North: Great South Road	LT	0.445 (0.976)	13.8 (72.7)	LOS B (E)	47.0 (351.1)
	RT	0.816 (1.311)	29.2 (352.7)	LOS C (F)	81.6 (1105.8)
West: Pokeno Road	LT	0.237 (0.357)	9.7 (10.3)	LOS A (B)	20.6 (75.9)
	TH	0.839 (1.179)	23.3 (173.4)	LOS C (F)	78.6 (598.9)
Intersection performance		**0.839 (1.311)**	**18.4 (155.4)**	**LOS B (F)**	**81.6 (1105.8)**

Table 32: Intersection J PM Movement summary results 2022 (2040)

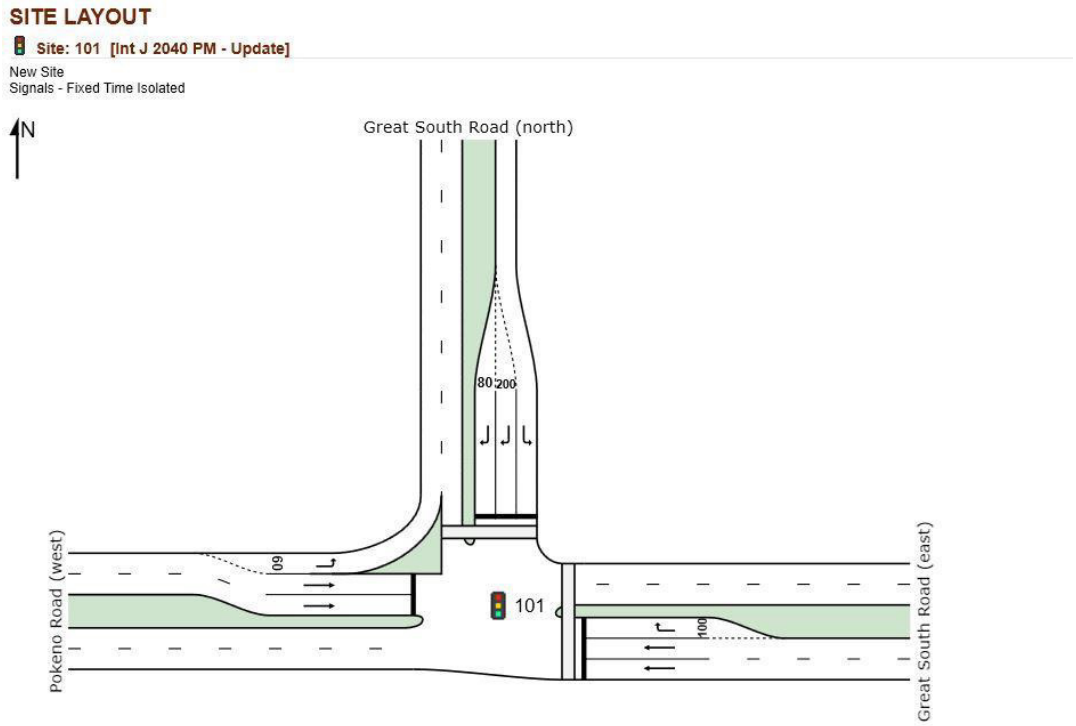
Movement		**Degree of Saturation (v/c)**	**Average delay (sec)**	**Level of service**	**95%tile back of queue (m)**
South: Great South Road	TH	0.325 (0.470)	6.9 (17.1)	LOS A (B)	39.4 (154.6)
	RT	0.787 (1.204)	21.0 (248.8)	LOS C (F)	84.8 (864.8)
North: Great South Road	LT	0.307 (0.307)	11.5 (10.3)	LOS B (B)	34.3 (63.1)
	RT	0.761 (1.271)	33.1 (322.4)	LOS C (F)	66.6 (699.0)
West: Pokeno Road	LT	0.517 (1.141)	16.6 (204.6)	LOS B (F)	67.6 (938.0)
	TH	0.739 (1.236)	26.8 (210.7)	LOS C (F)	57.3 (367.0)
Intersection performance (overall)		**0.787 (1.271)**	**17.5 (161.1)**	**LOS B (F)**	**84.8 (938.0)**

As shown above, the intersection continues to work acceptably during the morning and afternoon peak in 2022. The modelling results show that the intersection performs poorly in 2040 (morning and afternoon peak) with the maximum average delay of 352.7 seconds (morning peak) and maximum 95%tile back of queue of 1105.8 m.

9.11.1 MITIGATION

Based on the above assessment, the Pokeno Road/ Great South Road intersection layout has been altered to cater for the predicted traffic volumes in 2040 and is shown in Figure 9-13 below.

Figure 9-13: Intersection J amended layout



The intersection performance for each year 2040 is summarised in Table 33 below.

Table 33: Intersection J 2040 movement summary results am (pm)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
East: Great South Road	TH	0.182 (0.402)	7.5 (6.2)	LOS A (A)	20.2 (76.5)
	RT	0.682 (0.820)	19.3 (26.1)	LOS B (C)	41.0 (220.8)
North: Great South Road	LT	0.688 (0.330)	16.3 (10.7)	LOS B (B)	106.4 (53.9)
	RT	0.840 (0.896)	35.1 (62.7)	LOS D (E)	97.7 (114.5)
West: Pokeno Road	LT	0.283 (0.497)	5.7 (5.7)	LOS A (A)	0.0 (0.0)
	TH	0.895 (0.845)	35.4 (52.4)	LOS D (D)	113.6 (93.9)
Intersection performance		**0.895(0.896)**	**23.0(22.9)**	**LOS C (C)**	**113.6 (220.8)**

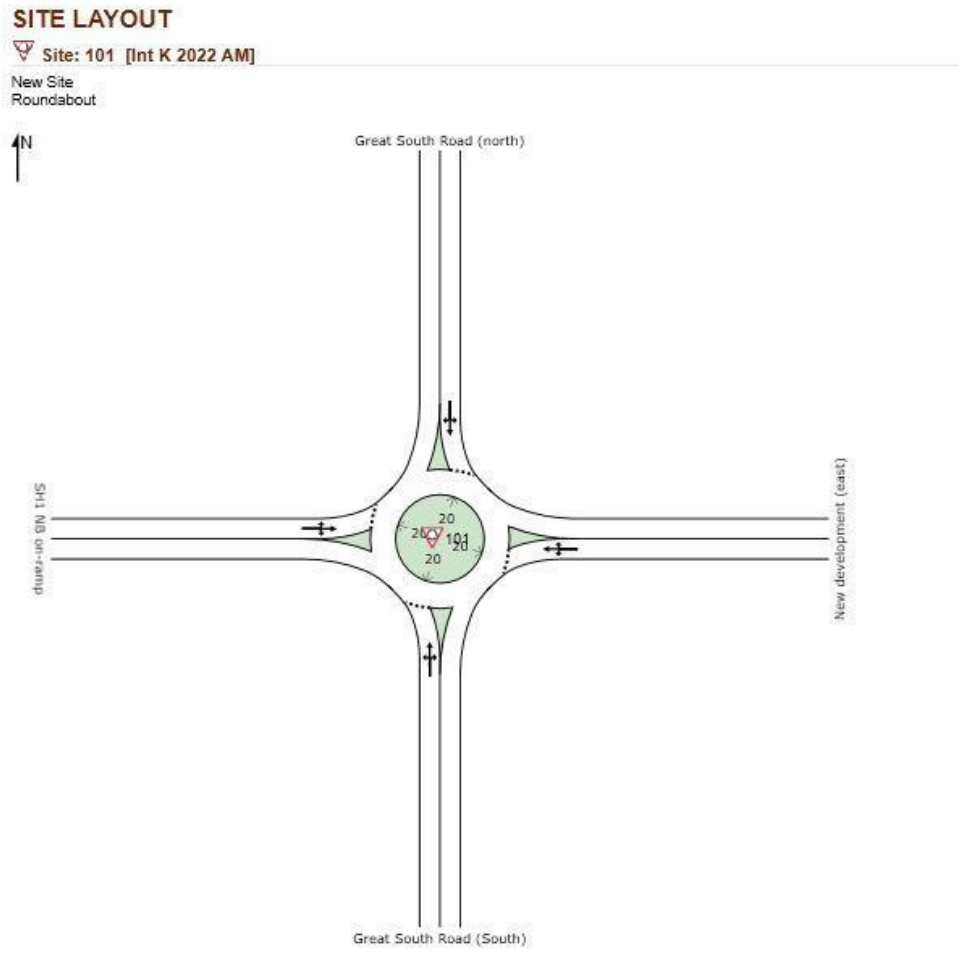
As shown above, the majority of the intersection performs at an acceptable level of service (LOS A – D) with the exception of the right turn from the northern approach operating at LOS E; given that the degree of saturation for this movement is less than 0.9, this is considered acceptable. The overall

performance of the intersection continues to operate at overall LOS C and the average delays are from 23.0 seconds (morning peak) to 22.9 seconds (evening peak). The maximum 95%tile back of queue of 220.8 m occurs on the right turn form the east approach (evening peak) and is considered typical of a major arterial road intersection. As such, the modelling results agree with the Pokeno Intersection Assessment report that a signalised intersection is required to cater for the predicted volumes in 2022 and 2040. It is noted that, prior to 2040, upgrades are required to ensure that the intersection continues to perform at an acceptable level of service. It is noted that the phasing time with nearby intersections should be synced to improve the performance of this intersection and reduce delays and congestion.

9.12 INT K – SH1 NB ON-RAMP/ GREAT SOUTH ROAD

This intersection is existing and is currently controlled by a give-way intersection. The Pokeno Intersection Assessment report identifies that this intersection requires a roundabout or signals by the year 2022. As such, a single lane roundabout has been modelled as shown in Figure 9-14 below.

Figure 9-14: Intersection K - recommended layout



Of note, while the existing intersection provides three approaches, the Pokeno Intersection Assessment report identifies that a development is expected to occur to the east of the intersection with a new road planned to connect directly to the intersection (eastern approach) thereby forming a cross road intersection (as shown above).

The intersection performance for each year (2022 and 2040) is summarised in Table 34 and Table 35.

Table 34: Intersection K AM movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Great South Road	LT	0.442 (0.798)	5.4 (11.6)	LOS A (B)	22.0 (86.3)
	TH	0. 442 (0.798)	5.6 (11.8)	LOS A (B)	22.0 (86.3)
	RT	0. 442 (0.798)	10.2 (16.4)	LOS B (B)	22.0 (86.3)
East: New development	LT	0.027 (0.067	7.1 (9.7)	LOSA (A)	1.0 (2.8)
	TH	0.027 (0.067)	7.3 (9.9)	LOS A (A)	1.0 (2.8)
	RT	0.027 (0.067)	11.9 (14.6)	LOS B (B)	1.0 (2.8)
North: Great South Road	LT	0.359 (0.533)	4.0 (4.0)	LOS A (A)	19.1 (40.3)
	TH	0.359 (0.533)	4.2 (4.2)	LOS A (A)	19.1 (40.3)
	RT	0.359 (0.533)	8.8 (8.8)	LOS A (A)	19.1 (40.3)
West: SH NB on-ramp	LT	0.003 (0.005)	5.5 (7.2)	LOS A (A)	0.1 (0.2)
	TH	0.003 (0.005)	5.8 (7.4)	LOS A (A)	0.1 (0.2)
	RT	0.003 (0.005)	10.4 (12.0)	LOS B (B)	0.1 (0.2)
Intersection performance (overall)		**0.442 (0.798)**	**5.7 (8.9)**	**LOS A (A)**	**22.0 (86.3)**

Table 35: Intersection K PM Movement summary 2022 (2040)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Great South Road	LT	0.755 (1.380)	5.1 (350.2)	LOS A (F)	65.0 (2470.6)
	TH	0.755 (1.380)	5.3 (350.5)	LOS A (F)	65.0 (2470.6)
	RT	0.755 (1.380)	10.0 (355.1)	LOS A (F)	65.0 (2470.6)
East: New development	LT	0.013 (0.029)	6.5 (7.6)	LOSA (A)	0.5 (1.1)
	TH	0.013 (0.029)	6.8 (7.8)	LOS A (A)	0.5 (1.1)

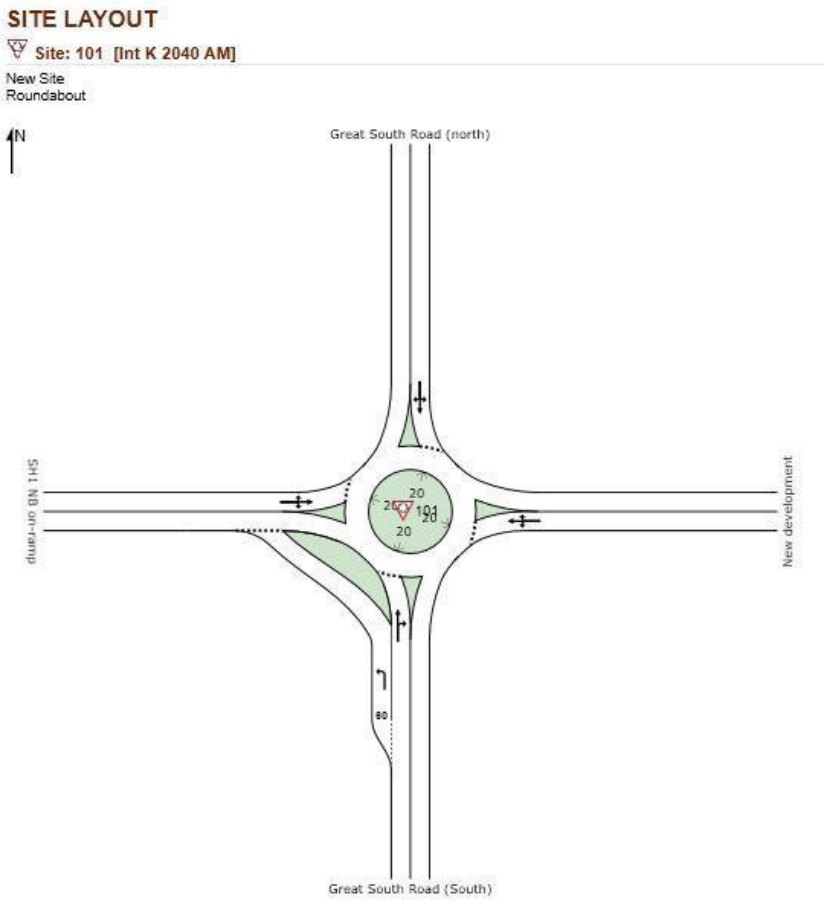
	RT	0.013 (0.029)	11.4 (12.4)	LOS B (B)	0.5 (1.1)
North: Great South Road	LT	0.345 (0.436)	3.9 (4.0)	LOS A (A)	18.1 (29.3)
	TH	0.345 (0.436)	4.2 (4.2)	LOS A (A)	18.1 (29.3)
	RT	0.345 (0.436)	8.8 (8.8)	LOS A (A)	18.1 (29.3)
West: SH NB on-ramp	LT	0.003 (0.003)	5.1 (5.5)	LOS A (A)	0.1 (0.1)
	TH	0.003 (0.003)	5.3 (5.7)	LOS A (A)	0.1 (0.1)
	RT	0.003 (0.003)	9.9 (10.3)	LOS A (B)	0.1 (0.1)
Intersection performance		**0.755 (1.380)**	**5.2 (251.7)**	**LOS A (F)**	**65.0 (2470.6)**

As shown above, the intersection is expected to perform at an acceptable LOS in 2022 (am and pm). In 2040 the overall intersection delay increases by 3.2 seconds during the morning peak and 246.5 seconds (evening peak). The modelling results indicate that the southern approach performs poorly (LOS F) during the evening peak in 2040 with a 95%tile back of queue of 2470 m therefore some form of mitigation is required.

9.12.1 MITIGATION

In this regard, the layout of the intersection has been adjusted to provide a left turn slip lane from the southern approach, connecting from Great South Road to SH1 NB on-ramp. This intersection layout has been used to model the traffic volumes in 2040 and is set out in Figure 9-15 below.

Figure 9-15: Updated layout for Intersection K



The results of the modelling are provided in Table 34 and Table 35 below.

Table 34: Intersection K movement summary 2040 am (pm)

Movement		Degree of Saturation (v/c)	Average delay (sec)	Level of service	95%tile back of queue (m)
South: Great South Road	LT	0.153 (0.870)	5.2 (7.5)	LOS A (A)	65.0 (115.9)
	TH	0.515 (0.363)	6.2 (5.0)	LOS A (A)	65.0 (16.7)
	RT	0.515 (0.363)	10.8 (9.6)	LOS A (A)	65.0 (16.7)
East: New development	LT	0.067 (0.029)	9.7 (7.6)	LOSA (A)	0.5 (1.1)
	TH	0.067 (0.029)	9.9 (7.8)	LOS A (A)	0.5 (1.1)
	RT	0.067 (0.029)	14.6 (12.4)	LOS B (B)	0.5 (1.1)
	LT	0.533 (0.443)	4.0 (4.0)	LOS A (A)	18.1 (25.2)

North: Great South Road	TH	0.533 (0.443)	4.2 (4.2)	LOS A (A)	18.1(25.2)
	RT	0.533 (0.443)	8.8 (8.9)	LOS A (A)	18.1 (25.2)
West: SH NB on-ramp	LT	0.004 (0.004)	7.2 (6.3)	LOS A (A)	0.1 (0.1)
	TH	0.004 (0.004)	7.4 (6.5)	LOS A (A)	0.1 (0.1)
	RT	0.004 (0.004)	12.0 (11.1)	LOS A (B)	0.1 (0.1)
Intersection performance		**0.533 (0.870)**	**6.1 (6.5)**	**LOS A (A)**	**37.3 (115.9)**

As can be seen above, the provision of the left turn slip lane improves the LOS of the intersection significantly, specifically the southern approach is now expected to perform at a LOS A (performed at LOS F when the slip lane was not provided). As such, the modelling results agree with the Pokeno Intersection Assessment report that a roundabout is warranted at this intersection in the year 2022 and 2040. The modelling also shows that, a left turn slip lane is required prior to 2040 to allow the intersection to perform at an acceptable LOS.

10 MITIGATION SUMMARY

10.1 INTERSECTIONS

Based on the above assessment, the following intersections, outlined in in Table 35 below, are recommended for the year 2022 and 2040.

Table 34: Recommended Intersection upgrades (indicative)

Intersection name		**Existing intersection form**	**Pokeno Intersection report recommendation (2022)**	**2022 layout (recommended)**	**2040 layout (recommended)**
A	Site A entrance/ Helenslee Road	-	-	Give-way	Give-way
B	Site A entrance/ Helenslee Road	-	-	roundabout	roundabout
C	Munro Road/ Helenslee Road	Give-way	-	Signals	Signals

D	Site A entrance/ Munro Road	Give Way proposed (subdivision opposite)	-	Roundabout	Roundabout
E	Huia Road/ Munro Road	Give-way	-	Give-way	Give-way
F	Site entrance/ Huia Road	-	-	Give-way	Give-way
G	Munro Road/ Pokeno Road	Give-way	Give-way/ roundabout	Give-way	Roundabout
H	Helenslee Road/ Pokeno Road	Give-way	Roundabout/ signals	Signals	Signals
I	McLean Street/ Pokeno Road	-	Roundabout/ signals	Signals	Signals
J	Great South Road/ Pokeno Road	Give-way	Roundabout/ signals	Signals	Signals
K	Great South Road/ SH1 NB on-ramp	Give-way	Roundabout/ signals	Roundabout	Roundabout

Furthermore, consideration should be given to the following:

- Access to individual properties, specifically along Munro Road and Helenslee Road;
- Phasing – intersection H to J are recommended to be signalised intersections. These are expected to cater for a high volume of turning and through volumes therefore consideration should be given to syncing the phases to optimise the performance of these intersections.

It is also recommended to assess the performance of these intersections in the year 2022 to ensure that the intersection is performing as expected.

10.2 PUBLIC TRANSPORT

As noted in section 2.3.2 of this report, there are limited public transport services in Pokeno. In this regard, the following public transport services should be considered to mitigate the transport effects of growth in this region and provide residents with an alternative transport mode when traveling to and from the site.

10.2.1 RECOMMENDED PUBLIC TRANSPORT SERVICES

Travel data has been obtained from NZ Stats commuter view which provides an interactive mapping tool showing the number of people commuting between area units throughout New Zealand. The

data obtained was collected during the 2013 census. Figure 10-1shows the direction of travel for commuters in Pokeno.

Figure 10-1: Travel to work (NZ stats)

Based on the NZ stats data, the following can be concluded for commuters within Pokeno during 2013:

- Approximately 70% of the Pokeno resident working population commute out of the area (the remainder work within Pokeno).
- the majority of commuters travel north to Auckland (54%) and Pukekohe (8%) with some travelling east and west of Pokeno including Tuakau (4%).

As such, any public transport network implemented should cater for these regions. The following services are recommended:

- Bus services to the southern elected rail stations in Auckland, operating on the hour between 6:00am – 9am;
- Local public transport services: bus route starting from the Pokeno town centre which passes through the proposed plan change area, the Helenslee residential block (located directly east of the site) and concludes back at the town centre. Of note, some thought should be given to connecting Tuakau and Pokeno via some means of public transport to encourage residents travelling to and from these destinations to utilise the public transport network;
- Lastly, given the recent improvements of connections between Hamilton and Pokeno (the Waikato expressway) the reduced travel time between the two areas is likely to encourage residents to commute to Hamilton. As such, consideration of an express bus route should be given for residents commuting between Pokeno and Hamilton.

Of note, the above recommendations are indicative and should be considered in conjunction with the community and any future land use developments to ensure the correct commuter areas are being incorporated.

It is noted that the Pokeno Structure Plan provides and an indicative bus route (shown in Figure 10-2 below). If this plan change is approved, consideration should be given to incorporating the plan change area into this bus route.

Figure 10-2: PSP indicative walking/ bus route

11 PARKING

11.1 WAIKATO DISTRICT PLAN (FRANKLIN SECTION)

Table 51.A of the Franklin Section states that the minimum parking spaces required for a dwelling hours is '1 covered or uncovered car park per unit'.

On this basis, each dwelling should provide a minimum of one parking space per dwelling to comply with the current district plan requirements.

11.2 ON-STREET PARKING

On-street parking on the proposed collector road can be determined at future resource consent stages however it is generally considered that a minimum of 1 space per 4 dwellings is an appropriate design standard. This would equate to some 300 parking spaces for the plan change area. These can be distributed between the local and collector road network.

This may require investigation of on-street angled parking and the provision of time restrictions to avoid residents using on-street parking as informal resident parking.

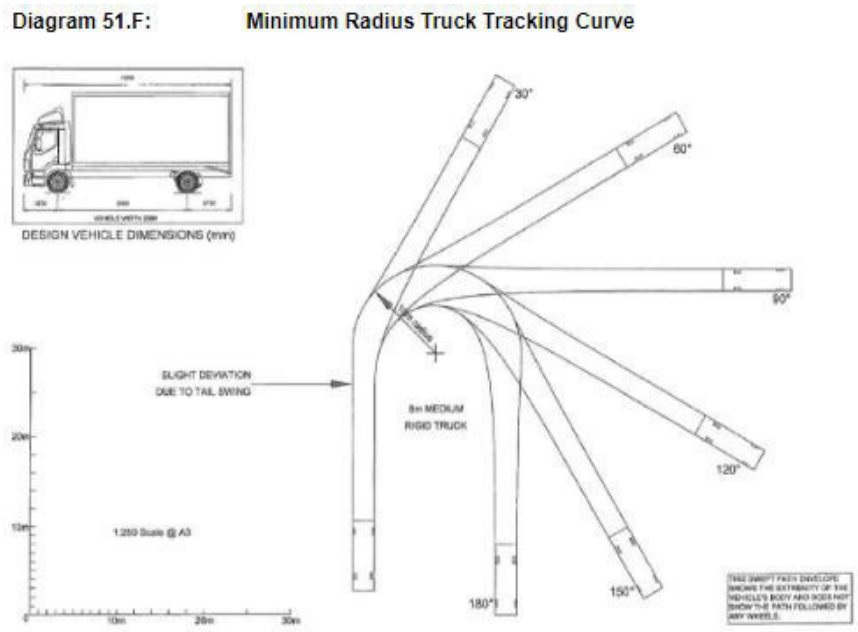
11.3 SERVICING

Rule 51.2 of the District Plan outlines the requirement for loading areas and spaces. For sites within other zones (excluding business zone) the following is required:

- Every activity shall have, on its own site, such provision as is appropriate for the safe and efficient setting down or picking up of all people, goods and materials likely to be associated with its normal operation or functioning. All such areas shall be formed and drained to an all-weather, dust free condition prior to any commencement of the activity to which the space or area relates.

Further, manoeuvring areas associated with loading spaces shall comply with the tracking curves as set out in Diagram 51.F (provided in Figure 11-1 below).

Figure 11-1: Radius truck tracking curve



The proposed road network would be designed to accommodate an 8m medium rigid truck as shown in the figure above. Within the site, it is expected that trucks will be able to access each apartment building for the purposes of furniture delivery and rubbish collection.

This can be investigated at subsequent resource consent stages.

12 INTEGRATION WITH FUTURE TRANSPORT NETWORK

12.1 GENERAL

The following section provides a review of established policy and plans in relation to the proposed development. The documents reviewed comprise:

- The Waikato Plan 2017;
- Waikato Regional Land Transport Plan;
- Waikato Regional Public Transport Plan;
- Regional walking and cycling strategy; and
- Franklin Engineering code of practise.

12.2 THE WAIKATO PLAN

The Waikato Plan ("the plan) is a comprehensive document that identifies and addresses issues that the region faces and seeks to take advantage of opportunities for the Waikato. The plan identifies five key priorities with 10 key action plans to address these priorities. The five priorities are as follows:

1. Planning for population change;
2. Connecting communities through targeted investment;
3. Partnering with iwi/ Maori;
4. Addressing water allocation and quality; and
5. Advancing regional economic development.

In order to achieve the second priority (connect communities), four key transport related actions have been identified including;

- Key action 4: advocate on behalf of regional transport priorities;
- Key action 5: Integrate Waikato and Auckland Transport networks;
- Key action 6: encourage development of a nationally significant cycling and walking experience; and
- Key action 7: Establish a freight and logistics action group.

As noted, the proposed residential development, will provide for an additional 1,222 dwellings, this will enable and support an increase in population within Pokeno and the North Waikato. It will also provide a roading network which integrates with the existing and Pokeno town centre as well as the wider state highway network to both the Waikato and Auckland, including pedestrian and cycling features and encouraging the use of alternative modes for local journeys. Several public transport services have also been recommended to better integrate the Waikato and Auckland transport networks. Based on this, the proposal is considered to support the Waikato Plans priorities.

12.3 WAIKATO REGIONAL LAND TRANSPORT PLAN (RLTP)

The Waikato Regional Land Transport Plan (2015-2045) sets out the direction for the region's transport system for the next 30 years. It identifies the land transport objectives and direction for land transport that the region is seeking to achieve to contribute to an effective, efficient and safe land transport system. Six transport objectives are identified in the plan and are summarised below:

- Providing an integrated and aligned land-use and transport system;

- Providing an effective and efficient land transport system that enhances economic well-being and support growth;
- Achieve a significant reduction in risk, deaths and serious injuries across the region;
- Provide an adaptable and flexible approach to managing and developing the land transport system that optimises funding options;
- Provide communities access to a multi modal land transport system that functions effectively to meet their social, cultural and economic needs; and
- Provide an environmentally sustainable and energy efficient land transport system that is robust and resilient to external influences.

The proposed upgrades to the existing land transport infrastructure surrounding the site will integrate and align with the current road network as well as support the proposed growth in the area, thus contributing to a safe, efficient and effective transport system within Pokeno. These upgrades will connect the proposed development with the existing Pokeno town centre community and provide access to multi modal services such as cycling walking and public transport.

As such, the proposed Plan Change is considered to be supportive of the RLTP objectives.

12.4 WAIKATO REGIONAL PUBLIC TRANSPORT PLAN (RPTP)

The Waikato Regional Public Transport Plan 2015 - 2025 outlines the strategic direction for public transport in the Waikato region over the next 10 years. The plan aims to deliver an effective, efficient and integrated public transport system for the region. The vision of the RPTP is to deliver "*a growing and affordable public transport system that contributes to the economic, social and environmental vitality of the region'*. The following key policy focus areas are outlined in the RPTP to support this goal:

- Effective and efficient transport services for the region while meeting current and future demands;
- affordable transport services to users and funders;
- a framework to ensure coordinated planning for the delivery of public transport services and infrastructure;
- an attractive and easily identifiable public transport network providing easily accessible information;
- procurement process that follows the best planning practises; and
- Improved value for money.

There are currently very limited public transport services available in the Pokeno area. However, the ITA provides recommendations to establish public transport services within Pokeno that would connect the area to locations within the wider network such as Auckland, Tuakau and Hamilton. Establishment of these services would provide the development with improved access to public transport services and has the potential to reduce traffic flows between these areas.

The RPTP plan does not identify any significant changes to the rural public transport services. In this regard, provided that the public transport services outlined in this ITA are implemented, the proposed development is considered to align well with the objectives of the RPTP.

12.5 REGIONAL WALKING AND CYCLING STRATEGY

The Waikato Regional Public Transport Plan 2015 - 2025 outlines the strategy for walking and cycling within the Waikato region in accordance with the RLTS. The vision of the strategy is that: "Walking and cycling are safe, integrated and accessible activities in the Waikato region". The strategy intends to achieve this vision with the following three policies and actions:

- Support the construction and maintenance of accessible walking and cycling infrastructure throughout the regions for all user types;
- Promote travel demand management and travel behaviour change initiatives that assist walking and cycling in relieving urban congestion and improving journey time reliability; and
- Recognise the role that walking and cycling can play in the economic development of the region.

The proposed development intends to provide a shared path (walking and cycling) within the development as well as along the main street connecting the site near the Pokeno Centre and school. This will provide an easily accessible path for the use of other modes of transport to and from the site and has the potential to reduce the number of vehicles on the road network. Therefore, the proposal is considered to align well with the walking and cycling strategy.

12.6 FRANKLIN ENGINEERING CODE OF PRACTISE

Should the proposed Plan Change be approved, any roading improvements will follow approved standards namely the Franklin Engineering Code of Practise, Austroads and NZS4404:2010.

13 CONSTRUCTION TRAFFIC

The development site is currently occupied by several dwellings and demolition works followed by earth works would be required before any new development could be constructed. Again, this would be subject to subsequent resource consent processes.

To facilitate construction, a left in/ left out access could be established on Munro Road to accommodate truck movements to and from the site. The volume of earth works is unknown at this stage however can be undertaken over an extended period to minimise traffic effects of necessary.

As is typical with a development of this scale, it is recommended that as part of any later resource consent, a Construction Traffic Management Plan (CTMP) should be required as a condition. It is considered that this Construction Traffic Management Plan should include:

- Construction dates and hours of operation including any specific non-working hours for traffic congestion/noise etc, aligned with normally accepted construction hours in the Auckland Region;
- Truck route diagrams between the site and external road network.
- Temporary traffic management signage/details for both pedestrians and vehicles, to manage the interaction of these road users with heavy construction traffic; and
- Details of site access/egress over the entire construction period and any limitations on truck movements. All egress points should be positioned to achieve appropriate sight distances.

Based on experience of constructing similar projects, and bearing in mind capacity within the existing road network, with the appropriate Construction Traffic Management Plan in place and the above measures implemented, it is considered that construction activities can be managed to ensure any generated traffic effects are appropriately mitigated.

14 CONSULTATION

The following consultation (attended by Commute) has been undertaken with Council on transport matters relating to the development:

- Meeting with Council on 3rd November 2017
- Meeting with Council engineers on 15th November 2017
- Meeting with Council engineers on 8th February 2018

15 IMPLEMENTATION PLAN

The following summarises an indicative Implementation Plan. It sets out proposed works that are proposed to be addressed as part of development of this site.

Table 36: Implementation Plan

Trigger	Indicative Upgrade	Comments	Funder
Consents as required	Construction of internal roads including collector roads with 3m shared paths	Provided as required within each stage	Developer
Consents as required	Construction of new 3m shared paths on existing road network including: • on Helenslee Road from Munroe Road to Pokeno Road • on Helenslee Road from Munroe Road to the northern edge of the site • on Munroe Road from Helenslee Road to Huia Road site entrance	Helenslee road from Munroe Road to Pokeno Road considered to be required initially. Others as development progresses	Developer
As demand occurs. Likely near end of Stage 1	Provision of PT service from / within the site	Collector roads to allow for PT provision in future. Bus service to be provided by Council when required	Council
Part of Stage 1	Helenslee Road / Munroe road signals	Required at start of development	Developer
As required	Site entrance (nth) / Helenslee Road	Give way intersection	Developer
Required when / if link added to Gateshead Cres	Helenslee Road / Gateshead Cres / Site	Roundabout required (X-roads)	Developer
Required when / if link added to Munroe Road	Munroe Road / Site / opposite subdivision	Roundabout required (X-roads)	Developer
Required for urbanisation regardless of development	Munroe Road one-way bridge	Two-way bridge	Council
As required	Site entrance / Huia Road	Give way intersection	Developer
Required regardless of development	Munroe Road / Pokeno Road	Roundabout	Council
Required regardless of development	Helenslee Road / Pokeno Road	Signals	Council
Required regardless of development	Mclean Road / Pokeno Road	Signals	Other development / Council
Required regardless of development	Great South Road / Pokeno Road	Signals	Other development / Council

Trigger	Indicative Upgrade	Comments	Funder
Required regardless of development	Great South Road/ SH1 NB on-ramp	Roundabout	Other development / Council

The above works are indicative only and are subject to change depending on the scale of development proposed. The detail of mitigation measures may be revisited at Resource Consent stage.

16 CONCLUSIONS

Based on the assessments undertaken in this report, it is concluded:

- The site, with the mitigation measures identified, has good accessibility to various transport modes: walking, cycling, bus and private vehicle;
- The effects of the proposed increase in vehicles are expected to be minimal provided that the upgrades to intersections recommended in this report are implemented;
- Sufficient parking can be provided on-site. On street parking is recommended to be established with a parking rate of approximately 1 on-street parking space per 4 dwellings through resource consents stages;
- The proposed development is consistent with, and encourages key regional and district transport policies.

The traffic effects of the development potential that could be achieved under the Residential zone, with the implementation of the measures identified in Section 15, are considered acceptable and there is no reason, from a transport perspective, to preclude approval of the proposed Plan Change.

APPENDIX A – MASTER PLAN

Approved for submission by: .....
Birch Surveyors Ltd

KEY

Lot Boundaries

Road Boundaries

Abuttals

Stage Boundaries

Existing Buildings

Medium Density Residential

Stormwater Detention Pond

Neighbourhood Centre

Medium Density Residential

NOTES:
1) Areas and measurements are approximate only and subject to final survey
2) Roads shown are legal
3) Datum is arbitrary and subject to final survey
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www.birchsurveyors.co.nz

LOCAL AUTHORITY	WAIKATO COUNCIL
PLANNING MAP	-
ZONING	RURAL
ACTIVITY	
COMPRISED IN	CFR 599274
TOTAL AREA	130.3502 ha
REGISTERED OWNERS	ALISON ST JOHN, MAURICE HAYES & MICHAEL SMITH

PROJECT NAME

CHENSHIU

POKENO WEST PLAN CHANGE

Surveyed -	Date -	Project No. 4101
Designed -	Date -	Scale Hz: 1:7000 @ A3
Drawn CH	Date 11/2017	
Approved PROJECT MANAGER	Date	

REV.	BY	DATE	COMMENT
B	CH	12/17	AMENDED
C	CH	12/17	Re-DESIGN
F	TM	05/18	Council Re-issue
F-1	JM	06/18	Road Amend

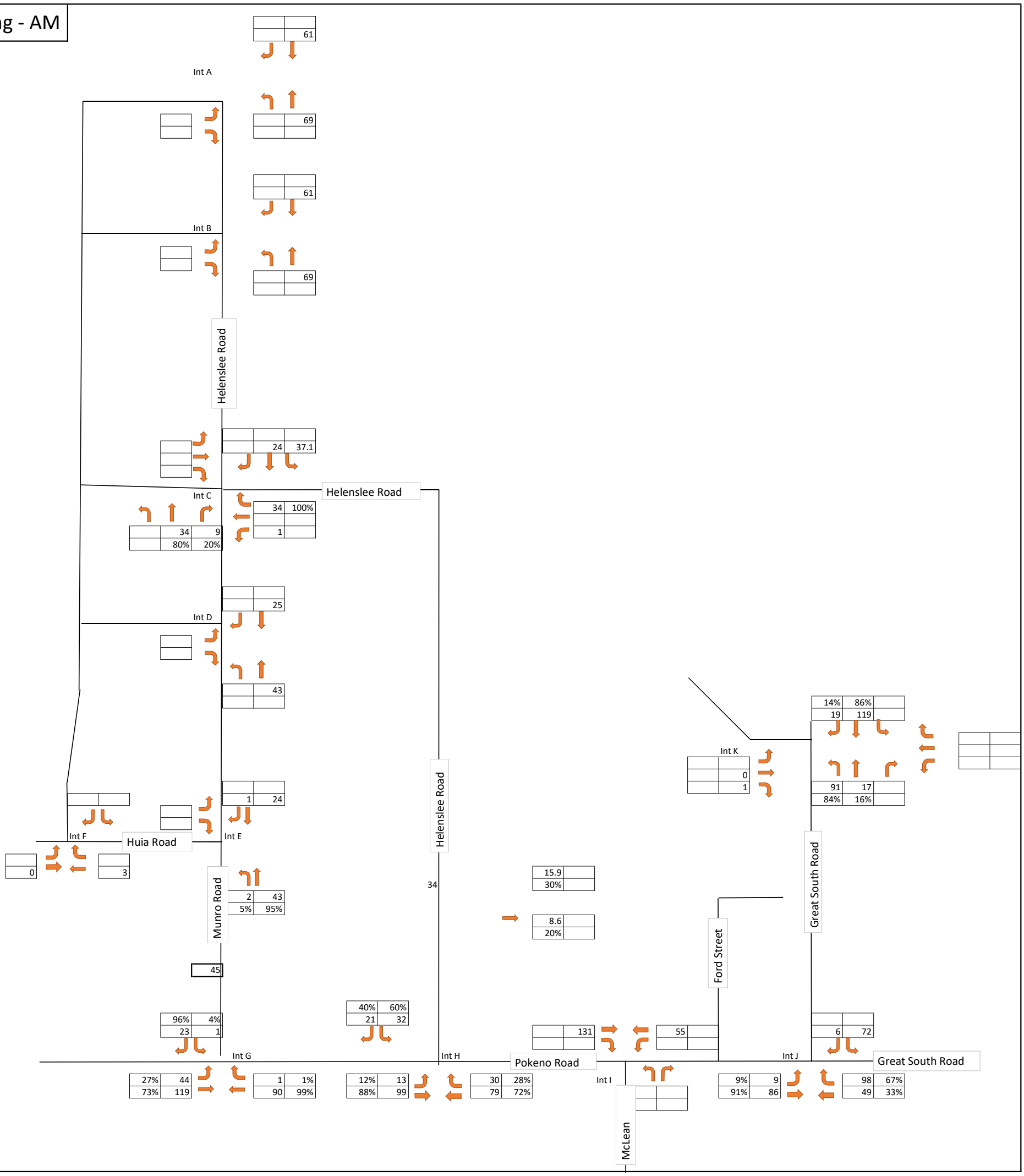
TITLE

STAGING PLAN OF POKENO WEST PC

Drawing Name	F:\..\CAD\CP 4101 F.dwg /	SUBJECT TO FINAL SURVEY	Rev. F-1

APPENDIX B – EXISTING SURVEY VOLUMES

Existing - AM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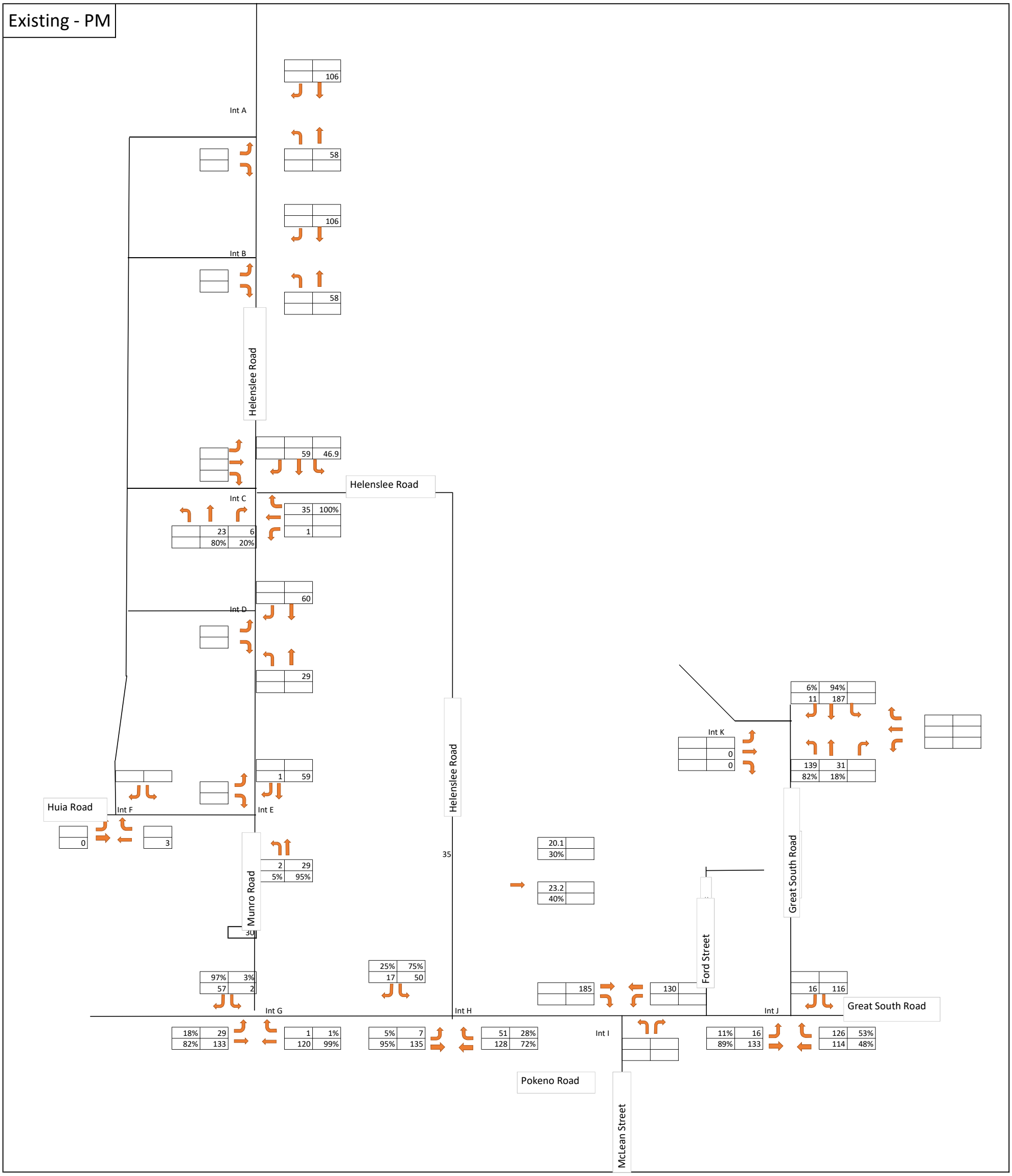
69
61
Int B
69
Helenslee Road
24
37.1
Int C
Helenslee Road
34
100%
1
34
9
80%
20%
Int D
25
43
Int F
Huia Road
Int E
1
24
0
3
Munro Road
2
43
5%
95%
45
Helenslee Road
34
15.9
30%
8.6
20%
Int K
0
1
14%
86%
19
119
91
17
84%
16%
Great South Road
Ford Street
96%
4%
23
1
Int G
40%
60%
21
32
Int H
Pokeno Road
131
55
Int I
6
72
Int J
Great South Road
27%
44
73%
119
1
1%
90
99%
12%
13
88%
99
30
28%
79
72%
9%
9
91%
86
98
67%
49
33%
McLean

Existing - PM


Int A
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58
106
Int B
58
Helenslee Road
59
46.9
Helenslee Road
Int C
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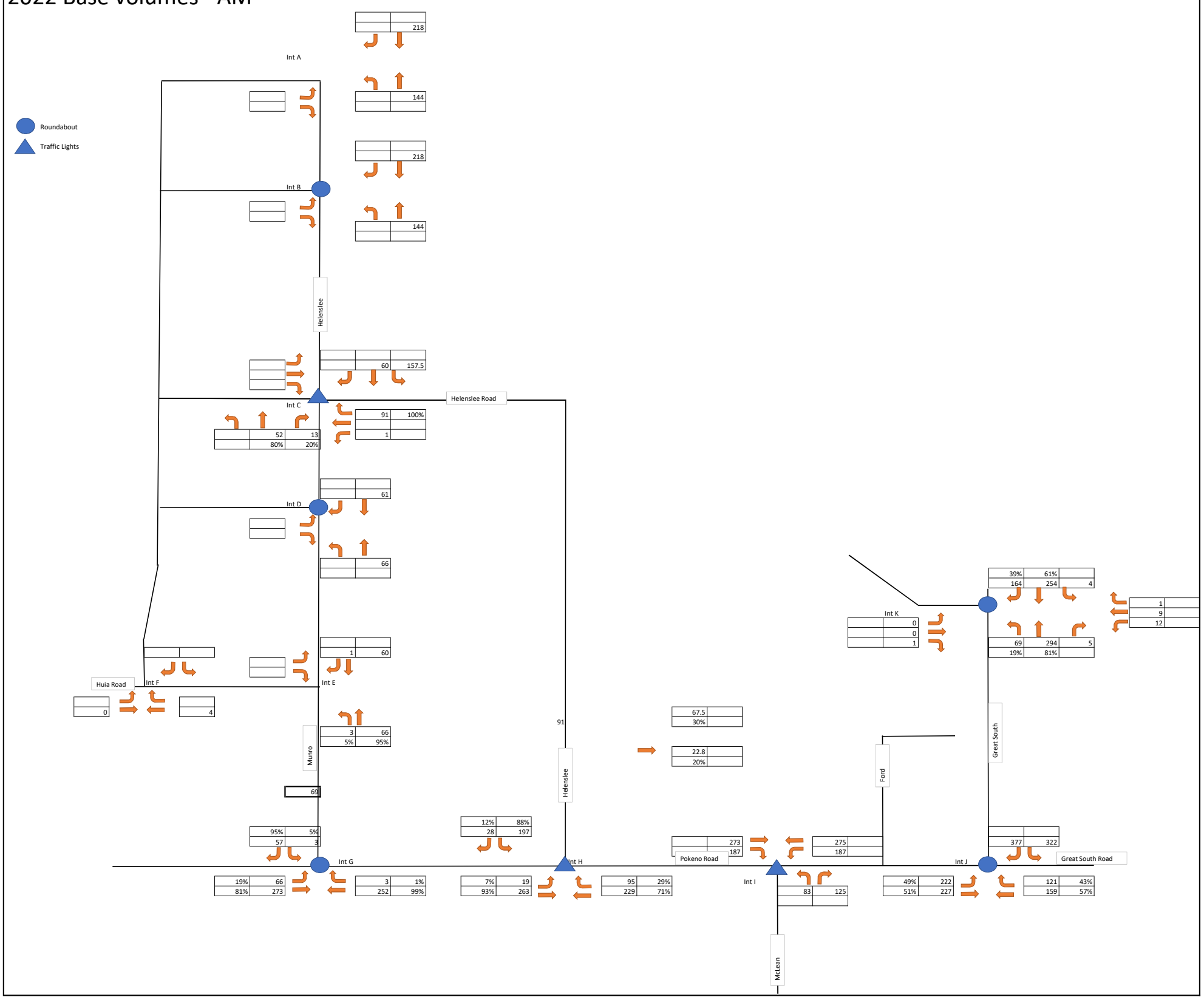
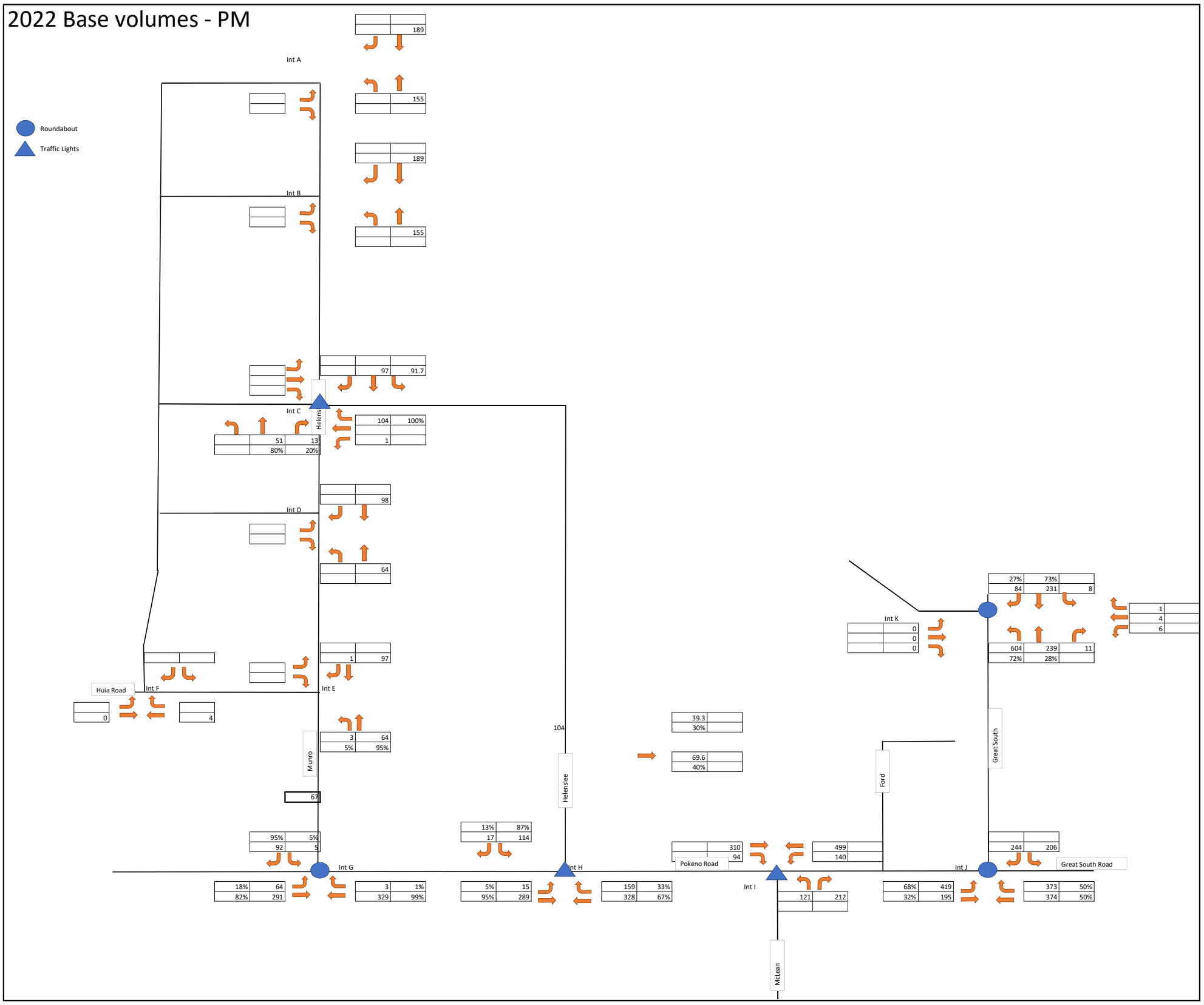
100%
1
23
6
80%
20%
60
Int D
29
1
59
Huia Road
Int F
Int E
0
3
Helenslee Road
35
2
29
5%
95%
Munro Road
30
20.1
30%
23.2
40%
Int K
0
0
6%
94%
11
187
139
31
82%
18%
Great South Road
Ford Street
97%
3%
57
2
25%
75%
17
50
185
130
16
116
Great South Road
Int G
Int H
Int I
Int J
18%
29
82%
133
1
1%
120
99%
5%
7
95%
135
51
28%
128
72%
11%
16
89%
133
126
53%
114
48%
Pokeno Road
McLean Street

APPENDIX C – ESTIMATED BASE VOLUMES (2022 AND 2040)

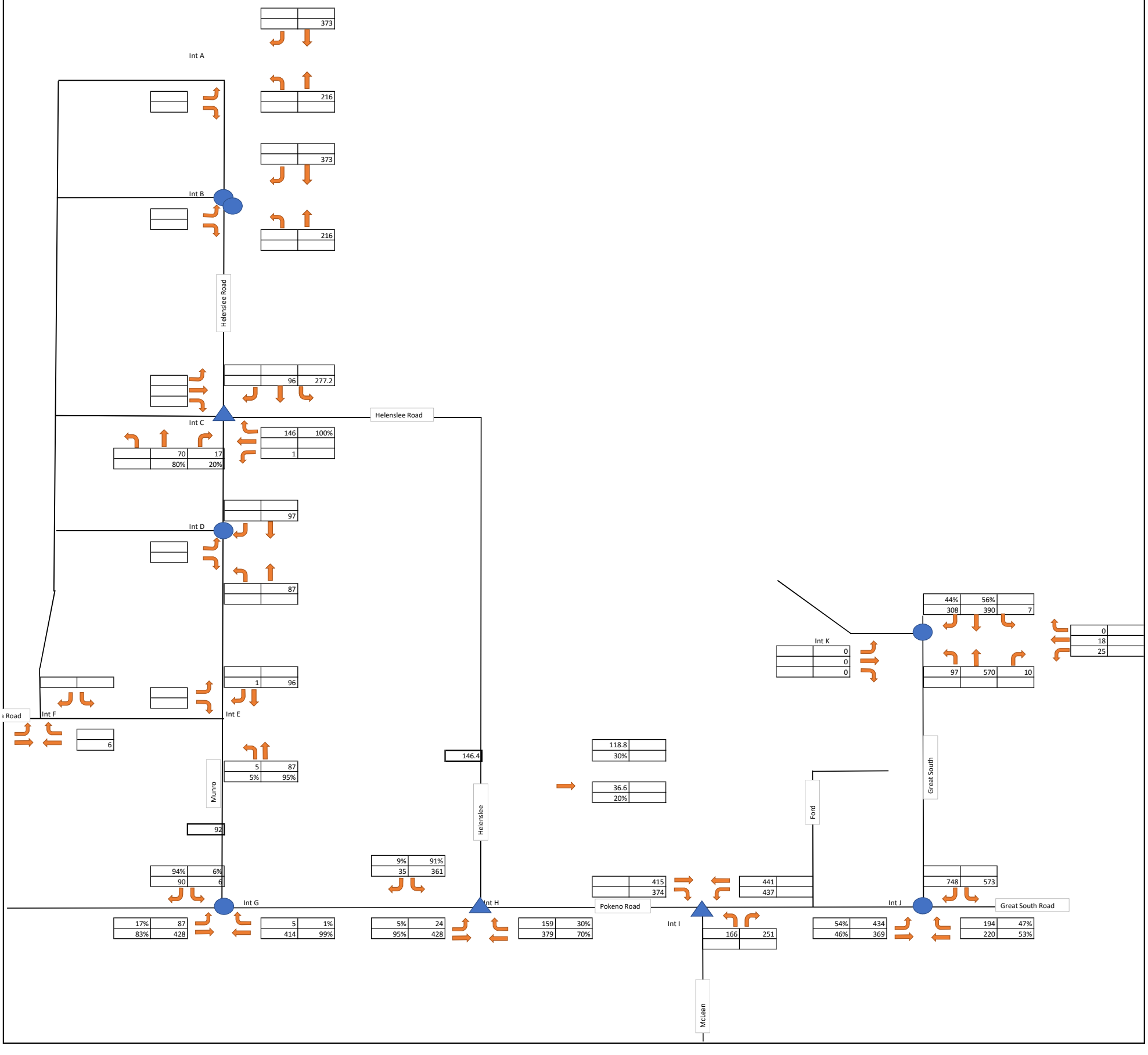
2022 Base volumes - AM



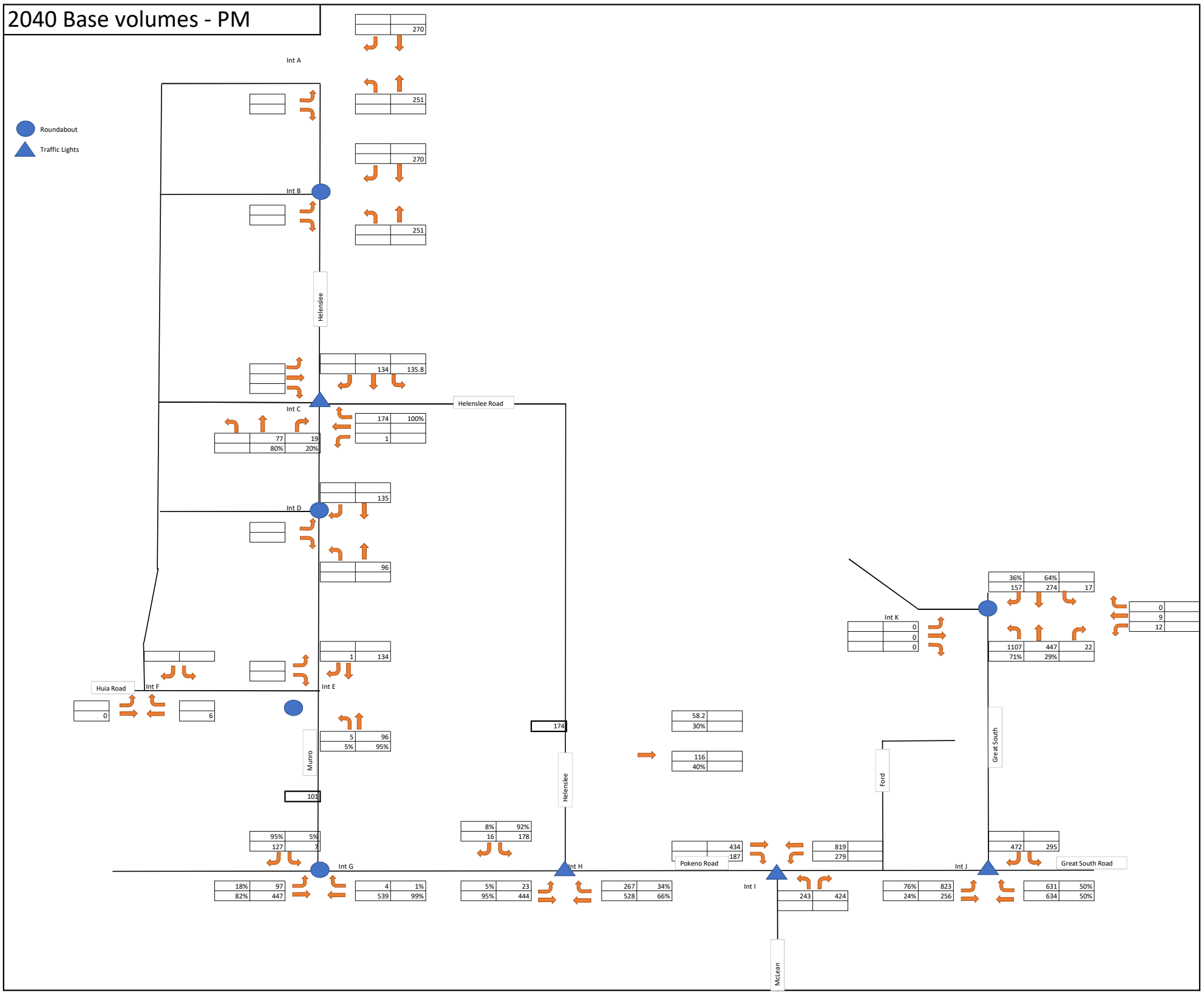
2022 Base volumes - PM



2040 Base volumes - AM

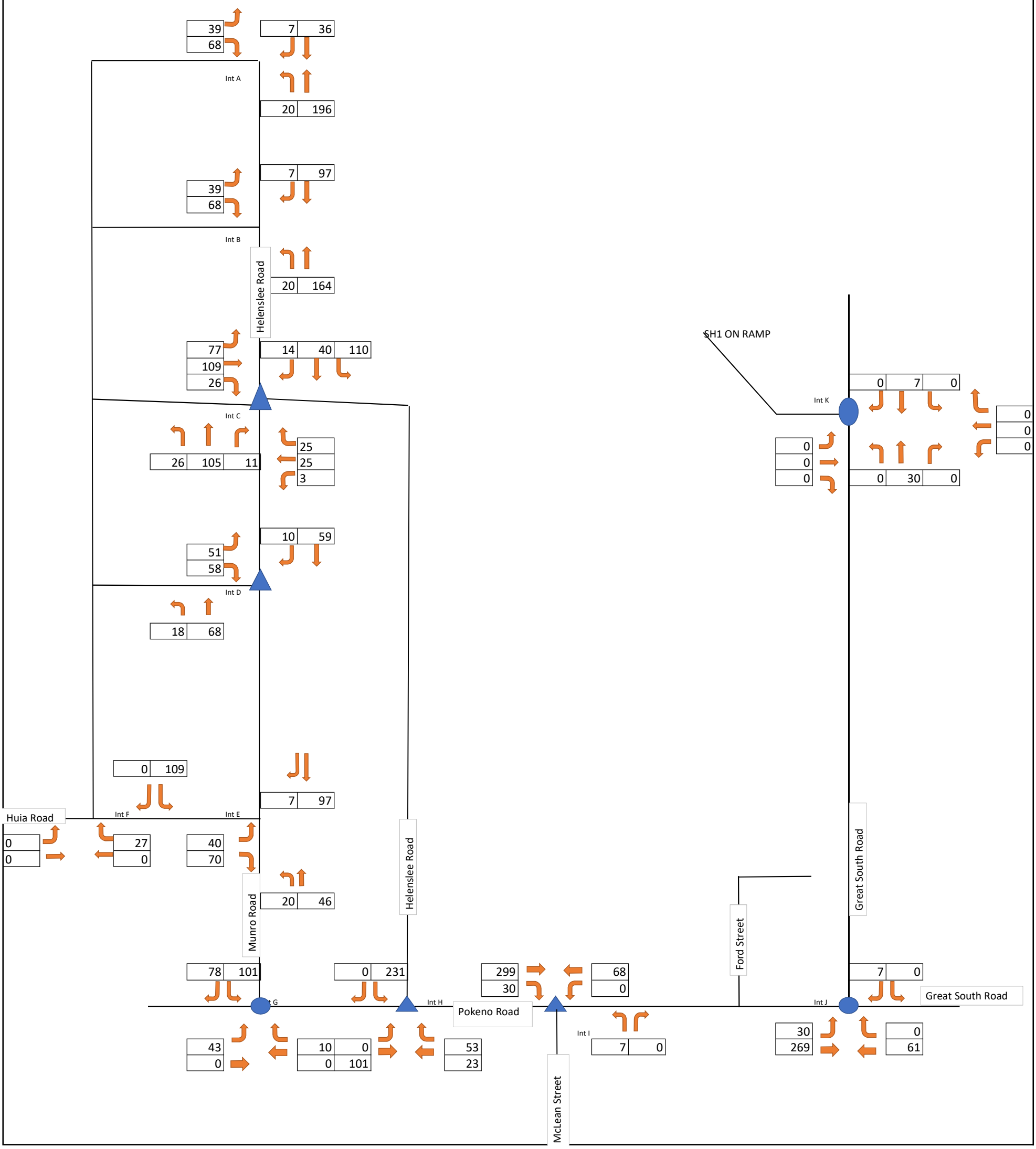


2040 Base volumes - PM

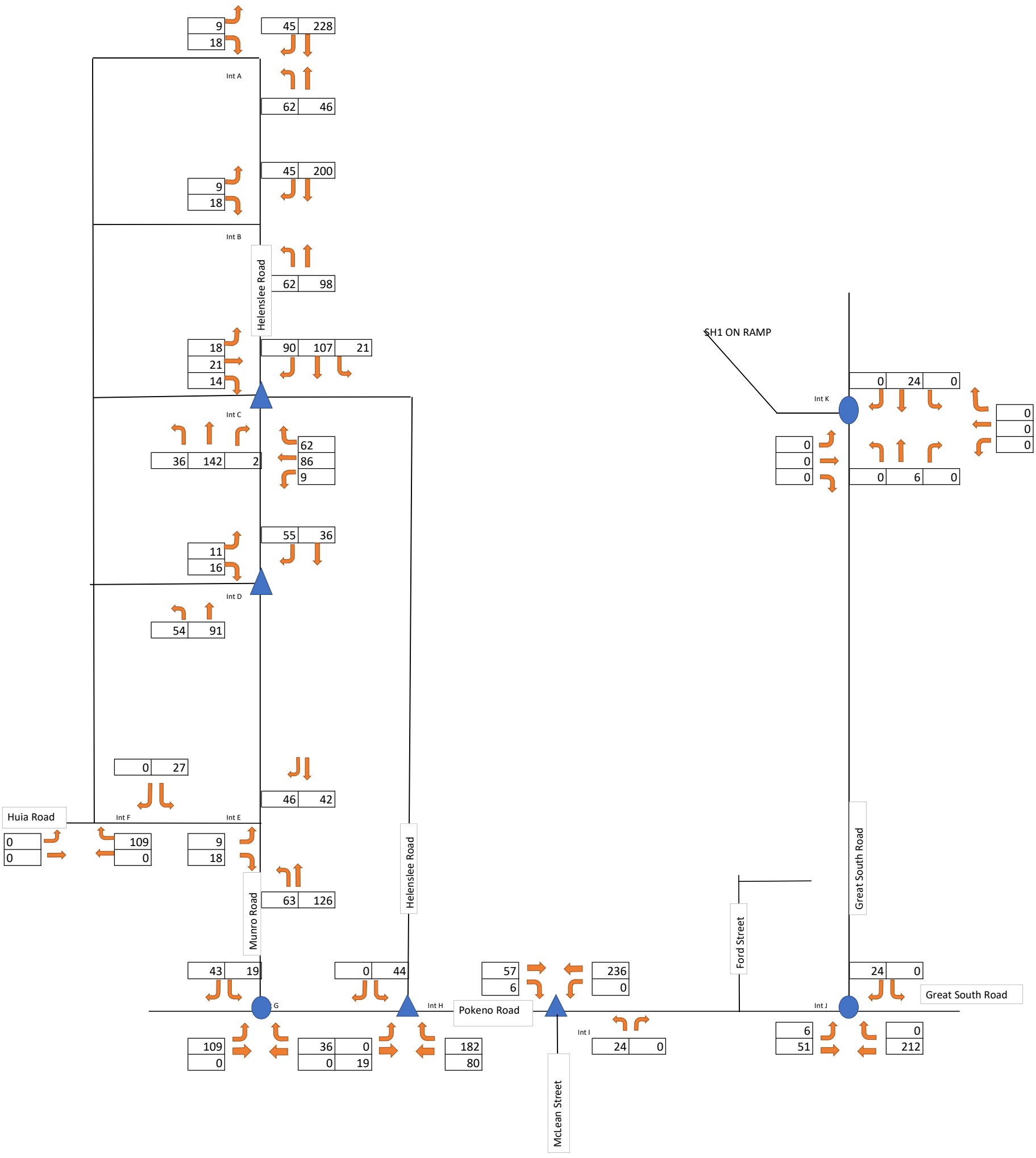


APPENDIX D – ESTIMATED ADDITIONAL VOLUMES (2022 AND 2040)

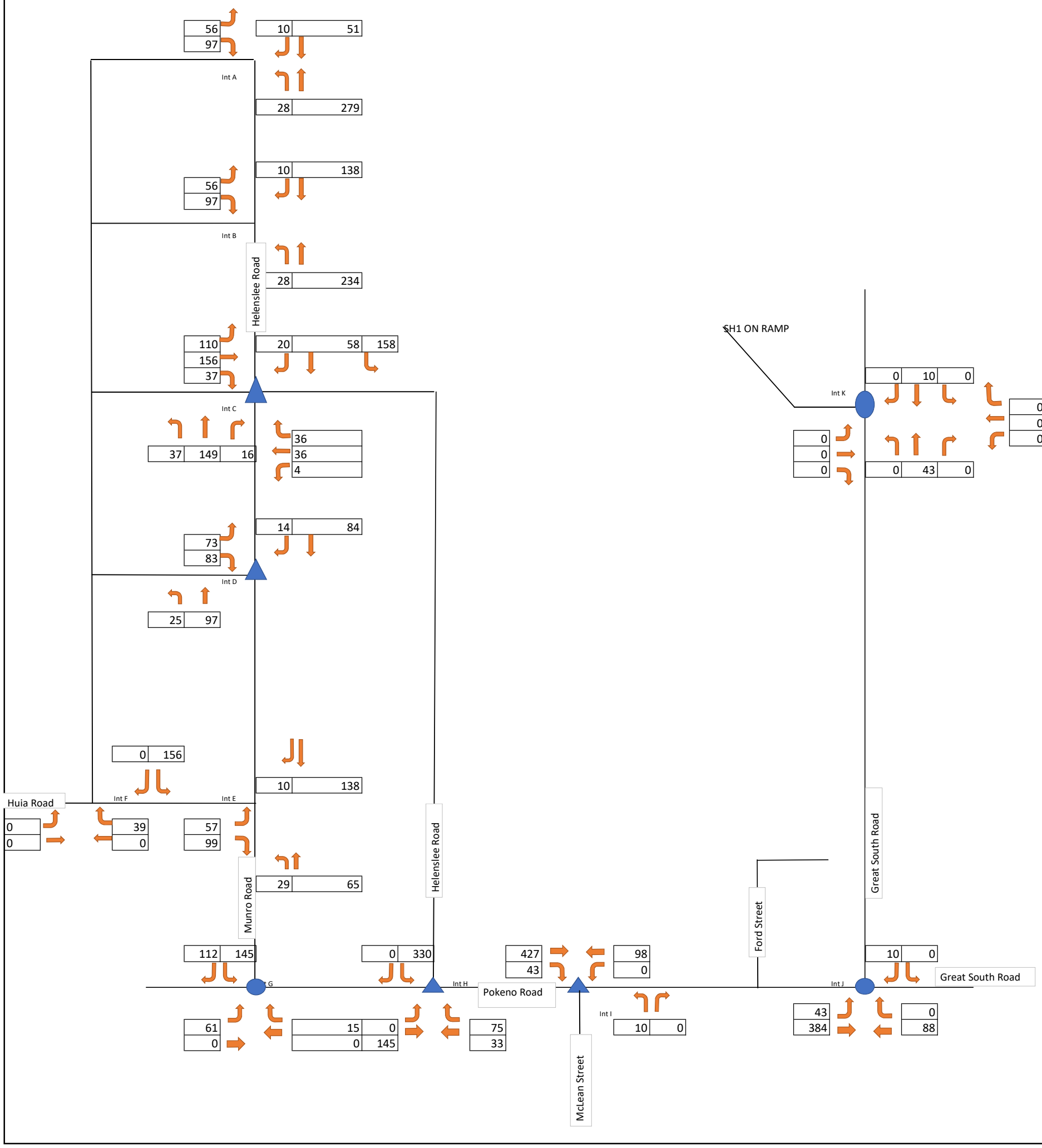
2022 Additional volumes - AM



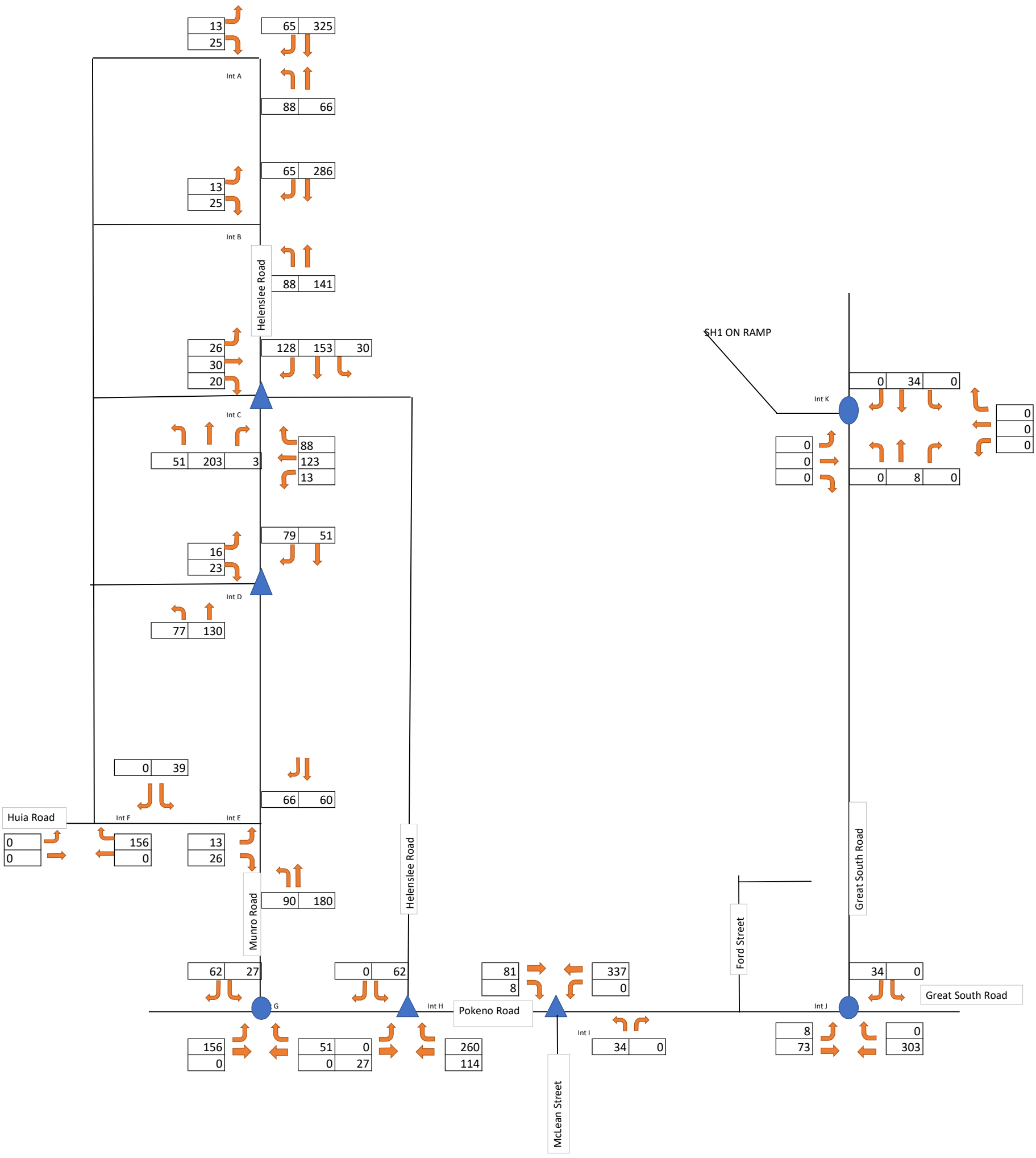
2022 Additional volumes - PM



2040 Additional volumes - AM

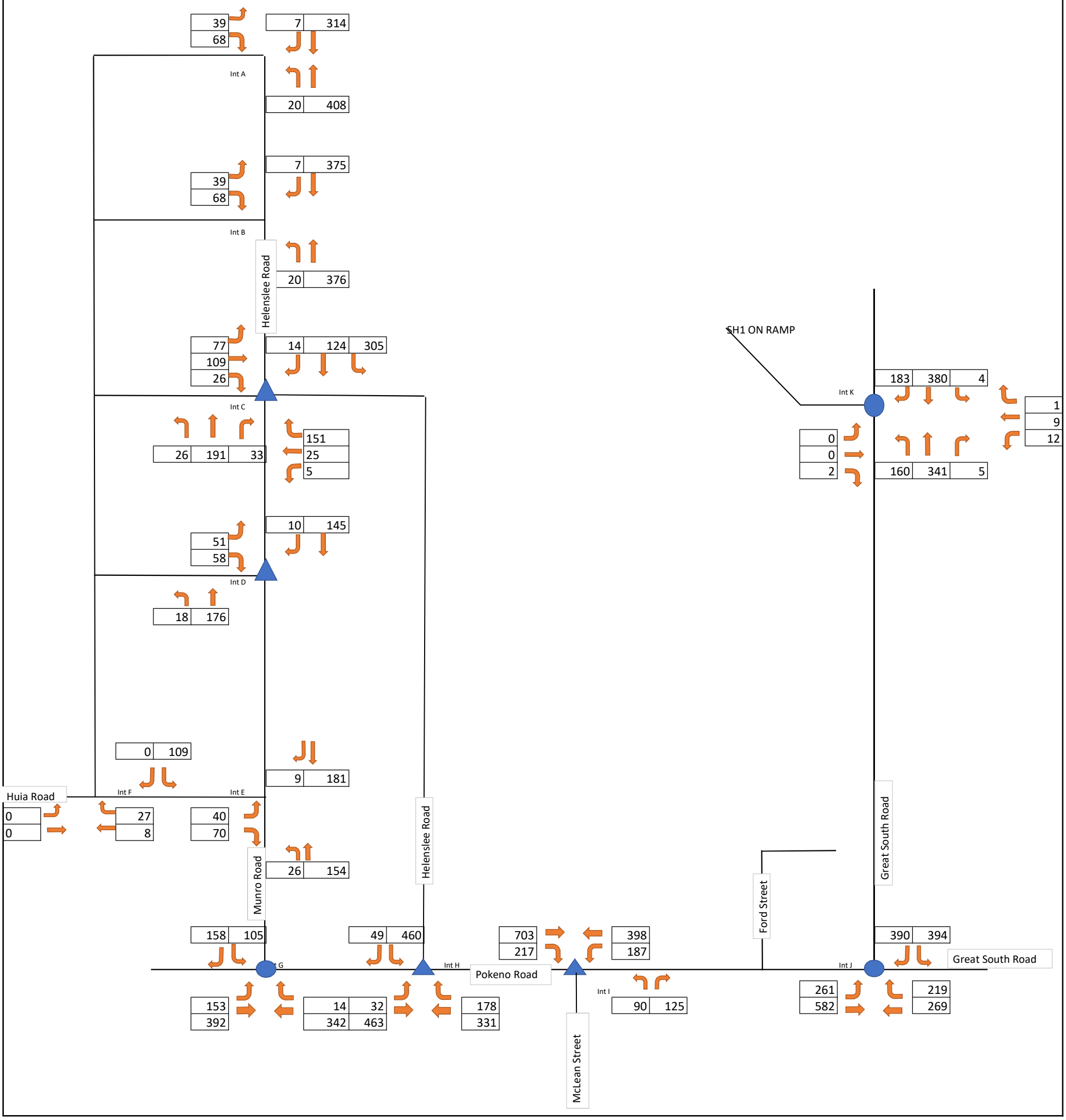


2040 Additional volumes - PM

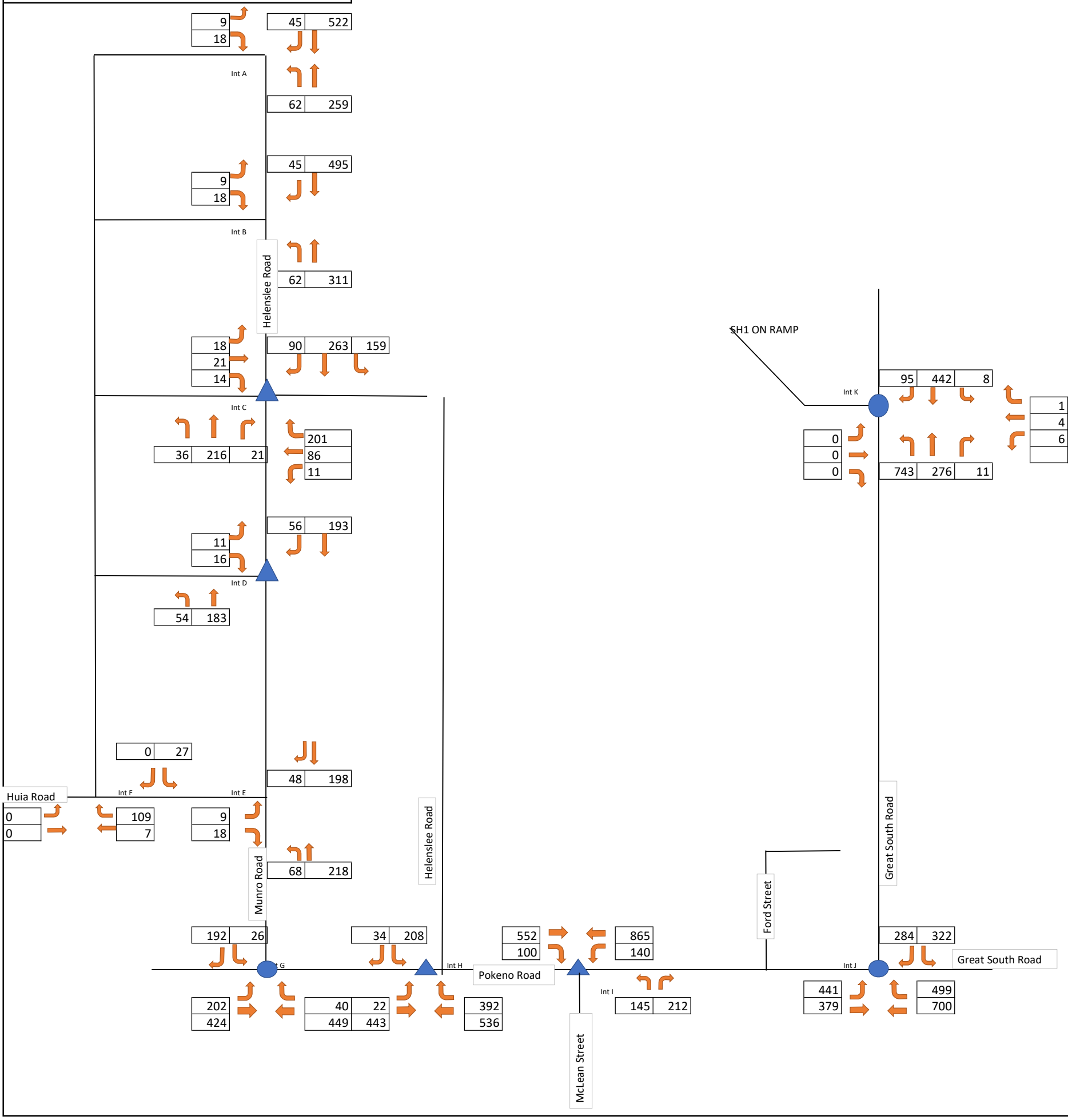


APPENDIX E – ESTIMATED FUTURE VOLUMES (2022 AND 2040)

2022 Proposed volumes - AM



2022 Proposed volumes - PM



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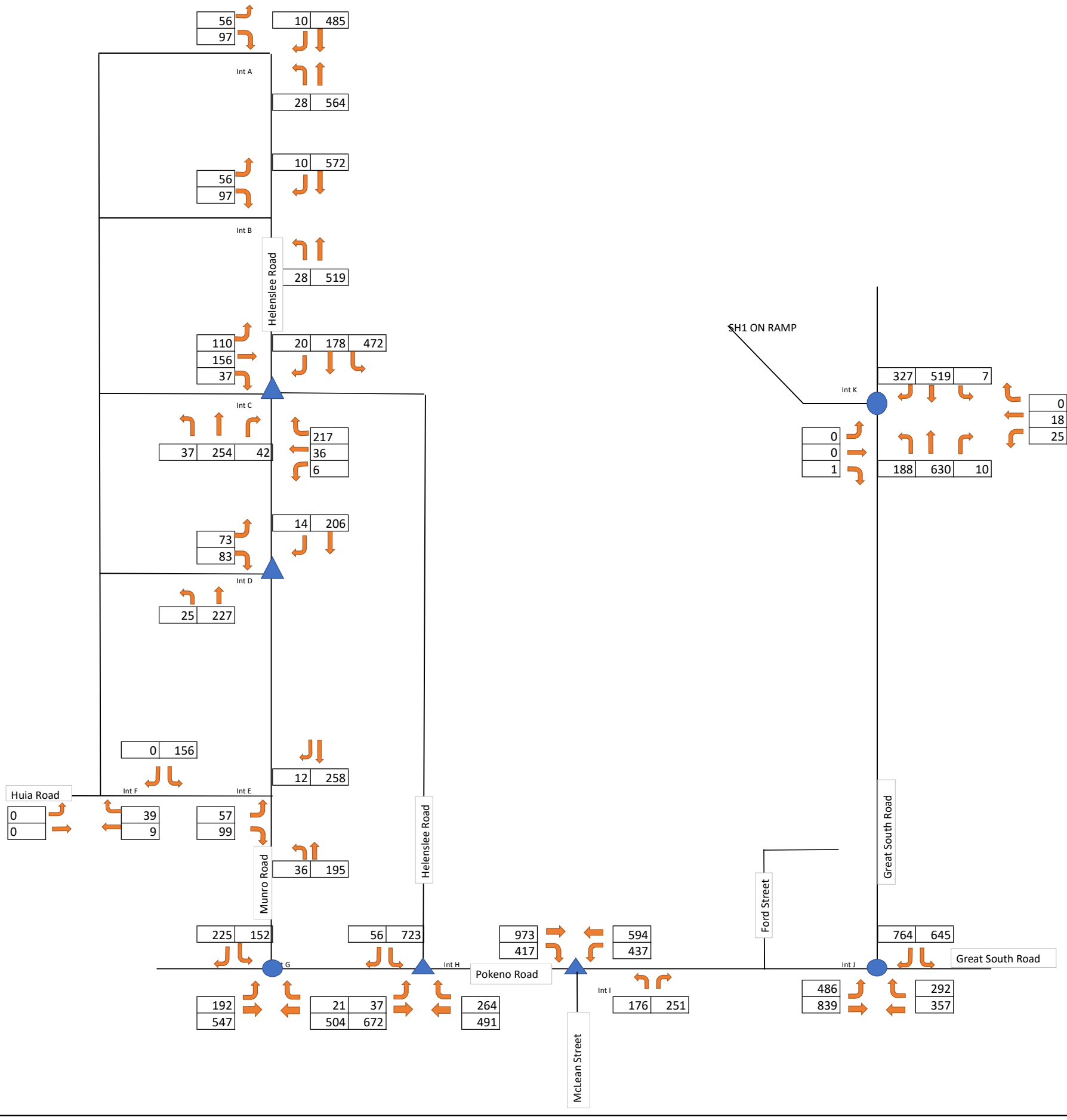

2040 Proposed volumes - PM