Drury Centre Precinct Fast-Track Integrated Transportation Assessment

PREPARED FOR Kiwi Property Group | November 2021

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Revision Schedule

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

This report has been prepared in support of the application by Kiwi Property Holding No.2 Limited (‘**Kiwi Property’**) for a referred project under the Covid 19 Recovery (Fast-track Consenting) Act 2020 (‘**the Act’**) for residential and commercial development and associated enabling works at 139, 155, 173 and 189 Fitzgerald Road, 61 Brookfield Road, 108, 116, 120, 124 and 132 Flanagan Road, Drury (‘**the site’**). The project is known as ‘Drury Centre’, which is a referred project under Schedule 2 of the Act and Schedule 32 of the COVID-19 Recovery (Fast-track Consenting) Referred Projects Amendment Order (No 14) 2021. This Integrated Transport Assessment (**ITA**) report outlines the transport implications of the proposed development of the site.

The site forms part of a larger land area within Drury East which is currently subject to Private Plan Change 48 – Drury Centre (‘**PC48**’). Land to the east and north of the site are subject to corresponding plan changes by Oyster Capital (Private Plan Change 50 (‘**PC50**’)) and Fulton Hogan Land Development Limited (‘**FHLDL**’) (Private Plan Change 49 (‘**PC49**’)) to rezone Future Urban Zone (‘**FUZ’**) land to residential zones.

PC48 seeks to rezone to the land from Future Urban Zone (‘**FUZ**’) to a combination of Business – Metropolitan Centre, Business – Mixed Use and Open Space – Information Recreation under the Auckland Unitary Plan (Operative in Part) (‘**AUP(OP)**’). The relationship of this project and PC48 is detailed in the Assessment of Environmental Effects (‘**AEE**’) prepared by Barker and Associates (‘**B&A’**). An ITA was prepared in September 2021 to support PC48, with this application being consistent with the wider development that was assessed as part of that ITA.

This ITA report assess the transport related issues of the proposal, including:

- The site and its surrounding transport environment;
- The proposal, focussing on key transport-related aspects of the development;
- The design of the local roads proposed to serve the development;
- The design and traffic operation of the proposed interim and final design;
- The adequacy and function of the proposed on-site parking and access for the individual lots within the interim and final design;
- The effect of both the interim and final design on the safety and efficiency of the existing road network; and
- The ability of both stages to meet the relevant AUP(OP) transport requirements, including the Drury Precinct transport requirements (where applicable).

The above points and other matters will be addressed in detail in this report.

2.0 EXISTING TRANSPORT ENVIRONMENT

2.1 SITE LOCATION

The site comprises 28.55 hectares of land at 133, 139, 155, 173 and 189 Fitzgerald Road; 61 and 97 Brookfield Road; and 108, 116, 120, 124, 128 and 132 Flanagan Road, Drury, Auckland (refer Figure 2-1 below). This area is bound by Fitzgerald Road to the east, Brookfield Road to the south and SH1 to the west.

Figure 2-1: Subject Site Subject to this Application in Context with the Local Road Network (Source: Ignite)

Waihoehoe Road, to the north of the site, is currently a rural road with no walking or cycling facilities. The North Island Main Trunk runs north-south to the northwest of the site. The site is located at the confluence of several major roads such as SH1, SH22 and Great South Road. Figure 2-2 shows the site in the context of the wider road network.

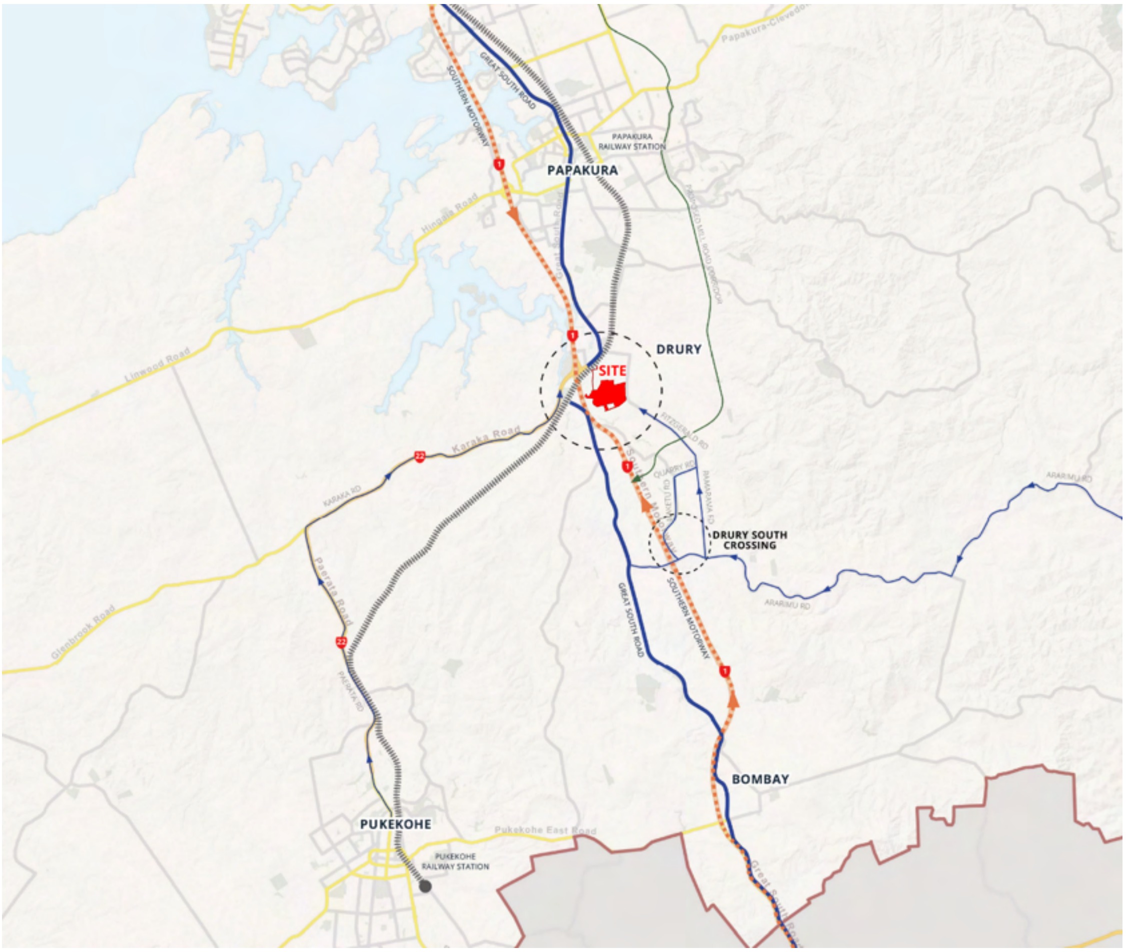


Figure 2-2: The site in context with the wider road network (Source: Ignite)

The site is zoned Future Urban (‘FUZ’) under the Auckland Unitary Plan (Operative in Part) (‘AUP(OP)’) and currently accommodates a range of rural and residential activities. The surrounding sites (with the exception of the rail corridor) are also zoned FUZ. The site is located approximately 30km southeast of Auckland’s central business district,14km southeast of Manukau, 6km south of Papakura, and within 1km of the existing Drury Town Centre.

Predominantly industrial and commercial activities are located to the west (existing Drury Town Centre) of the site. Drury School and Drury School Hall are also located to the west of the site, adjacent Great South Road. Low density residential dwellings are located to the east and west of the site, with the Manukau Harbour located further to the west.

As previously mentioned, there are two other sites within Drury East that are proposed to be developed via the Fast-Track process. The Waihoehoe Precinct is proposed to be developed by Oyster and the Drury East Precinct by Fulton Hogan, these sites in relation to the subject site are shown in Figure 2-3.

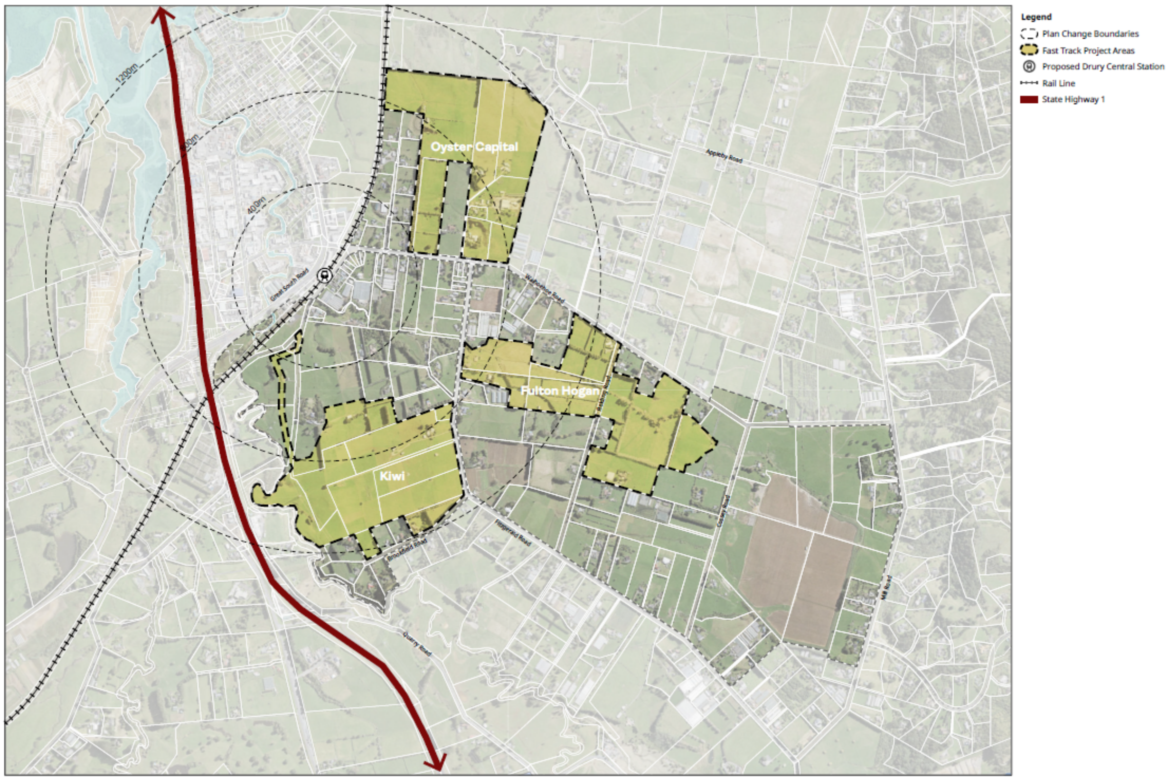


Figure 2-3: The site in context with the other Drury East Fast-Track sites (Source: B&A)

2.2 ROAD NETWORK

2.2.1 Waihoehoe Road

Waihoehoe Road forms a key east-west road to the north of the proposed development and is also the northern boundary of the neighbouring Fulton Hogan fast track area. It currently has a predominantly collector road function in connecting the eastern side of Drury to the Drury town centre and Great South Road. The cross section of Waihoehoe Road consists of one lane in each direction separated by a solid centreline, and with no kerb lines either side of the carriageway. The road widens to include a right turning bay at the Waihoehoe Road / Fitzgerald Road intersection.

Waihoehoe Road has a posted speed limit of 50km/h just east of Drury Interchange, 60km/h between Flanagan Road and Fitzgerald Road, and 80km/h east of Fitzgerald Road. It crosses the NIMT via a bridge that provides a kerb-to-kerb carriageway width of 10.5m, with a narrow footpath on the northern side of the bridge.

2.2.2 Fitzgerald Road

Fitzgerald Road forms the western and southern frontage of the neighbouring Fulton Hogan Plan Change and fast track area and a portion of the eastern frontage of the site. The Fulton Hogan Plan Change area boundary runs from Waihoehoe Road at its northern end to Drury Hills Road at its southern end. Fitzgerald Road continues south until the Quarry Road intersection.

Fitzgerald Road is currently classified as a collector road connecting low density residential housing and lifestyle blocks in Drury East to Great South Road and the Drury Interchange. The cross section of Fitzgerald Road comprises of one lane in each direction separated by a solid yellow line, with the exception of a right turning bay into Brookfield Road.

2.2.3 Brookfield Road

Brookfield Road runs along the southern frontage of the site and is currently classified as an access road. Fitzgerald Road connects to Brookfield Road at the southeast corner of the site.

2.2.4 Great South Road

Great South Road runs generally north-south through the wider Drury-Ōpaheke area, forming an S-bend where it crosses underneath SH1. Great South Road forms the main arterial route between Wiri / Manukau (to the northwest) and Papakura (to the southeast). The road follows a similar route to SH1 and for this reason is often used as an alternative route to SH1. Great South Road is part of SH22 (until some 600m west of the motorway interchange) and is located on the south-western end of the site.

Great South Road accommodates one lane in each direction to the east of the Drury interchange. The two directions are separated from each other by a solid line for most of the route with the exception of a flush median on the approach to adjacent intersections. The posted speed limit on Great South Road is 60km/h in the interchange area and reduces to 50 km/h entering the existing Drury centre at the creek bridge east of Firth Street. On-street parking is prohibited or unfeasible in most sections in the vicinity, albeit wide and often sealed berms in some areas transition into commercial property sealed forecourt area, resulting in the occasional parking being effectively or partially on-street.

Great South Road carries approximately 15,500vpd on weekdays.

2.3 PUBLIC TRANSPORT

Access to commuter rail services near the development site is currently via the Papakura train station, which is approximately 5km north of the Drury interchange. Train services connecting Papakura and Britomart (the Southern Line services) operate every 10 minutes during weekday peak morning and evening; between 20-30 minutes outside of the peak periods. Rail services between Papakura and Pukekohe are currently diesel shuttles operating at a 20-minute headway at peak periods, and hourly at other times.

Figure 2-4 shows that the only public transport service connecting Drury to Papakura is the bus service 376 which runs along Great South Road every 20 minutes during weekday peak times (6:50am-8:17am and 4:55pm-5:50pm) and every 30 mins during off-peak and weekends. Since August 2021, this service has been extended to Auranga as shown in **Figure 2-5.**

Figure 2-4: Public Transport Network

From Papakura, there are several bus services (in addition to the southern rail line), which operate approximately every 15 minutes during peak hours. These serve the local Papakura area and provides a service to Manurewa and Manukau (refer to **Figure 2-4**).

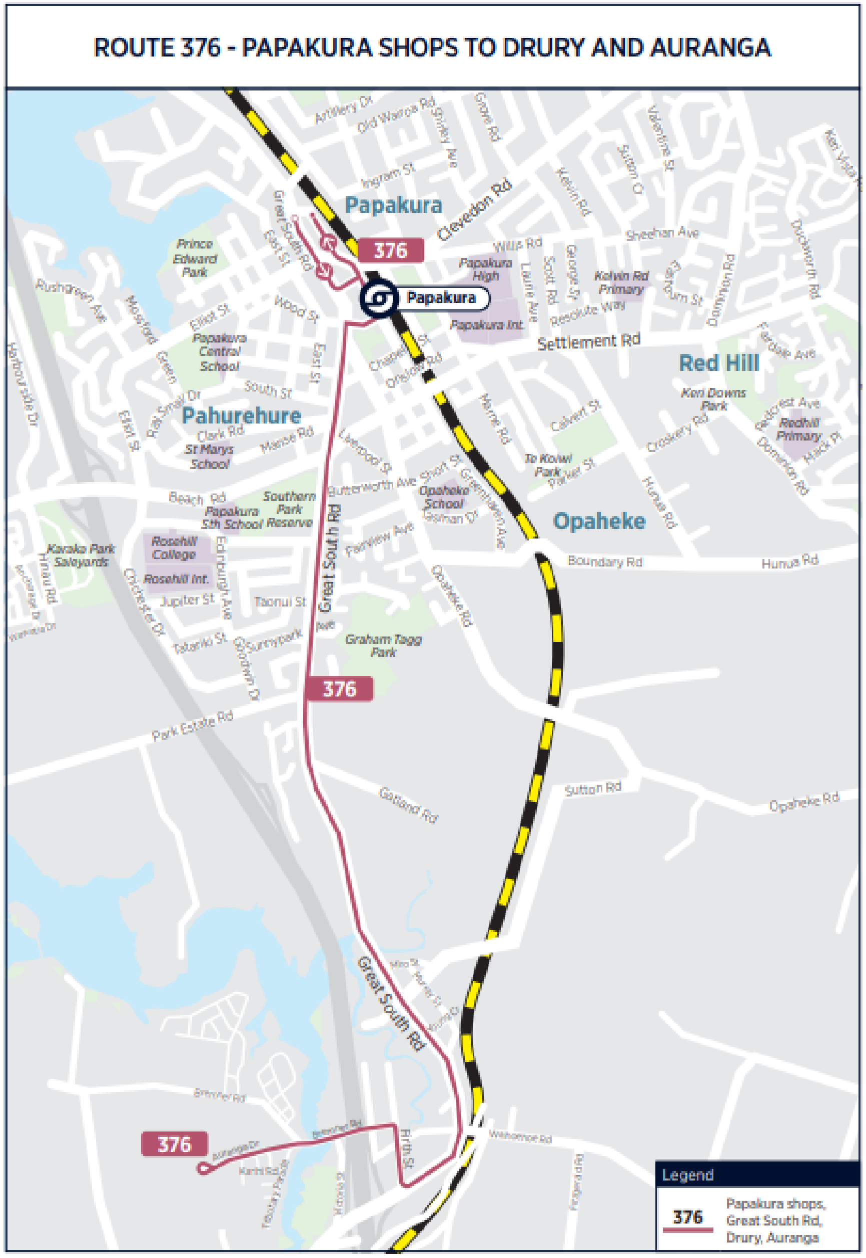


Figure 2-5: Updated 376 Bus Route to Auranga

In general, the bus services are adequate to serve the currently small population in the area.

2.4 WALKING AND CYCLING PROVISION

The local road network within Drury East does not currently accommodate any cycling or walking provisions. There are no footpaths on any of the roads within the site area.

Waka Kotahi are currently developing an extension of the Southern Pathway (shared path) along the western side of SH1 from its current end at the Papakura interchange southwards as far as the Drury Interchange. Funding is understood to have been allocated as part of the current motorway works in this section, but details of active mode designs in the interchange area are not yet known. The expected delivery is understood to still be several years away.

2.5 ROAD SAFETY

A search of the road safety record was undertaken using the New Zealand Transport Agency (**Waka Kotahi**) Crash Analysis System (**CAS**) for the period from 2016 to 2020. Due to the size of the development area, the scope was divided into three zones to assess the major intersections surrounding the proposed Oyster, Kiwi and Fulton Hogan sites. The scope of each zone is outlined below:

Zone 1: West of the Drury Interchange

- 50m radius of Karaka Road / Great South Road intersection
- 50m radius of Great South Road / Pitt Road intersection
- 50m radius of Great South Road / Quarry Road intersection
- Great South Road between Karaka Road and Quarry Road

Zone 2: Along Great South Road

- 50m radius of the Great South Road / Northbound off-ramp intersection
- 50m radius of the Great South Road / Southbound off-ramp intersection
- Great South Road between Karaka Road and Waihoehoe Road

Zone 3: Along Waihoehoe Road

- 50m Radius of Great South Road/ Waihoehoe Road
- 50m radius of Waihoehoe Road / Fitzgerald Road
- 50m radius of Fitzgerald Road / Brookfield Road
- Waihoehoe Road between Great South Road and Brookfield Road

A total of 79 crashes were recorded within all three zones for this period. These were divided into one fatal, six serious, 18 minor and 54 non-injury crashes. The reported crashes are summarised in the Table 2-1 below.

Table 2-1: Crash History by Local Search Zone; 2016-2020

Search Zone	Number of Crashes by Crash Severity				
	Fatal	Serious	Minor	Non-injury	Total
Zone 1	1	3	4	11	19
Zone 2	0	2	10	32	44
Zone 3	0	1	4	11	16
Total	**1**	**6**	**18**	**54**	**79**

From the above table, Zone 2 (along Great South Road) had the highest recorded number of crashes of the three crash search zones. This is expected from the higher traffic volumes and complexity of the motorway interchange.

An analysis of crashes in each zone is described in detail overleaf.

2.5.1 Zone 1

The crash search extent for Zone 1 is shown in Figure 2-6.

Figure 2-6: Zone 1 - West of the Drury Interchange

Table 2-2 outlines the crashes that occurred in Zone 1 below, by severity.

Table 2-2: Crash Severity Summary for Zone 1

Location	Number of Crashes by Crash Severity				
	Fatal	Serious	Minor	Non-injury	Total
Karaka Road (SH 22) / Great South Road Intersection	0	2	1	7	10
Great South Road / Pitt Road Intersection	0	1	1	1	3
Great South Road between Karaka Road and Pitt Road, midblock	1	0	1	1	3
Great South Road between Pitt Road and Quarry Road, midblock	0	0	1	2	3
Total	**1**	**3**	**4**	**11**	**19**

One fatal rear-end crash occurred on Great South Road between Karaka Road and Pitt Road, where an inexperienced motorcyclist collided with a slowing vehicle. The road rises over the bridge which may limit visibility.

Three crashes resulting in serious injuries occurred in the search extent, outlined as follows:

- Two crashes occurred at the intersections of Karaka Road / Great South Road and Great South Road / Pitt Road, where the vehicle on the minor road failed to give way and was hit by an oncoming vehicle on the major road; and
- One head-on crash occurred at the intersection of Karaka Road/Great South Road, as the driver was intoxicated.

The four minor-injury crashes are outlined as follows:

- Two occurred due to sunstrike, resulting in a rear-end crash and a head-on collision;
- A Karaka Road / Great South Road intersection resulting from a failure to give-way to traffic travelling along Karaka Road; and
- A loss of control crash on Great South Road between Pitt Road and Quarry Road, involving a vehicle veering onto the wrong side of the road, hitting oncoming traffic.

There were no crashes involving pedestrians or cyclists within the specified five-year period in this zone.

Overall the injury crashes outlined above do not appear to follow a specific pattern that would indicate any inherent safety issues in the design of roads and intersections within Zone 1.

2.5.2 Zone 2

The crash search extent for Zone 2 is shown in Figure 2-7.

Figure 2-7: Zone 2 - Along Great South Rd

Table 2-3 outlines the crashes that occurred in Zone 2 overleaf, by severity.

Table 2-3: Crash Severity Summary for Zone 2

Location	Number of Crashes by Crash Severity				
	Fatal	Serious	Minor	Non-injury	Total
Northbound off-ramp / Great South Road	0	0	3	9	12
Southbound off-ramp / Great South Road	0	0	4	9	13
Great South Road between Southbound off-ramp and Waihoehoe Road, midblock	0	2	2	7	11
Great South Road between Karaka Road and Northbound off-ramp, midblock	0	0	1	7	8
Total	**0**	**2**	**10**	**32**	**44**

Twelve injury crashes occurred in this zone, with two serious-injury and ten minor-injury crashes.

The serious injury crashes are outlined as follows:

- A failure to give way at the Great South Road / Firth Street intersection, where the vehicle on the minor road did not notice the oncoming motorcycle on Great South Road; and
- A loss of control crash on Great South Road between the Southbound off-ramp and Waihoehoe Road involving a motorcyclist, due to accelerating too quickly.

The minor-injury crashes are outlined as follows:

- Two minor-injury crashes occurred due to driver errors. These occurred at the intersections of Northbound offramp/ Great South Road and Southbound off-ramp/ Great South Road, as a result of the driver losing consciousness and crashing into another vehicle/object;
- Two rear-end crashes occurred at the Northbound off-ramp/ Great South Road intersection and on Great South Road between Karaka Road and Northbound off-ramp, due to driver distraction and following too closely to the vehicle in front;
- Two incidents involving intoxicated drivers resulted in a rear-end and loss of control crash;
- A lane change crash occurred at the Southbound off-ramp / Great South Road intersection, where a vehicle in the rightmost lane continued through instead of right, colliding with the vehicle turning right;
- One rear-end crash occurred on Great South Road between Waihoehoe Road and the Southbound off-ramp due to road rage; and
- One loss of control crash occurred in a stolen vehicle during a pursuit at the Northbound off-ramp / Great South Road intersection.
- A crash involving a cyclist changing lanes was hit by an oncoming vehicle at Great South Road between Firth Street and Waihoehoe Road.

There does not appear to be any recurring crash patterns or inherent road safety defects in Zone 2.

2.5.3 Zone 3

The crash search extent for Zone 2 is shown in Figure 2-7.

Figure 2-8: Zone 3 - Along Waihoehoe Road and Fitzgerald Road

Table 2-4 outlines the crashes that occurred in Zone 3 below, by severity.

Table 2-4: Crash Severity Summary for Zone 3

Location	Number of Crashes by Crash Severity				
	Fatal	Serious	Minor	Non-injury	Total
Great South Road / Waihoehoe Road Intersection	0	0	2	7	9
Fitzgerald Road between Waihoehoe Road and Brookfield Road, midblock	0	0	1	3	4
Fitzgerald Road / Brookfield Road Intersection	0	1	0	1	2
Waihoehoe Road between Great South Road and Fitzgerald Road, midblock	0	0	1	0	1
Total	**0**	**1**	**4**	**11**	**16**

Of the injury crashes outlined above, there was one incident resulting in serious injuries. This crash was a loss of control crash due to an animal running in front of the oncoming vehicle at the Fitzgerald Road / Brookfield Road intersection.

The four minor-injury crashes in the specified five-year period involved vulnerable road users (pedestrians or cyclists), all resulting in minor injuries. These crashes are outlined as follows:

- Two involved a failure to give way to cyclists at the Great South Road / Waihoehoe Road roundabout. Contributing factors for such crashes were weather conditions and driver misjudgment of the gap available to enter the roundabout; and

- Two involved vehicles striking pedestrians. One occurred on Fitzgerald Road in between Waihoehoe Road and Brookfield Road, and was construction related where a truck driver and pedestrian were working on the road. The truck driver reversed his vehicle and accidently hit the pedestrian. The other crash involved a pedestrian running onto the road heedless of traffic at Waihoehoe Road in between Great South Road and Fitzgerald Road.

There does not appear to be any recurring crash patterns or inherent road safety defects in Zone 3.

2.5.4 Summary

There do not appear to be any significant safety issues arising from road or intersection designs in the crash search areas above. In the majority of cases, the crashes were observed to have occurred due to human factors such as intoxication/medication, distracted driving, and inadequate spatial awareness.

The total number of crashes within all three zones, one fatal, six serious, 18 minor and 54 non-injury crashes, are typical given the high traffic volumes, proximity to a motorway interchange and the higher surrounding speed limits. It is also noted that the crashes involving cyclists and pedestrians are considered relatively low. Therefore, it is considered that there are no inherent safety concerns with the current road design. It is noted that the proposed development and enabled developments aid infrastructure improvements and will enhance pedestrian, cyclist and road user safety.

3.0 PROPOSAL

3.1 SITE LAYOUT

Kiwi Property are proposing the subdivision and development of the site as the first stage of the Drury Centre. The proposal will result in the development of a commercial retail centre in the western part and residential balance super lots enabling future residential development to the east of the LFR, and parks/reserves including an open space reserve adjacent the Hingaia Stream. The construction of roads to vest, associated site preparation works and construction of civil infrastructure and landscaping are also proposed.

The site development also includes new roads and upgrades of existing roads to provide multi-modal access, and to connect the activities within the site to the wider network including the new Drury Central train station. This includes the new Pitt Road / Fitzgerald Road intersection and Brookfield / Fitzgerald intersection which will be delivered by Kiwi as the main accesses of the site, as well as road upgrades along Fitzgerald Road north of this intersection, and Waihoehoe Road to Great South Road, jointly undertaken by other fast track applicants.

The site layout is shown in Figure 3-1 below, bound by rural properties to the north, Fitzgerald Road to the east, Brookfield Road and rural properties to the south and the Hingaia Stream and rural properties to the west.

Figure 3-1: Proposed Development Layout (Source: Ignite)

4.0 PROPOSED TRANSPORT NETWORK

4.1 GENERAL ROAD LAYOUT

The development will primarily be accessed via two new collector roads; Pitt Street and Main Street South. Pitt Street runs in the east-west direction along the top edge of the fast-track development site. Main Street South passes through the western centre of the site (the retail area).

Pitt Road will connect the site to Fitzgerald Road to the east, while Main Street South will connect to Creek Road and then terminate at Brookfield Road to the south. Brookfield Road will also function as a collector, albeit in a somewhat more interim format, considering large parts of adjacent frontages on this road are not owned by the applicant and remain in rural or low-density residential usage for the immediately foreseeable future.

It is noted that Main Street South is proposed as a private road to be owned and operated by the applicant as part of the retail centre.

A network of local roads will facilitate access and movement to the retail and residential developments, with this network concentrated in the eastern (residential) half of the site. The internal "local roads" within the western part of the site/the commercial retail centre will be private roads / car park aisles not to be vested.

The proposed public road layout for the Kiwi fast track development is shown in Figure 4-1 below.

Figure 4-1: Proposed Road Layout (Source: Ignite)

The site will initially be accessible via the signalised Pitt Road / Fitzgerald Road and Brookfield / Fitzgerald Road intersections, as well as an added left-in / left-out access halfway along Fitzgerald Road into the residential area. In future stages, more access particularly from the north will be enabled (not part of the fast track application).

The new intersections will allow for efficient and safe movements of traffic, public transport and active modes to and from the site, with the details of the intersections described further later in this report.

The proposed mid-block design of these roads is set out in Sections 4.4.2 to 4.4.7 of this report.

4.2 ACTIVE MODE NETWORK

The site and the surrounding roads aims to achieve high standards of level of service and safety for active modes to enable safe and amenable walking, cycling and scootering to and around the fast track area.

This is generally provided with footpaths and protected one-way cycle lanes on both sides of all roads. In combination with safe intersections and slow-speed-design local roads, these paths create a network that will be highly accessible and safe, encouraging travel by active modes and reducing the reliance on private vehicular travel. This will be especially crucial in enabling local trips via cycle and scooter modes for distances of up to several kilometers.

The provision of continuous, high-quality walking and cycling facilities on Fitzgerald Road and Waihoehoe Road, in particular, will overcome issues in ensuring active travel uptake often experienced in other historic development areas. In these areas, cycleways and footpaths were often inconsistent and intermittent, making these routes impractical and unattractive until other developments closed the gaps many years later. Ensuring connectivity from the start – in particular between the three fast track applicant areas, the train station / transport interchange and the old Drury town centre – is therefore a key objective.

The starting network of active mode facilities on the main roads will be supported by a north-south interim connection of approximately 1km between the fast track area and the new Drury Centre train station / interchange planned near Flanagan Road / Waihoehoe Road. This shared path will not initially follow a road, though it will approximately align with the future Creek Road alignment along the western edge of the future development area.

This shared path will enable added active mode connectivity to the main public transport node of Drury in advance of later development, which will ultimately provide road connections with protected cycle lanes and footpaths (not part of this application).

The pedestrian and cycle connections through the site are shown in Figure 4-2.

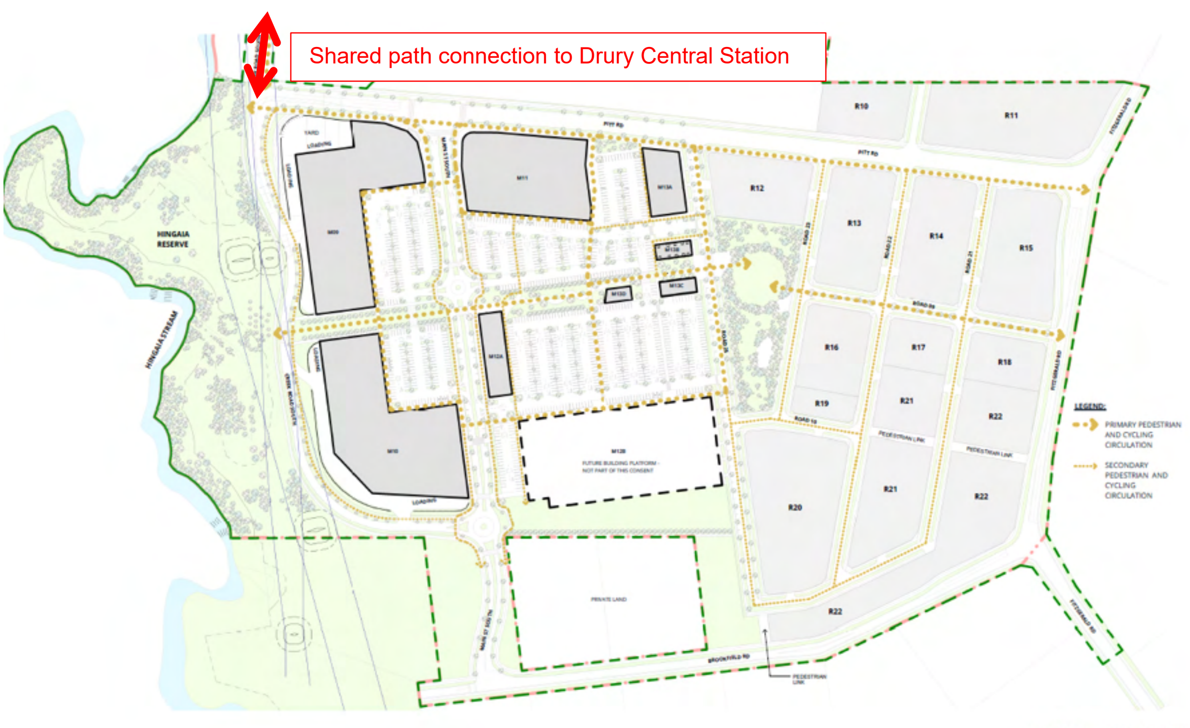


Figure 4-2: Pedestrian and Cycle Connections

The key walking and cycling routes through and between the sites and the Drury Central train station are shown in Figure 4-3

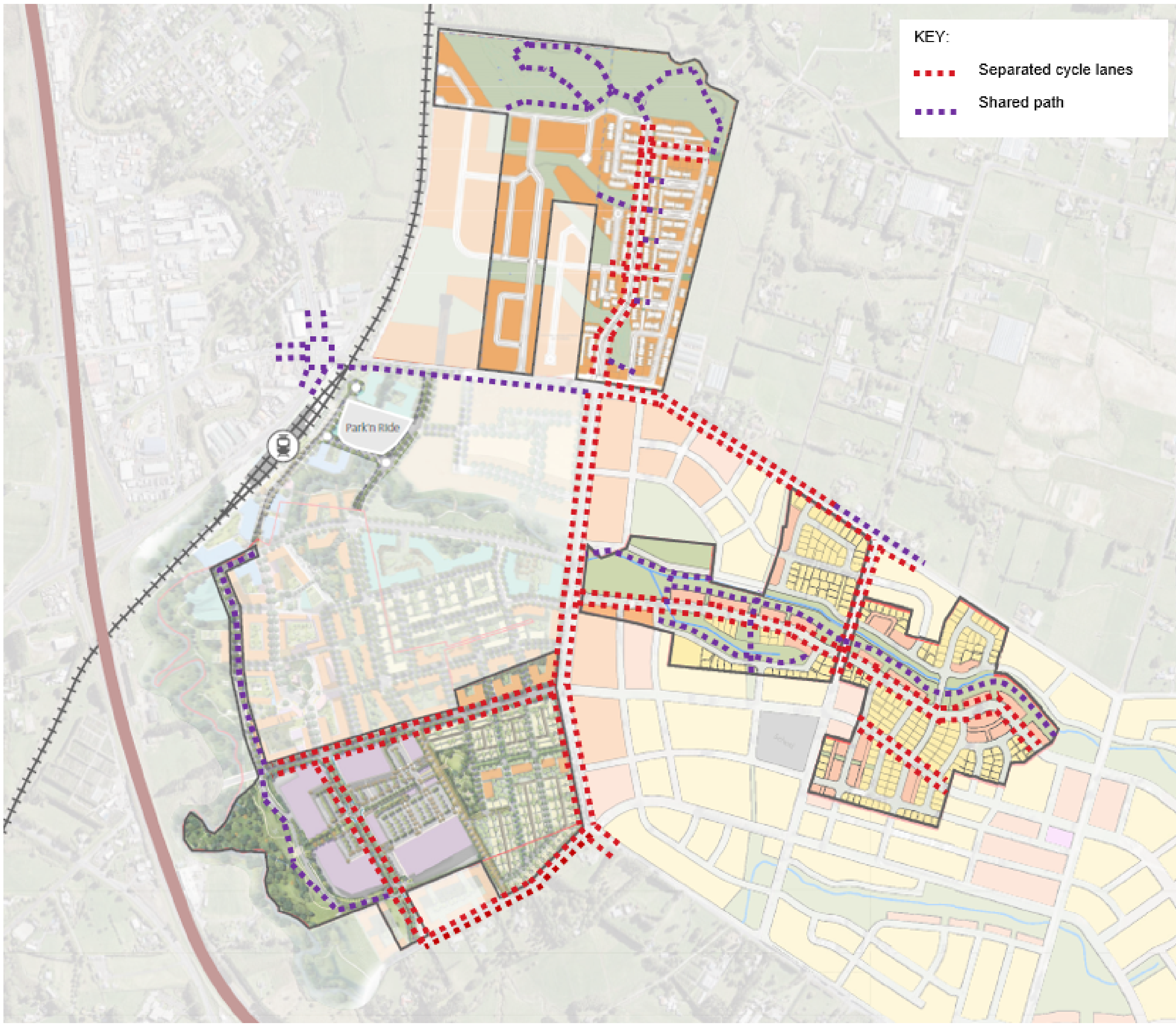


Figure 4-3: Key Walking and Cycling Routes

4.3 PUBLIC TRANSPORT NETWORK

The future public transport network in the fast track area has not yet been developed by authorities. This will be further discussed as part of the proposed plan changes, and also, in future network development activities by Auckland Transport. However, certain high-level assumptions can be made.

The core of the public transport network in the Drury plan change / fast track areas is expected to be the Drury Central train station and bus interchange just south of the current intersection of Flanagan Road and Waihoehoe Road. This will provide train service connections to Pukekohe, Papakura, Manukau and Auckland City Centre. With the train route to be electrified in the coming years (confirmed) and with added tracks planned, this will ensure high-quality train services linking the fast track areas to key surrounding towns as well as the heart of Auckland.

The transport interchange associated with the train station is also expected to be the focus (or, depending on route, at least a key stop) of all future local bus routes serving the fast track areas and the wider Drury area. The interchange will enable passengers to switch between bus services or between train and bus services.

As the fast track areas grow, these will also increasingly become destinations in their own right, in particular the new Drury Town Centre, and it will become increasingly important to provide public transport services connecting this town centre with the train station, and the other fast track areas, to allow residents to access not just the train station / interchange but also the new town centre via bus and train.

To support public transport use, two key infrastructure strategies are being pursued in the fast track area:

- Provision of a network of high-quality active mode facilities that link the fast track areas with the train station / interchange (See Section 4.2). Together with appropriate intersection facilities this fine-grained network will allow residents, employees and visitors of the fast track areas to efficiently access the train station by walking, cycling or scootering, ensuring that locals are less reliant on private cars supporting public transport use.
  - Examples include the interim shared path between the Kiwi Property fast track area and the train station (to be replaced by a road with separated cycle and walking facilities as the town centre development progresses), the interim shared path on Waihoehoe Road West, as well as the permanent dedicated separated walk and cycle facilities on Opaheke Road, Waihoehoe Road East, Pitt Road, Main Street, Fielding Road and Fitzgerald Road.
- Provision of localised bus priority facilities, to allow bus services to bypass intersection delays at key locations. These provision range from those proposed to be included as part of the fast track works to those expected to be added later, but (where suitable) future-proofed as part of the fast track works:
  - Examples of facilities proposed to be provided from the start are the westbound bus lane on Waihoehoe Road West approaching the train station / interchange from the east, and the provision of a second left-turn lane from Fitzgerald Road into Pitt Road for buses serving the future town centre.
  - Examples of facilities future-proofed include the future bus lanes on Opaheke Road and on the approach to Opaheke Road / Fitzgerald Road via wide grass berms (for later FTN route provision), and the added lane provided on Pitt Road to provide a bus lane (See Section 4.4.4) either westbound or eastbound as appropriate for future services in the centre of the future Drury Town Centre.

Overall, while public transport routing and provision levels are thus not yet known, it is considered that the fast track areas are well set up to encourage public transport use.

4.4 ROAD CROSS-SECTIONS

4.4.1 WAIHOEHOE ROAD

4.4.1.1 GENERAL MID-BLOCK (20m Interim, 30m Long-Term)

Waihoehoe Road is located to the north of the site and provides access to the site from the wider road network. It is proposed to upgrade the section of Waihoehoe Road between Great South Road to the west of the development and the intersection with Ōpaheke Road / Fitzgerald Road to incorporate walking and cycling facilities. This will be undertaken within the existing property boundaries, consisting of a 20m wide corridor with some localised widening at intersections.

An NoR has been lodged for Waihoehoe Road West (adjacent to the site) to upgrade the road in the long term to a four lane FTN arterial with active transport facilities. Discussions with authorities have focused on the ability of the interim design to provide for the necessary capacity, safety and general transport needs (including for active modes), while fitting into the existing (pre NoR-land take) corridor, and also minimising, where possible, the future reconstruction needed when the road is four-laned to FTN arterial form (by others).

Further constraints and requirements identified include:

- Significant width required in the corridor to be allocated for stormwater treatment;

- An existing water main under the road which cannot realistically be moved, and which limits the areas where “deep” features such stormwater treatment (rain gardens and swales) can be provided; and
- To ensure public transport reliability along Waihoehoe Road, a westbound bus lane will be provided in the interim layout.

These constraints led to a design which limited the ability to provide separated active mode facilities within the interim 20m corridor layout. In particular, separated cycle lanes and footpaths on both sides of the road are not able to be provided in the proposed interim cross-section, unlike the vast majority of the fast track arterial / collector road designs proposed elsewhere.

Walking and cycling will therefore be accommodated in the interim via a proposed 3.5m shared path on the southern side of the road. A 3.5m wide westbound bus lane (including 0.3m channel allowance), a 3.1m wide general traffic westbound lane, and a 3.4m wide general traffic eastbound lane (including 0.3m channel allowance) are also provided.

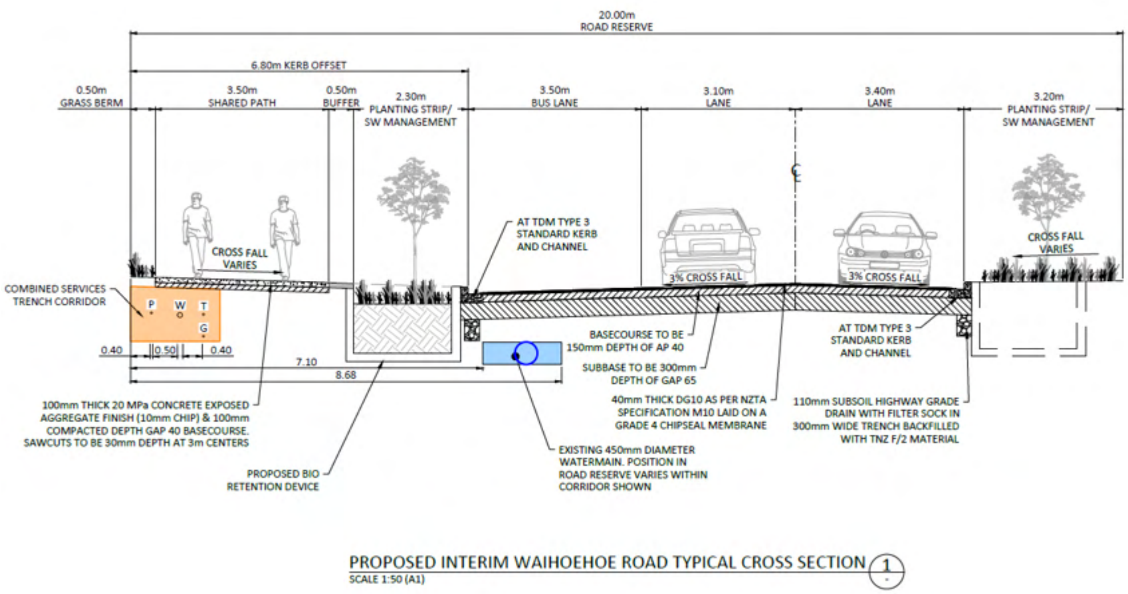


Figure 4-4: Waihoehoe Road – Interim Cross-Section

As a minor added benefit from these changes, the interim layout of the southern kerb and bus lane are located in the same location as in the long-term NoR design (6.8m off-set from the southern boundary).

The long-term cross-section for Waihoehoe Road as per the NoR is shown in **Figure 4-5** below.

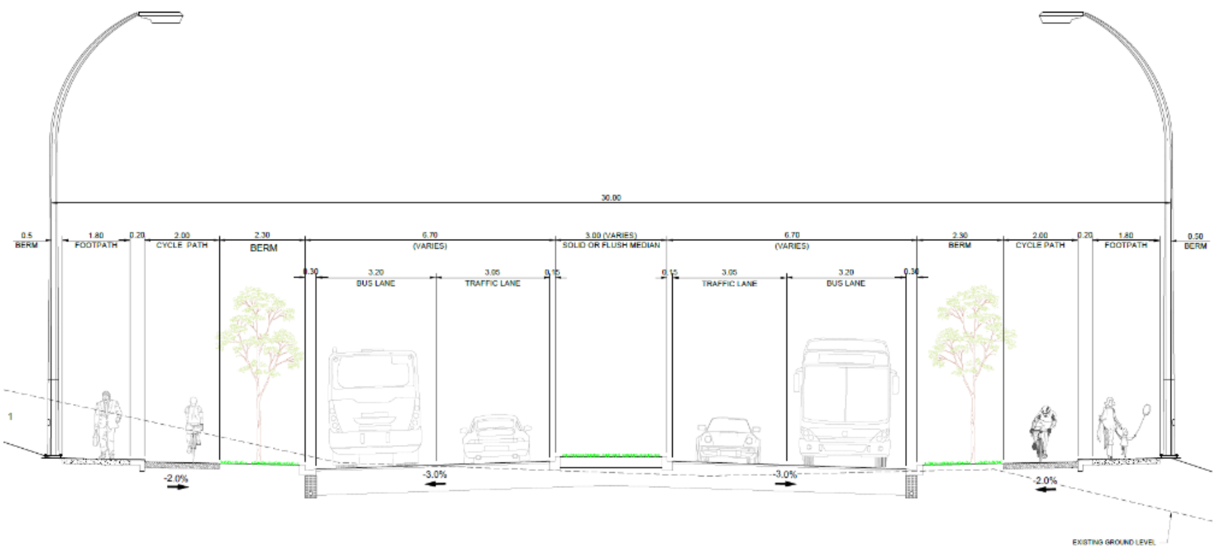


Figure 4-5: Waihoehoe Road NoR Cross-Section (identical to the NoR cross-section for Opaheke Road)

4.4.1.2 WAIHOEHOE ROAD WEST – GSR TO RAIL OVERBRIDGE (Varies)

Between the Great South Road intersection and the rail overbridge, the road cross-section is essentially an extension of the intersection design at the Great South Road roundabout, described further in Section 6.9 of this report.

In terms of active mode provision, the proposal is to remove the narrow, inconsistent footpath on the northern side of the road and install a 3m wide, continuous shared path on the southern side of the road, up to and across the rail bridge. This will be included as part of the upgrades to the roundabout and the general Waihoehoe Road West upgrades proposed as part of this application.

The long-term cross-section in this section will be defined by the future long-term signal design at the intersection of Great South Road / Waihoehoe Road and rail overbridge replacement design (not part of this application). It is expected that the long-term design will provide footpaths and protected cycle lanes on both sides, as well as added lanes for bus priority and intersection queue storage.

4.4.1.3 WAIHOEHOE ROAD WEST – RAIL OVERBRIDGE (Varies)

The rail overbridge to the west of the site, close to Great South Road, currently provides one traffic lane in each direction, plus shoulders, and a narrow footpath on the northern side of the road only. The approximate width between railings is estimated to be 10.5m, although a width of 10.4m has been conservatively assumed for design purposes. The current layout provides acceptable conditions for motor vehicles, but very low convenience and safety for people travelling by bicycle or on foot.

In the interim, it is proposed to provide improved walking and cycling connections across the bridge by providing a 3m wide shared path on the southern side of the bridge. To accommodate the shared path, the traffic lanes will be narrowed to 3m, with 0.2m channel allowance for the lane directly adjacent to the shared path, and a 1.2m shoulder allowance on the northern side (eastbound). The additional shoulder allowance acknowledges a greater need for physical separation of the westbound lane from the adjacent crash barrier / railing, and also provides an effective 4.2m wide lane for on-road cyclists to be more safely overtaken.

It is noted that the eastbound (northern-side buffer) is located where the narrow northern bridge footpath currently exists. This footpath will need to be removed and sealed at carriageway level as appropriate for vehicle traffic. Should later structural investigations identify that the removal of the footpath and use of this space as a traffic lane shoulder is not feasible, the northern footpath would likely be retained. This would then require the shared path to be reduced to approximately 2.5-2.8m wide across the bridge (a length of approximately 35m) to also allow acceptable lane widths across the bridge to be retained.

It is also noted that vehicle tracking constraints in and out of the nearby Flanagan Road intersection to the east will require a short section of the shared path (less than 5m long) at the eastern end of the bridge to be reduced to a minimum of 2.5m.

The proposed interim cross-section across the overbridge is shown in Figure 4-6.

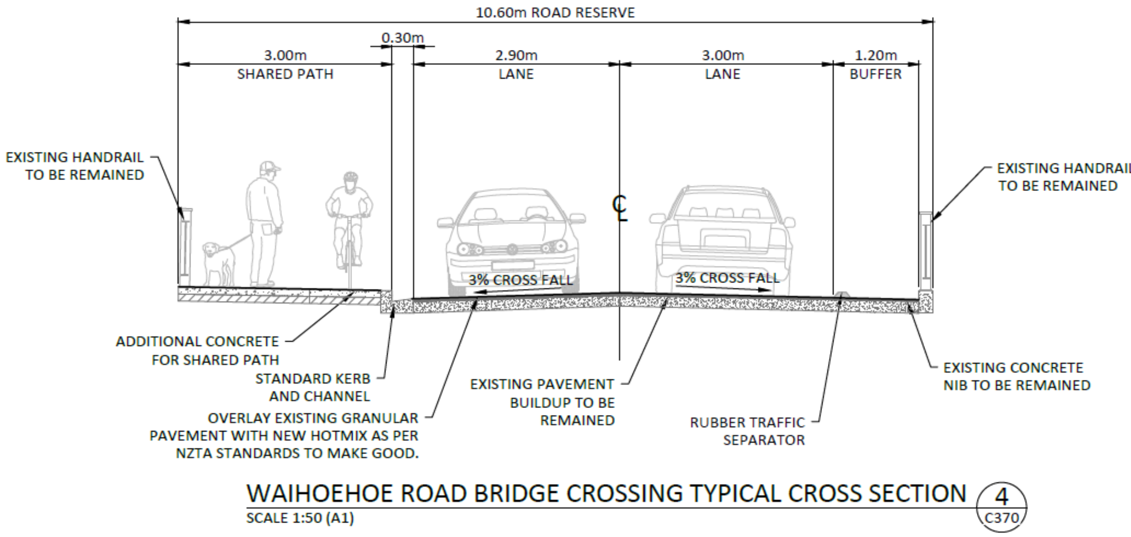


Figure 4-6: Waihoehoe Road – Rail Overbridge Cross-Section (looking east)

Traffic modelling has identified that added lanes are not required for the levels of development proposed in the applications by Kiwi Property, Oyster Capital and FHLDL. Changes proposed to the overbridge proposed as part of the application therefore are limited to improving active mode safety and connectivity as discussed above.

In the long-term, it is expected that the overbridge will be rebuilt to allow the triple / quadruple tracking of the rail line and to allow the long-term layout of the Great South Road/ Waihoehoe Road intersection (all not part of this application). At that time, bus priority lanes and some queue storage lanes are expected to be provided on the overbridge, as well as footpaths and protected cycle lanes on both sides. As this layout is highly dependent on future adjacent intersection design related to Great South Road, the final designs of the rail line bridges, and the layout of the nearby transport interchange planned by SGA, no likely long-term cross-section is provided.

4.4.2 Fitzgerald Road (Varies, 20-23m)

Fitzgerald Road will serve as a collector road, and the only vehicular route to and from the surrounding road network during the initial fast track stage. As part of this fast track stage the road will be upgraded from just south of the Brookfield Road intersection up to Waihoehoe Road.

It is proposed to have one traffic lane in each direction, with a design intent to provide suitable widths (including channel allowance) for high traffic volumes and heavy vehicle access while limiting excessive speed in an edge-of-town-centre area. Footpaths and protected cycle lanes will be provided on both sides of the road. Occasional recessed parking may be provided where beneficial along the road, with compliant cycle door buffer zones.

As part of the fast track works, there are two general mid-block arrangements for Fitzgerald Road proposed. One arrangement will be applicable where the fast track applicants have frontage on one side of the road. For this scenario, the applicants will undertake widening of 1.5m into their sites to anticipate the future full cross-section. This equates to half of the widening required to upgrade the overall cross section from 20m existing to 23m long term corridor width.

The other mid-block arrangement will be proposed where there is no fast track applicant frontage at all (i.e. especially in the northern section of Fitzgerald Road closest to Waihoehoe Road). Here, the upgrade is required to occur within the existing 20m wide road corridor.

In either case, all elements are to be designed and constructed to limit any future roading re-work that may be needed when development (and thus widening) occurs in frontage areas not covered by this fast track application.

There are no sections along Fitzgerald Road where the fast track applicants have frontage on both sides. Therefore, no sections will be widened to the full 23m long-term width as part of this fast track application, however the below cross-sections enable this to be easily achieved later, without need for significant road reconstruction.

Crucially, this approach also enables walking and cycle facilities to be constructed as continuous routes providing good connectivity to and from the wider network from the start, rather than fractious routes limited to development frontage sections only.

4.4.2.1 Fitzgerald Road Cross-Section, Single-Side Development Frontage (21.5m)

Figure 4-7 below shows the cross-section scenario where the applicant has site frontage. This scenario results in a 21.5m wide corridor, with the existing 20m corridor widened 1.5m into the applicant site.

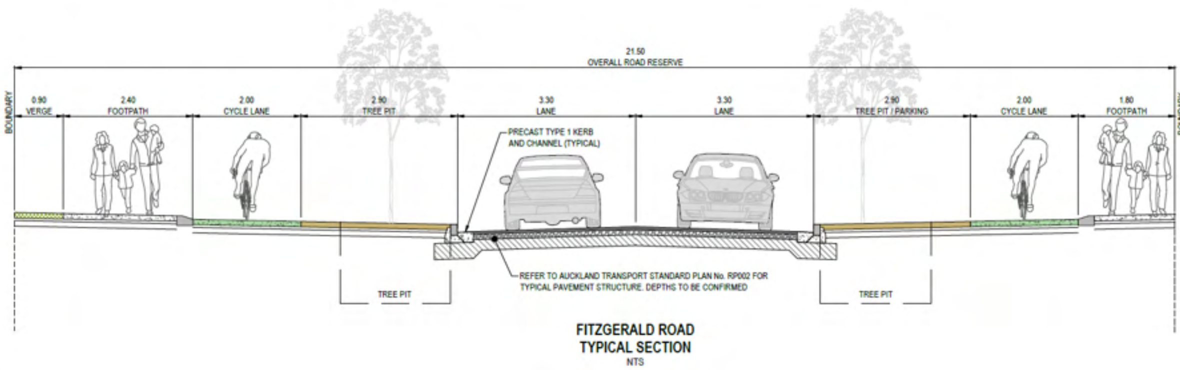


Figure 4-7: Cross Section with One-Sided Fast track Development Frontage on Fitzgerald Road, looking north

As can be seen in the above Figure, the cross-section is slightly asymmetrical to ensure that the centre line between the vehicle lanes is located in the same place as the long-term centre of the road (i.e. centred in the 20m and 23m stages, but slightly off-centre during the 21.5m stage). This anticipates widening to occur in later development on the oppose frontage owned by third parties (right hand side in the cross-sections).

Along the site frontage of the applicant side, the additional 1.5m corridor width contributes to a generous 2.4m wide footpath with a grassed back berm. This design reflects the fact that Fitzgerald Road will be a primary road at the edge of a busy town centre/medium density housing area.

4.4.2.2 Fitzgerald Road Cross-Section, No Development Frontage (20m)

In the section of Fitzgerald Road that does not front the development site and where the road is limited to the existing 20m corridor, footpaths will be narrower and no formal back berms are provided initially. However, all other cross-section elements proposed remain identical and in the same location as the elements described above.

This ensures that the only change at future long term development stages in these sections will be providing footpath widening and addition of back berms for development-related features such as services points. This is shown in Figure 4-8 below:

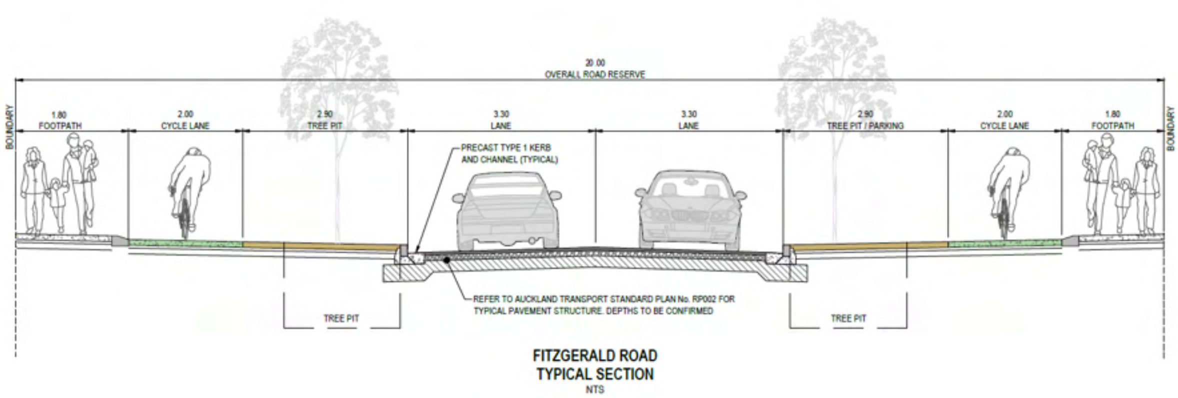


Figure 4-8: Cross Section without Fast Track Development Frontage on Fitzgerald Road, looking north

It is noted that there may be localised sections within the non-widened, third party-adjacent corridor where topography (level differences to adjacent properties) makes the above cross-section unfeasible without significant works within the third-party property areas.

In these sections, no parking will be provided, and the separation between carriageway and cycle lane will reduce as needed. This may be achieved by simply removing the door zone buffer which will be unnecessary without adjacent parking. However, in some locations it may also be required to reduce the separation between the cycle lane and the carriageway edge to a minimum of 1.2m, thus providing some 1.7m extra width to transition into adjacent property levels each side.

While this will reduce the separation between vehicle and cycle traffic, 1.2m is permitted in Auckland Transport's design guidance for retrofit situations (such as this construction of a new-standard road in an existing narrower corridor) and still provides a very high level of safety and amenity compared to historic unprotected cycle lanes.

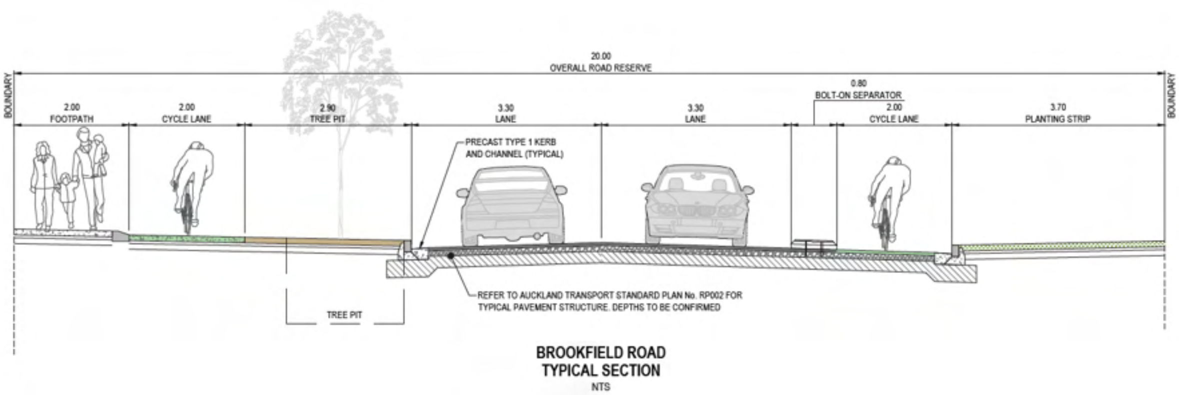
4.4.3 Brookfield Road (20m)

Brookfield Road is a future collector road in the south of the fast track area, which provides access to the retail area in particular. As most parts of this road frontage are not currently owned or controlled by Kiwi Property, the proposed treatment is an interim solution until any future development undertaken by others takes place.

The road is proposed to be provided with a footpath on the north side and protected one-way cycle lanes on both sides of the road. It is not proposed to provide a footpath on the southern-side of the road as there are only existing low-density dwellings provided in this area and no development is known to be planned. The westbound cycle lane is proposed to be a wide shoulder separated from traffic by a physical separator. This, and the wide grass berm on the southern side of the road, retains flexibility for future upgrades and third-party development.

On the northern side, compliant long-term walk and cycleways are provided, reflecting the development of medium-density residential in the eastern half of this road as part of this application.

This is shown in Figure 4-9 below:



This interim solution can be undertaken either within the existing road corridor or to site frontages which are owned/controlled by Kiwi Property to control the physical upgrade and implementation of this interim solution.

Figure 4-9: Cross Section of Brookfield Road East of Main Street (South), looking east

4.4.4 Pitt Road (East) (27M)

This collector road forms the primary short and long-term west-east route through the fast track application area. It provides four lanes in the mid-block, with added lanes largely for public transport priority and turn lane arrangements as discussed below. Footpaths and protected cycle lanes are provided on both sides of the road.

Pitt Road is characterised by having a high number of side roads, including local roads such as those accessing the residential area in the eastern part of the site, as well as various collector roads or roads that will otherwise be very busy in the long term. Examples include Creek Road (South) in the west, Main Road (South) in the western centre, and future retail access streets.

Although not part of this application, there will be future connections on the north side of Pitt Road via Creek Road (North), Main Road and Drury Boulevard as well as local roads as part of the overall Drury Masterplan that has guided the layout of this project. In the long term, Pitt Road may also be continued westwards over SH1.

The resulting closely spaced, high-volume intersections mean that there will be a high demand for turn lanes, particularly for right turns. Additionally, it is expected that the future bus services connecting through the centre will travel along Pitt Road as a key part of their route. This implies a need for localised bus priority, especially on approaches to busy intersections, to assist with service reliability.

Therefore, while there are sections of Pitt Road where one lane each direction might be feasible, these will be very short. For these reasons, the standard mid-block to be constructed as part of the initial fast track works is proposed to provide four lanes, with two lanes in each direction. Individual turn lane / bus priority arrangements will be developed as part of detailed design or adjusted as part of future stages, with the currently proposed four-lane design ensuring that the need to reconstruct kerbs is mitigated.

The cross section of Pitt Road is shown in Figure 4-10.

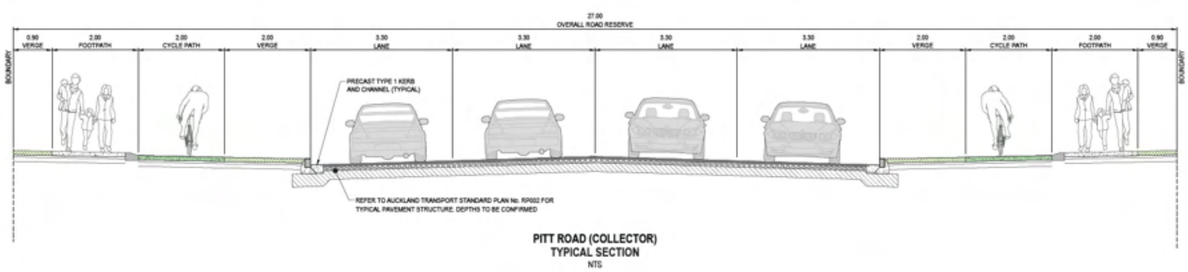


Figure 4-10: Cross Section of Pitt Road

4.4.5 Main Street (South) (24m)

As noted earlier, Main Street (South) is proposed as a collector road connecting north-south through the centre of the western, retail-focused, half of the fast track application area. It will largely be a private road, with only the section between Creek Road and Brookfield Road proposed to be vested. The carriageway is proposed to consist of one lane in each direction.

Despite its key vehicular function being to provide access to the parking areas proposed in the centre of the retail area, Main Street (South) will also provide high-quality walking facilities that will mainly serve local trips within the retail area, between shops or between car parks and shops. The road will also provide high-quality cycle facilities in the form of protected cycle lanes for both through access, and access to the retail area from the surrounding residential areas in the fast track applications.

The cross section for Main Street (South) is shown in Figure 4-11.

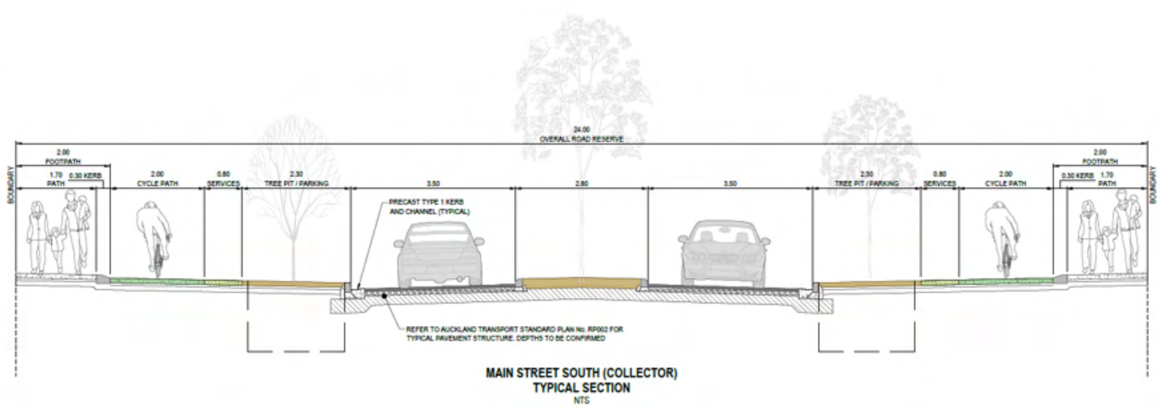


Figure 4-11: Cross Section of Main Street

4.4.6 Creek Road South (17m)

This collector road in the fast track application primarily provides a “back of house” access route to the retail servicing areas to the west of the retail area. While formally deemed a collector road, it is somewhat narrower in this initial interim arrangement where it serves more the function of a local road (industrial / commercial). As such, it for example does not provide protected cycle facilities. The shared path discussed below is only provided as a creek reserve edge path, and continuation of the interim (see Section 4.2) – the primary dedicated cycle facilities north south through the town centre are formed along Main Street instead.

The initial layout proposed as part of the fast track application provides one lane in each direction, with lanes the same width as the other collector roads in the area, a footpath on the eastern side, and a shared path on the western side (continuation of the interim shared path connecting to the train station in the north).

The cross section of Creek Road is shown in Figure 4-12.

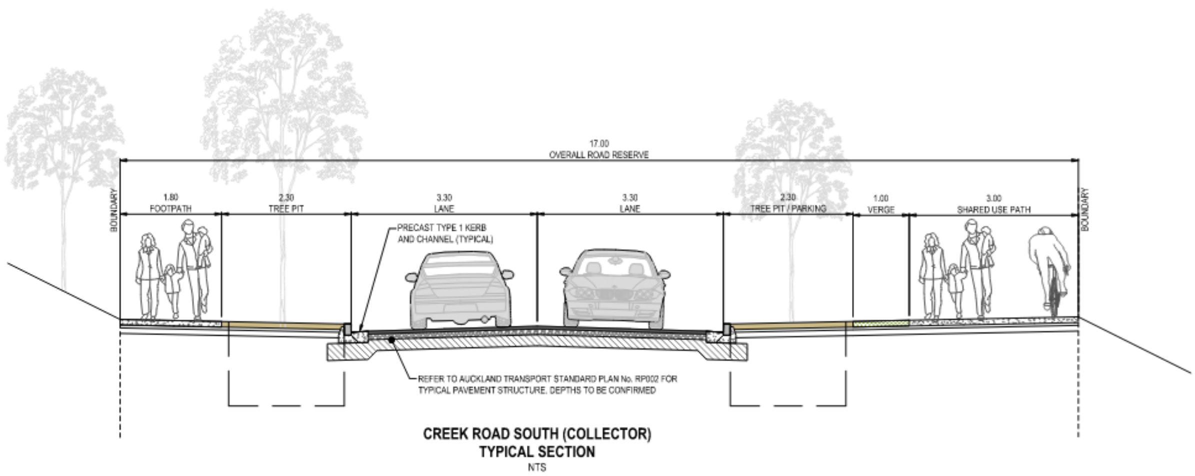


Figure 4-12: Cross Section of Creek Road, looking south

In the longer term (not part of this application) Creek Road will also be extended northwards and upgraded to provide a "bypass" function for traffic exiting the motorway southbound at the future Drury Interchange ramp leading into the town centre, but not entering the town centre. It will then allow traffic to Fitzgerald Road South or the wider Drury South area to bypass the town centre and the retail area via Creek Road and Brookfield Road, without adding through traffic to Pitt Road and Main Street.

4.4.7 Local Roads (16.0m,18.60m and 20m)

Local roads within the fast track application area are mainly concentrated within the eastern, residential part of the development, to provide access and circulation within these areas. They are designed as narrow, slow-speed roads, and provide footpaths on both sides. Cycling will occur on-road, supported by the low-speed design and generally low-volume (no through roads) layout.

The cross section of a typical local road is shown in Figure 4-13.

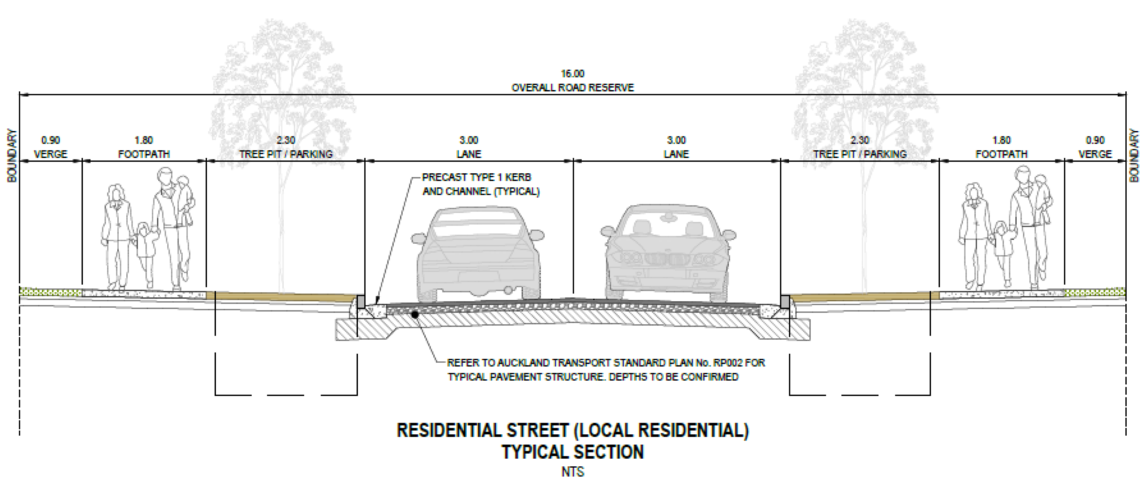


Figure 4-13: Cross Section of typical local road

One exception to the above cross-section will be the west-east local road (Road 09 / “Green Street”) travelling through the residential area from Fitzgerald Road westwards. This is intended to have a central landscape island splitting apart the opposing directions, and therefore is slightly wider, but otherwise has the same functions and features.

The cross section of a “Green Street” is shown in Figure 4-14.

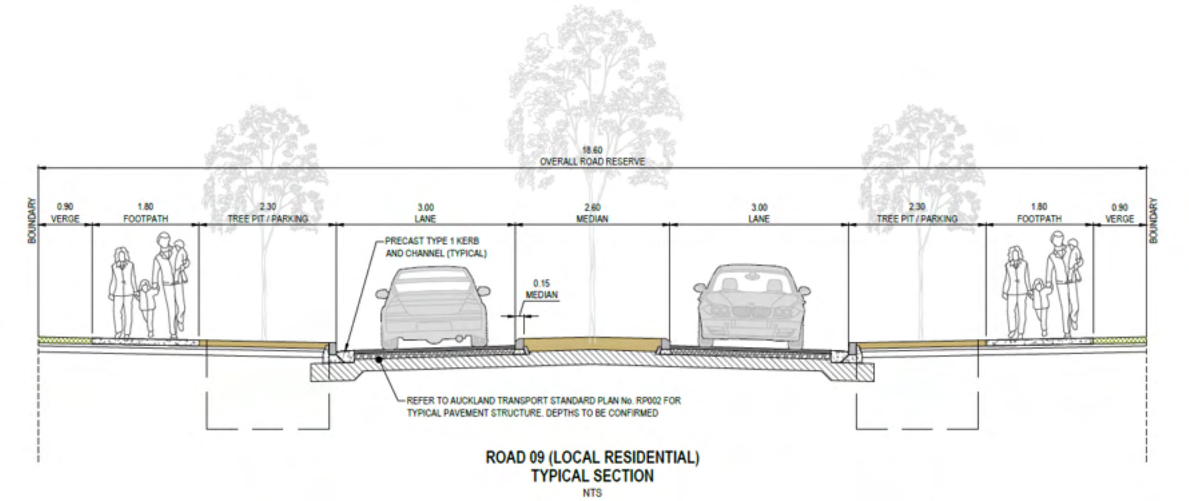


Figure 4-14: Cross Section “Green Street” (Road 09)

Some variant local roads will also be provided within the retail area. However, these will be private roads - and will functionally be more akin to car park access aisles (though often with generous footpath provision). Therefore, these roads are not discussed as separate cross-sections here.

The only other local road cross-section type proposed to be publicly vested is the “local business” local road (Road 25) proposed between the retail area and the residential area running north south. While proposed to also have two narrow lanes as per the other local roads to restrict volumes and speeds, it will be expected to carry slightly higher traffic flows (providing some secondary routes in and out of the retail car parking areas) as well as providing added landscaping buffers to help transition the environment between the retail and residential areas.

The cross section of a “Local Business” Road is shown in Figure 4-15.

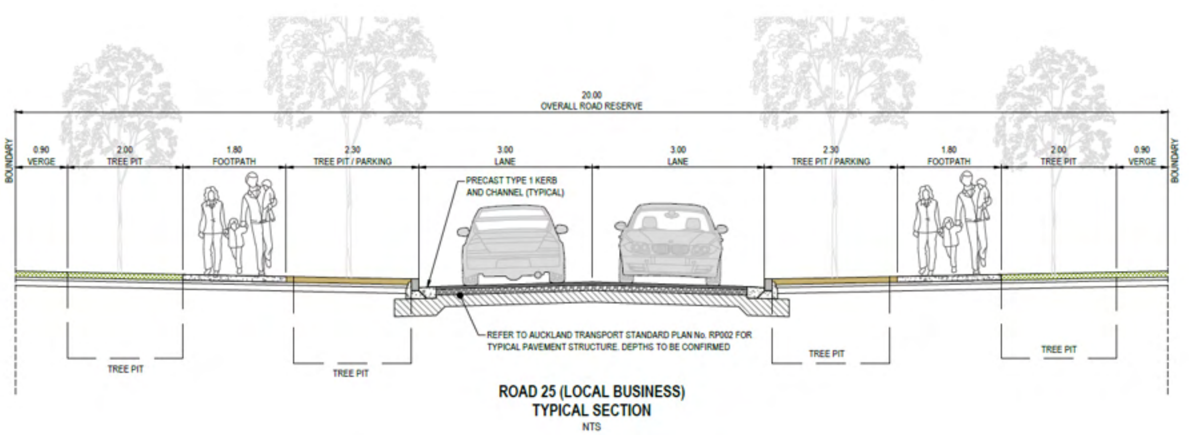


Figure 4-15: Cross Section “Local Business” (Road 25)

4.5 VEHICLE CROSSINGS

Vehicle crossings and associated tracking at this stage of design are indicative only. While the proposed locations are fixed, width and design (including internal gradients etc) are not yet fully resolved. This will occur in a subsequent detailed design stage.

Vehicle crossings will comply with the relevant rules of E27 of the AUP, such as gradients, widths, minimum distances from intersections etc except where noted otherwise. Generally, non-compliance will relate to crossings that are wider than the relevant AUP rules allow, to allow large servicing vehicles to use them (a typical non-compliance for retail).

Formally speaking, as the area is still under rural zoning, the maximum width for a crossing (as per Table E27.6.4.3.2 Vehicle crossing and vehicle access widths (T156)) is 6m with 9m permitted where “large heavy vehicles” access.

The over-width crossings are primarily located on the eastern side of Creek Road, at the western edge of the retail development, serving the back of house and loading areas for the M09 and M10 LFR buildings, as well as north onto Pitt Road at M11. The draft crossing widths proposed are:

- M9 onto Creek Road South: This crossing is 18m in width, exceeding the maximum by 9m. The draft width proposed (which may be refined in detailed design to a reduced width) is due to the need to have large articulated trucks turn into a narrow dock area along the western edge of the retail area.
- M10 onto Creek Road South, I of II: This northern crossing is 10m in width, exceeding the maximum by 1m. However, it is also a one-way crossing provided at an angle, which is part of the reason it exceeds the width despite the single-direction nature/
- M10 onto Creek Road South, I of II: This southern crossing is 11m in width, exceeding the maximum by 2m.
- M11 onto Pitt Road: This crossing is 12m in width, exceeding the maximum by 4m.

It is considered that these non-compliances are acceptable at this design stage for the following reasons:

- Added width is geometrically required to allow large trucks (including articulated trucks and large rigid trucks typical for large format retail stores) to access the servicing areas.
- For the three crossings on Creek Road South, their locations are off a “back off house” street, and while they would cross footpaths, the eastern-side footpaths are considered to be low-volume pedestrian routes both in the short and long term.
- The vehicle crossings will (in future detail design) be reviewed to ensure they are not wider than needed for the layout of the servicing areas and expected service vehicles, and to incorporate features such as mountable aprons, splitter islands and raised tables to improve safety. This need to review the crossings with a view to further optimising safety and minimising width (while remaining appropriate for the design vehicles intended to use them) could form a condition of consent.

No vehicle crossings are being proposed at this stage for the residential superlots at this stage (as no buildings / dwellings are being applied for).

4.6 PARKING

4.6.1 Parking Numbers

Standard E27.6.2(5) in the AUP states the number of parking spaces required on site for the proposed retail and residential areas. These requirements are outlined below.

The AUP requires a minimum of one park per 45m^2 of Large Format Retail (LFR) gross floor area, thus 778 parking spaces are required with the 35,000m^2 of proposed LFR. The proposal provides provisions of 1,155 parking spaces, therefore AUP requirements are met by the proposal.

As per E27.6.2. 9) in the AUP, and the referenced NZS: 4121-2001, for every 50 car parking spaces, one of the spaces for the retail activities is required to be a mobility space, plus one initial base mobility space. For the 1,155 retail car parking spaces, this translates to 24 spaces needing to be mobility spaces, which is complied with.

Provision of 1 minimum parking space per dwelling in the residential areas is required, with no maximum requirement. The proposed parking provisions for the residential area will be separately assessed in the future at the time of development on those balance lots because no dwellings are proposed in this application.

4.6.2 Parking Layout and Design

Standard E27.6.3 (1) in the AUP states the manoeuvring aisle space required for the proposed 90-degree parking spaces in the retail area is 7m, for 2.6m x 5m spaces used by “casual users”. This will be provided, with generally 7.5m manoeuvring aisle depth, exceeding the requirement.

Any parallel parking spaces proposed in the retail area will also meet the AUP requirement of 6.0m length and 3.7m manoeuvring space. No angled car parks are proposed.

On-street parking (all parallel parking) on the local roads and (where suitable) on the collector roads has not yet been completely designed and will be refined as part of future detailed design, complying with the requirements.

4.6.3 Bicycle parking

Retail has to provide visitor and secure bicycle storage spaces as per Table E27.6.2.5 Required bicycle parking rates of the AUP. For this assessment, we have applied the rate of 1 per 750m2 for all retail activities and have not differentiated between what would be food/beverage retail or all other retail as tenants for the retail spaces have not been confirmed.

Table 4-1:

Building	Area (sqm GFA)	Requirement rate (Table E27.6.2.5)	Resulting Requirement
M09	9,746	1 visitor space / 750 sqm + 1 secure space per 300 sqm (retail-internal) offices	13 visitor +3 secure spaces
M10	10,313	1 visitor space / 750 sqm + 1 secure space per 300 sqm (retail-internal) offices	14 visitor + 3 secure spaces
M11	7,226	1 visitor space / 750 sqm + 1 secure space per 300 sqm (retail-internal) offices	10 visitor + 2 secure spaces
M12A	2,979	1 visitor space / 500 sqm + 1 secure space per 300 sqm (retail-internal) offices	6 visitor + 1 secure spaces
M13A	3,233	1 visitor space / 500 sqm + 1 secure space per 300 sqm (retail-internal) offices	6 visitor + 1 secure spaces
M13B	722	1 visitor space / 500 sqm + 1 secure space per 300 sqm (retail-internal) offices	1 visitor + 0 secure spaces
M13C	722	1 visitor space / 500 sqm + 1 secure space per 300 sqm (retail-internal) offices	1 visitor + 0 secure spaces
M13D	523	1 visitor space / 500 sqm + 1 secure space per 300 sqm (retail-internal) offices	1 visitor + 0 secure spaces
			TOTAL: 52 visitor spaces + 10 secure spaces

As shown above, 52 visitor spaces (i.e. 26 double-sided racks) and at least 10 secure bicycle spaces (inside buildings or secure storage cages with access control) are required. A total of 111 bicycle spaces will be provided in total across the retail centre which more than sufficiently meets the minimum requirements.

The architect’s plans show indicative placement of visitor bike racks and the final location of these spaces will be determined as part of the detailed design phase.

The provision of the 10 or more secure spaces will be defined in a future stage, as part of the building consent. Due to the impracticality of providing even smaller secure bike storage for the various buildings individually, it is proposed that the secure spaces for staff will be arranged in one location (noting that no part of the retail area is more than some 300-

400m away from any other part, it is considered acceptable to centralise the secure bike parking and place it under the control of the general centre management, rather than be arranged by individual tenants or buildings.

As noted earlier, at this stage only superlots (without buildings/dwellings) are being applied for in the residential areas, as such no bicycle parking requirements exist yet for these future activities.

4.7 SERVICING

Retail has to provide loading spaces as per Table E27.6.2.7 Minimum loading space requirements of the AUP.

For the proposed buildings, this results in the following requirements, and the proposed provision:

Table 4-2

Building	Area (sqm GFA)	Requirement rate (Table E27.6.2.7)	Proposed Provision	Comment
M09	9,746	2 minimum (T110)	2 x 18m by 3.5m loading spaces	In service area, accessed off Creek Road
M10	10,313	3 spaces (T111, fraction rounded down)	3 x 18m by 3.5m loading spaces	In service area, accessed off Creek Road
M11	7,226	2 minimum (T110)	2 x 11m by 3.5m loading spaces	In service area, accessed off Pitt Road
M12A	2,979	1 minimum (T109)	1 x 8 by 3.5m loading space	On internal (private) road as parallel parking
M13A	3,233	1 minimum (T109)	1 x 8 by 3.5m loading space	On internal (private) road as parallel parking
M13B	722	1 minimum (T109)	1 x 8 by 3.5m loading space	On internal (private) road as parallel parking
M13C	722	1 minimum (T109)	1 x 8 by 3.5m loading space	On internal (private) road as parallel parking
M13D	523	1 minimum (T109)	1 x 8 by 3.5m loading space	On internal (private) road as parallel parking

As shown, the proposed loading complies with the AUP requirements.

Vehicle tracking and loading zones are shown – indicatively - on the architect's plans of the application set, "200" series, especially plan RC206. These areas, the associated vehicle tracking and the resulting vehicle crossings will be refined further in detailed design.

As noted earlier, at this stage only superlots (without buildings/dwellings) are being applied for in the residential areas, as such no servicing requirements exist yet for these future activities.

However, it is noted that the proposed (public) local roads and associated intersections have been designed to suit 10.3m waste collection trucks.

5.0 TRAFFIC EFFECTS

5.1 BACKGROUND

Extensive investigations and transport modelling of Drury have been undertaken by Stantec to inform the Integrated Transport Assessments supporting PC48. The extent of this background analysis includes the site area for this application and can therefore be relevantly applied to transportation considerations for the proposed subdivision and development of the land. The various background assessments undertaken for PC48 and informing our conclusions and recommendations for the application are summarised in the following sections.

5.1.1 Plan Change 48, 49 and 50

Traffic modelling has been undertaken to assess the traffic effect of the proposed developments within Drury East. The modelling has considered the proposed developments by Kiwi Property, Fulton Hogan, and Oyster Capital.

The traffic modelling has been undertaken using a three-tiered approach, consisting of a macro strategic model (MSM), a mesoscopic project model (SATURN), and a localised intersection operational model (Sidra Intersection). The assessment period spans three decades, between the beginning of the developments in 2023 through to 2048.

In November 2019, Stantec undertook traffic modelling and prepared a modelling report to assess the traffic effects of the proposed developments within Drury East. The modelling considered the SGA future transport network, as reported in the SGA ITA for the Drury-Opaheke and Pukekohe-Paerata areas, with land use assumptions adjusted to align with Kiwi, Fulton Hogan and Oyster Capital's desired build rates. This modelling assumed mode share assumptions consistent with the MSM model, which was conservative noting a lower mode share for Drury East than Drury West.

Subsequent to the above modelling, in January 2020 the Government announced funding and delivery timeframes of the New Zealand Upgrade Programme (NZUP) including several key projects that are influential to the outcomes of the Plan Change traffic modelling. Notably this included the construction of Drury South Interchange by 2025 and the full length of Mill Road by 2028. Moreover, Auckland Council shared a number of relevant projects within indicative timeframes.

Stantec undertook revised modelling to include the infrastructure upgrade announcements and assumptions, to reassess the traffic effect of the proposed developments on the future network. This modelling was presented in the ITA for Kiwi Property and Oyster Capital, dated March 2020. It is noted that the Fulton Hogan land parcel was included in the traffic modelling however the ITA was prepared by Mott McDonald and utilised the Stantec traffic model.

In March 2021, Stantec received the Drury Infrastructure Funding and Financing Study (DIFF) SATURN model prepared by SGA. Upon review of the model, the decision was made to utilise this model for the Plan Change traffic modelling. By doing so, any ambiguity surrounding trip generation rates, mode share splits, internalisation assumptions and the refined zone system were resolved.

In June 2021 Stantec produced a Modelling Report based on the SGA model, and this was provided to the parties involved in the Drury East plan changes traffic caucusing. Shortly thereafter, a further announcement was made by the government regarding the NZUP projects. Of particular relevance was the removal of the Takanini, Papakura and Drury sections of the Mill Road project, and the Papakura to Drury South Stage Two project, including the Drury South interchange, from NZUP.

Stantec therefore revised its modelling to change the assumptions regarding when these projects would be implemented and assessed the development thresholds relevant to these projects.

Refer to the Drury East Traffic Modelling Report (Rev D, dated 30 September 2021) in Appendix A for full detail of the traffic modelling undertaken to support PC48. The modelling report describes the revised modelling methodology used and the land use assumptions for Drury East, outlines the various scenarios investigated, and discusses the effects on the relevant surrounding road network. The modelling has considered specified magnitudes of land use in relation to assumed infrastructure upgrades in terms of dwellings, commercial and retail Gross Floor Area (GFA).

A summary of the plan change traffic modelling is presented below.

5.2 PLAN CHANGE MODELLING OUTCOME

Extensive traffic modelling of the future network has been undertaken to investigate and understand the effects of various infrastructure scenarios on the surrounding road network. There are a number of uncertainties related to infrastructure upgrade timing, especially for the infrastructure that does not have allocated funding. Modelling of this infrastructure timing was indicative and instead of focusing on when each element of infrastructure can be introduced, an estimate of the capacity that each element of infrastructure relevant to the Drury East development can provide was assessed.

A list of assumed infrastructure with indicative timeframes when an infrastructure piece can be built is listed in Table 5-1 below. The timeframes are identified simply to inform the assumptions regarding background development and traffic conditions outside the PC 48, 49 and 50 area. These timings are based upon those provided in SGA's 2019 ITA to support Council's Drury-Opaheke Structure Plan.

Table 5-1: Infrastructure Upgrade Assumptions

Decade	SGA / Stantec Assumed Infrastructure	Funding Source
2025-2028	SH1 3-laning Papakura to Drury, including upgraded Drury Interchange Rail Electrification Papakura to Pukekohe New Drury Central, West and Paerata Stations Minor Improvements to the GSR/Waihoehoe Road roundabout	NZUP NZUP NZUP Drury East Developers
2028-2038	Waihoehoe Road West ATAP improvements, including the signalisation of the GSR/Waihoehoe Road intersection Construction of southern connection from Fitzgerald Road to SH1 (similar or alternative to previously planned Mill Road South) including Drury South Interchange SH1 3-laning from Drury Interchange to Drury South Interchange Connection from Drury South Interchange to GSR	ATAP Planned (SGA) Planned (SGA) Planned (SGA)
2038-2048	SH1 3-laning from Drury South Interchange to Bombay First northern connection to Papakura (similar or alternative to Mill Road North link between Waihoehoe Road and Ponga Road) Second northern connection (similar or alternative to north-south arterial – Opaheke Road extension to Ponga Road)	Planned (SGA) Planned (SGA) Planned (SGA)
2048+	Third Main Rail Line Pukekohe to Papakura Pukekohe Expressway full Route (SH1 to Pukekohe)	Planned (SGA) Planned (SGA)

The modelling calculated the point at which the development yields / traffic generated cause the Network Capacity Criteria to be exceeded. Network Capacity Criteria was developed that defined poor intersection performance and an assessment point of network operation. The criteria focused on:

- Peak hour queue lengths at the critical intersection (Great South Road / Waihoehoe Road). In particular the intersection operation was acceptable if the average queue during the peak hours was sustained within the available storage length and on average does not overspill into an adjacent intersection;
- Public transport delays at key locations of the network. Whilst enabling intersection queuing, consideration was given to delays along specific public transport routes, especially where no bus lanes are provided;
- Interpeak delays. In particular, if the above criteria are met then network operation is considered acceptable so long as interpeak intersection operation was better than Level of Service F.
- Northbound queuing on SH1 and whether this queue extends to Drury Interchange. These queues were monitored to understand potential overspill into the local network as a result of on-ramp signal operation; and
- Average daily link flows for roads connecting to the Great South Road / Waihoehoe Road intersection to ensure these were acceptable in comparison to other arterial roads within the Auckland city network.

The results show the development yields / traffic generated that perform within the capacity thresholds as the Point of Assessment. The Point of Assessment is defined as the level of development that can be enabled by the transport infrastructure prior to exceeding the network criteria. To enable further development beyond that which is shown as the Point of Assessment, either additional infrastructure is required, or an Integrated Transport Assessment is required to assess the traffic conditions at that specific point in time. These results are shown in Table 5-2.

Further explanation and clarification on the infrastructure upgrades are included in the modelling report in Appendix A

Table 5-2: Points of Assessment for Infrastructure Upgrades

Transport Infrastructure	Level of Development Enabled by Transport Infrastructure				
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Community (GFA)	Drury East Trip Generation
Interim upgrade to Great South Road/Waihoehoe Road roundabout	Up to 710 units	-	-	-	Up to 400 trips (AM peak)
SH1 Widening – Stage 1B	Up to 1,300 units	Up to 24,000m2	Up to 6,400m2	Up to 800m2	400 to 2,000 trips (PM peak)
Drury Central Station Direct connection from SH1 to Town Centre	1,300 to 1,800 units	24,000 to 32,000m2	6,400 to 8,700m2	800 to 1,000m2	2,000 to 2,500 trips (PM peak)
Waihoehoe Road ATAP upgrade including signalisation of GSR/Waihoehoe intersection	1,800 to 3,300 units	32,000 to 56,000m2	8,700 to 17,900m2	1,000 to 2,000m2	2,500 to 3,800 trips (PM peak)
Southern connection between Fitzgerald Rd and SH1 (incl. Drury South Interchange)	3,300 to 3,800 units	56,000 to 64,000m2	17,900 to 21,000m2	2,000 to 2,400m2	3,800 to 4,300 trips (PM peak)
Mill Road northern connection and Opaheke northern link	3,800 to 5,800 units	64,000 to 97,000m2	21,000 to 47,000m2	2,400 to 10,000m2	4,300 to 5,600 trips (PM peak)
Assessment of PT uptake required	5,800 to 6,400 units	97,000 to 108,000m2	47,000 to 60,000m2	10,000 to 16,000m2	5,600 to 6,000 trips (PM peak)

5.1 PLAN CHANGE MODELLING UPDATE

As a result of discussions at the Drury East Plan Changes 48,49 & 50 Traffic Expert Caucusing, the modelling for the Drury East development was revised. The key change for the updated modelling assessment was the introduction of an interim signalised intersection to replace the previously proposed upgraded roundabout layout at the intersection of Great South Road and Waihoehoe Road.

The results of this revised modelling are shown in Appendix B.

5.2 FAST TRACK APPLICATION TRAFFIC MODELLING

As per the Plan Change modelling, the proposed Kiwi Property Fast-track development has been modelled in conjunction with the proposed Fast-track development applications by Oyster and FHLDL. The development yields of the proposed Fast-track developments in Drury East are outlined in Table 5-3.

Table 5-3: Fast-Track Development Yields

Developer	Residential (dwellings)	Retail (GFA)
Kiwi Property	600	35,000 sqm
Fulton Hogan	593	-
Oyster Capital	627	-

With regard to the assumed infrastructure, there are changes from that which was modelled in the Plan Change modelling, most notably it is not proposed to develop the SH1 direct connection to the development site as part of the Fast-track development. Further, it is now proposed to upgrade the intersection of Great South Road / Waihoehoe Road with an interim traffic signal arrangement, prior to any development commencing.

The revised modelling is to reassess Test 3 of the Plan Change modelling, without the SH1 direct connection. This revised modelling therefore assumes the following infrastructure upgrades to support the full Fast-Track development:

- An interim signalised intersection of Great South Road / Waihoehoe Road (as outlined in Section 6.9)
- An interim upgrade to Waihoehoe Road that includes a westbound bus lane (as outlined in Section 4.3)
- An interim signalised intersection of Waihoehoe Road / Opaheke Road / Fitzgerald Road (as outlined in Section 6.8.1)
- New Drury Central, West and Paerata Stations.

The SATURN model was updated to reflect the Fast-track development yields and infrastructure assumptions noted below. As per the Plan Change modelling methodology, key intersections within Drury East and the surrounding area were modelled in Sidra utilising the traffic volumes from the SATURN model.

The results of the modelling showed that all intersections performed satisfactorily and within the Network Capacity Criteria as outlined in Section 5.2 and therefore the proposed network is adequate to cater for the proposed Fast-Track development across the three sites. The outcome of the modelling of key intersections being upgraded as part of this application are provided in Section 6.0. The results of the wider network intersection modelling are shown in Appendix C.

5.3 TRAFFIC MODELLING SUMMARY

Utilising the same modelling methodology as the Plan Change modelling, the proposed Fast-Track development yield for the Oyster, Kiwi and FHLDL have been modelling without the direct connection from SH1 to the Kiwi development site. This replaces Test 3 of the Plan Change modelling. The level of development enabled by the transport infrastructure proposed is summarised in Table 5-4.

Table 5-4: Fast-Track Points of Assessment for Infrastructure Upgrades

Transport Infrastructure	Level of Development enabled by Transport Infrastructure			
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Community (GFA)
Interim upgrade to Great South Road/Waihoehoe Road roundabout Interim upgrade to Waihoehoe Road that includes a westbound bus lane Interim signalised intersection of Waihoehoe Road / Opaheke Road / Fitzgerald Road	Up to 710 units	-	-	-
SH1 Widening – Stage 1B	Up to 1,300 units	Up to 24,000m2	Up to 6,400m2	Up to 800m2
Drury Central Station	1,820 units	35,000m2		

5.4 TRAFFIC EFFECTS SUMMARY

Prior to any development on the Kiwi Fast-Track site, the following infrastructure needs to be provided:

- An interim signalised intersection of Great South Road / Waihoehoe Road (as outlined in Section 6.2)
- An interim upgrade to Waihoehoe Road that includes a westbound bus lane (as outlined in Section 4.3)
- An interim signalised intersection of Waihoehoe Road / Opaheke Road / Fitzgerald Road (as outlined in Section 6.8.1)

This infrastructure will accommodate traffic associated with the three Drury East development sites, up to 710 dwellings, as outlined in Table 5-4. Beyond these 710 dwellings, additional infrastructure is required as outlined in Table 5-4.

In addition to the above infrastructure, walking and cycling facilities within the road corridor (as outlined in Section 4.0) need to be provided in association with the staged site development, to enable access from the development to the wider walking and cycling facilities being provided to access Drury Central station and the other Drury East precincts. This includes Brookfield Road to the east of Main Street South and Fitzgerald Road to the north of Brookfield Road.

The proposed infrastructure from the outset, and to be provided progressively as development continues is adequate to facilitate the safe and efficient operation of the transport network.

6.0 INTERSECTION DESIGN

For all intersection designs, please refer to the civil engineering set of the application package. The excerpt figures in this section are provided for context to the descriptions only.

6.1 FITZGERALD ROAD / PITT ROAD

6.1.1 Interim Layout

The proposed design for this signalised T-intersection provides two approach lanes for Pitt Street and Fitzgerald Road (North), and three approach lanes for Fitzgerald Road (South). It provides a single departure lane on all roads except on Pitt Street, where the westbound departure provides two lanes. This relates to the extra left turn lane from the south, which is intended for a bus priority short lane, which can then lead into a westbound bus lane as and where required for future bus priority on the future Pitt Street alignment.

Walking and cycling is provided as separated paths on all sides of the intersection, albeit owing to the fact that there is no development yet on the eastern side of the intersection, the mid-block separation between the cycleways and the carriageway reduces to 1.2m in the intersection vicinity to allow the turning requirements of large articulated trucks. This is considered to provide significant protection even at this reduced width. The intersection design is shown in Figure 6-1.

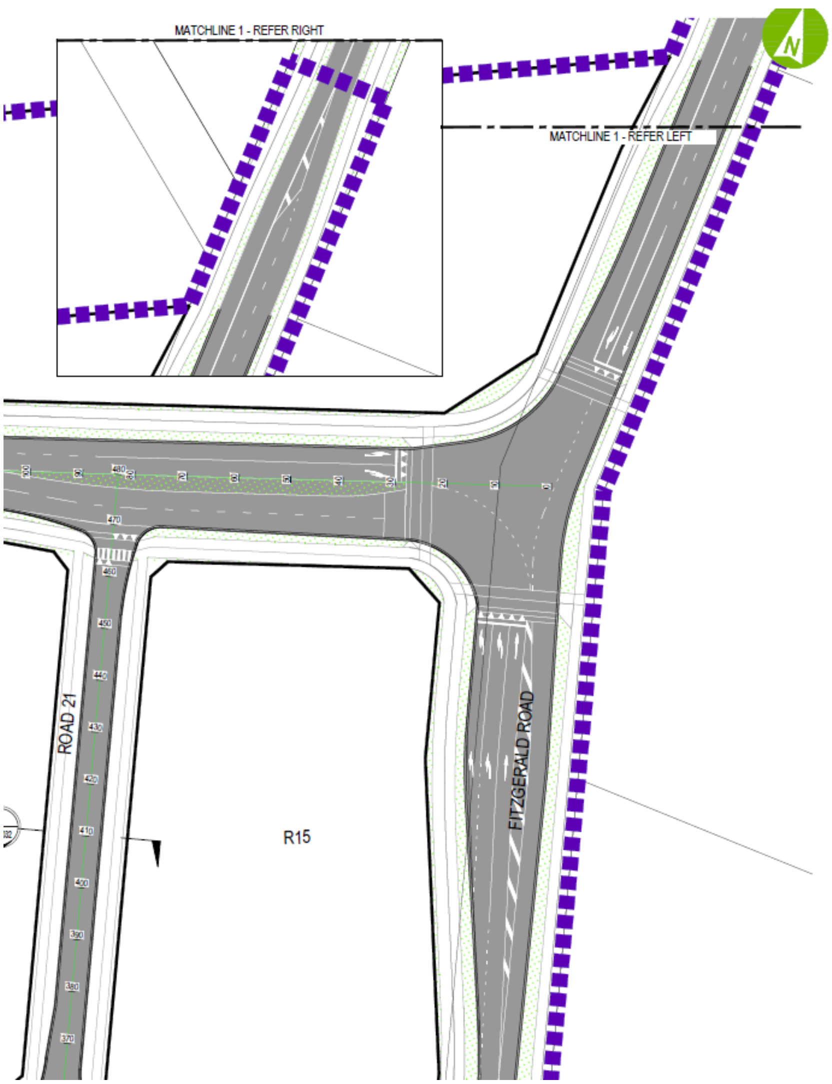


Figure 6-1: Pitt Road / Fitzgerald Intersection Layout

It is noted that the intersection at this stage does not provide connectivity to the east, into the future residential area of Proposed Plan Change 49. This is because the fast track application for that plan change area connects to Fitzgerald Road only at an intersection further to the north. When, as part of later development not part of this application, Fitzgerald Road / Pitt Street becomes a four-arm signal, the additional turn lanes required will be provided via widening to the east side, respectively (for the Pitt Street approach) via removal of the solid median.

For safety, the intersection is proposed to be placed on a raised safety platform, extending far enough into all approaches so that the pedestrian / cycle crossings are located on the raised table. The appropriate gradient for the approach ramps would require further discussion during the EPA stage but is recommended to be a 100mm vertical rise at an 1:12-1:14 gradient, acknowledging that the intersection would initially be located in a still largely semi-rural area where steeper safety platforms gradients may not be appropriate.

Provision of a raised safety platform aligns with new Austroads guidance indicating the safety and usability of such devices even on arterial and certainly on collector roads to improve road safety and “Vision Zero” outcomes.

It is noted that Auckland Transport has previously constructed raised tables even on various arterial road signals, and is currently consulting or has already approved designs for a wide variety of further such raised platform signals, such as in the New Lynn area (several intersections currently being consulted with raised tables on arterial road approaches) on Oteha Valley Road (raised tables on arterial road approaches) and East Coast Road in the Glenvar Road area (two large signals proposed on raised safety platforms).

6.1.2 Intersection Performance

Modelling has been undertaken using SIDRA to assess the performance of the proposed access. The intersection has been assessed using peak hour traffic volumes from the SATURN model as outlined in Section 5.1. These have been input into the SIDRA model and the results of the assessment are summarised in Table 6-1.

Table 6-1: Interim Traffic Signals - SIDRA Modelling Results

Approach	Mvmt	Morning Peak Hour				Evening Peak Hour			
		Delay (s/veh)	LOS	Average queue (m)	DoS	Delay (s/veh)	LOS	Average queue (m)	DoS
Fitzgerald (South)	LT	18.8	B	0.8	0.020	24.9	C	1.0	0.123
	TH	11.5	B	19.7	0.341	14.9	B	2.4	0.110
Fitzgerald (North)	TH	9.8	A	8.3	0.156	17.1	B	16.2	0.635
	RT	27.0	C	2.1	0.094	20.1	C	7.6	0.340
Pitt (West)	LT	21.6	C	1.8	0.052	15.8	B	22.8	0.565
	RT	27.0	C	2.1	0.094	19	B	1.4	0.068

The results show that traffic signals controlling intersection operations results in the intersection operating within an acceptable level of service in both the AM and PM peak.

As can be seen from the above results, the development traffic will not cause queues to encroach on other intersections in the network, and the intersection will operate at an acceptable LOS.

The maximum average queue of 22.8m is associated with vehicles turning left from the Pitt Road west approach in the PM peak, which would not encroach on the intersection approximately 110m to the west. The maximum delay of 24.9 seconds associated with the left-turning traffic from the Fitzgerald Road south approach in the PM peak is not considered to have a material impact on the development network.

Overall it is considered that the design of the Pitt Road / Fitzgerald Road intersection will be able to accommodate additional traffic generated by the Kiwi Property development in 2028.

6.2 BROOKFIELD ROAD / FITZGERALD ROAD

The proposed design for this signalised T-intersection has two approach and one departure lane on all legs. Footpaths and cycleways are proposed on both sides of all three legs of the intersection, apart from the southern side of Brookfield Road which only has a cycleway, as discussed in Section 4.4.3

As with Pitt Street / Fitzgerald Road, space constraints reduce the separator between the cycleway and the carriageway to 1.2m. As per Pitt Street / Fitzgerald Road, the intersection is also proposed to be located on a raised safety platform as described there. Apart from the safety benefit for the intersection itself, this assists with providing a “gateway” location where Fitzgerald Road transitions from a more rural environment to the southeast into a more urban environment associated within the future town centre. The proposed intersection layout is shown in Figure 6-2.

Figure 6-2: Brookfield Road / Fitzgerald Road Intersection Layout

6.2.1 Intersection Performance

Modelling has been undertaken using SIDRA to assess the performance of the proposed access. The intersection has been assessed using peak hour traffic volumes from the SATURN model as outlined in Section 5.1. These have been input into the SIDRA model and the results of the assessment are summarised in Table 6-1.

Table 6-2: Interim Traffic Signals - SIDRA Modelling Results

Approach	Mvmt	Morning Peak Hour				Evening Peak Hour			
		Delay (s/veh)	LOS	Average queue (m)	DoS	Delay (s/veh)	LOS	Average queue (m)	DoS
Fitzgerald (South)	LT	12.7	B	2.1	0.054	13.5	B	10.0	0.236
	TH	18.3	B	23.1	0.683	16.1	B	2.9	0.117
Fitzgerald (North)	TH	15.8	B	9.7	0.327	18.1	B	17.5	0.605
	RT	21.3	C	1.6	0.076	21.3	C	1.6	0.076
Brookfield (West)	LT	27.4	C	2.0	0.227	25.4	C	1.8	0.151
	RT	22.3	C	19.4	0.625	20.9	C	19.8	0.589

The results show that traffic signals controlling intersection operations results in the intersection operating within an acceptable level of service in both the AM and PM peak.

6.3 MAIN STREET (SOUTH) / PITT ROAD

The proposed design for this signalised T-intersection has two approach lanes except on the western approach where there are three, and one departure lane and one departure lane on all legs except on the south leg, where there are two. The added approach leg (dual right turn) from the west anticipates that as part of the mid-term development of the town centre, a large proportion of traffic will arrive from the northwest via Creek Road (off the motorway – section of Creek Road not part of this application). The dual departure lane allows for this double right turn to be received, but also for a dedicated site-internal turn lane which commences shortly to the south.

Footpaths and protected cycleways are proposed on both sides of all three legs of the intersection.

As per Pitt Street / Fitzgerald Road, the intersection is also proposed to be located on a raised safety platform as described there. Apart from the safety benefit for the intersection itself, this assists with providing a “gateway” location where Fitzgerald Road transitions from a more rural environment to the southeast into a more urban environment associated within the future town centre.

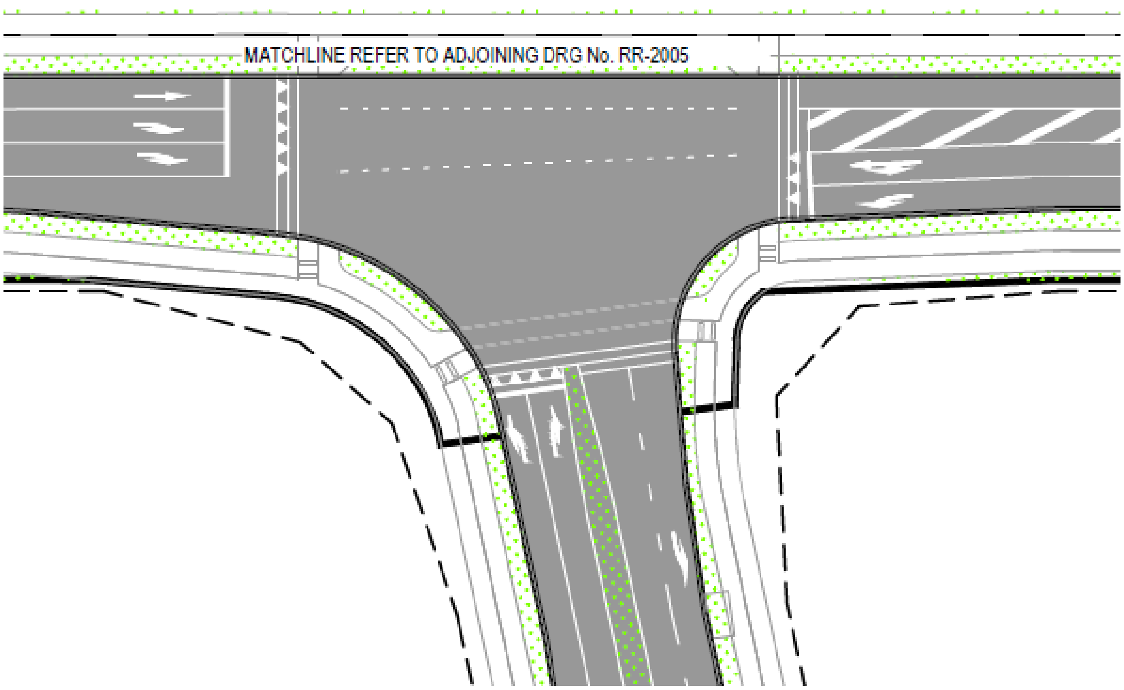


Figure 6-3: Pitt Road / Main Street South Intersection Layout

6.4 MAIN STREET SOUTH / INTERNAL LOCAL ROAD

This intersection is a single-lane roundabout fully within the (private road part) of the retail area, providing the primary access to the adjacent car park areas. It is also designed to allow smaller trucks to undertake all movements, while larger trucks (articulated trucks and similar) can only travel through north-south but cannot turn off into the car park areas of the western and eastern legs.

It will provide raised crossings for the separated walk and cycle facilities over all arms. To allow large trucks accessing the retail area to travel north-south through the intersection, it will contain several sections of over-run areas (paver setts or similar) as well as a mountable central apron around the non-mountable island.

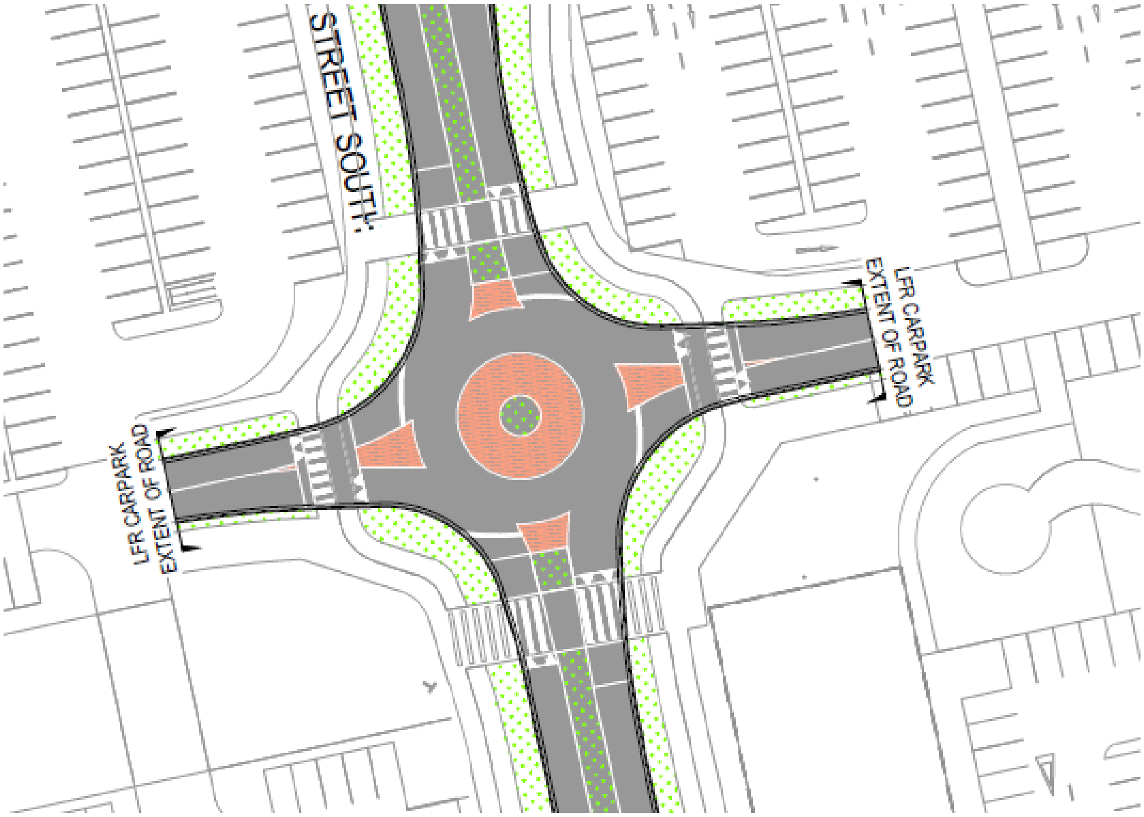


Figure 6-4: Pitt Road / Main Street South Intersection Layout

6.5 MAIN STREET SOUTH / CREEK ROAD SOUTH

This intersection will be a single-lane roundabout intersection for the two collector roads to meet at the southern end of the retail area, and also provide key vehicular and servicing access into the area from the south (Brookfield Road route). Due to constraints in the local environment (property restrictions), it is slightly oval-shaped.

It will provide raised crossings for the separated walk and cycle facilities over all three arms (and over the future eastern fourth arm – not part of the fast track application). To allow large trucks accessing the retail area to travel around the intersection, it will contain several sections of over-run areas (paver setts or similar) as well as a mountable central apron around the non-mountable island.

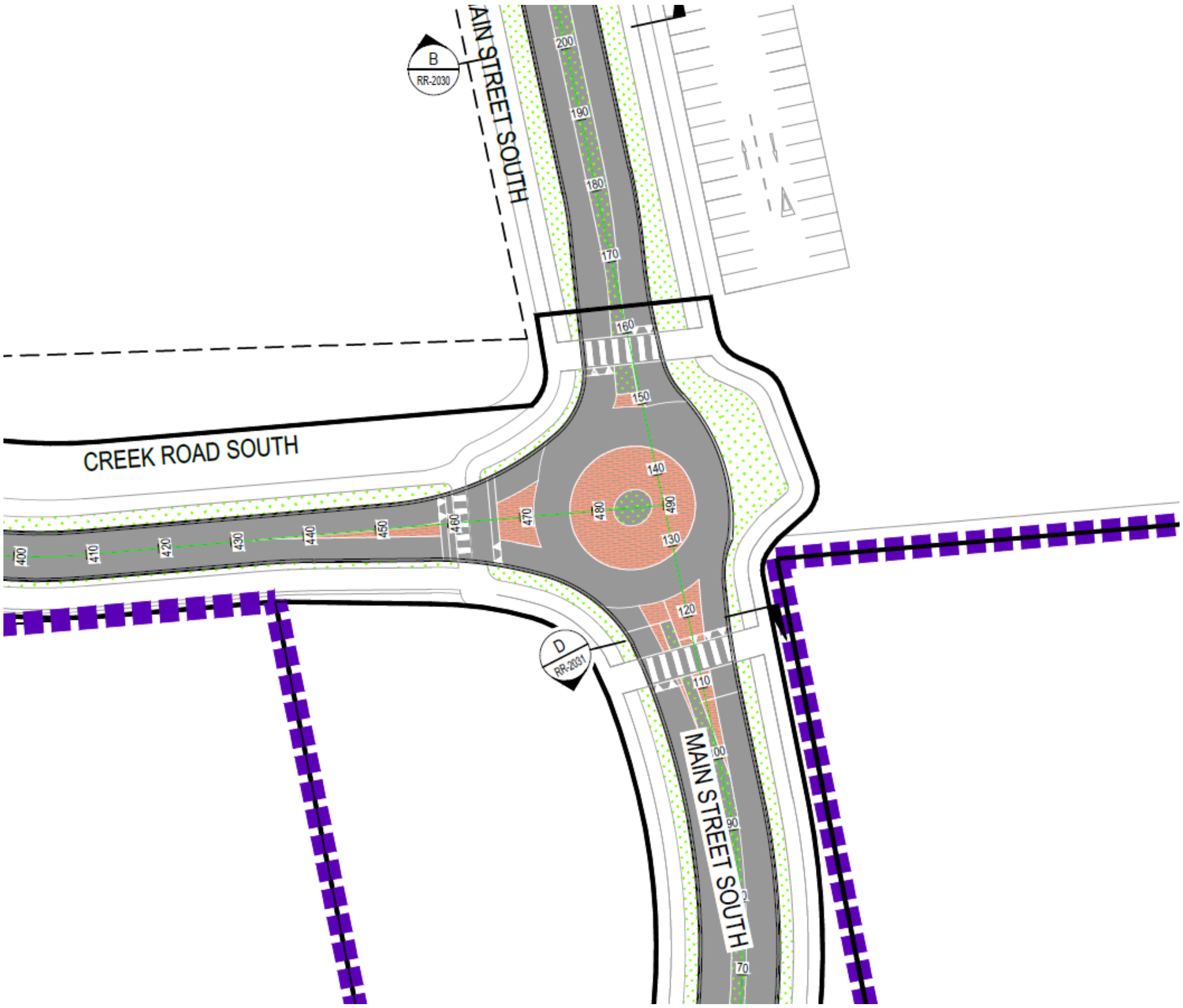


Figure 6-5: Creek Road South / Main Street South Intersection Layout

6.6 BROOKFIELD ROAD / MAIN STREET (SOUTH)

This unsignalised give-way T-intersection connects the southern end of Main Road with Brookfield Road. The primary traffic flow will be north leg to and from the east leg (with the western stub leg serving less than half a dozen low-density properties). However, to avoid an intersection on a curve, traffic from the northern leg is still expected to give way (but will usually have no traffic to give way to). Due to the lack of right turns out of Main Road, no added turn lanes are considered required here.

As this is a key access route for service vehicles of the retail area, it is required to allow large trucks to pass each other. This could have resulted in an excessively large intersection which in turn would have allowed inappropriately high speeds for smaller vehicles. To avoid this, it is proposed to narrow down the intersection via mountable truck aprons that can be traversed by large vehicles, but channel others into the narrower lanes.

A walk and cycle raised table crossing is provided across the western stub leg, to ensure safe connectivity for the one-way cycle facilities from Brookfield Road to continue north into the application area.

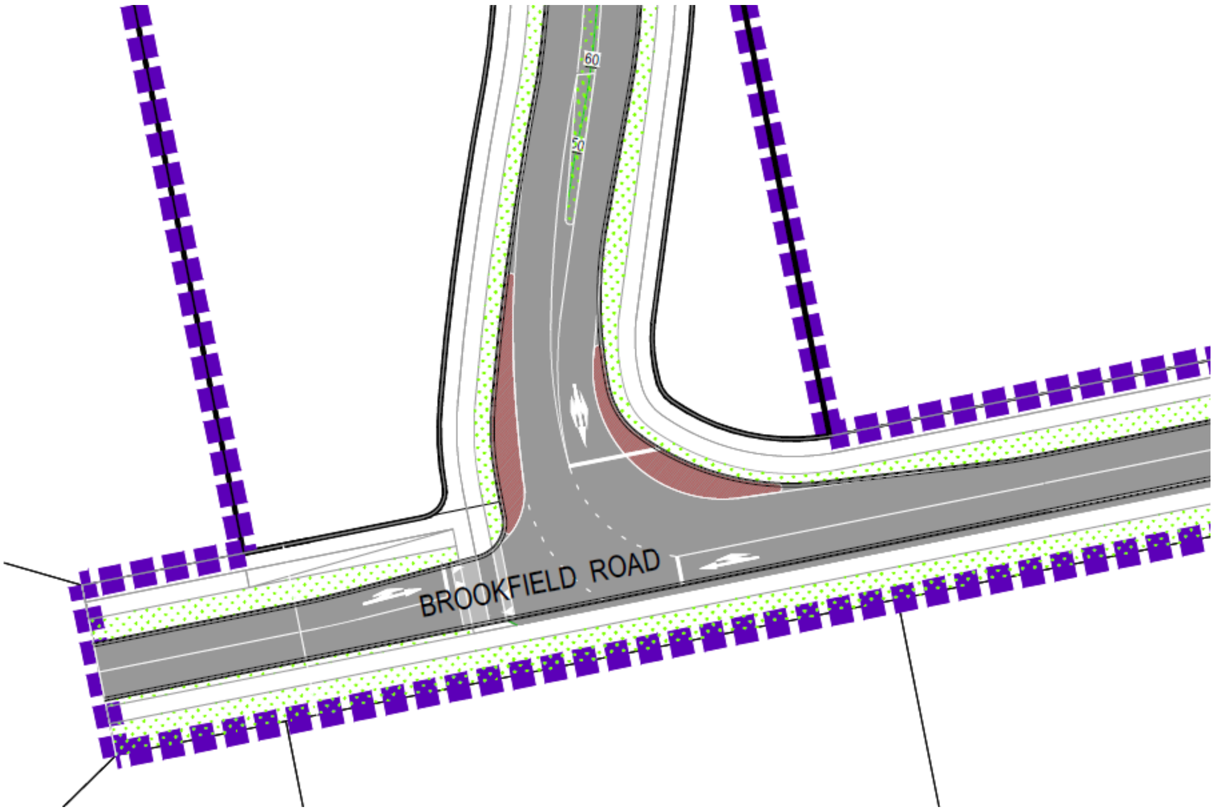


Figure 6-6: Brookfield Road / Main Street South Intersection Layout

6.7 CREEK ROAD SOUTH / PITT ROAD

In the fast track application, this intersection has only two legs, i.e. is functionally a curve / road-road connection rather than an intersection. In the longer term (not part of this application), it will connect with Creek Road (North) to the future stages of the proposed plan change area development.

In the fast track works, the main noteworthy features are that it is already designed space-wise to accommodate future turning lanes for the future northern leg (via flush median provision), and that in the interim (before later becoming a signalised intersection in future applications) it will provide a raised walk/cycle priority crossing over the southern arm to connect to the interim path to the train station in the north.

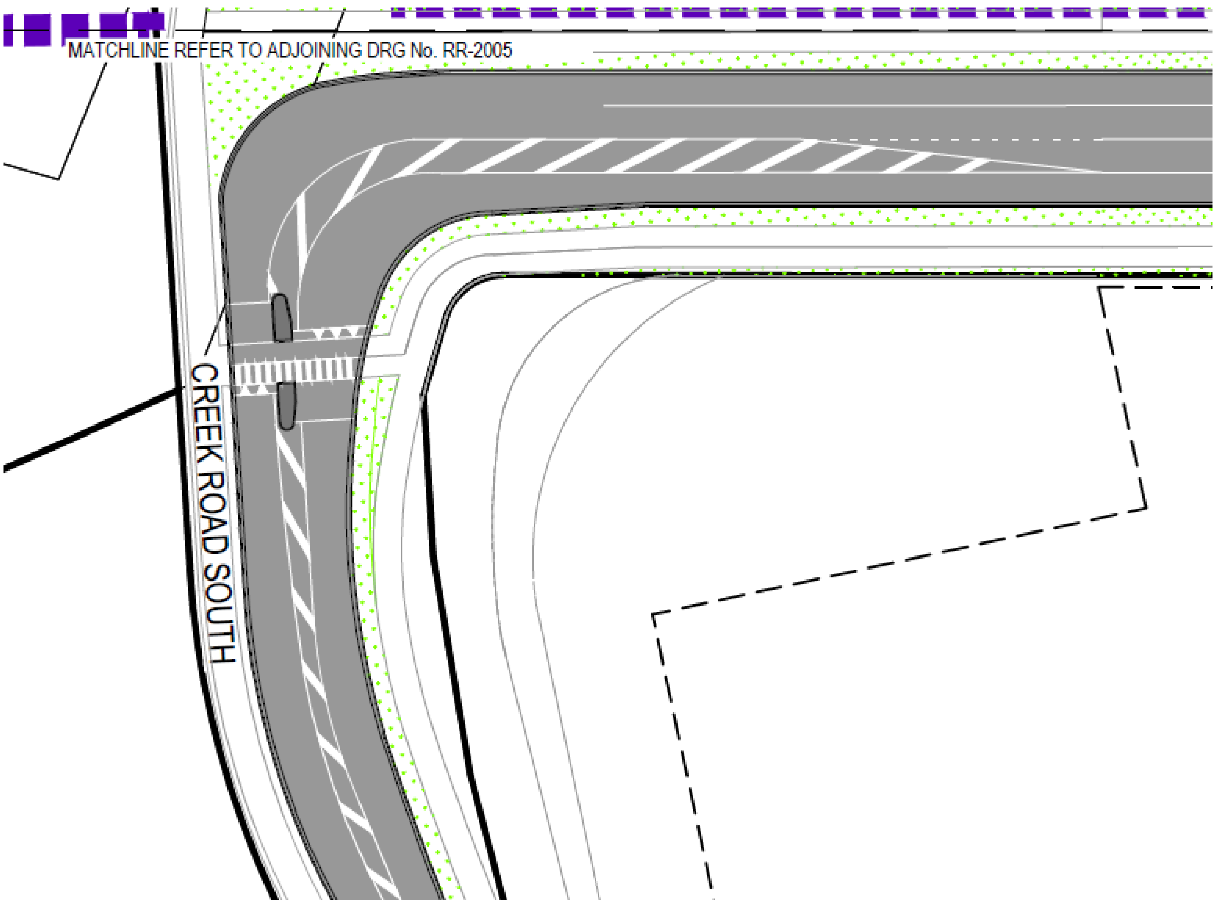


Figure 6-7: Creek Road South / Pitt Road Intersection Layout

6.8 ŌPAHEKE / FITZGERALD / WAIHOEHOE

6.8.1 Interim Layout

It is proposed to construct an interim design for the intersection of Ōpaheke Rd/Waihoehoe Rd/Fitzgerald Rd, which acknowledges current constraints due to third-party land ownership particularly on the southern side, and the fact that full build-out (intended for longer term traffic volumes and FTN bus routes not yet present) is not yet required.

This design has been laid out to be able to be efficiently converted at a later stage (by others, or as part of future applications) into a “final” design once third-party land becomes available - in particular through a completed Notice of Requirement (NOR) process and activation of the resulting designation.

The signalised intersection for the interim scenario is shown in Figure 6-8. The design incorporates the following key parameters:

- Two approach lanes and a single departure lane on all four approaches – a left-and-through and a right turn lane. Dedicated right turn lanes are to provide approximately the following storage lengths (excl. taper lengths):
    - Opaheke Road: 60m
    - Waihoehoe Road West: 70m
    - Waihoehoe Road East: 60m
    - Fitzgerald Road: 15m
- Provision of a wide (~4.8m) solid median on the northern approach (Opaheke Road) that can be converted to a solid narrow (~1.8m) median and a dedicated bus right turn lane (3m) for the “final” design. This will provide bus priority for the future FTN route south along Opaheke Road, without requiring major road reconstruction.
- Signalised, separated pedestrian and cycle crossings over all arms

  - Due to space constraints in the southwest and southeast quadrants, the design in these quadrants will use “shared path corners”, i.e. cycleway and footpath cannot be kept separate as in the northern quadrants where more space is available. At the (very short) tightest locations defined by the existing property boundaries, the shared paths will be at least 2.5m or wider, albeit these constraints will widen out again immediately, and will disappear in the “final” layout post-NOR.
  - Shifting the whole interim intersection northwards to allow an “interim” design without shared path corners is not feasible, due to further third-party land constraints at 112 Waihoehoe in the Northwest.
- It is proposed that the intersection be placed on a raised safety platform, extending far enough into all approaches so that the pedestrian / cycle crossings are located on the raised table. The appropriate gradient for the approach ramps would require further discussion during the EPA stage but is recommended to be a 100mm vertical rise at an 1:12-1:14 gradient, acknowledging that the intersection would initially be located in a still largely semi-rural area where steeper safety platforms gradients may not be appropriate.
- Provision of a raised safety platform aligns with new Austroads guidance indicating the safety and usability of such devices even on arterial roads to improve road safety and “Vision Zero” outcomes. It is noted that Auckland Transport has previously constructed raised tables at arterial road signals, and is currently consulting or has already approved designs for a wide variety of further such raised platform signals, such as in the New Lynn area (several intersections currently being consulted with raised tables on arterial road approaches) on Oteha Valley Road (raised tables on arterial road approaches) and East Coast Road in the Glenvar Road area (two large signals proposed on raised safety platforms).

Further information regarding the merits of a signalised intersection at this location compared with a roundabout is provided in the response to AT provided in Appendix A.

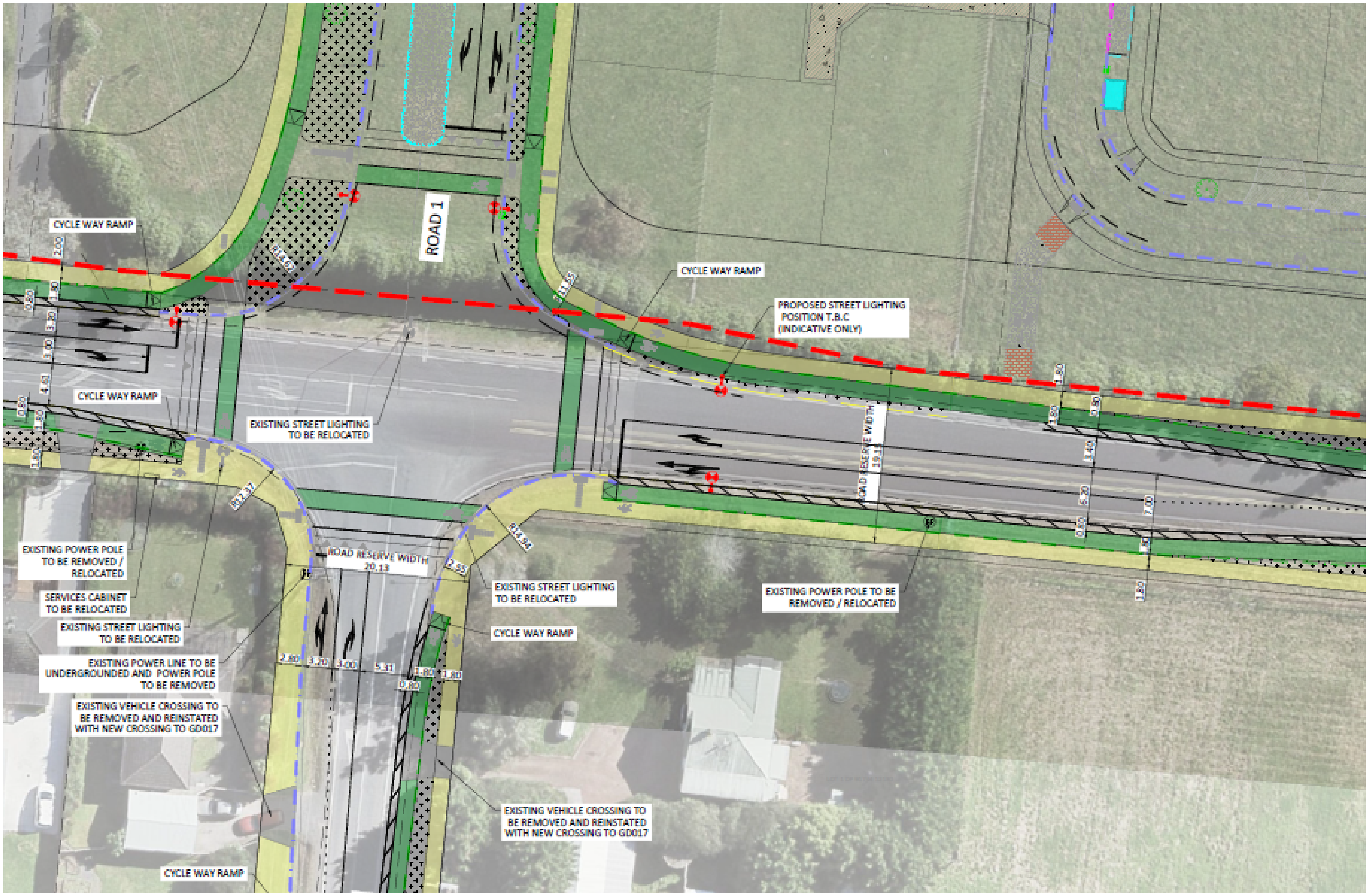


Figure 6-8: Interim Signalised Intersection Design, Opaheke Road / Waihoehoe Road

6.8.2 Interim Intersection Performance

Modelling has been undertaken using SIDRA to assess the performance of the proposed access. The intersection has been assessed using peak hour traffic volumes from the SATURN model as outlined in Section 5.1. These have been input into the SIDRA model and the results of the assessment are summarised in Table 6-1.

Table 6-3: Interim Traffic Signals - SIDRA Modelling Results

Approach	Mvmt	Morning Peak Hour				Evening Peak Hour			
		Delay (s/veh)	LOS	Average queue (m)	DoS	Delay (s/veh)	LOS	Average queue (m)	DoS
Fitzgerald (South)	LT	27.8	C	65.2	0.784	19.3	B	100.3	0.834
	TH	22.0	C	4.8	0.105	54.0	D	9.3	0.222
	RT	26.6	C	4.8	0.105	58.6	E	9.3	0.222
Waihoehoe (East)	LT	38.1	D	29.6	0.757	71.3	E	31.9	0.788
	TH	33.5	C	29.6	0.757	66.7	E	31.9	0.788
	RT	35.0	C	2.6	0.115	62.0	E	5.2	0.170
Opaheke (North)	LT	22.3	C	3.4	0.314	43.2	D	7.7	0.287
	TH	17.7	B	3.4	0.314	38.6	D	7.7	0.287
	RT	38.0	D	20.6	0.689	61.7	E	24.5	0.552
Waihoehoe (West)	LT	31.2	C	20.6	0.488	21.0	C	38.9	0.290
	TH	26.5	C	20.6	0.488	16.3	B	38.9	0.290
	RT	37.4	D	28.9	0.755	55.9	E	186.4	0.963

The results show that traffic signals controlling intersection operations results in the intersection operating within an acceptable level of service in both the AM and PM peak.

6.8.3 Final Layout

To ensure that spatial allowance is provided to allow the upgrade of Waihoehoe Road to a four-lane arterial road, as per the NoR, a potential signalised layout has been prepared as shown in Figure 6-9. The proposed potential design incorporates the following parameters:

- Lanes compared to the interim design:
    - Opaheke Road: One additional southbound bus right turn lane for the FTN, for a total of three approach lanes - two right turn lanes and one left-and-through lane, plus an added departure bus lane
    - Waihoehoe Road West: One additional through lane, and one additional left turn bus lane for the FTN, for a total of four approach lanes – one left, one left-and-through, one through and one right turn lane, plus an added bus departure lane
    - Waihoehoe Road East: One additional through lane, for a total of three approach lanes – one left-and-through, one through and one right turn lane, plus an added general traffic departure lane (albeit noting that as per our understanding of the Waihoehoe Road East NOR, this would soon east of the intersection then reduce to only one lane each way.
    - Fitzgerald Road: One added left turn lane (with slip lane control), for a total of three approach lanes – one left turn slip lane, one through lane and one right turn lane, no changes to the single departure lane southwards
        - It is noted that the proposed left-turn slip lane has previously been raised as a possible safety / active mode concern by Auckland Transport. This slip lane was added as this would provide some minor efficiencies for a significant turn and reduce one signalised crossing distance (over Waihoehoe Road West), while intending to provide adequate active mode safety and convenience via a raised table and active mode formal priority.
        - However, it is noted that the applicant does not consider this slip lane mandatory. It could be modified to provide a standard left turn lane instead, within the signal controls. Final design is in any case subject to separate approvals unrelated to this Fast-track application.

- Narrow solid medians for added road safety on all approaches except Fitzgerald Road (only collector road) which has only a narrow flush median. Depending on the final agreed design of Fitzgerald Road mid-block (separate Fast-Track applications), there likely will be no flush median on this approach at all, albeit that would not significantly change the interim or final designs.
- Signalised, separated pedestrian and cycle crossings over all arms
  - Unlike in the space-constrained interim design, after the NOR provides the ability to widen into the southern quadrants, the intersection is now a fully "protected intersection", with separation between walking and cycling throughout.
- It is proposed that the intersection be placed (retained from interim design) on a raised platform, extending far enough into all approaches so that the pedestrian / cycle crossings are located on the raised platform.

As noted in discussions with AT, the applicant considered the likely upgrade of this intersection to the ultimate layout would be expected to be some decades away. As such, the specific design – which will have to follow design standards that are likely to change between now and then - is of less importance than showing that identifying that the proposed layout would provide the desired capacity, and that there will be the ability to implement the desired intersection functionality, including active mode facilities, without undue space or cost issues caused by the interim design.

This is considered covered via the modelling that is provided in the modelling report in Appendix A and the space allocation for future widening provided by both the applicant design (where available, i.e. on the northern side) and the future NOR designation (on the southern side).

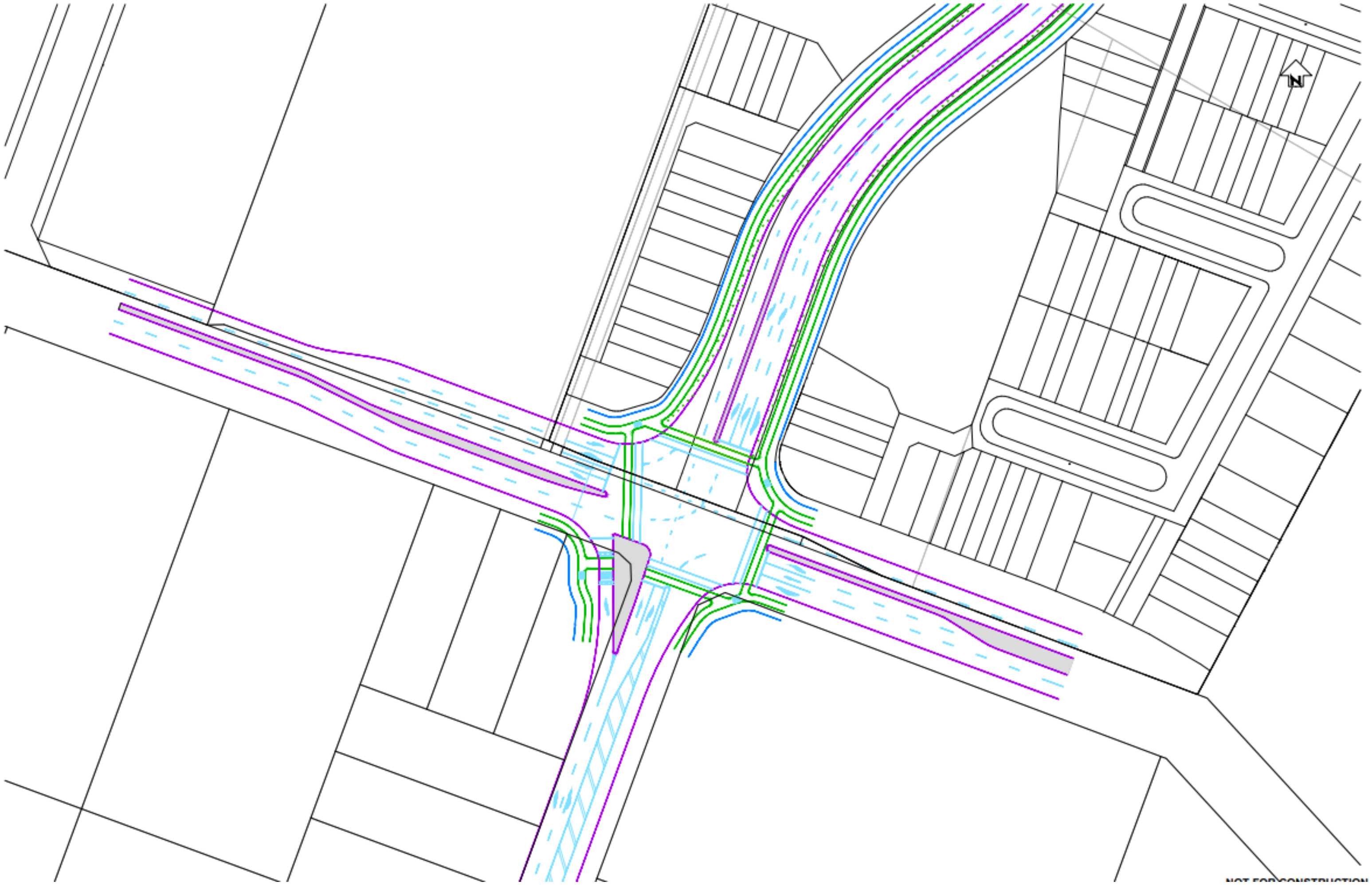


Figure 6-9: Potential Final Signalised Intersection Design, Opaheke Road / Waihoehoe Road

6.9 GREAT SOUTH ROAD / WAIHOEHOE ROAD INTERSECTION

6.9.1 Interim Layout

Consistent with the approach proposed in PC 50, an interim upgrade to the Great South Road / Waihoehoe Road intersection will be undertaken prior to any development taking place.

This is proposed to be undertaken by implementing an interim traffic signal, as developed in principle during the plan change caucusing process that is ongoing at the time of writing of this report. The proposed design includes provision of walk/cycle crossings on all four arms of the crossing, and sections of shared path approaching the interim signals. The layout is shown in the figure below:

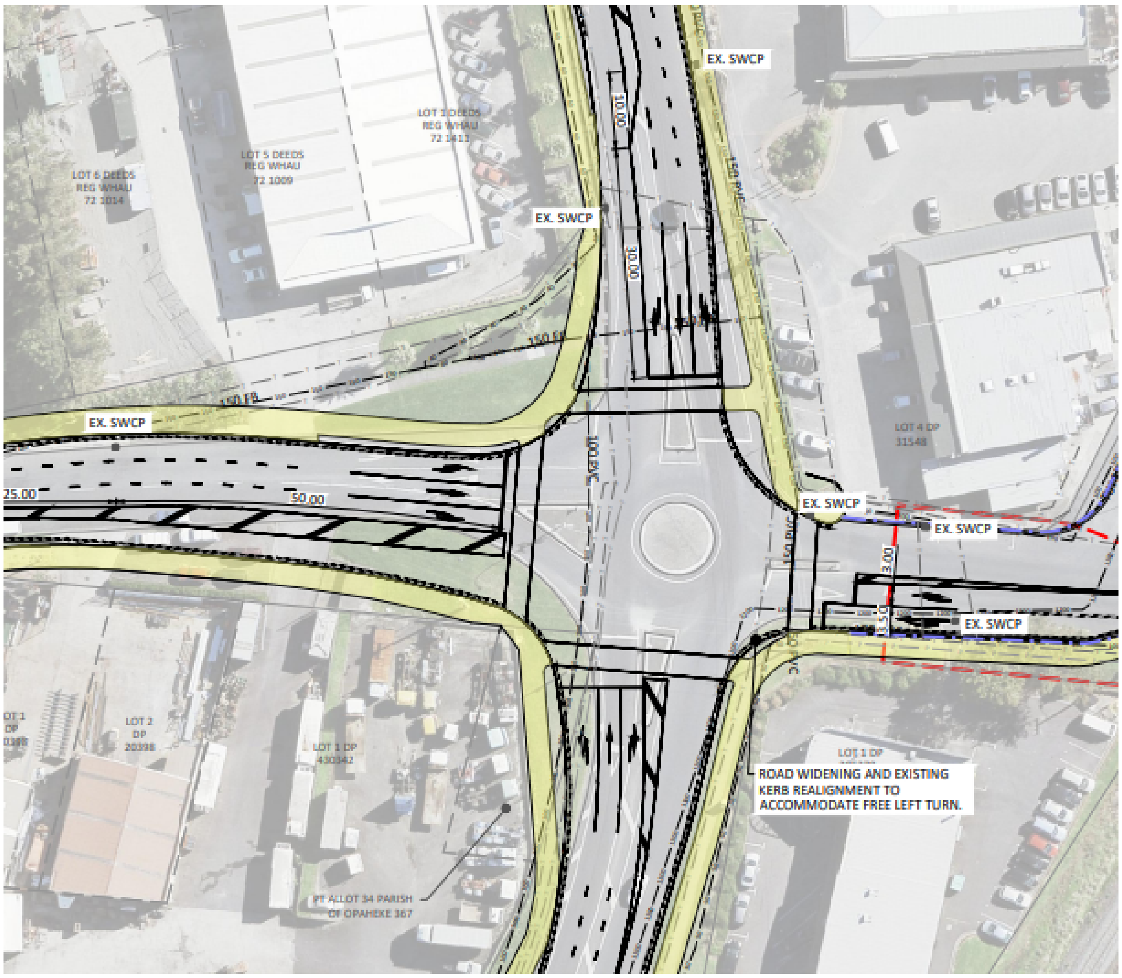


Figure 6-10: Waihoehoe Road / Great South Road / Norrie Road interim layout

The layout is to provide the following lengths of approach lanes, with single departure lanes on all legs (lengths are excluding tapers):

- GSR North approach:
  - LT lane: 50m
  - Through lane: Continuous
  - RT lane: 30m
- Waihoehoe Road approach:
  - LT and through lane: Continuous

    - RT lane: 45m
- GSR South approach:
    - LT lane: 75m
    - Through lane: Continuous
    - RT lane: 75m
- Norrie Road approach:
    - LT turn lane: 100m
    - Through lane: Continuous
    - RT lane: 50m

It is noted that this design has been developed to fit into the existing road boundaries without land take, until the NOR process enables land take by others at a future stage. As such (due to the need of achieving sufficient intersection signal capacity), the active mode facilities will not be to new-build standard. The facilities provided around the interim intersection are proposed to be shared paths, with some localised short pinch-pints as low as 2m at the immediate corners – albeit these occur over distances of 5m or less. Outside of these pinch points, the paths will generally be 3m wide, and in most areas, set back by a 1m grass berms from the carriageway edge.

Considering that the existing roundabout intersection is multi-lane and provides no crossing facilities at all, it is considered that the proposed signalised crossings represent a significant safety improvement for active mode users.

It is also similarly noted that lane widths are somewhat lower than standard on an arterial road intersection. Kerbside lanes are 3.5m wide (including a 0.3m channel allowance), while through lanes and right turn lanes are 3.0m. However, the design has been vehicle-tracked to allow up to 19.45m articulated trucks on all movements. This has been enabled in part by removing solid medians on the approaches, instead using flush median areas that these very large turn vehicles can track over.

6.9.2 Interim Intersection Performance

Modelling has been undertaken using SIDRA to assess the performance of the intersection. The intersection has been assessed using peak hour traffic volumes from the SATURN model as outlined in Section 5.1. These have been input into the SIDRA model and the results of the assessment are summarised in Table 6-4

Table 6-4: Interim Traffic Signals - SIDRA Modelling Results

Approach	Mvmt	Morning Peak Hour				Evening Peak Hour			
		Delay (s/veh)	LOS	Average queue (m)	DoS	Delay (s/veh)	LOS	Average queue (m)	DoS
Great South Road (South)	LT	27.0	C	2.2	C	38.1	D	3.4	0.0067
	TH	40.3	D	32.2	D	50.5	D	41.2	0.762
	RT	34.8	C	14.3	C	103.2	F	68.7	1.029
Waihoehoe (East)	LT	16.6	B	18.7	B	23.3	C	75.1	0.739
	TH	12.0	B	18.7	B	18.7	B	75.1	0.739
	RT	36.7	D	58.4	D	76.6	E	139.2	0.986
Great South Road (North)	LT	13.6	B	17.6	B	15.4	B	47.2	0.616
	TH	23.8	C	19.9	C	63.6	E	73.3	0.954
	RT	29.6	C	29.2	C	47.6	D	39.9	0.791
Norrie Road (West)	LT	25.7	C	45.2	C	42.7	D	63.0	0.775
	TH	29.1	C	9.8	C	59.6	E	34.2	0.933
	RT	33.7	C	2.5	C	48.6	D	3.7	0.152

The results show that traffic signals controlling intersection operations results in the intersection operating within an acceptable level of service in both the AM and PM peak.

7.0 CONSTRUCTION TRAFFIC

It is standard practice as part of the Resource Consent that a Construction Traffic Management Plan (CTMP) is developed to outline how construction deliveries to and from the site will be managed and mitigated. The CTMP should include the following:

- 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 both internal to the site and within the local road network;
- Temporary traffic management signage / details for both pedestrians and vehicles to appropriately manage the interaction of these road users with heavy congestion traffic; and
- Details of site access / egress over the entire construction period. Noting that all egress points to be positioned so that they achieve appropriate site distance as per the RTS-6 document.

Based on experience of constructing similar developments, bearing in mind the capacity within the existing road network, with the appropriate CTMP in place and the above measures implemented, it is considered that construction activities will be able to be managed to ensure an appropriately low level of traffic effects. The construction activities are temporary and with appropriate measures in place will be able to be managed.

Refer to Appendix B for the appended CTMP for the proposed development.

8.0 AUCKLAND UNITARY PLAN REQUIREMENTS

An assessment of the proposed development against the relevant, transport-related standards within the Unitary Plan Operative in Part are shown in the table below.

Table 8-1: Assessment of relevant Unitary Plan standards

Standard	Description	Compliance
E27.6.1(1)(a)	Where a proposal (except where excluded in Standard E27.6.1(2)) exceeds one of the following thresholds: a new development in Table E27.6.1.1 resource consent for a restricted discretionary activity is required.	**Applies.**
E27.6.2 (1)	The number of parking spaces must meet the minimum rates and not exceed the maximum rates specified which apply to the zone or location specified in Tables E27.6.2.3 and E27.6.2.4, as follows: Residential THAB zone: no minimum and no maximum Residential MHU zone: minimum of 1 per dwelling and no maximum for dwellings with two or more bedrooms.	**Complies (retail)** – See Section 4.6 **Will comply (residential)** (cannot be assessed at this stage)
E27.6.2 (6)	For residential developments of 20 or more dwellings the following minimum bicycle parking must be provided: Visitor (short-term stay): 1 per 20 dwellings Secure (long-stay): 1 per dwelling without a dedicated garage	**Complies (retail)** – See Section 4.6 **Will comply (residential)** (cannot be assessed at this stage)
E27.6.3.1	Every parking space must comply with the following minimum dimensions; For 90 degrees regular users: 2.4m width, 5.0m length and 7.1m manoeuvring space	**Complies (retail)** – See Section 4.6 **Will comply (residential)** (cannot be assessed at this stage)
E27.6.3.3 (1)	Every parking space must have driveways and aisles for entry and exit of vehicles to and from the road, and for vehicle manoeuvring within the site. Access and manoeuvring areas must accommodate the 85 percentile car tracking curves in Figure E27.6.3.3.1	**Complies (retail)** – See Section 4.5 **Will comply (residential)** (cannot be assessed at this stage)
E27.6.3.4	Sufficient space must be provided on the site so vehicles do not need to reverse off the	**Complies (retail)** – See Section 4.5

Standard	Description	Compliance
	site or onto or off the road from any site where any of the following apply: (a) four or more required parking spaces are served by a single access; (b) there is more than 30m between the parking space and the road boundary of the site; or	**Will comply (residential)** (cannot be assessed at this stage)
E27.6.3.6(1)	The whole area of parking and loading spaces, and manoeuvring areas and aisles must be formed, drained, provided with an all-weather surface to prevent dust and nuisance, and be marked out or delineated. This must be done before the activity to which those parking and loading spaces relate commences, and maintained for as long as that activity is continued.	**Will comply (retail and residential)** (cannot be assessed at this stage)
E27.6.3.6(3)	The gradient for the surface of any parking space must not exceed: 1 in 25 in any direction for accessible spaces for people with disabilities; or 1 in 20 (five per cent) in any direction for other spaces.	**Will comply (retail and residential)** (cannot be assessed at this stage)
E27.6.3.6(4)	The gradient for the manoeuvring area must not exceed 1 in 8.	**Will comply (retail and residential)** (cannot be assessed at this stage)
E27.6.4.1(3)	Vehicle Access Restrictions apply and vehicle crossings must not be constructed or used to provide vehicle access across that part of a site boundary which: a) is located within 10m of any intersection as measured from the property boundary, illustrated in Figure E27.6.4.1.1; b) is subject to the following types of Vehicle Access Restriction as identified on the planning maps in the zones listed in Table E27.6.4.1.1; c) has frontage to an arterial road as identified on the planning maps; or (d) is located closer than 30m from a railway level crossing limit line.	**Complies and will comply (retail and residential)** No vehicle crossings are proposed at this stage that would fall under these rules. If any are applied accordingly in a future stage (such as the vehicle crossing to form the fourth, eastern arm of the Creek Road South / Main Street South intersection) then they will be assessed accordingly at that point (not part of this application)
E27.6.4.2 (1)	The maximum number of vehicle crossings permitted for any site and separation distance	**Complies (retail)** – See Section 4.5 **Will comply (residential)** (cannot be assessed at this stage)

Standard	Description	Compliance
	between crossings is specified in Table E27.6.4.2.1: Maximum number of vehicle crossings per road frontage of the site: 1 per 50m of frontage or part thereof Minimum separation from crossings serving adjacent sites: 2m where two crossings on adjacent sites can be combined and where the combined crossings do not exceed a total width of 6m at the property boundary, no minimum separation distance will apply Minimum separation between crossings serving same site 6m	
E27.6.4.2 (2)	The width of a vehicle crossing(s) must meet the minimum width and not exceed the maximum width as specified in Table E27.6.4.3.2: Minimum width of crossing at site boundary: 5.5m (two-way) Maximum width of crossing at site boundary: 6.0m (two-way) Minimum formed access width: 5.5m (providing for two-way movements) provided it is contained within a corridor clear of buildings or parts of a building with a minimum width of 6.5m The formed width is permitted to be narrowed to 2.75m if there are clear sight lines along the entire access and passing bays at 50m intervals are provided.	**Does not comply (retail)** See Section 4.5 **Will comply (residential)** (cannot be assessed at this stage)
E27.6.4.4 (1)	The gradient of the access must not be steeper than specified in Table E27.6.4.4.1, 1 in 5 (20%)	**Will comply (retail and residential)** (cannot be assessed at this stage)
E27.6.4.4 (2)	To avoid the underside of the car striking the ground, as illustrated in Figure E27.6.4.4.2, access with a change in gradient exceeding 1 in 8 (greater than 12.5 per cent change) at the summit or a 1 in 6.7 (15 per cent change) at a sag must include transition sections to achieve adequate ground clearance, refer to Figure E27.6.4.4.3. Typically, a transition section requires a minimum length of 2m.	**Will comply (retail and residential)** (cannot be assessed at this stage)
E27.6.4.4 (3)	All vehicle access must be designed so that where the access adjoins the road there is sufficient space onsite for a	**Will comply (retail and residential)** (cannot be assessed at this stage)

Standard	Description	Compliance
	platform so that vehicles can stop safely and check for pedestrians and other vehicles prior to exiting. This is illustrated in Figure E27.6.4.4.4. The platform must have a maximum gradient no steeper than 1 in 20 (5 per cent) and a minimum length of 4m for residential activities and 6m for all other activities.	

Subdivision Standards

Table 8-2 below provides an assessment of the proposal against the key, relevant, transport-related standards in Section E39 Subdivision - Rural of the Unitary Plan.

Table 8-2: Assessment of transport-related Unitary Plan subdivision standards

Standard	Description	Compliance
E39.6.1.2.(1)	All proposed sites must be provided with legal and physical access to a road.	Complies

9.0 CONCLUSION

Based on the assessments and findings discussed within this transportation assessment, it is concluded that:

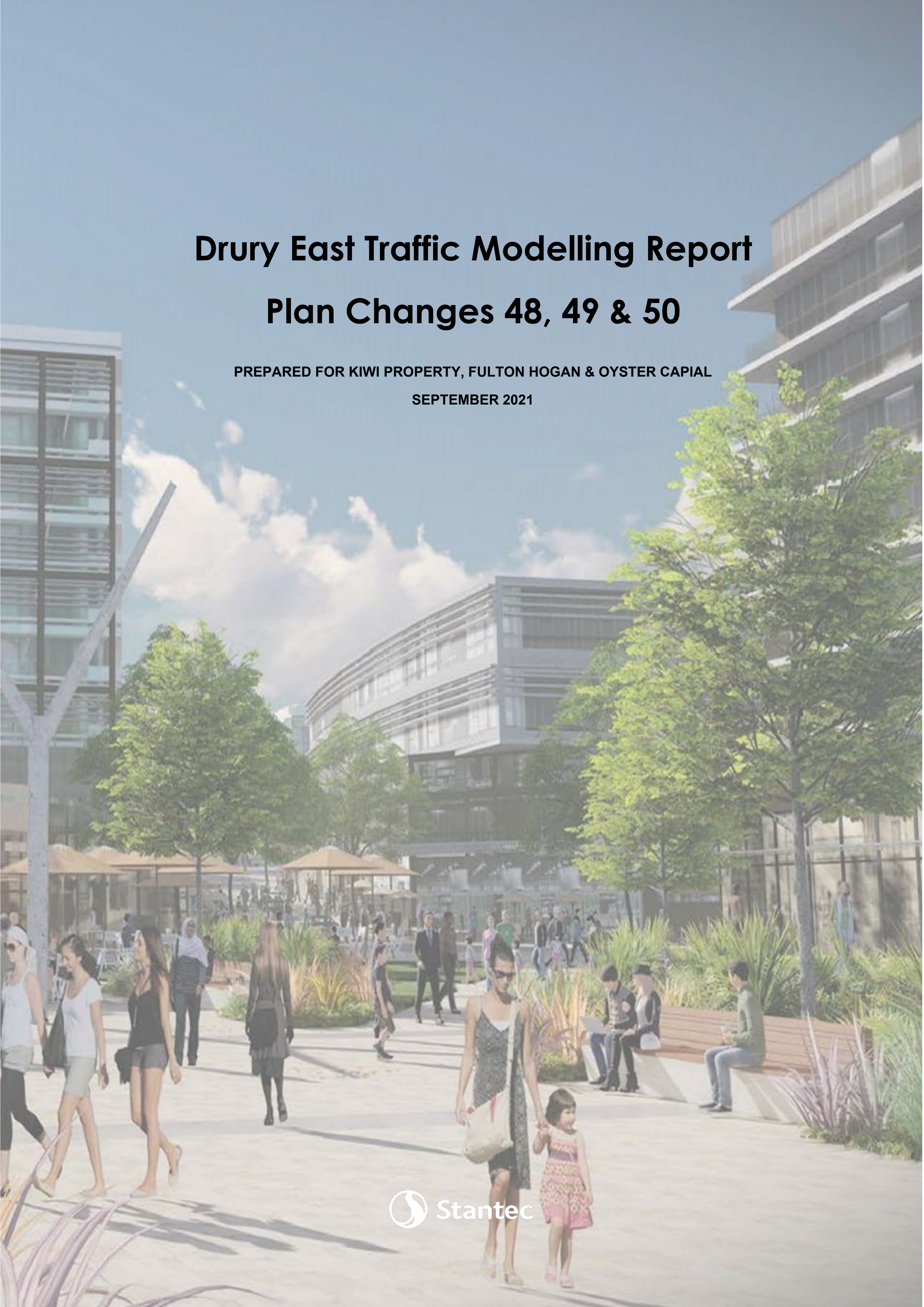
- Based on the previous transport assessments and the review of the masterplan, it is expected that all anticipated upgrades can be accommodated on the surrounding road network in a sustainable manner and in the existing public road corridor, respectively in applicant land.
- The design of the roads within the development are generally in accordance with the requirements and recommendations of the Unitary Plan and design guidance such as the Transport Design Manual and Engineering Code of Auckland Transport and can appropriately accommodate the relevant design vehicles and road users; and
- The proposal complies with the Unitary Plan transport requirements, with the exception of vehicle crossing widths for the retail area, noting that a number of vehicle crossing and car parking requirements will only be able to be assessed fully in a subsequent detail design stage.

It is therefore considered that there are no traffic or transport reasons to preclude the approval of the resource consent as requested.

Appendices

We design with community in mind

Appendix A PLAN CHANGE MODELLING REPORT



Drury East Traffic Modelling Report

Plan Changes 48, 49 & 50

PREPARED FOR KIWI PROPERTY, FULTON HOGAN & OYSTER CAPIAL

SEPTEMBER 2021

Stantec

Revision Schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)			
			Prepared by	**Checked by**	**Reviewed by**	**Approved by**
A	23/08/2021	First Draft	H Papps/S Vingrys	D. Hughes	D. Hughes	D. Hughes
B	30/08/2021	Second Draft	H Papps/S Vingrys	D. Hughes	D. Hughes	D. Hughes
C	02/09/2021	Final	H Papps/S Vingrys	D. Hughes	D. Hughes	D. Hughes
D	30/09/2021	Revised Final	H Papps/S Vingrys	D. Hughes	D. Hughes	D. Hughes

Quality Statement

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Executive Summary

Stantec has undertaken traffic modelling to assess the traffic effect of the developments enabled by the proposed Drury East private plan changes 48, 49 and 50 for Kiwi Property (Kiwi), Fulton Hogan, and Oyster Capital. The modelling has identified Points of Assessment at which development yield has been assessed in relation to specified infrastructure upgrades.

Traffic modelling has previously been prepared to support the plan changes, however changes to the modelling methodology and government infrastructure announcements regarding Mill Road and SH1 funding necessitates this update.

The traffic modelling has been undertaken using a three-tiered approach, consisting of a macro strategic model (MSM), a mesoscopic project model (SATURN), and a localised intersection operational model (Sidra Intersection). The assessment period spans three decades, between the anticipated start of the developments in 2023 through to 2048.

This revised traffic modelling assessment has been undertaken utilising Supporting Growth Alliance (SGA)'s SATURN model which was prepared to support the Drury Infrastructure Funding and Finance Study. Stantec adopted SGA's trip generation rates, mode share splits, internalisation assumptions and refined zone system, so the same testing platform would be used to assess the development's impact. Some of the assumptions made by SGA are considered conservative, however the Stantec modelling has adopted these assumptions to remain consistent with the overall modelling philosophy.

The key difference in modelling objectives between the Stantec modelling assessment and SGA's assessment is the focus on a more detailed analysis of network operation, including the assessment of varying infrastructure supply scenarios at the Points of Assessment. This is in comparison to SGA's modelling which focused on a more strategic assessment of the transport infrastructure needs using infrastructure staging principles and link flow values.

Infrastructure staging was tested using two core scenarios; planned infrastructure supply; and additional infrastructure supply. The planned infrastructure supply includes planned infrastructure as part of SGA's Preferred Network and infrastructure that developers are able to provide. The additional infrastructure supply was tested as a sensitivity test, including Brookfield Road/Quarry Road link and a Firth Street overbridge. These were tested to assess if such measures could be used to expedite the development.

Modelling was undertaken to test several short-, medium- and long-term infrastructure scenarios at the Points of Assessment, which will be used to inform the Plan Changes Precinct Provisions.

Intersection operational criteria was developed that defined poor intersection performance and an assessment point of network operation focused on the queue lengths, including the remaining queue storage capacity to the adjacent intersection and, where applicable, interpeak delays. Consideration was also given to the northbound queuing on SH1 and average daily link flows for roads connecting to the GSR/Waihoehoe Road intersection.

Where the implementation dates of infrastructure upgrades were unknown, Indicative years of when potential infrastructure could be built were estimated based on SGA's assumptions to enable background traffic (growth outside of the Drury East area) to be taken into consideration. The land uses in both the SGA and Stantec models are based on the original Council i11.5 land use assumptions, with updates reflecting the latest Drury East and Drury West development schedules. Utilising the Council i11.5 households and employment estimates for the background traffic is considered a conservative approach given the considerable development predicted for areas outside of Drury East and Drury West that face unresolved environment issues which may restrict development. Additionally, the development programme for other zones outside of Drury East relied on an earlier introduction of major infrastructure such as Mill Road or Pukekohe Expressway.

The modelling approach was developed in coordination with authorities (Waka Kotahi, Auckland Transport, Auckland Council and SGA) through a series of meetings. Broad consensus on the overall approach was reached, albeit with some outstanding questions regarding some aspects of the analysis. It is expected that most of these outstanding questions will be resolved within this report, and any remaining issues can be discussed in traffic caucusing.

The modelling demonstrated that the rezoning sought by the plan changes can be accommodated by the surrounding transport network, with several targeted local upgrades recommended within the first two decades.

These are primarily an immediate minor upgrade to the intersection of Great South Road and Waihoehoe Road with a signalised upgrade proposed as part of the Auckland Transport Alignment Project (ATAP) works. Provision of a direct

access to the Metropolitan Centre from SH1 would benefit the centre and help reduce traffic flows elsewhere in the immediate vicinity of the Metropolitan Centre. Urbanisation of Fitzgerald Road, Brookfield Road and other roads fronting Kiwi's, Oyster's and Fulton Hogan's developments is also proposed.

Based on the modelling, it is considered that the Drury East plan changes can be supported from a traffic perspective and are unlikely to have a significant adverse effect on the traffic network, assuming that infrastructure to support the developments is implemented.

Contents

List of Appendices

List of Tables

List of Figures

1 Introduction

Stantec has been engaged to undertake traffic modelling to assess the traffic effect of proposed developments within Drury East as part of Plan Change 48 (Kiwi Property (Kiwi)), Plan Change 49 (Fulton Hogan) and Plan Change 50 (Oyster Capital).

The traffic modelling assessment period spans three decades, between the start of the development in 2023 through to 2048. The purpose of the modelling is to forecast future traffic movements in the area based on a series of infrastructure and land use assumptions. It should be noted from the outset that the modelling is conservative and is inherently less accurate as time progresses. In this regard, the modelling has identified a number of Points of Assessment in the development schedule at which infrastructure is assumed to have been developed, failing which a further Transport Assessment would be required, taking account of the actual traffic conditions at that time.

There are other important transport planning aspects, in addition to the traffic modelling, that are important to consider for the Plan Changes. These will be more widely discussed in the Integrated Transport Assessment reports prepared for Plan Change 48, Plan Change 49 and Plan Change 50.

1.1 Background

To accommodate further growth and to facilitate urbanisation in Drury, Council has undertaken Structure plans for Drury-Opaheke and Pukekohe-Paerata. The Drury-Opaheke area is divided into Drury East / Central / South (Drury East) and Drury West, as shown in Figure 1-1 below. State Highway 1(SH1) separates Drury East and Drury West and provides a direct connection northbound and southbound.

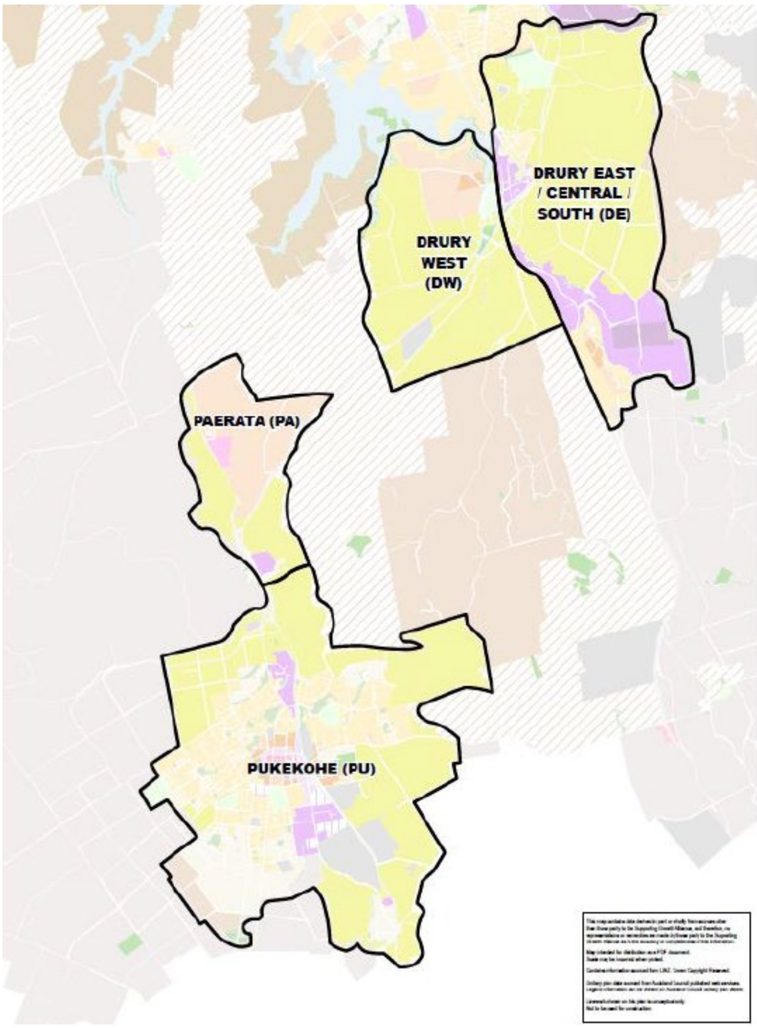


Figure 1-1: Geographic subdivisions of Structure Plan Area

On 2 April 2019, a Draft Integrated Transport Assessment by Supporting Growth Alliance (SGA ITA) was released. This outlined the transportation effects of the proposed Structure Plan areas for Drury-Opaheke and Pukekohe-Paerata, as part of the Council's Future Urban Land Supply Strategy (FULSS). The Drury-Opaheke Structure Plan Area is shown in Figure 1-2.

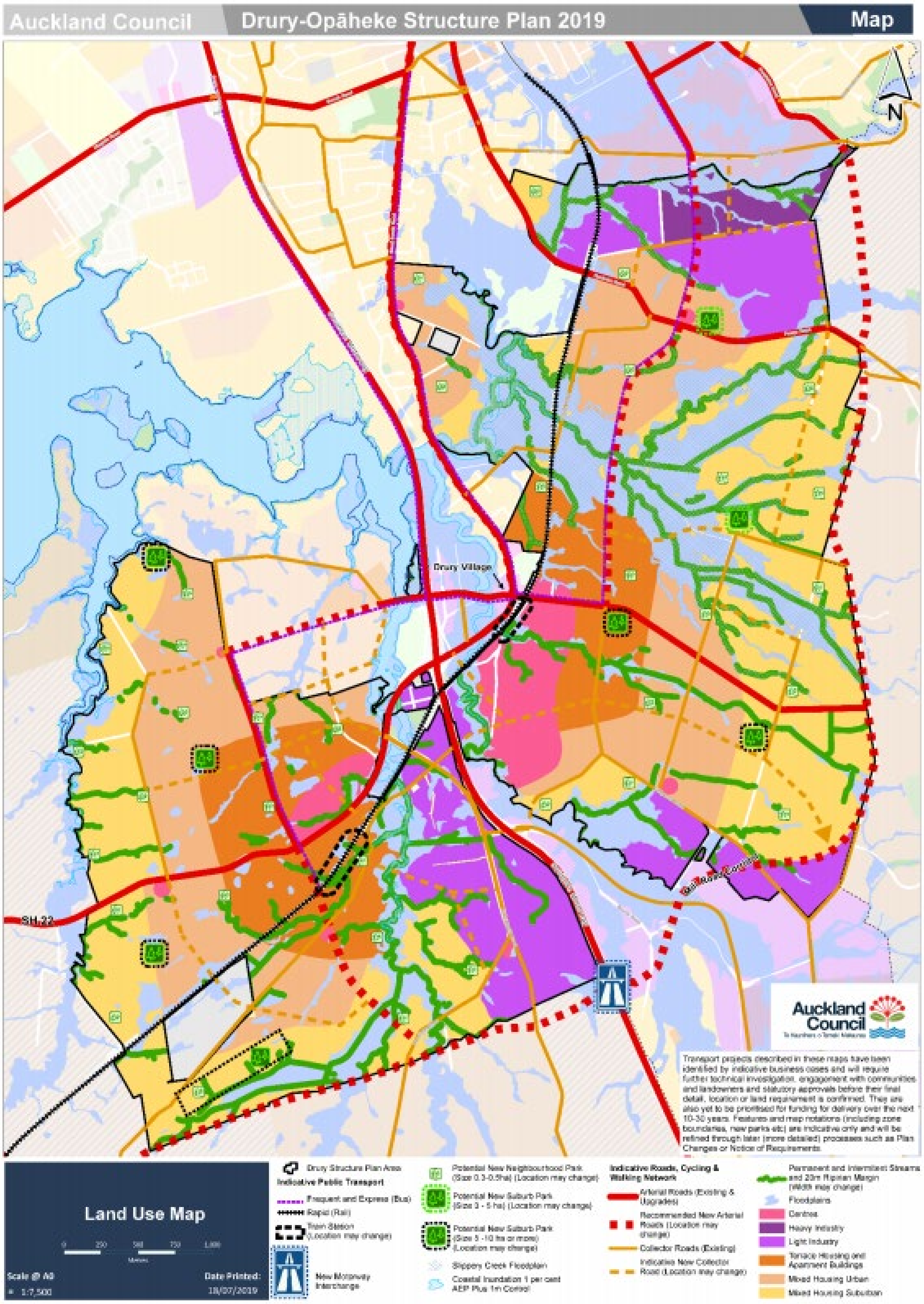


Figure 1-2: Drury-Opaheke Structure Plan 2019 (from SGA ITA)

Kiwi Property, Fulton Hogan and Oyster Capital have substantial landholdings within Drury East and are seeking to progress development ahead of the Council's current staging. Kiwi Property is proposing to develop a Metropolitan Centre (i.e. mixed use) whilst Fulton Hogan and Oyster Capital are both proposing primarily residential development. The broad proposed plan change areas for each property owner are outlined in Figure 1-3 below.

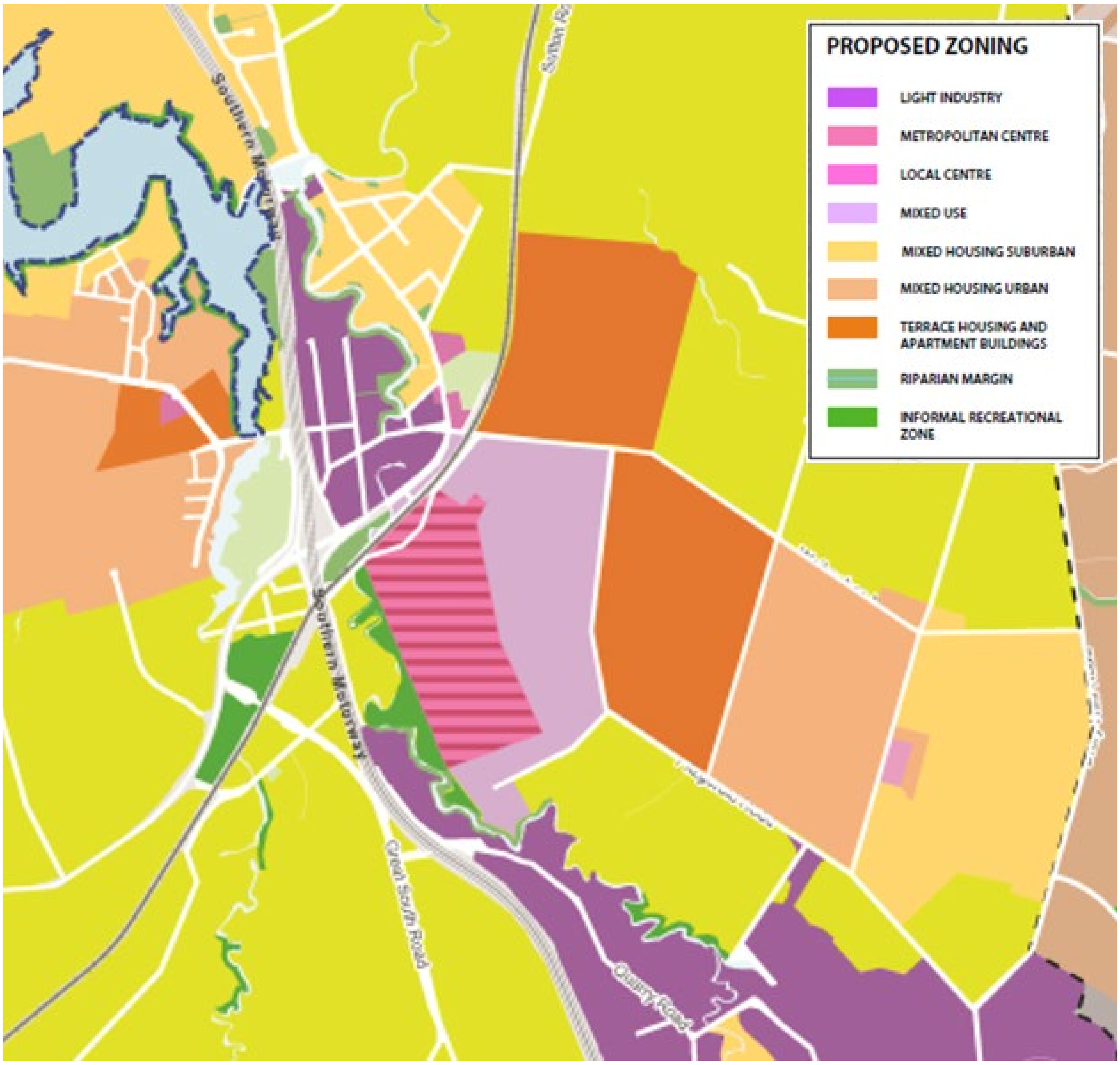


Figure 1-3: Kiwi, Fulton Hogan and Oyster Capital broad proposed plan change areas in the context of the Draft Structure Plan boundary

The traffic effects due to the proposed developments are required to be assessed on the surrounding network, and the access routes to each site also need to be considered. This will indicate any additional infrastructure that could be implemented to enable development as desired by Kiwi, Fulton Hogan, and Oyster Capital, prior to or beyond any committed future network upgrades.

1.2 Previous Assessments

In November 2019, Stantec undertook traffic modelling and prepared a modelling report to assess the traffic effects of the proposed developments within Drury East. Stantec undertook the traffic modelling using a three-tiered approach, consisting of a macro strategic model (MSM), a mesoscopic project model (SATURN), and a localised intersection operational model (Sidra Intersection).

The modelling considered the SGA future transport network, as reported in the SGA ITA for the Drury-Opaheke and Pukekohe-Paerata areas, with land use assumptions adjusted to align with Kiwi, Fulton Hogan and Oyster Capital's desired build rates. This modelling assumed mode share assumptions consistent with the MSM model, which was conservative noting a lower mode share for Drury East than Drury West.

The modelling demonstrated that the rezoning could be accommodated by the surrounding transport network, on the assumption of several targeted local upgrades within the first two decades including;

- The signalisation of the Great South Road / Waihoehoe Road roundabout prior to 2028;
- The widening of Waihoehoe Road and Great South Road prior to 2038; and
- A network capacity upgrade prior to 2038 which could be achieved through doubling the northbound ramps at the Drury Interchange or an earlier provision of the Southern Mill Road (proposed in 2038) connection to Fitzgerald Road.

Subsequent to the above modelling, in January 2020 the Government announced funding and delivery timeframes of the New Zealand Upgrade Programme (NZUP) including several key projects that are influential to the outcomes of the Plan Change traffic modelling. Notably this included the construction of Drury South Interchange by 2025 and the full length of Mill Road by 2028. Moreover, Auckland Council shared a number of relevant projects within indicative timeframes.

Stantec undertook revised modelling to include the infrastructure upgrade announcements and assumptions, to reassess the traffic effect of the proposed developments on the future network. This modelling was presented in the Integrated Transport Assessments (ITA) for Kiwi Property and Oyster Capital, dated March 2020. It is noted that the Fulton Hogan land parcel was included in the traffic modelling however the ITA was prepared by Mott McDonald and utilised the Stantec traffic model.

This revised modelling showed that given much earlier delivery of critical upgrades, in particular the Papakura and southern section of Mill Road, that only a limited number of local roading upgrades were required to enable the development, such as:

- Interim safety upgrade to the Waihoehoe Road / Great South Road roundabout to provide safe crossing facilities for pedestrians and cycles on all approaches; and
- Upgrade and signalisation to the Great South Road / Waihoehoe Road intersection to signals prior to 2038 (by 2033 when a new access to the Metropolitan Centre is not provided, and by 2038 when a new access is provided).

1.3 Revised Modelling Assessment

In March 2021, Stantec received the Drury Infrastructure Funding and Financing Study (DIFF) SATURN model prepared by SGA. Upon review of the model, the decision was made to utilise this model for the Plan Change traffic modelling. By doing so, any ambiguity surrounding trip generation rates, mode share splits, internalisation assumptions and the refined zone system were resolved. Further discussion regarding the SGA model and adjustments made to the model is provided in Section 2.1.

In June 2021 Stantec produced a Modelling Report based on the SGA model, and this was provided to the parties involved in the Drury East plan changes traffic caucusing. Shortly thereafter, a further announcement was made by the government regarding the NZUP projects. Of particular relevance was the removal of the Takanini, Papakura and Drury sections of the Mill Road project, and the Papakura to Drury South Stage Two project, including the Drury South interchange, from NZUP.

Stantec therefore revised its modelling to change the assumptions regarding when these projects would be implemented and assessed the development thresholds relevant to these projects.

This traffic modelling report describes the revised modelling methodology used and the land use assumptions for Drury East, outlines the various scenarios investigated, and discusses the effects on the relevant surrounding road network. The modelling has considered specified magnitudes of land use in relation to assumed infrastructure upgrades in terms of dwellings, commercial and retail Gross Floor Area (GFA). These Points of Assessment will inform the planning policy proposed within the Precinct Provisions as part of the Drury East Plan Changes.

2 Modelling Philosophy

2.1 Background

This modelling iteration to assess Drury East Plan Change developments utilised the updated South Auckland Mesoscopic SATURN models developed by SGA (S3M) for Drury Infrastructure Funding and Financing Study (DIFF). The models were received on 15 June 2021 and comprised three modelling years: 2028, 2038 and 2048+.

Similar to previous iterations of S3M models, the latest models are based on regional Macro Strategic Model (MSM) which estimates travel patterns based on inputs of land use and transport infrastructure assumptions. The key land use inputs to the MSM models, as discussed in the SGA's DIFF report, are:

- Land use forecasts developed by Auckland Council and the Auckland Forecasting Centre (AFC) referred Scenario I11.5; and
- Yield estimates in the FUZ areas estimated by Auckland Council for a full build model scenario referred to as 2048+.

SGA also updated the trip generation for Drury East and West zones to reflect the developers' land use plans by applying a first-principles traffic generation approach and factoring the S3M demand for these zones to better reflect planned deviations from I11.5 land use.

In addition to the above, the latest SGA models have a more desegregated zoning structure in the Drury East area compared to the models previously used in the Plan Change assessment and include the most up to date land use and infrastructure assumptions. As such Stantec chose to utilise the SGA models so that the same testing platform is used to assess the development's impact. The key difference in modelling objectives between this modelling assessment and SGA's assessment is that Stantec has focused on a more detailed analysis of network operation, including the assessment of varying development and infrastructure supply scenarios (i.e.: the Points of Assessment) to consider network performance, whereas SGA has focused on a more strategic assessment of the transport infrastructure needs using infrastructure staging principles and link flow values.

Stantec has made some refinements to the S3M model mostly relating to heavy vehicle proportions, link capacities, and intersection layouts, and these are documented in Section 2.5.5.

2.2 Modelling Methodology

2.2.1 Modelling Approach

Transport modelling for Drury has been undertaken primarily using a three-tiered approach, consisting of a macro strategic model, a mesoscopic project model, and a localised intersection operational model. The strategic model is the AFCs MSM. The MSM is an EMME based conventional four stage model[1] covering the wider Auckland area.

The mesoscopic model is a SATURN based multi-user class (light vehicle and heavy vehicle) user equilibrium assignment model detailing the road network and intersections in the area. The mesoscopic model takes the private vehicle and heavy vehicle demands from MSM and further disaggregates the zoning to give a greater level of detail.

SIDRA Intersection was used to test the operational performance of the key intersections in the network (with the primary focus on the Great South Road / Waihoehoe Road intersection) and aid in identifying potential intervention measures to ensure an acceptable level of service is maintained.

[1] The four stages consist of trip generation, distribution, mode split, and assignment.

2.2.2 Model Extent

The zoning areas for the MSM model is shown in Figure 2-1below.

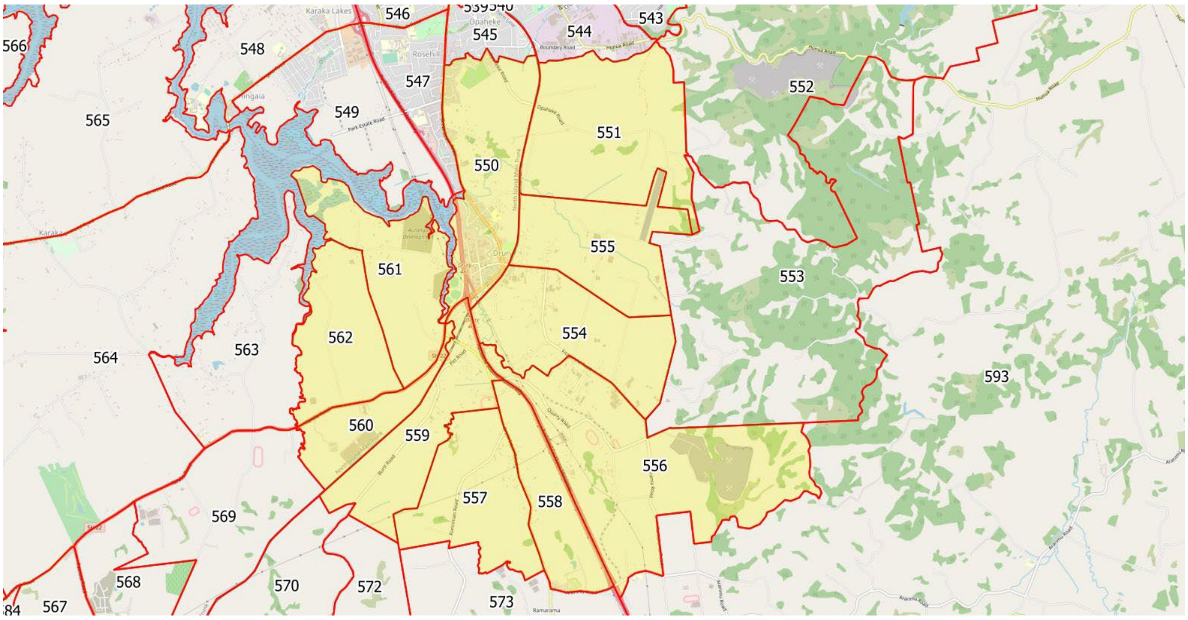


Figure 2-1 Latest MSM Model Zoning Map

The MSM model was used as a base in the SATURN modelling, to allow more representative and accurate results to be determined. The extent of the SATURN model is shown in Figure 2-2 below.

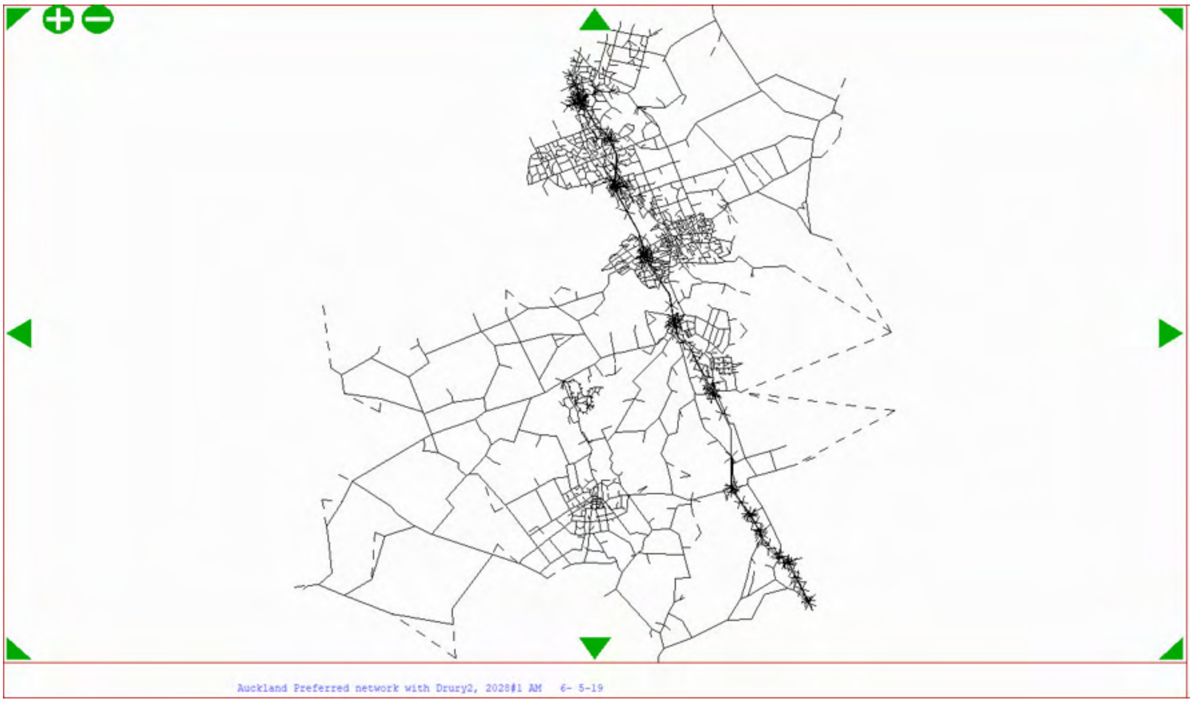


Figure 2-2 SATURN Model Extent

The original SGA models that were used as starting points to test the Drury East development are:

- **2028 model scenario - Scenario C** with the removal of all of Mill Road south of Papakura but includes Maketu-Waihoehoe Road internal collector roads.
- **2038 model scenario - Scenario A** - Reference Case Mill Road Models updated for DIFF 3.0 Study (with 2038 Drury East and Drury West land uses). These include full Mill Road and Papakura to Drury South projects and Opaheke North-South Arterial (with signals) but do not include Brookfield-Quarry Link (BQL) or direct Drury-Kiwi ramp access (DKR).
- **2048 model scenario - Scenario A** - Reference Case Mill Road Models updated for DIFF 3.0 Study (with 2048 Drury East and Drury West land uses). These include full Mill Road and P2DS projects and Opaheke North-South Arterial (with signals) but do not include Brookfield-Quarry Link (BQL) or direct Drury-Kiwi ramp access (DKR).

These SGA models were then adapted by Stantec for the Drury East plan change testing. Some changes to these models were made such as:

- Additional infrastructure was coded;
- Traffic demands were estimated to develop new future year scenarios; and
- Amendments described in Section 2.5.5 were included.

These changes were necessary to develop a set of tests/models for assessment point definition as described in the section below.

2.2.3 Modelling Scenarios

The land use scenarios considered in the modelling are grouped in decades and interpolated to develop interim scenarios to define Points of Assessment. For the interim scenario, modelling the land use and traffic demand were interpolated in a linear manner.

The infrastructure staging was tested using two core scenarios:

- **Planned infrastructure supply** which includes only currently planned infrastructure included within SGA's Southern Preferred Network (some of which has funding already identified, and some of which that hasn't), plus infrastructure that the developers are able to provide, such as a direct southbound connection from SH1 to the Town Centre. This scenario excludes options that require third party land acquisition.
- **Additional infrastructure supply** (treated as a sensitivity test) and covering additional infrastructure to the Planned infrastructure scenario, namely Brookfield Road – Quarry Road Link (which relies on private land acquisition) and Firth Street overbridge connection which relies on complex engineering and consenting challenges. In this scenario it is investigated if such measures can be introduced by the developers (from a modelling perspective) to increase network resilience and therefore increase the potential yield of the developments, to supplement the planed infrastructure supply.

All infrastructure from both scenarios is depicted in Figure 2-3.

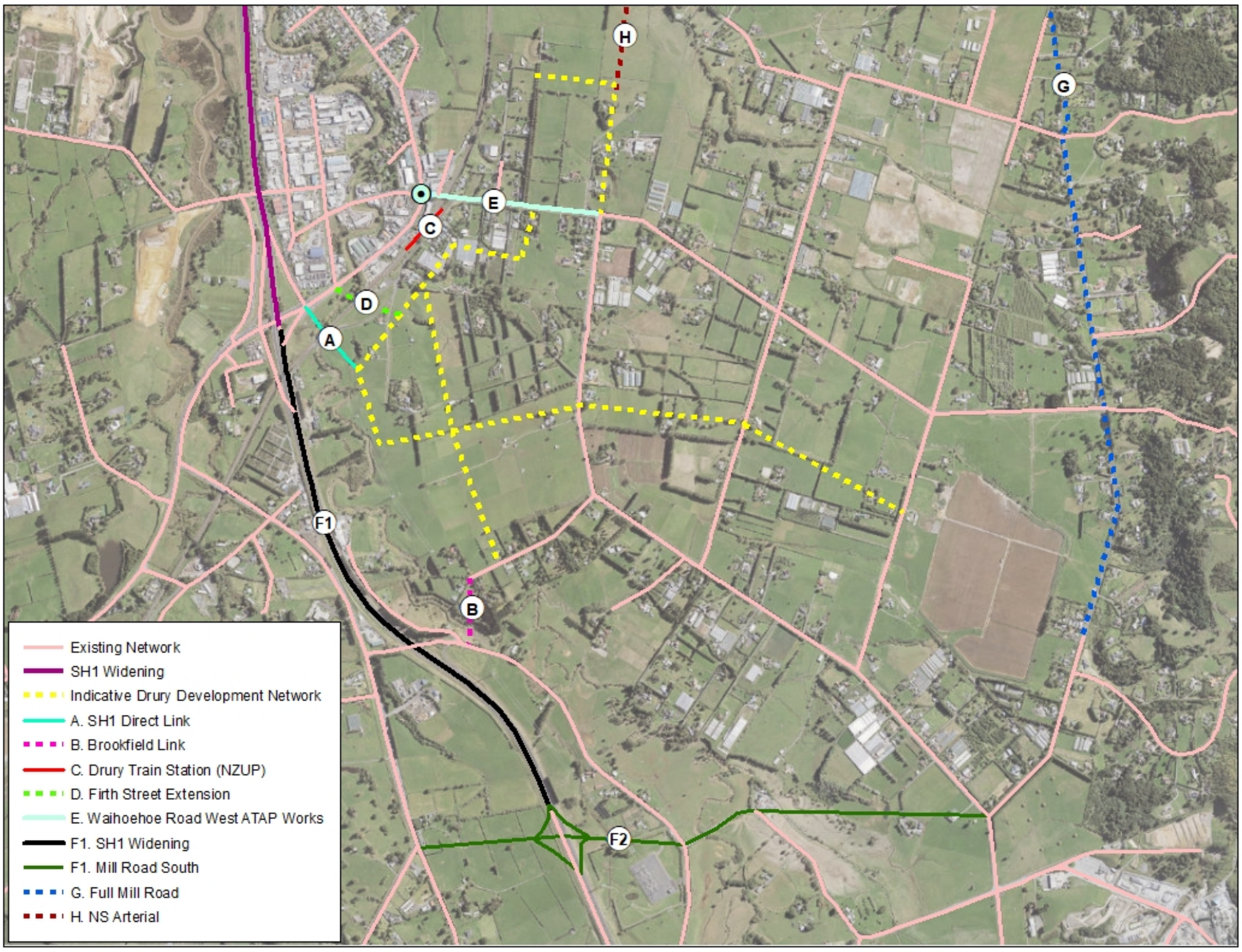


Figure 2-3: Infrastructure to be tested

The Planned Infrastructure Scenario test was completed for the full 30+ year programme. The Additional Scenario tests were completed to provide an indication of additional capacity that Brookfield Road- Quarry Road link and Firth Street link can unlock. See Table 2-1 for the list of tested scenarios.

The core eight tests that were completed for three peak hours (AM, PM and Interpeak (IP) hours) are listed below:

- **Short-term (1-5 year) infrastructure tests** – covers the period of development prior to Waihoehoe Road West Auckland Transport Alignment Project (ATAP) scheme implementation. These scenarios include modelling of the following scenario:
  - **Test 1** – models the first development years with minor improvements to the GSR/Waihoehoe Road roundabout (within the existing road boundary) only. This incorporates a lower Public Transport (PT) mode share uptake percentage assumption, as it would occur prior to Drury Central rail station construction.
  - **Test 2** – assesses the impact of the SH1 widening and Drury Interchange improvements. As with Test 1, this model includes lower PT mode share uptake percentage without the train station.
  - **Test 3** – assesses the impact of Drury Central station and models the impact of the immediate larger PT % mode share uptake that it enables. It also includes the impact of the direct SH1 connection from SH1 (in the vicinity of the Drury interchange) to the development

Note that each test builds upon the previous to produce cumulative infrastructure improvement scenarios.

- **Medium-term (6-15 year) infrastructure tests** – these tests estimate the additional capacity provided by Waihoehoe Road West ATAP scheme and new southern connection from Fitzgerald Road to SH1 (similar or alternative to Mill Road South Interchange previously proposed as part of NZUP programme). The model tests include:
  - **Test 4** – which builds on improvements included in abovementioned three tests and adds signalisation and widening of the Waihoehoe Road/GSR intersection and widening of Waihoehoe Road between Fitzgerald Road and GSR to provide bus lanes as per the ATAP scheme.
  - **Test 5** – this modelled scenario assesses the capacity that construction of the southern connection from Fitzgerald Road to SH1 (Mill Road South or similar) would provide in addition to improvements included in Test 4. This includes SH1 3-laning between Drury Interchange and Drury South interchange.
- **Long-term (16 – 25 year) infrastructure tests** – includes three tests that cover the additional network capacity provided by the completion of northern connections; the provision of the first new connection to the Ponga Road similar to the full Mill Road initially proposed as part of the NZUP, the second new North-South connection such as Opaheke Road extension or similar link and Pukekohe expressway which was designed to enable full growth in Pukekohe, Paerata and Drury West areas. As such the following tests were completed:
  - **Test 6** – builds on improvements included in medium-term testing and adds the first Mill Road connection from Ponga Road to east of Fitzgerald Road. This test is aimed at identifying how much capacity can be unlocked with the new link to the north before further improvements are needed.
  - **Test 7** – assesses the impact of the second north-south connection as part of Opaheke Road extension.
  - **Test 8** – assess the impact that Pukekohe expressway has on unlocking further capacity and enabling growth in South Auckland

The sequence of the infrastructure was based on the SGA previously adopted schedule with the large infrastructure elements included in mid to long-term periods.

The modelling identifies the effects on operational efficiency and any constraints on access at intersections that arise for each scenario. This is defined as a Point of Assessment. The criteria for what is considered acceptable is discussed in Section 3. That information will be taken into account when determining the PC48, PC49 and PC50 precinct provisions regarding traffic and transport matters.

A number of alternative infrastructure tests were also completed as Additional Infrastructure Scenarios. These tests included the modelling of the potential overbridge connection from Drury East to Firth Street (Firth Street Link) and a potential Brookfield Road – Quarry Road connection (Brookfield Link). The Additional Infrastructure Scenario was only undertaken as sensitivity testing due to Brookfield Link requiring third party land and due to uncertainties around Firth Street Link being a complex engineering and planning piece of infrastructure.

Indicative years of when potential infrastructure could be built had to be estimated to enable background traffic (growth outside of the Drury East area) to be taken into consideration.

A summary of each of the scenarios tested are provided in Table 2-1 below:

Table 2-1: Summary of Infrastructure Scenario Tests

	Planned Infrastructure Supply Scenario								Additional Infrastructure Supply Scenario		
	Short-term infrastructure			Medium-term infrastructure		Long-term infrastructure			Additional infrastructure tests		
Test No, setting out **background traffic assumption**. Point of Assessment to be determined based on performance metrics	GSR / Waihoehoe Roundabout (RAB) upgrade	SH 1 Widening from Papakura to Drury completion	Drury Central Station and SH1-Town Centre Connection (Coincides with Drury Interchange Upgrade	Waihoehoe Road West ATAP upgrade as per NOR including signalisation and widening of GSR/Waihoehoe intersection	Southern Connection - linking Fitzgerald Road to SH1and GSR (alternative or similar to Mill Road South)	First North-South connection from Waihoehoe Road to Ponga Road (e.g. full Mill Road connection)	Second North-South connection (e.g. Opaheke Road extension)	Pukekohe Expressway	Firth Street Outbound connection	Brookfield Road- Quarry Road link	
Prior to 2025 (Test 1)	✓										
2025-2026 (Test 2)	✓	✓									
2026-2028 (Test 3)	✓	✓	✓							✓	Test 3A
2028-2033 (Test 4)	✓	✓	✓	✓					✓		Test 3B
2033-2038 (Test 5)	✓	✓	✓	✓	✓						
2038-2048 (Test 6)	✓	✓	✓	✓	✓	✓					
2038-2048 (Test 7)	✓	✓	✓	✓	✓	✓	✓				
2038-2048 (Test 8)	✓	✓	✓	✓	✓	✓	✓	✓			

2.3 Network Capacity Criteria

Intersection operational criteria defining the threshold of poor intersection operation focused on the queue lengths, including the remaining queue storage capacity to the adjacent intersection and, where applicable, interpeak delays. It was considered that network operation is acceptable if:

- The average queue during the peak hours is sustained within the available storage length and on average does not overspill into an adjacent intersection; and
- if the above condition was met then peak hour delays are considered acceptable as long as interpeak intersection operation was better than Level of Service F.

The table below shows the storage length for the approaches at GSR / Waihoehoe intersection.

Table 2-2: Approach Storage Length for GSR / Waihoehoe Intersection

Great South Road / Waihoehoe Road Intersection Approach	To Downstream Intersection	
	Road Name	Distance (m)
North	Sutton Road	770
West	Firth Street	340
South	Firth Street	450
East	Kath Henry Lane	250

These network capacity definitions were broadly discussed with other modelling specialists and are specifically put forward to move away from the peak hour delay threshold as this could result in the oversupply of transport infrastructure that enables or even encourages private vehicle usage and impacts the competitiveness/attractiveness of public transport and active modes.

Three additional parameters that were monitored are:

- The northbound queue on SH1 and whether this queue extends to Drury Interchange. These queues were monitored to understand potential queue over spill into a local network, e.g. as a result of on-ramp signal operation.
- Average daily link flows at links connecting to the GSR/Waihoehoe Road intersection.
- Public transport delays at key locations of the network. Whilst enabling intersection queuing, consideration was given to delays along specific public transport routes, especially where no bus lanes are provided;

As per SGA's request, daily link flows on were monitored in the local network with the key focus on the links at the GSR/Waihoehoe intersection. For the context of how Waihoehoe Road (a future arterial road with one traffic and one bus lane in each direction) daily traffic volumes compare to traffic volumes of the operational arterial roads refer to Table 2-4 and Appendix A. As shown in Table 2-4 the daily traffic volumes of the arterial roads range from around 20,000 to 30,000 vehicles per day and peak hour volumes are around 2,200 vehicles per hour.

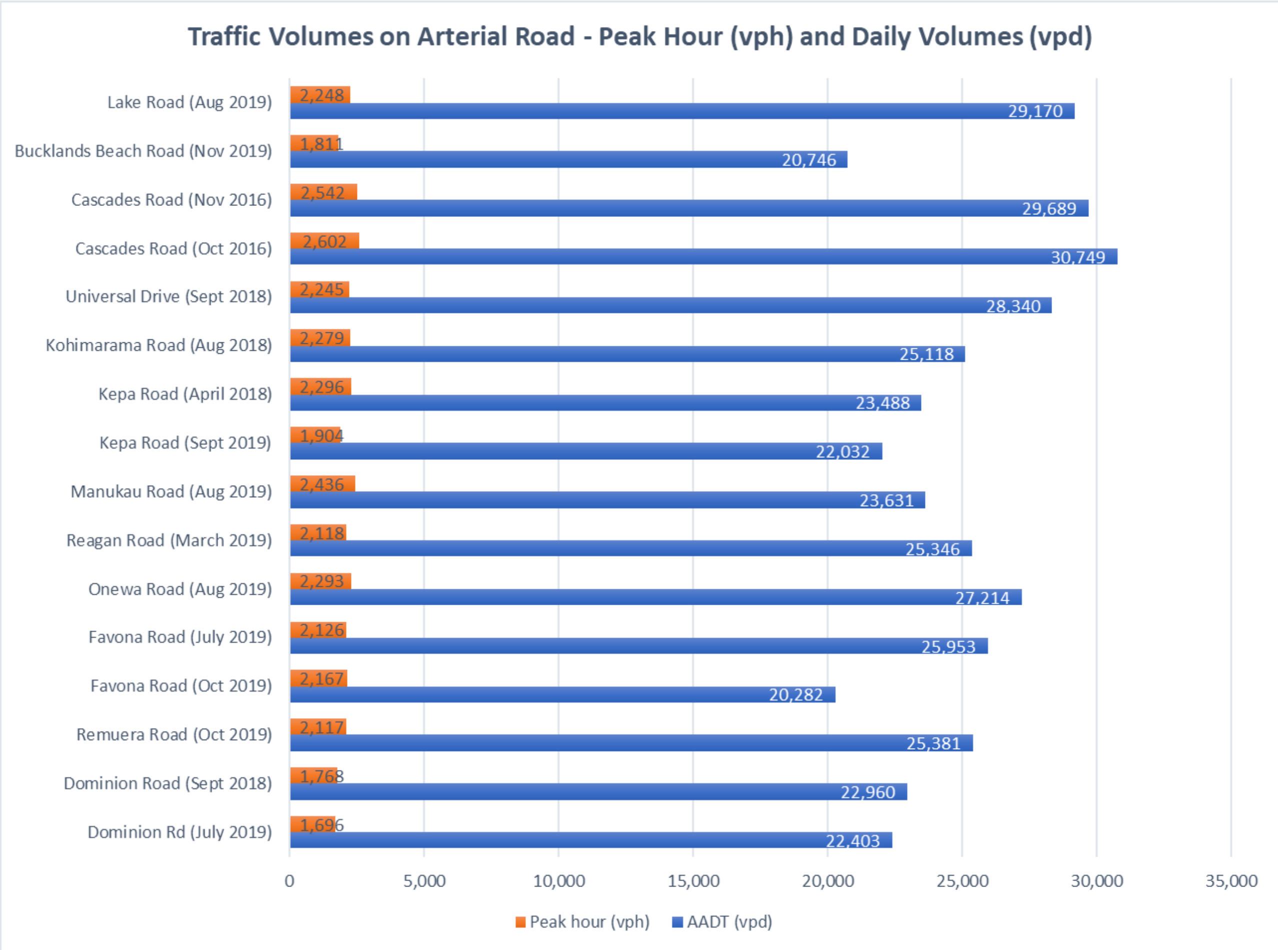


Figure 2-4: Daily and Peak hour traffic volumes on key arterial roads in Auckland

It should be noted that as years progress, the modelling results have greater uncertainty and therefore, whilst the above criteria have been used to establish Points of Assessment, at the time of development a revised Transportation Assessment could be undertaken that reflects the actual traffic operations at the time. The proposed Plan Changes Precinct Provisions will describe how this will be undertaken in practice.

2.4 Land Use Assumptions

The Auckland Forecasting entre (AFC) MSM model, with the original Council's I11.5 land use assumptions, was used as a base model for both the Stantec modelling and the SGA model, in order to create a standard baseline.

B&A then reconfigured the land use assumptions to align with the proposed developers' staging plans for the Plan Change 48-50 areas and refined the yield predictions for Drury South based on the consented development underway there. These development yields were adopted by SGA and included in its updated S3M models.

The employment assumptions for Drury East have been adjusted using an estimated target build-out of 60,000m2 of commercial (office),107,650 m2 of retail, and the expected level of employment of approximately 5,500 jobs.[2] For commercial employment, a rate of 17.6m2/person has been adopted. This is based on the New Zealand national office density reported in the Colliers Workplace Report (2016). The remaining employment are therefore retail park-related jobs.

[2] According to the 2048 Masterplan Vision Hybrid Concept Urban Design Framework (February 2019) by Civitas.

Some differences can be observed between the developers' land use assumptions and the I11.5 households and employment estimates. The developers' land use assumptions were adopted by SGA including approximately 18% higher residential development yield. There were also large differences in It is noted that many of the assumptions used in the model are considered conservative, as considerable development has been predicted for areas outside PCs 48, 49 and 50 that have several challenges in realising significant development, including fragmented land ownership and reduced yield as a result of tightening freshwater treatment legislation. Additionally, the development program for other zones outside of this development relied on an earlier introduction of major infrastructure such as Mill Road or Pukekohe Expressway. With the immediate funding for these projects removed from NZUP, the development potential of those other zones is likely to be restricted, but that has not been reflected in our modelling which assumes continued future growth.

A detailed land use breakdown for the key zones in the south Auckland model is shown in Table 2-3. For the full list of zone-by-zone land use assumptions breakdown, refer to Appendix B.

It is noted that Drury West includes the MSM zones 557, 558, 559, 560, 561, and 562; while Drury East includes the MSM zones 550, 551, 554 and 555, Drury South - zone 556 and Paerata – zones 567 and 568. The Kiwi, Fulton Hogan, and Oyster Capital development are contained within the zones 554 and 555. As shown, most of the housing in these zones is provided in Drury East, West and Paerata areas whereas the key employment areas are Drury East and South

Table 2-3: Land Use Assumptions for Drury- Opaheke Area

HOUSEHOLD FORECASTS (number of dwellings)							
MSM Zone	**Zone Name**	**2016**	**2028**	**2038**	**2048**	**SGA48+**	**Diff 2048+ vs 2016**
554	Drury East (south of Waihoehoe Road)	148	1,919	4,207	4,804	5,400	5,252
555	Drury East (north of Waihoehoe Road)	128	1,024	1,453	2,295	2,905	2,777
556	Drury South	109	866	912	954	1,000	891
557 - 562	All Drury West Zones	356	2,198	6,605	10,805	13,181	12,825
Total for Drury East, West and South						**22,486**	
567	Paerata (west of SH 22)	58	454	758	849	1,583	1,525
568	Paerata (east of SH 22)	48	1,704	2,959	3,426	3,617	3,569
Total for Drury East, West and South + Paerata						**27,686**	
EMPLOYMENT FORECASTS (number of jobs)							
MSM Zone		**2016**	**2028**	**2038**	**2048**	**SGA48+**	**Diff 2048+ vs 2016**
554	Drury East (south of Waihoehoe Road)	69	1,429	3,108	5,508	5,508	5,439
555	Drury East (north of Waihoehoe Road)	117	175	175	175	175	58
556	Drury South	156	2,125	4,776	5,580	6,296	6,140
557 - 562	All Drury West Zones	565	1,019	2,346	3,643	4,323	3,757
Total for Drury East, West and South						**16,302**	
567	Paerata (west of SH 22)	21	112	173	186	358	337
568	Paerata (east of SH 22)	74	451	704	775	857	784
Total for Drury East, West and South + Paerata						**17,517**	

The planned growth of South Auckland within the MSM zones noted above is shown visually in Figure 2-5 (for the increase in households) and Figure 2-6 (for employment increase). The zones with the largest increase in households in 2048+ scenario compared to the base year can be seen in Drury East, West, Paerata, Kingseat and Pukekohe, whereas, the largest increase in jobs is expected in Opaheke, Drury East, Drury South and Pukekohe.

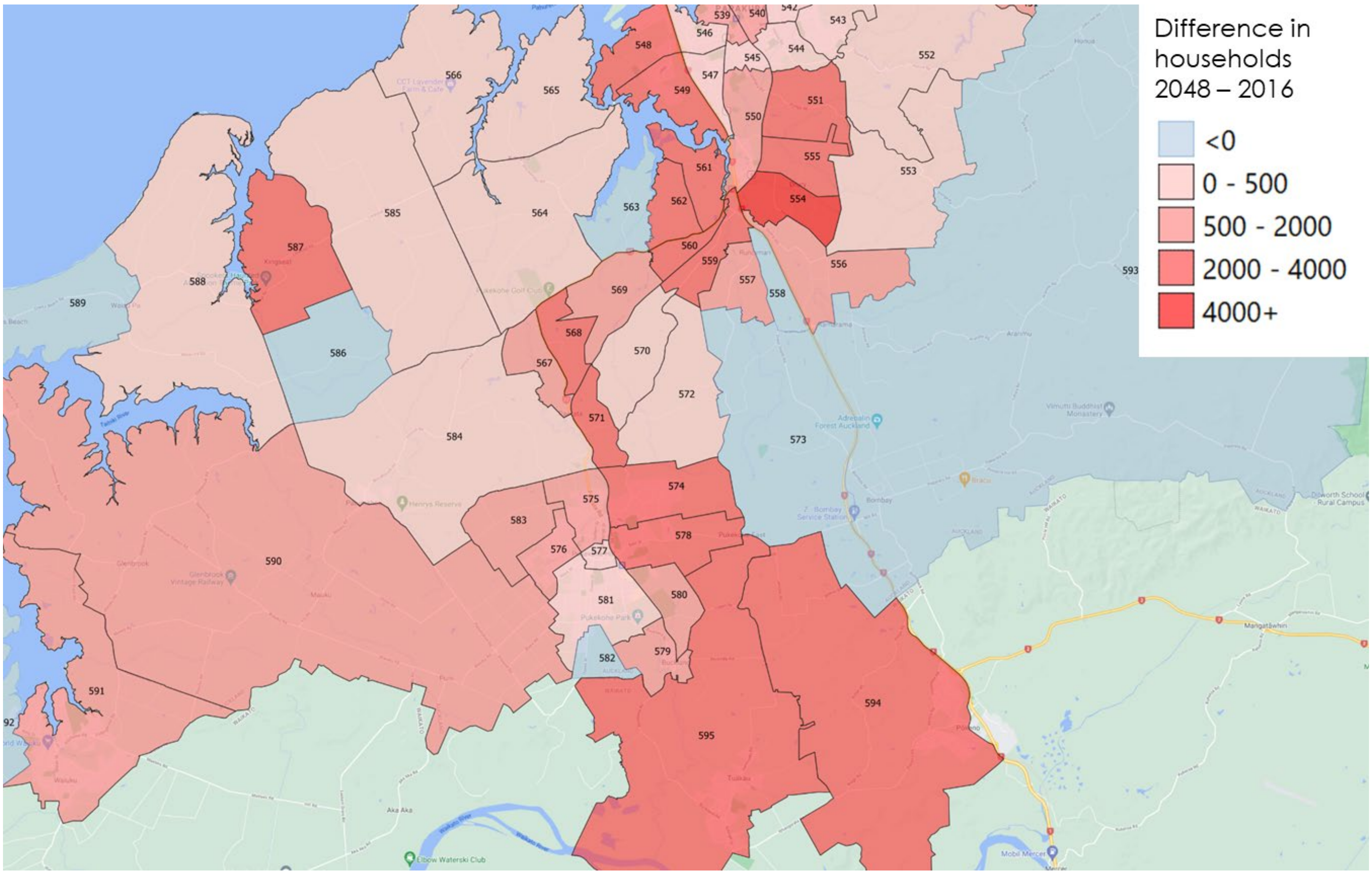


Figure 2-5: 2048+ Household growth per MSM zones

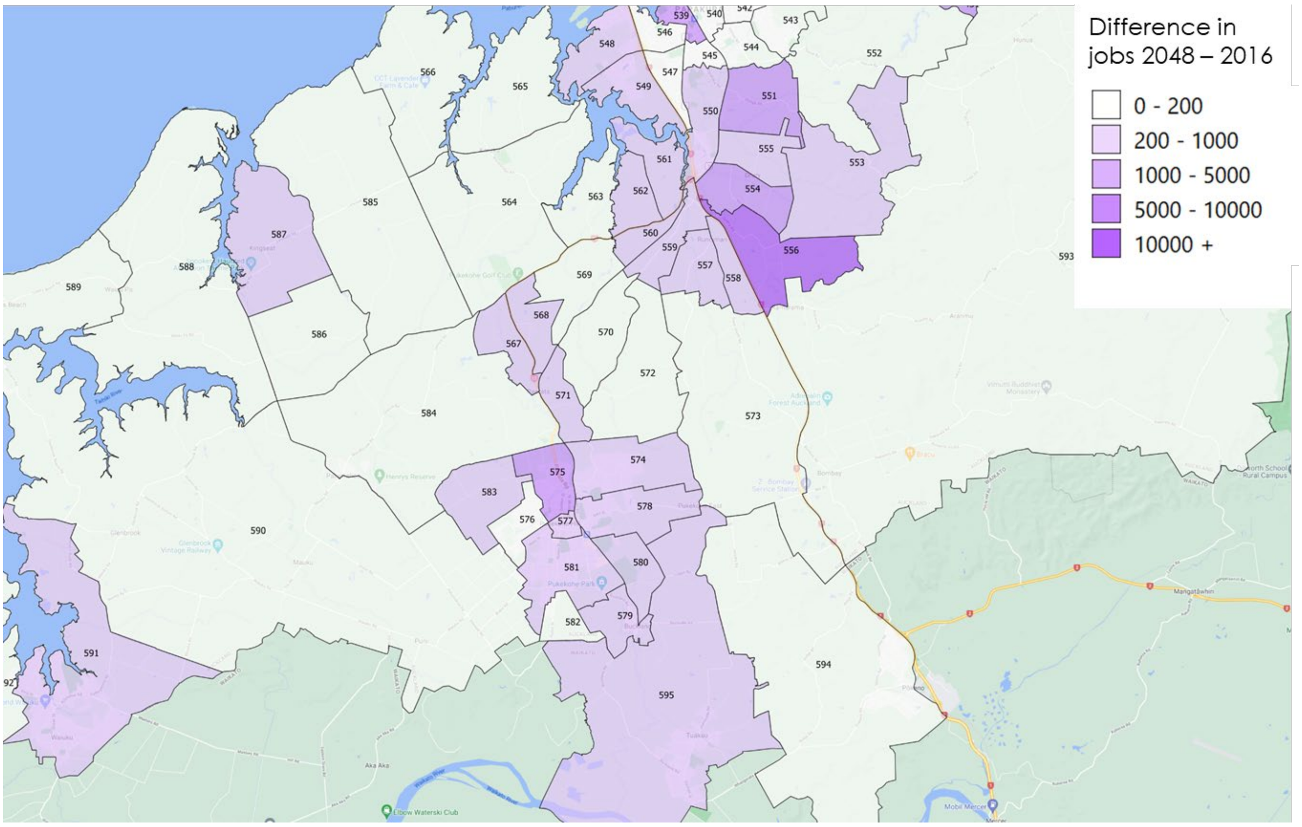


Figure 2-6: 2048+ Employment growth per MSM zones

2.5 SGA Trip Generation and Distribution

Trip generation and distribution estimates were adopted as per SGA's methodology and are discussed in detail in Appendix C. All trip rates, mode share percentages, vehicle occupancy, pass-by and internalisation rates are consistent with those adopted by SGA.

Overall, the trip generation was estimated using the number of trips generated by different household types and retail/commercial trips were calculated using the estimated floor area. These trip rates were then refined by applying internalisation, pass-by and PT/Active mode share assumptions. The key elements of trip generation estimation are summarised in the following sub-sections as outlined in the SGA's "Trip Generation Review" report.

2.5.1 Trip Generation – Residential, Retail and Other Land Uses

The trip generation for Drury East area (MSM Zones 554 and 555) covered residential, retail, commercial and community service trips. A step-by-step trip generation process for Drury East adopted by SGA is summarised below:

- **Residential Trips** - estimate residential trip generation totals. This step included the following calculation/assumptions:
  - Estimate average people per household for Low-, Medium- and High-density dwellings.
  - Apply a typical trip rate of 4.0 trips per person per day to get person-trip generation estimates.
  - Estimate PT/Active mode shares based on density and proximity to rail station.
  - Subtract PT/Active trips to obtain estimated trip rates by vehicle.
  - Apply average vehicle occupancy of 1.2 persons per vehicle to obtain daily vehicle trip rates.
  - Apply percentages of the daily values to get AM (9%), interpeak (5.5%) and PM peak (9%) generation estimates.
  - The total person trip rates and vehicle occupancies were kept constant over time, however other assumptions were varied through the modelled years as follows:
    - The average people per household was reduced over time to reflect demographic trends (10% reduction over 40 years was assumed).
    - The PT/Active mode shares were increased over time to reflect expected increasing relative attractiveness of these modes relative to vehicle travel and completeness of the wide network.
- **Other Trip Types** - estimate commercial/community and retail generation totals using the following calculations/assumptions:
  - Estimate peak-hour vehicle trip rates per 100m2 GFA from typical sources for each of the retail, commercial and community service activities.
  - Estimate the potential mode shift to active/PT modes for this location to derive reduced vehicle trip rates.
  - Apply the peak-hour trip rates to the relevant period (PM peak for retail, AM peak for Commercial and interpeak for community activities).
  - Estimate trip rates for the other periods, as a percentage of the peak rates.
  - Apply pass-by discounts for the trips external to the site.

For the retail trip rates, data from the ITE manual and survey data from the Sylvia Park shopping Centre in Auckland was considered and for the purposes of this analysis rates half-way between the two data sets were adopted. The trip generation rate for retail depends on the size of the retail development. Trip rates for smaller retail sites are higher per square metre than for larger sites as larger sites can offer multi-purpose activities thus reducing the need to travel to several separate destinations. Stantec adopted this non-linear trip generation profile when modelling the development during the early years.

Peak hour vehicle trip rates for the commercial areas were assumed to be 1.8/100m2 GFA, while those for community services were assumed to be 1.0.

Once this was completed, the peak generation was assigned to the respective model peaks and assumed proportion applied for the other periods as indicated in the screenshot (Table 2-4) from SGA's report below.

Table 2-4:: Proportion of Peak Generation (reproduced from SGA DIFF Transport Assessment Appendix C)

Activity Type	AM	Interpeak	PM
Retail	25%	80%	100%
Commercial	100%	30%	90%
Community	30%	100%	70%

Further trip generation details are provided in Appendix C.

2.5.2 Pass-by Trips

Pass-by trip proportions as per SGA's methodology were then applied to retail, commercial and community trips of 30%, 5% and 40% respectively. No pass-by trips were applied for the residential trip generation. These pass-by values were retained for Drury East development testing.

2.5.3 Internalisation

The internalisation percentage derived from SGA's MSM zone indicated that the internalisation between two zones is modelled to be around 6%. SGA in their *"Trip Generation Review"* report indicated that this could be plausible for the early stages of development but potentially considered low for full build out due to MSM including lower number of jobs than proposed in the plan change. As such SGA have adopted a 2% increase for each subsequent modelling scenario with the final internalisation factor of 12% for the 2048+ models.

SGA also stated that:

> *"Although the proportion of total person trips remaining internal is expected to be relatively significant, a high proportion of those short internal trips are expected to be undertaken by active modes. Hence the proportion of vehicle trips remaining within the zone is not expected to be particularly high."*

Stantec agrees that a large proportion of internal trips will be taken by active modes as the active mode network will be complete and protected, however, it is considered that assuming such a low internal vehicle trip assumption represents a very conservative approach. The main reason for this is that the retail area is proposed to include a supermarket and large format retail areas and for such large format shopping trips a fair proportion of those vehicle trips to these areas are expected to be completed by car, especially from residential areas like the Oyster and Fulton Hogan sites which are located more than a kilometre away from the town centre. As a result, this internalisation would reduce the proportion of external trips through such critical intersections like the GSR/Waihoehoe Road.

Despite this, to remain consistent with the overall modelling philosophy, Stantec adopted SGA's internalisation factors for the modelled scenarios for the Planned Infrastructure Supply scenario.

2.5.4 Public Transport/Active Travel Mode Share

SGA estimated potential PT/active travel mode shares based on density and proximity to key facilities and, as such, higher percentage of PT/active travel were adopted for higher density residential areas closer to the Drury Central station. In the modelled 2028-year, approximately 13% of trips from lower density

residential areas located approximately 2km away from the station were estimated to use PT or active modes compared to 28.8% from higher density residential areas located just around 500 metres away from the station. In the final 2048+ models these combined PT and active modes travel proportions increased to 20% and 46% respectively. We have used those figures in our modelling.

From the SGA's "Traffic Generation Review" report it is understood that for the retail, commercial and community areas 0% and 25% PT/active mode shares were adopted for 2028 and 2048+ years respectively. These figures were adopted in this modelling.

Walking and cycling infrastructure will be in place to support and enable a high proportion of active mode travel from the early stages of the development, therefore, the SGA's PT/Active mode shares described for the residential land uses are considered appropriate once the Drury Central Station is operational.

The PT/active mode share of 0% for the other land uses such as retail, commercial and community areas in 2028 is considered very conservative. Take for instance the 2028 PM peak model in which almost 50% of trips relate to retail, commercial and community land uses. With a PT/active mode share of 21% for the resultant 50% of trips (assuming an average of low and high density residential) and taking into account 0% PT/active mode share for the retail, commercial and community land uses, then the total PT/active mode share for the Drury East development in the PM peak is 10.5%. By comparison, New Lynn in Auckland and Waterloo in Wellington have PT/active modes shares of 50% and 30% respectively[3] as shown in Figure 2-7and Figure 2-8.

In this regard, Stantec consider the SGA assumptions regarding PT/Active mode rates, especially for the early modelling years, to be conservative. Despite that, to provide the modelling comparison to SGA results, PT/active mode assumptions were retained for the models that include Drury Central station. For the earlier year tests vehicle trip generation was increased by 10.5% to reflect lower level of PT accessibility.

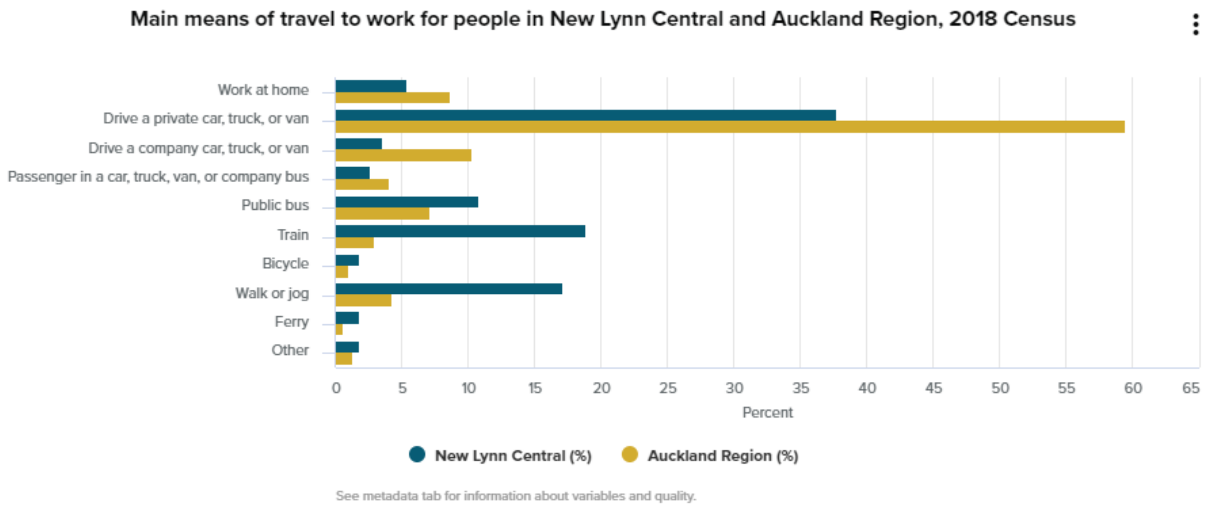


Figure 2-7: New Lynn Mode Share based on Census 2018

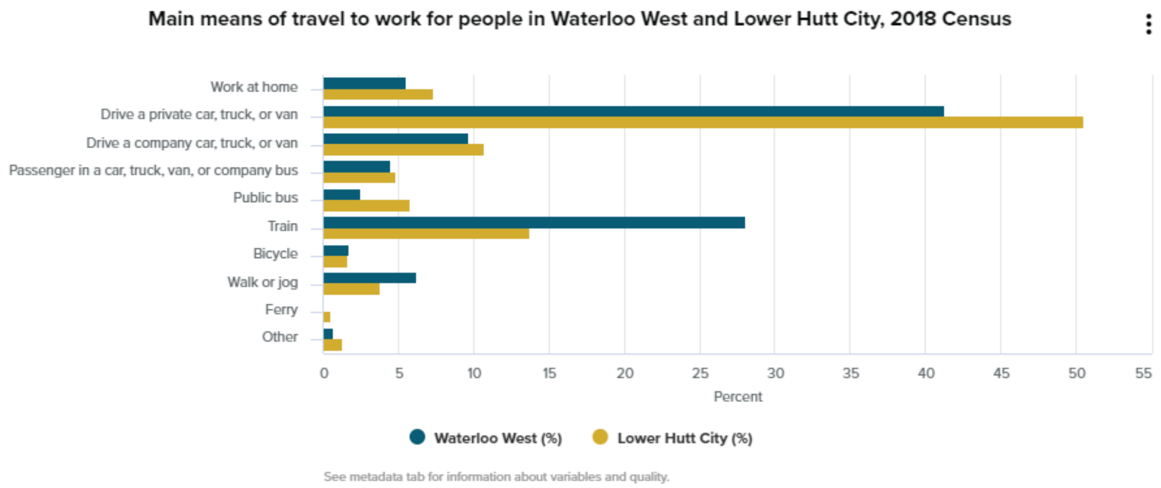


Figure 2-8: Waterloo West Mode Share based on Census 2018

[3] As per 2018 census data

MSM model outputs were also reviewed to understand non-combined mode shares for active travel and public transport and are provided in Appendix D split by peak hour and the future year scenario. MSM only provides the daily active mode splits. The active mode trips for each peak period has been estimated using the peak period to daily ratio for motorised vehicles (car and public transport trips). A comparison has also been undertaken by splitting the daily active mode trips using the AT Regional Cycle Monitoring report from 2015. These two methodologies provide a range of potential active mode shares for the peak periods from the MSM data.

Figure 2-9 shows the average mode share for active travel and public transport for Drury East as per MSM. It is noted that the current data is based on 2018 census data and excludes school bus trips which for the base year comprise 6% more than that shown in Figure 2-9.

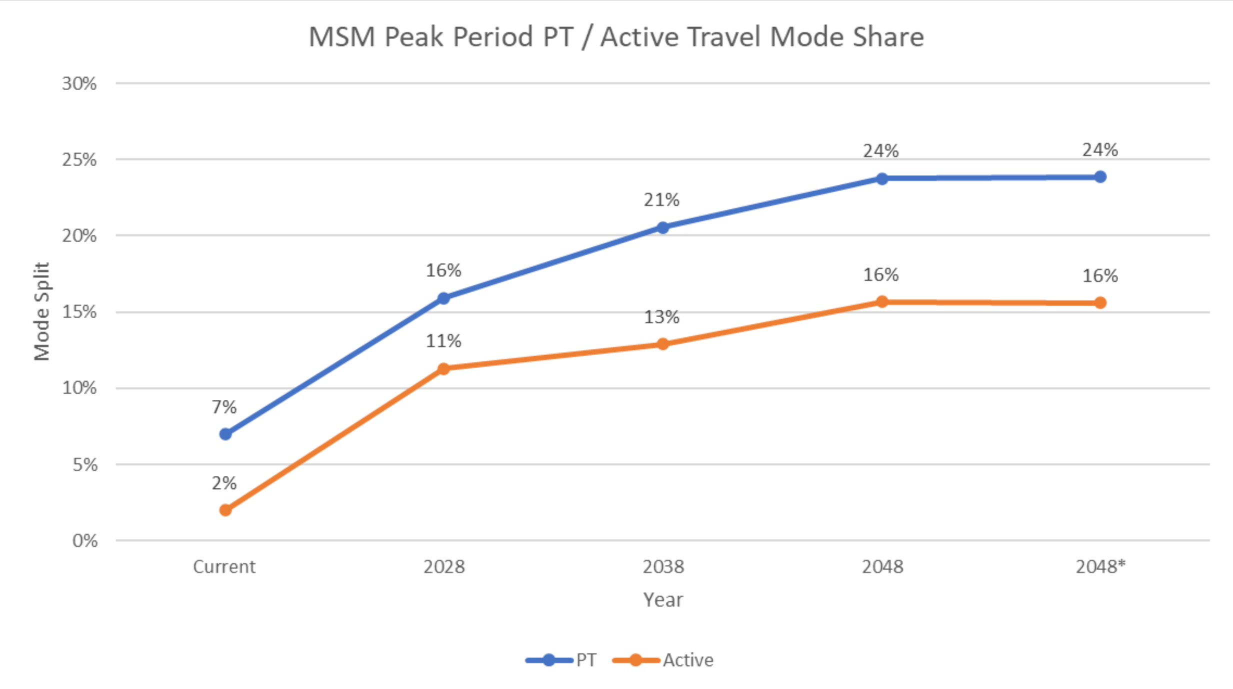


Figure 2-9: PT and Active Travel Mode Shares in Drury East Area Based on MSM models

As shown in Figure 2-9, MSM data shows that the expected PT and active mode shares are between 27% in 2028 and 40% in 2048+. When comparing the MSM data to SGA's mode share assumptions, the MSM 2048+ PT/Active travel mode share of 40% is higher than both the SGA's assumptions for residential land uses (which are 20%-46% for low density and high-density development respectively) and retail, commercial and community areas (which are 25%). SGA's DIFF report stated that the SGA PT/active mode share assumptions were optimistic however the comparison with the MSM data would suggest that these are less than the MSM assumptions.

Notwithstanding the above, Stantec has retained the SGA assumptions but again note that these should be considered conservative and easily achievable.

2.5.5 Changes to SGA Models

Some changes were introduced to the SGA models, and these are summarised below:

- Change to heavy vehicle/light vehicle proportion was amended from approximately 10%-20% heavy vehicle proportion related to Drury East zones to 5% across all zones as this is considered more representative of traffic composition travelling to/from residential, retail and commercial zones.
- Coding of the GSR/Waihoehoe Road and the Fitzgerald Road/ Waihoehoe Road intersections were amended to reflect more efficient intersection layouts.
- Short lane coding removed as this was found to sometimes cause excessive delays, which were not replicated in the more detailed SIDRA analysis.
- Coding of link capacities at Drury interchange were amended to reflect capacity more accurately.

- Distances between intersections on the Waihoehoe Road were amended to reflect more accurately the position of existing and future intersections.
- Addition of one-way direct link from SH1to the Metropolitan Centre in 2025.
- Slight amendment of retail/commercial zone location in SATURN was done moving it closer to the location better matching the master plan.

2.5.6 Trip Distribution

The latest (2018) commuter census data[4] for Drury shows that most current commuters in the area originate or end their trips outside of Drury, and that currently there is only a small proportion of internal trips. It is noted that 10% of employment/education trips within the Drury area originate from within the Drury area unit itself. However, there is still higher level of external commutes compared to that of internal commutes given the current land use and employment opportunities in Drury. The key outbound destinations relate to the key employment centres in Auckland Airport, Penrose, Wiri, East Tamaki and City Centre areas as shown in Figure 2-10.

It is expected that in the future, as the Metropolitan Centre is developed and more jobs are created, the commuting pattern will change with more significant commuting trips originating to and from within the Drury area (East, West and South). As discussed in the next sections, given the future infrastructure upgrades and PT services, a greater proportion of these commuting trips are likely to be undertaken via alternative modes other than private cars.

[4] https://commuter.waka.app/

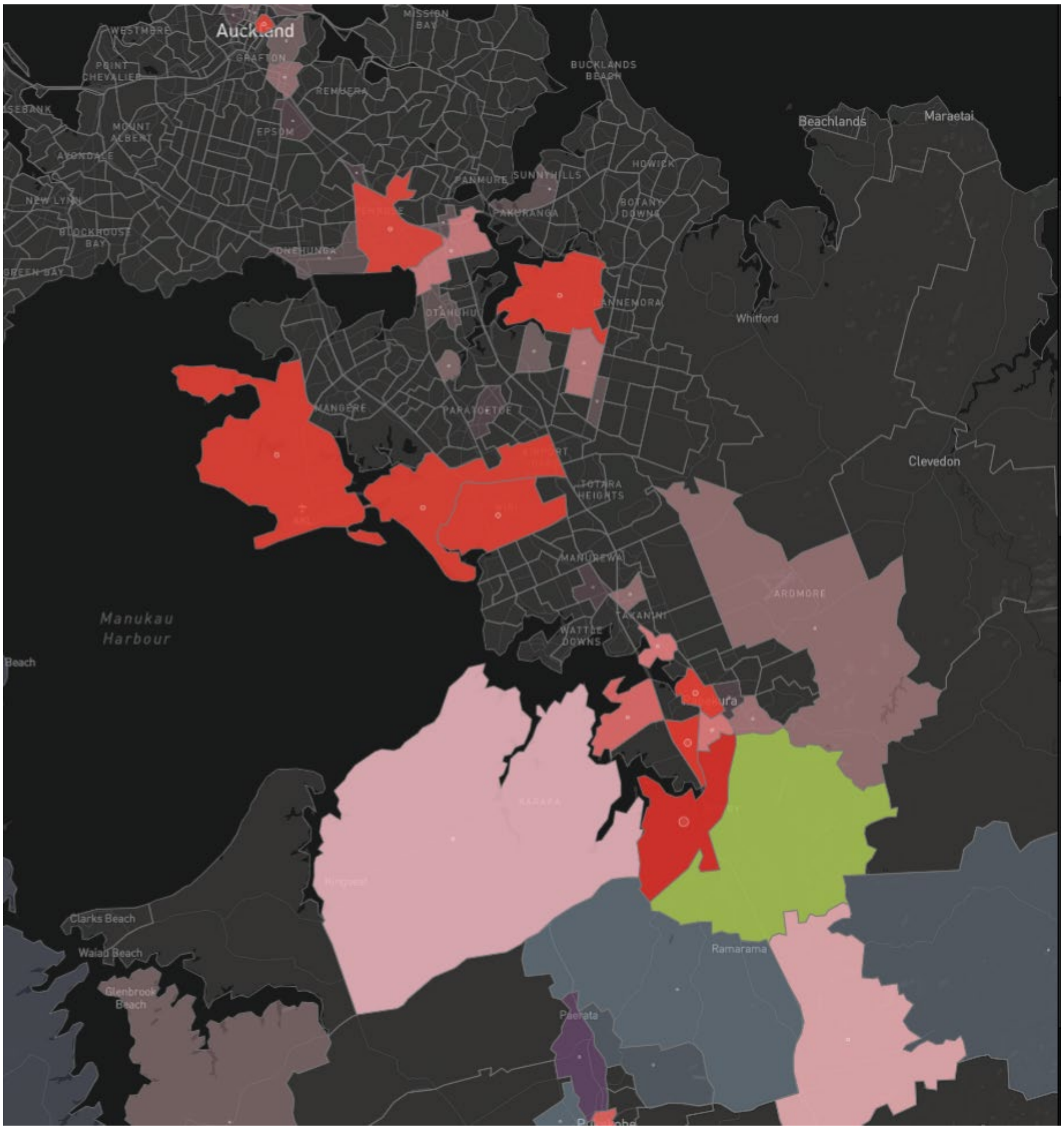


Figure 2-10: Existing Commuter Census Data for Drury Rural showing Departures for Work or School

The modelled Select Link Analysis (SLA) was undertaken for the inbound and outbound trips in peak periods to understand the trip pattern in the network in 2028 models (prior to Waihoehoe Road West widening). The origin for residential (Zone 5547) and destination for retail/commercial areas was analysed in the morning peak and the opposite in the afternoon peak as these are the dominant movements.

In the AM peak, the analysis shows the inbound trips to the Drury Metropolitan Centre travel southbound on SH1 and Great South Road via the Drury Interchange direct access. Outbound trips from Drury East residential zone, such as trips from the Kiwi Property plan change area, travel citybound via the Great South Road / Waihoehoe Road intersection or southbound towards Drury South employment area. Refer to Figure 2-11 for the SLA plots of outbound trips.

In the PM peak, the analysis shows that the outbound trips from the Drury Metropolitan Centre travel either via the Great South Road / Waihoehoe Road intersection or via Fitzgerald Road and Quarry Road northbound up GSR. Other inbound trips access Drury East via the Great South Road / Waihoehoe Road intersection. Refer to Figure 2-12 for the SLA plots of inbound trips.

Routing of these trips changes depending the modelled scenarios but the distribution of trips largely remains similar. No changes were made to SGA trip distributions as these disruptions compared well to previous modelling completed by Stantec in 2019.

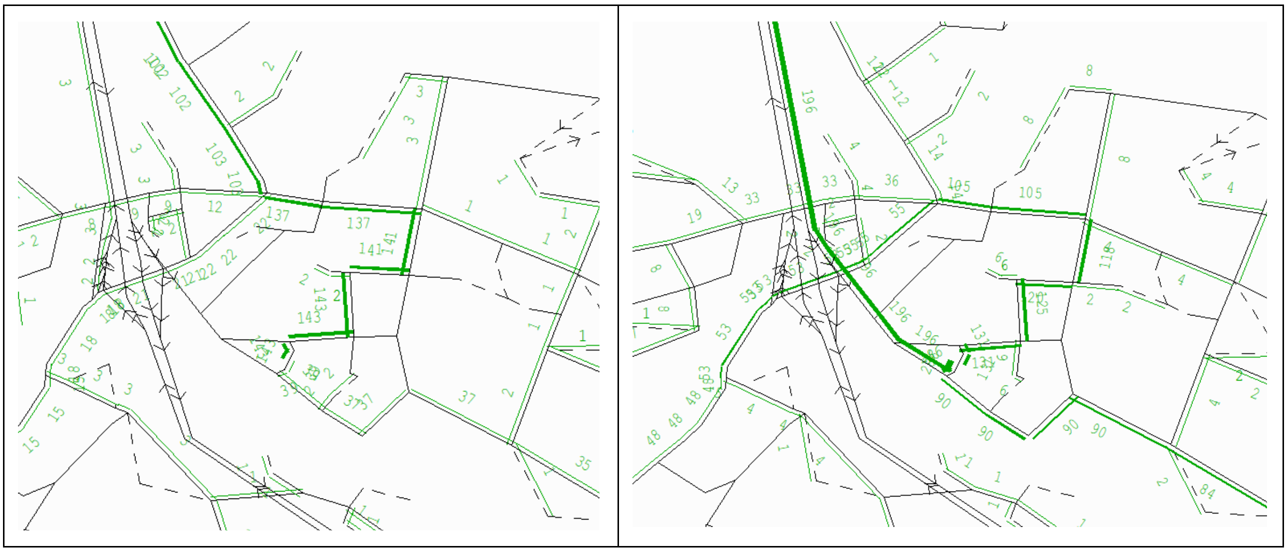


Figure 2-11: AM Peak - outbound trips to the retail/commercial zone (left) and inbound trips from the residential zone (right).

Figure 2-12: PM Peak – outbound trips from the retail/commercial zone (left) and inbound trips to the residential zone.

2.6 Infrastructure Upgrade Assumptions

There are a number of uncertainties related to infrastructure upgrade timing, especially for the infrastructure that does not have allocated funding. Modelling of this infrastructure timing was indicative and instead of focusing on when each infrastructure can be introduced, an estimate of the capacity that each element of infrastructure relevant to the Drury East development can provide was assessed. A list of assumed infrastructure with indicative timeframes when an infrastructure piece can be built is listed in Table 2-5 below. The timeframes are identified simply to inform the assumptions regarding background development and traffic conditions outside the PC 48, 49 and 50 area. These timings are based upon those provided in SGA's 2019 ITA to support Council's Drury-Opaheke Structure Plan.

Table 2-5: Infrastructure Upgrade Assumptions

Decade	SGA / Stantec Assumed Infrastructure	Funding Source
2025-2028	SH1 3-laning Papakura to Drury, including upgraded Drury Interchange	NZUP
	SH22 intersection upgrades at Great South Road and Jesmond Road	NZUP
	Rail Electrification Papakura to Pukekohe	NZUP
	New Drury Central, West and Paerata Stations	NZUP
	Minor Improvements to the GSR/Waihoehoe Road roundabout	Drury East Developers
2028-2038	Waihoehoe Road West ATAP improvements, including the signalisation of the GSR/Waihoehoe Road intersection	ATAP
	Construction of southern connection from Fitzgerald Road to SH1 (similar or alternative to previously planned Mill Road South) including Drury South Interchange	Planned (SGA)
	SH1 3-laning from Drury Interchange to Drury South Interchange	Planned (SGA)
	Connection from Drury South Interchange to GSR	Planned (SGA)
2038-2048	SH1 3-laning from Drury South Interchange to Bombay	Planned (SGA)
	First northern connection to Papakura (similar or alternative to Mill Road North link between Waihoehoe Road and Ponga Road)	Planned (SGA)
	Second northern connection (similar or alternative to north-south arterial – Opaheke Road extension to Ponga Road)	Planned (SGA)
2048+	Third Main Rail Line Pukekohe to Papakura	Planned (SGA)
	Pukekohe Expressway full Route (SH1 to Pukekohe)	Planned (SGA)

SH1 Papakura to Bombay is a project undertaken by Waka Kotahi (New Zealand Transport Agency). These upgrades include additional vehicle lanes, wider shoulders to future-proof for bus services along the SH1 corridor, improvements to interchanges, new bridges over the Main Trunk Rail Line rail line to enable electrification and additional tracks, and a shared walking and cycling path to support future growth in housing and employment.

The SH1 Upgrade is divided into two main stages[5]. The first stage of the SH1 Papakura to Bombay project will deliver improvements between Papakura to Drury Interchange. The breakdown of the stages is as follows:

- Stage 1A is the widening of SH1 to three lanes in each direction from Papakura interchange to Slippery Creek Bridge. Construction of this Stage of works commenced in April 2021.
- Stage 1B1 includes the provision of a Shared Use Path between Papakura interchange and Slippery Creek bridge, and the widening of SH1 between the Bremner Road bridge to Drury Interchange. This stage also includes the reconstruction of the Drury Interchange to provide new bridges over the Main Trunk Rail Line to enable electrification and widening of the rail corridor. This Stage is currently being consented as part of the Covid-19 Fast Track Process.
- Stage 1B2 is the widening of SH1 to three lanes between Slippery Creek Bridge and Bremner Road bridge.
- Stage 2 is the widening of SH1 from the south of the Drury Interchange to Drury South, including the provision of a new interchange at Drury South. It was announced in June 2021 that the funding for this stage will be deferred as is no longer part of NZUP.

Figure 2-13:SH1 Papakura to Bombay Upgrade Stages (sourced from NZTA website)

For modelling purposes, the above upgrades have been assumed to be in place in accordance with the SGA assumed timeframes, as outlined in Figure 2-13.

2.7 Local Upgrade Assumptions

The developer-led staging will generate additional traffic volumes in the Drury East area prior to the completion of key infrastructure upgrades assumed by SGA / Council to enable the planned growth in South Auckland. In order to access and accommodate the proposed development, it is initially assumed that some local Drury East infrastructure is required to be upgraded within the immediate vicinity of the site, within the first development period (2025-2028). This is to ensure sufficient access capacity to and from the site for vehicles and public transport options.

The Metropolitan Centre can have multiple connections to the external network, which could be implemented in stages depending on the actual rate of development, while Fulton Hogan and Oyster Capital properties can be primarily accessed via Waihoehoe Road and Fitzgerald Road.

For the modelling purposes the one-way southbound only direct access to the Metropolitan Centre via Drury Interchange has been assumed to be constructed at the same time as Drury Central rail station. However, it is noted that the other

[5] https://www.nzta.govt.nz/projects/sh1-papakura-to-bombay/

options (i.e. access via Firth Street or Quarry Road) will all work from a capacity perspective and therefore offer some flexibility in the future selection process. However, these were modelled only as a sensitivity test and the capacity improvements these infrastructure elements enable are discussed in Section 3 – Modelling Results.

Overall, the potential local infrastructure upgrades that are considered relevant to the accessibility of Drury East developments are:

- Waihoehoe Road Upgrade including bus lanes, a new bridge over the rail line and signalising the Great South Road / Waihoehoe Road Intersection;
- The direct access to the Metropolitan Centre from the Drury Interchange;
- Urbanisation of Fitzgerald Road and Brookfield Road; and
- Urbanisation of other roads fronting Oyster's and Fulton Hogan's developments as the area grows.

Explanations of what each upgrade entails are provided in the following sections. Traffic modelling was undertaken to confirm the impact of the above local upgrades. These results are discussed in further detail within **Section 3** of this report.

2.7.1 Great South Road / Waihoehoe Road Intersection Upgrades

The Great South Road / Waihoehoe Road roundabout currently serves as the main access between Drury East and the wider street network, including Great South Road and SH1. The existing roundabout has limited capacity, particularly during the AM peak period when northbound traffic demand is high due to northbound SH1 trips using Great South Road to avoid queuing. The single lane approaches to the roundabout on the west and south legs are the key limiting factor on its current performance. It is noted that once the widening of SH1from Drury to Papakura as part of the NZUP project (SH1Papakura to Bombay improvements – Stage 1[6]) is completed, there is likely to be a reduction of traffic leaving the motorway to avoid queuing, thereby easing congestion at the roundabout.

To cater for the future land use and travel demand in Drury East, an upgrade to the current intersection is needed. It is envisioned that the roundabout will be upgraded in two stages:

- Firstly, an interim upgrade will be provided with minor improvements to the roundabout by introducing an additional left turn lane from Waihoehoe Road and the provision of raised zebra crossings across all approaches to enhance active mode safety and amenity. A concept sketch of the changes to the roundabout is shown in Figure 2-14 below.

[6] https://www.nzta.govt.nz/projects/sh1-papakura-to-bombay/

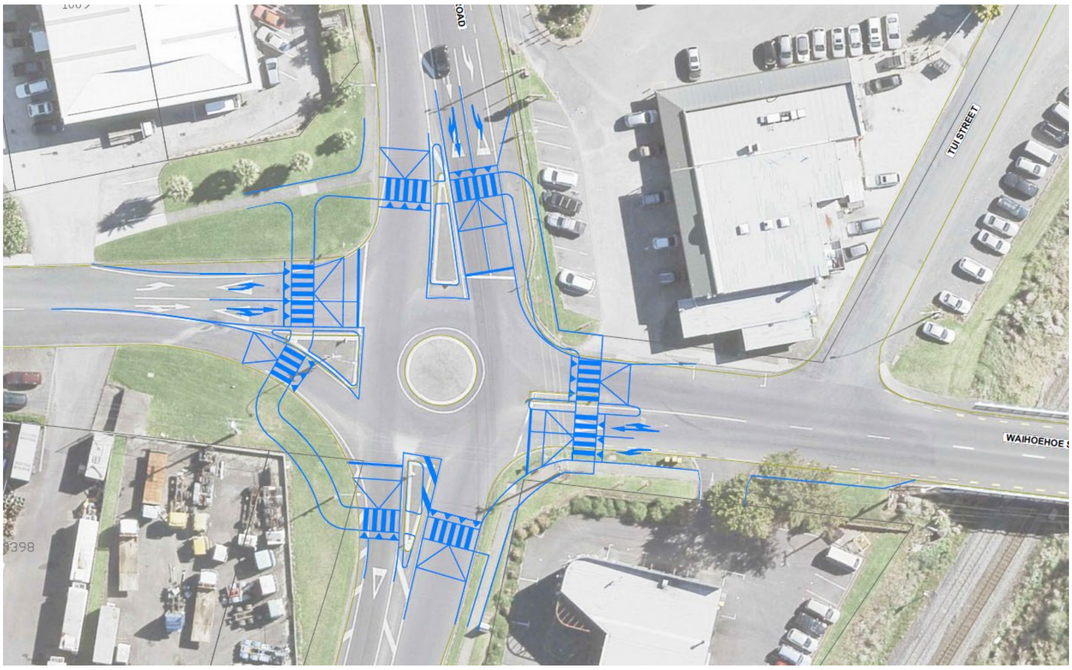


Figure 2-14: Interim upgrade to Great South Road / Waihoehoe Road roundabout

- Secondly, conversion of the roundabout to a high-capacity signalised intersection with pedestrian facilities as part of the Waihoehoe Road West ATAP scheme and Waihoehoe Road widening. It is likely that this intersection and Waihoehoe Road widening will have to occur alongside the construction of the Drury Central station and Park and Ride access. The intersection layout is shown in Figure 2-15.

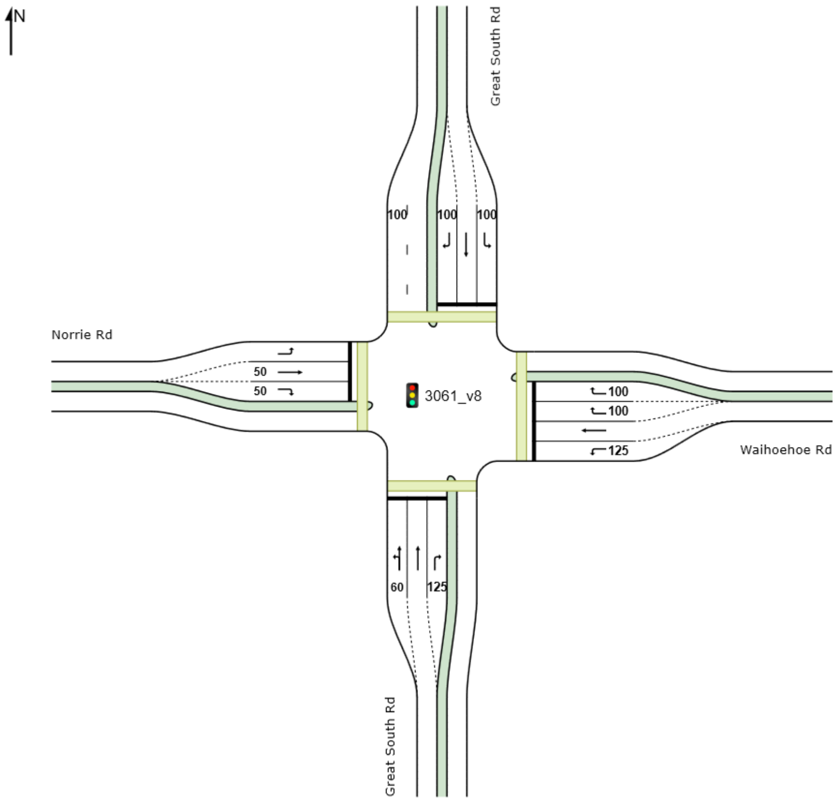


Figure 2-15: Proposed Signalised Intersection Upgrade at Great South Road / Waihoehoe Road

This is broadly consistent with the Drury Arterials Network: Jesmond to Waihoehoe West FTN Upgrade plans which have been lodged as a NOR. The plans for the intersection are shown in Figure 2-16 below.

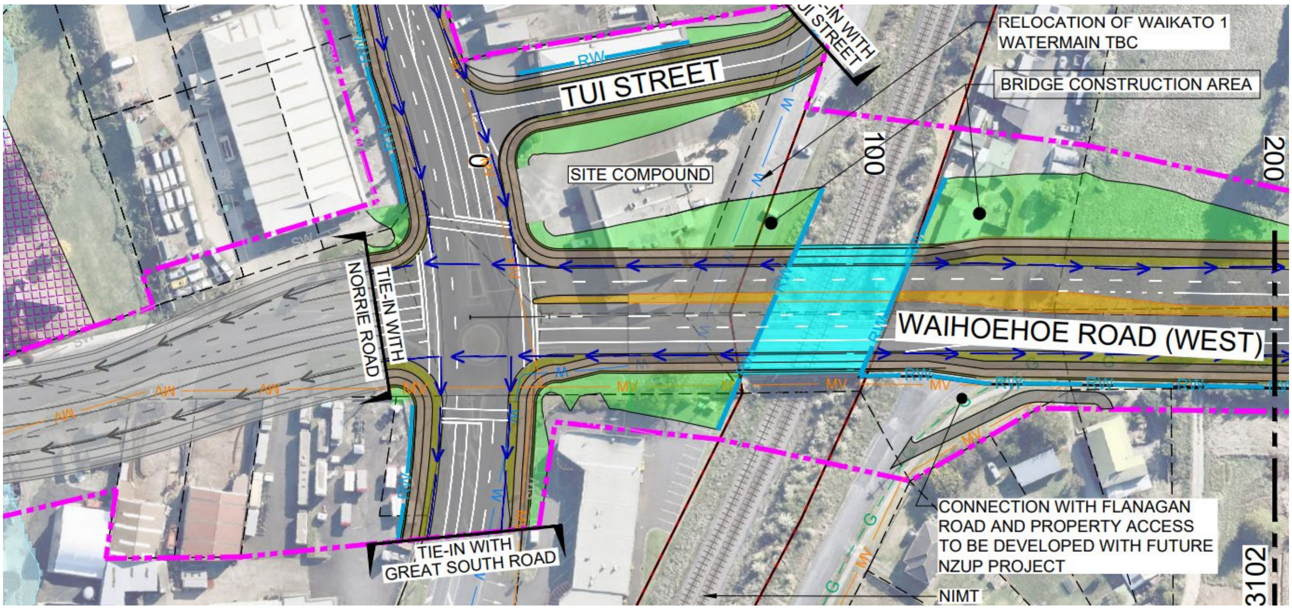


Figure 2-16: Great South Road / Waihoehoe Road upgrade as part of Jesmond Road and Waihoehoe Road West Upgrade

2.7.2 Direct access to the Metropolitan Centre from the Drury Interchange

Direct and legible access is desirable for the metropolitan centre and the surrounding residential areas. One potential access location that will fulfil the criterion is a direct access from the Drury Interchange. An access at this location would provide a primary route from SH1, over the rail line, directly into Drury East Metropolitan centre.

There is the potential to align the direct access construction with the committed SH1 Drury Interchange upgrades that are planned to occur during Stage 1B1 of the SH1 Papakura to Drury project. It is understood that discussions between Waka Kotahi and the Drury East developers are currently being undertaken to understand the viability of providing this connection.

3 Modelling Results

Stantec has undertaken extensive traffic modelling of the future network to investigate and understand the effects of various infrastructure scenarios on the surrounding network.

It is noted that while the modelling has considered the traffic effects on the wider network and assessed key local intersections, the focus of the assessment and reporting is on the Great South Road / Waihoehoe Road intersection, due to its relevance to the developments.

The results are presented in two formats. Firstly, a graph depicting the development growth profile and development yields per infrastructure supply scenario based on eight modelled tests is shown in Figure 3-2 below. A summary of modelling results for each test scenario are then provided within the subsequent sections (3.1 onwards), with the detailed modelling results contained within Appendix E.

The results describe the point at which the development yields / traffic generated cause the thresholds described in Section 2.3 to be exceeded, then provide the development yields / traffic generated that perform within the capacity thresholds as the Points of Assessment. In other words, the intersection is iteratively tested to failure, then the previous successful test represents the Point of Assessment.

The legend explaining the concept of Figure 3-2 is shown below in Figure 3-1.

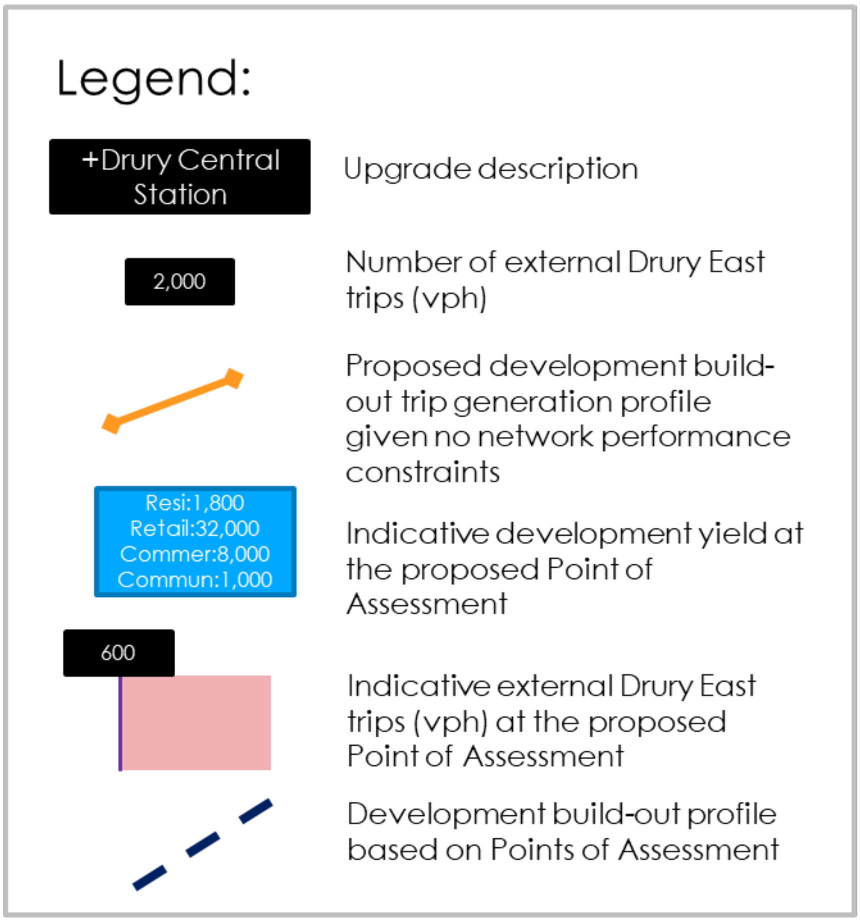


Figure 3-1: Legend for Modelling Testing Figure

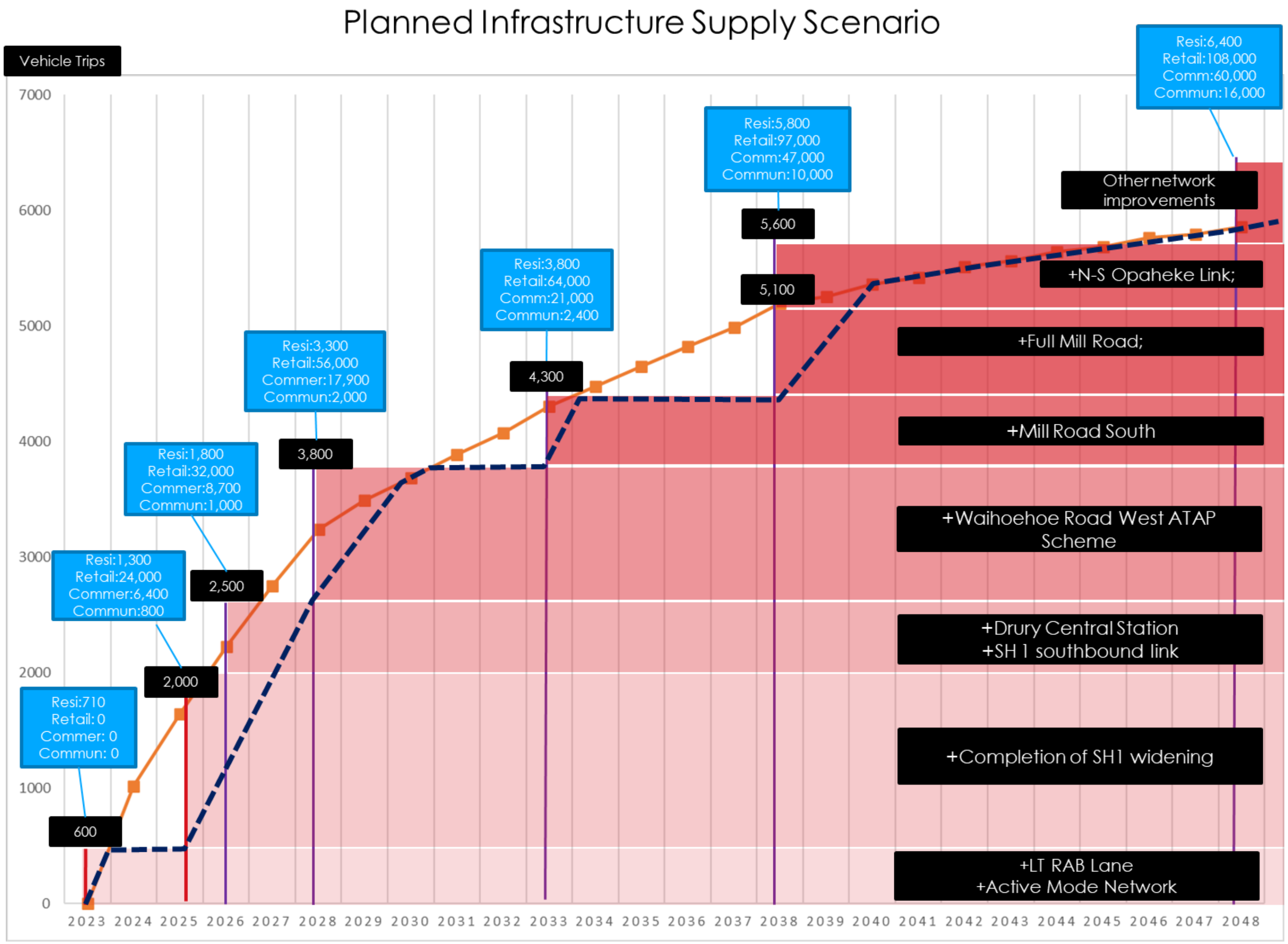


Figure 3-2: Development growth profile (residential dwellings, retail/commercial and community land uses in square metre)

3.1 Test 1 - Prior to Drury Interchange and SH1 Widening

This test assessed the modelling of the early development years, prior to the construction of SH1 widening. No SATURN modelling was completed for this scenario (as the base year was not available) therefore the base year SIDRA model for the GSR/Waihoehoe Road intersection was used.

Background traffic was added to develop the future year models, including growth from Drury West and Drury South areas. The annual background traffic growth of up to 4% per annum was used and Drury East trip rates were increased by 10% to replicate the absence of the Drury Central station and resulting lower PT uptake.

Only minor improvements to the GSR/Waihoehoe Road roundabout are included, such as the additional left turning lane and active mode crossings. A capacity penalty to replicate the vehicle interruptions at the zebra crossings was applied.

The modelling results for Test 1 are shown in the Table 3-1 below.

Table 3-1: Test 1 Modelling Results

	Criteria	AM Peak	PM Peak	Interpeak
Great South Road / Waihoehoe Road Results (FAIL test)	**Intersection LOS**	172s	56s	No interpeak model available but given good PM performance, it is expected to operate without issues.
	Intersection Delay	F	E	
	Worst Queue	South (643m queue with storage capacity of 450m)	East (167m queue with storage capacity of 250m)	
	Outcome	Queue length capacity exceeded	All queues within capacity limits	
Great South Road / Waihoehoe Road Results (PASS test)	**Intersection LOS**	97s	26s	
	Intersection Delay	F	C	
	Worst Queue	South (387m queue with storage capacity of 450m)	East (63m queue with storage capacity of 250m)	
	Outcome	All queues within capacity limits	All queues within capacity limits	
Point of Assessment	**Trip Generation – Point of Assessment**	400 trips based on AM peak hour model; 600 trips based on PM peak model.		
	Development Yield – Point of Assessment	710 dwellings		

The results establish that beyond the assessment point of 400 external trips / 710 dwellings, the capacity of the intersection would be exceeded during the AM peak hour.

3.2 Test 2 – Prior to Drury Central Rail Station

Test 2 assessed the development impact on transport infrastructure once SH1Papakura to Drury upgrades are completed.

This model was developed using the 2028 SATURN model and scaling down the demand trips to replicate 2025 future year. The lower PT mode share percentage from Test 1 was retained as the test replicates the infrastructure prior to Drury Central Station.

The modelling results for Test 2 are shown in the Table 3-2 below.

Table 3-2: Test 2 Modelling Results

	Criteria	AM Peak	PM Peak	Interpeak
Great South Road / Waihoehoe Road Results (FAIL test)	**Intersection LOS**	F	F	. No interpeak model available but given good IP performance of Test 3 it is not considered an issue.
	Intersection Delay	215s	130s	
	Worst Queue	South (644m queue with storage capacity of 450m)	East (374m queue with storage capacity of 250m)	
	Outcome	Queue length capacity exceeded	Queue length capacity exceeded	
Great South Road / Waihoehoe Road Results (PASS test)	**Intersection LOS**	F	F	
	Intersection Delay	123s	89	
	Worst Queue	South (434m queue with storage capacity of 450m)	South (239m queue with storage capacity of 250m)	
	Outcome	Queue length within capacity	Queue length within capacity	
Point of Assessment	**Trip Generation – Point of Assessment**	2,000 trips based on PM peak hour model.		
	Development Yield – Point of Assessment	Residential: 1,300 dwellings Retail: 24,000sqm Commercial: 6,400sqm Community: 800 sqm		

The modelling results show that the assessment point could be reached once approximately a total of 2,000 vehicle trips are generated from the Drury East area (areas covering MSM zones 554 and 555), beyond which, capacity would be exceeded.

3.3 Test 3 - Drury Central Rail Station

This test assessed the development and its impact on transport infrastructure modelling the scenario which includes the Drury Central rail station and the direct southbound town centre link from SH1 at the Drury Interchange to the development.

The modelling results for Test 3 are shown in the Table 3-3 below.

Table 3-3: Test 3 Modelling Results

<table>
<tr><th></th><th>Criteria</th><th>AM Peak</th><th>PM Peak</th><th>Interpeak</th></tr>
<tr><td rowspan="4">Great South Road / Waihoehoe Road Results (FAIL test)</td><td>Intersection LOS</td><td>F</td><td>E</td><td>A</td></tr>
<tr><td>Intersection Delay</td><td>173s</td><td>64s</td><td>10s</td></tr>
<tr><td>Worst Queue</td><td>South (556m queue with storage capacity of 450m)</td><td>East (260m queue with storage capacity of 250m)</td><td>East (21m queue with storage capacity of 250m)</td></tr>
<tr><td>Outcome</td><td>Queue length capacity exceeded</td><td>Queue length capacity exceeded</td><td>Queues within storage capacity</td></tr>
<tr><td rowspan="4">Great South Road / Waihoehoe Road Results (PASS test)</td><td>Intersection LOS</td><td>F</td><td>D</td><td>A</td></tr>
<tr><td>Intersection Delay</td><td>105s</td><td>36s</td><td>9s</td></tr>
<tr><td>Worst Queue</td><td>South (383m queue with storage capacity of 450m)</td><td>East (124m queue with storage capacity of 250m)</td><td>East (17m queue with storage capacity of 250m)</td></tr>
<tr><td>Outcome</td><td>Queues within storage capacity</td><td>Queues within storage capacity</td><td>Queues within storage capacity</td></tr>
<tr><td rowspan="3">Wider Network Results</td><td>Daily Link Flows</td><td colspan="3">Average daily link flows on Waihoehoe Road West, GSR North, GSR South and Norrie Road approaches are below 28,000 vpd.</td></tr>
<tr><td>SH1 Congestion</td><td colspan="3">SH1 northbound congestion does not extend to Drury Interchange</td></tr>
<tr><td>Other Intersections</td><td colspan="3">Performance of other intersections is acceptable – see Appendix F</td></tr>
<tr><td rowspan="2">Point of Assessment</td><td>Trip Generation – Point of Assessment</td><td colspan="3">2,500 trips based on PM peak hour model.</td></tr>
<tr><td>Development Yield – Point of Assessment</td><td colspan="3">Residential: 1,800 dwellings
Retail: 32,000sqm
Commercial: 8,700sqm
Community: 1,000sqm
Results are based on 2028 background traffic flows.</td></tr>
</table>

The modelling results show that the assessment point would be reached once approximately 2,500 vehicle trips are generated from the Drury East area, beyond which, capacity would be exceeded. A check was undertaken of the delays on Waihoehoe Road to ensure that buses would not be unduly delayed during peak hours. In the AM and PM peak hours, the delays on the eastern approach to the GSR/Waihoehoe intersection would be 17s and 81s respectively. These minimal delays would have no effect on the viability and attractiveness of bus services servicing Drury East. On the southern approach, delays are 362s and 383s respectively, however, there are currently no public transport services travelling along GSR south of the intersection, and the new Drury West route joins to GSR via Norrie Road. Should any new bus services be introduced along GSR to the south of the intersection, then this delay can easily be timetabled into the schedule for the short interim period until additional bus priority can be introduced.

Sensitivity tests were completed to assess this scenario with and without the SH1 direct one-way connection to the Drury East town centre. The test showed that for a scenario like Test 3, where the AM peak operates at high congestion levels, the direct link (which mostly provides congestion reduction in the PM), did not add significant amount of capacity/transportation benefits during the critical AM peak. However, in the medium- and long-term scenarios, where the PM peak becomes most critical, the direct link provided additional capacity of around 200-400 vehicles per hour.

In addition, it was noted that a proportion of traffic departing from Drury East area to travel northbound bypasses the GSR/Waihoehoe Road intersection and travels via Fitzgerald Road then Quarry Road and GSR as shown in Figure 3-3 below (traffic departing town centre zone). The intersections along this route were assessed and showed acceptable levels of operation (details are provided in Appendix F). Approximately 400 trips during the peak hour use Quarry Road to leave Drury East zones. This number decreases significantly to 160 trips during the PM peak hour once the widening of Waihoehoe Road is completed (Test 4 – see Section 3.6).

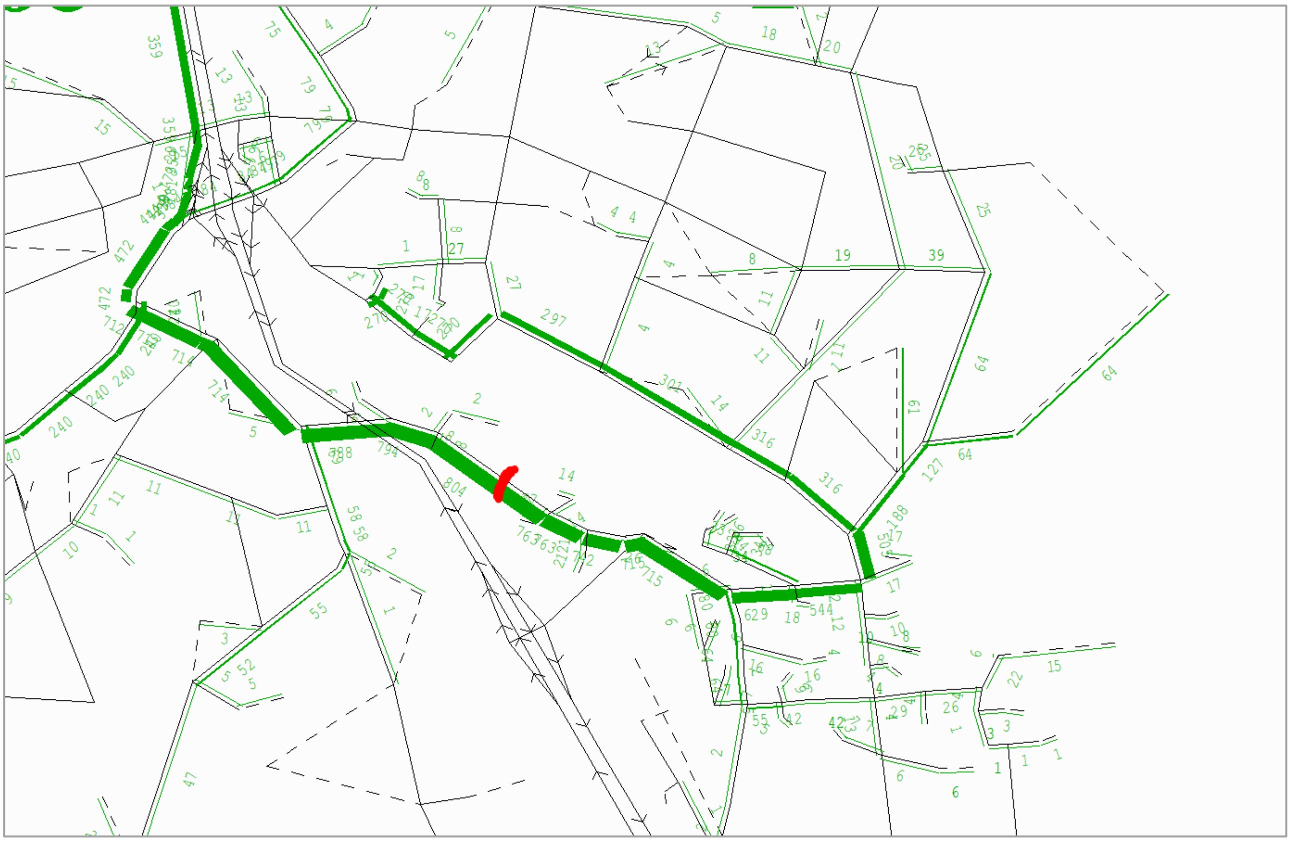


Figure 3-3: SATURN SLA of the northbound Quarry Road direction in the PM peak (cross section shown in red)

3.4 Test 3A – Brookfield Road to Quarry Road Link (Sensitivity Test)

Test 3A assessed the introduction of the Brookfield link, indicated as network infrastructure B in Figure 3-2 linking existing Brookfield Road with Quarry Road at Tegal Road. This test was created as a sensitivity based on Test 3, as it relies on third party land acquisition or complex engineering/consenting challenges.

The modelling results for Test 3A are shown in the Table 3-6 below.

Table 3-4: Test 3A Modelling Results

	Criteria	AM Peak	PM Peak	Interpeak
Great South Road / Waihoehoe Road Results (FAIL test)	**Intersection LOS**	C	F	A
	Intersection Delay	25s	82s	9
	Worst Queue	South (69m queue with storage capacity of 450m)	East (374m queue with storage capacity of 250m)	East (22m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queue length capacity exceeded	Queues within storage capacity
Great South Road / Waihoehoe Road Results (PASS test)	**Intersection LOS**	B	E	A
	Intersection Delay	15s	52s	8s
	Worst Queue	South (35m queue with storage capacity of 450m)	East (240m queue with storage capacity of 250m)	East (18m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queues within storage capacity	Queues within storage capacity
Wider Network Results	**Daily Link Flows**	Average daily link flows on Waihoehoe Road West, GSR North, GSR South and Norrie Road approaches are below 26,000 vpd.		
	SH1 Congestion	SH1 northbound congestion does not extend to Drury Interchange		
	Other Intersections	Performance of other intersections is acceptable – see Appendix F		
Point of Assessment	**Trip Generation – Point of Assessment**	2,500 trips based on PM peak hour model		
	Development Yield – Point of Assessment	Residential: 1,800 dwellings Retail: 32,000sqm Commercial: 8,700sqm Community: 1,000sqm *Results are based on 2028 background traffic flows.*		

The results show that Brookfield link to Quarry Road does not provide much additional capacity to the local network. The overall trip generation this network can support is similar to test 3. However, the link does divert the traffic on Waihoehoe Road with the resulting AADT expected to be 10% less than test 3 for the eastern approach, and 30% less for the southern approach.

3.5 Test 3B – Firth Street Overbridge

Test 3B assesses the introduction of the outbound only Firth Street overbridge, indicated as network infrastructure D in Figure 2-3 extending existing Firth Street to development network. Similarly to Test 3A, this test was created as a sensitivity based on test 3.

The modelling results for Test 3B are shown in the Table 3-6 below.

Table 3-5: Test 3B Modelling Results

	Criteria	AM Peak	PM Peak	Interpeak
Great South Road / Waihoehoe Road Results (FAIL test)	**Intersection LOS**	C	F	A
	Intersection Delay	29s	72s	9s
	Worst Queue	South (87m queue with storage capacity of 450m)	East (341m queue with storage capacity of 250m)	East (20m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queue length capacity exceeded	Queues within storage capacity
Great South Road / Waihoehoe Road Results (PASS test)	**Intersection LOS**	B	D	A
	Intersection Delay	16s	49s	8s
	Worst Queue	South (38m queue with storage capacity of 450m)	East (235m queue with storage capacity of 250m)	East (16m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queues within storage capacity	Queues within storage capacity
Wider Network Results	**Daily Link Flows**	Average daily link flows on Waihoehoe Road West, GSR North, GSR South and Norrie Road approaches are below 28,000 vpd.		
	SH1 Congestion	SH1 northbound congestion does not extend to Drury Interchange		
	Other Intersections	Performance of other intersections is acceptable – see Appendix F		
Point of Assessment	**Trip Generation – Point of Assessment**	2,800 trips based on PM peak hour model		
	Development Yield – Point of Assessment	Residential: 2,000 dwellings Retail: 36,000sqm Commercial: 9,700sqm Community: 1,300sqm *Results are based on 2028 background traffic flows.*		

The results show that Firth Street overbridge does provide some additional capacity to the local network, where the intersection can support 10% more development traffic in this scenario compared to Test 3.

Similar to Test 3A, the link is expected to reduce traffic on the eastern and southern approaches at the Waihoehoe / GSR roundabout, with the resulting AADT expected to be 10% less than Test 3 for the eastern approach, and 40% less for the southern approach.

3.6 Test 4 - Waihoehoe Road ATAP Scheme

Test 4 assessed the introduction of the wider Waihoehoe Road West ATAP scheme, incorporating the signalisation of the GSR/Waihoehoe Road intersection, widening of the Waihoehoe Rail Bridge, and widening of Waihoehoe Road to include bus lanes. Lane coding followed the concept designs provided within the Waihoehoe NOR package.

The modelling results for Test 4 are shown in the Table 3-6 below.

Table 3-6: Test 4 Modelling Results

	Criteria	AM Peak	PM Peak	Interpeak
Great South Road / Waihoehoe Road Results (FAIL test)	**Intersection LOS**	E	F	C
	Intersection Delay	65s	81s	35s
	Worst Queue	East (210m queue with storage capacity of 250m))	East (261m queue with storage capacity of 250m)	East (83m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queue length capacity exceeded	Queues within storage capacity
Great South Road / Waihoehoe Road Results (PASS test)	**Intersection LOS**	E	E	C
	Intersection Delay	62s	79s	35s
	Worst Queue	East (189m queue with storage capacity of 250m)	East (244m queue with storage capacity of 250m)	East (80m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queues within storage capacity	Queues within storage capacity
Wider Network Results	**Daily Link Flows**	Average daily link flows on Waihoehoe Road West, GSR North, GSR South and Norrie Road approaches are below 30,000 vpd.		
	SH1 Congestion	SH1 northbound congestion does not extend to Drury Interchange		
	Other Intersections	Performance of other intersections is acceptable – see Appendix F		
Point of Assessment	**Trip Generation – Point of Assessment**	3,800 trips based on PM peak hour model		
	Development Yield – Point of Assessment	Residential: 3,300 dwellings Retail: 56,000sqm Commercial: 17,900sqm Community: 2,000sqm *Results are based on 2028 background traffic flows.*		

The results show that Waihoehoe Road widening and signalisation of the GSR/Waihoehoe Road add substantial amount of capacity to the local network. The key links in the area are likely to carry a large volume of traffic through the day, however interpeak operation of the GSR/Waihoehoe intersection and other local intersections in the model operate satisfactorily at LOS D.

Also of note is that around 2033, the model forecasts that northbound SH1 queuing begins to reach the Drury Interchange, therefore there may be congestion at the interchange that is not a direct result of Drury East or West intersection performances. This is not considered to be a critical consideration as State Highway congestion is evident at every Auckland urban intersection during peak hours and is therefore considered normal.

3.7 Test 5 - Mill Road South

Test 5 assessed the introduction of a connection to the south of the plan change areas, linking Fitzgerald Road to SH1, including the provision of an interchange at SH1 (Drury South interchange) and a connection to Great South Road on the western side of SH1. This is similar to that which was previously proposed as part of the Mill Road scheme and has therefore been named Mill Road South for simplicity. It was assumed that the SH1 widening between Drury interchange and Drury South interchange would be implemented at this point.

The modelling results for Test 5 are shown in the Table 3-7 below.

Table 3-7: Test 5 Modelling Results

	Criteria	AM Peak	PM Peak	Interpeak
Great South Road / Waihoehoe Road Results (FAIL test)	**Intersection LOS**	E	F	D
	Intersection Delay	56s	100s	36s
	Worst Queue	East (151m queue with storage capacity of 250m))	East (278m queue with storage capacity of 250m)	East (91m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queue length capacity exceeded	Queues within storage capacity
Great South Road / Waihoehoe Road Results (PASS test)	**Intersection LOS**	D	F	C
	Intersection Delay	51s	91s	34s
	Worst Queue	East (126m queue with storage capacity of 250m)	East (238m queue with storage capacity of 250m)	East (73m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queues within storage capacity	Queues within storage capacity
Wider Network Results	**Daily Link Flows**	Average daily link flows on Waihoehoe Road West, GSR North, GSR South and Norrie Road approaches are below 29,000 vpd.		
	SH1 Congestion	SH1 northbound congestion during the AM peak hour extends to Drury Interchange in 2033.		
	Other Intersections	Performance of other intersections is acceptable – see Appendix F		
Point of Assessment	**Trip Generation – Point of Assessment**	4,300 trips based on PM peak hour model		
	Development Yield – Point of Assessment	Residential: 3,800 dwellings Retail: 64,000sqm Commercial: 21,000sqm Community: 2,400sqm *Results are based on 2028 transport models using linear increase. Testing the development from 2038 demands resulted in slightly higher capacity therefore the worst case has been chosen.*		

The modelling results indicate that the provision of a connection between Fitzgerald Road and SH1 around 2033 will not add substantial capacity to the network as the other key links in the vicinity of the development are already congested. As such, with the infrastructure included in this scenario the assessment point could be reached at 4,300 vehicle trips generated by Drury East area.

3.8 Mill Road (Test 6 and 7)

These tests model the planned infrastructure in the long-term such as a provision of the northern connection(s) from Waihoehoe Road to Ponga Road.

The modelling results for Tests 6 and 7 are shown in the Table 3-8 below.

Table 3-8: Tests 6 & 7 Modelling Results

	Criteria	AM Peak	PM Peak	Interpeak
Great South Road / Waihoehoe Road Results (FAIL test)	**Intersection LOS**	D	D	C
	Intersection Delay	38s	53s	28s
	Worst Queue	West (99m queue with storage capacity of 340m)	East (261m queue with storage capacity of 250m)	East (57m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queue length capacity exceeded	Queues within storage capacity
Great South Road / Waihoehoe Road Results (PASS test)	**Intersection LOS**	D	D	C
	Intersection Delay	38s	44s	28s
	Worst Queue	West (98m queue with storage capacity of 340m)	East (184m queue with storage capacity of 250m)	East (50m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queues within storage capacity	Queues within storage capacity
Wider Network Results	**Daily Link Flows**	Average daily link flows on Waihoehoe Road West, GSR North, GSR South and Norrie Road approaches are below 22,000 vpd.		
	SH1 Congestion	Satisfactory due to alternative north – south route		
	Other Intersections	Performance of other intersections is acceptable – see Appendix F		
Point of Assessment	**Trip Generation – Point of Assessment**	5,100 vehicles per peak hour with one northern connection (similar to previously proposed full Mill Road) 5,600 vehicles per hour with both northern connections.		
	Development Yield – Point of Assessment	Residential: 5,800 dwellings Retail: 97,000sqm Commercial: 47,000sqm Community: 10,000sqm *Results are based on 2038 transport models using linear increase. Testing the development from 2048 demands resulted in slightly higher capacity therefore the worst case has been chosen.*		

The results show that one or both northern connections from Waihoehoe Road to Ponga Road will substantially increase road network capacity.

3.9 2048 Year (Test 8)

This test assessed the final year with full Drury East yield and other developments in south Auckland as per I11.5 land use data.

The modelling results for Test 8 are shown in the Table 3-9 below.

Table 3-9: Tests 8 Modelling Results

	Criteria	AM Peak	PM Peak	Interpeak
Great South Road / Waihoehoe Road Results (FAIL test)	**Intersection LOS**	E	E	C
	Intersection Delay	73s	66s	30s
	Worst Queue	West (295m queue with storage capacity of 340m)	East (287m queue with storage capacity of 250m)	East (63m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queue length capacity exceeded	Queues within storage capacity
Great South Road / Waihoehoe Road Results (PASS test)	**Intersection LOS**	E	E	C
	Intersection Delay	64s	56s	29s
	Worst Queue	West (235m queue with storage capacity of 340m)	East (221m queue with storage capacity of 250m)	East (45m queue with storage capacity of 250m)
	Outcome	Queues within storage capacity	Queues within storage capacity	Queues within storage capacity
Wider Network Results	**Daily Link Flows**	Average daily link flows on Waihoehoe Road West, GSR North, GSR South and Norrie Road approaches are below 25,000 vpd.		
	SH1 Congestion	Satisfactory due to alternative north – south route		
	Other Intersections	Performance of other intersections is acceptable – see Appendix F		
Point of Assessment	**Trip Generation – Point of Assessment**	6,000 vehicles per peak hour based on PM peak model		
	Development Yield – Point of Assessment	Residential: 6,400 dwellings Retail: 108,000sqm Commercial: 60,000sqm Community: 16,000sqm *Results are based on 2048 transport models.*		

This modelling scenario has been run with and without Pukekohe Expressway and the results above are shown for the model that does not include this arterial road. Overall, the modelling results show that with full operational development the network during the peak hours will be busy but local network intersections during the other times of the day is estimated to be within LOS D.

SATURN volume and delay plots for the above discussed scenarios are shown in Appendix G

3.10 Modelling Summary

To summarise the outcomes of the modelling that has been undertaken, a tabulated summary of the diagram is provided in Figure 3.2. This identifies the level of development at which the network criteria set out in Section 2.3 are exceeded. For example, development of up to 710 dwellings could occur with the interim upgrade of Great South Road/Waihoehoe Road roundabout in place, without exceeding the criteria. Between 710 dwellings and up to 1,300 dwellings, up to 24,000m^2 retail, up to 6,000m^2 commercial and up to 800m^2 community, it is assumed that the SH1 widening – Stage 1B will be in place.

The table is the output of the transport modelling undertaken. Because the transport modelling is conservative and is based on assumptions about what will occur in the future, any development that occurs ahead of the transport infrastructure listed in the table will require an assessment.

Table 3-10: Points of Assessment for Infrastructure Upgrades

Transport Infrastructure	Level of Development enabled by Transport Infrastructure				
	Residential (Dwellings)	Retail (GFA)	Commercial (GFA)	Community (GFA)	Drury East Trip Generation
Interim upgrade to Great South Road/Waihoehoe Road roundabout	Up to 710 units	-	-	-	Up to 400 trips (AM peak)
SH1 Widening – Stage 1B	Up to 1,300 units	Up to 24,000m^2	Up to 6,400m^2	Up to 800m^2	400 to 2,000 trips (PM peak)
Drury Central Station Direct connection from SH1 to Town Centre	1,300 to 1,800 units	24,000 to 32,000m^2	6,400 to 8,700m^2	800 to 1,000m^2	2,000 to 2,500 trips (PM peak)
Waihoehoe Road ATAP upgrade including signalisation of GSR/Waihoehoe intersection	1,800 to 3,300 units	32,000 to 56,000m^2	8,700 to 17,900m^2	1,000 to 2,000m^2	2,500 to 3,800 trips (PM peak)
Southern connection between Fitzgerald Rd and SH1 (incl. Drury South Interchange)	3,300 to 3,800 units	56,000 to 64,000m^2	17,900 to 21,000m^2	2,000 to 2,400m^2	3,800 to 4,300 trips (PM peak)
Mill Road northern connection and Opaheke northern link	3,800 to 5,800 units	64,000 to 97,000m^2	21,000 to 47,000m^2	2,400 to 10,000m^2	4,300 to 5,600 trips (PM peak)
Assessment of PT uptake required	5,800 to 6,400 units	97,000 to 108,000m^2	47,000 to 60,000m^2	10,000 to 16,000m^2	5,600 to 6,000 trips (PM peak)

4 Conclusions

Modelling has been undertaken to assess the effect of the proposed development by Kiwi Property, Fulton Hogan and Oyster Capital enabled by Plan Changes 48, 49 and 50 in Drury East. The modelling has been undertaken utilising SGA's model prepared to support the Drury Infrastructure Funding and Finance Study and takes into account recent government NZUP announcements regarding the removal of funding for Mill Road and the southern section of the Papakura to Drury South three-laning.

By utilising SGA's assumptions as well as Council's i11.5 land use assumptions, the modelling undertaken presents a conservative assessment of the impact of the Drury East development on the surrounding road network. The modelling approach was broadly agreed with Authorities, albeit with some outstanding issues that are likely to be discussed in caucusing or hearing evidence.

The modelling demonstrates that although congestion will be evident during the peak hours, interpeak times will operate satisfactorily, and two-way daily flows remain within normal operating levels for urban arterials. From 2033, northbound queues on SH1 during the morning peak period are forecast to begin to block back into the Drury Interchange which may affect local intersection performance. Again, this is considered acceptable and normal for busy urban motorway interchanges and returns to free-flowing operation outside of that peak period.

The direct southbound SH1 link into the town centre was found to have limited effectiveness from a traffic capacity perspective in earlier years when the AM peak period is critical. However, in medium to longer term tests, as the PM peak period becomes most critical, the link provides a more significant capacity benefit. Regardless of traffic capacity, this link will significantly enhance legibility of access from the north.

The Brookfield Link and Firth St Link sensitivity tests established that the Brookfield link has limited effectiveness, but the Firth Street link would add further resilience to the network. It is therefore considered that the Firth Street link could potentially be utilised to provide additional yield to development within Drury East should that be required, assuming that geometrical design constraints can be overcome.

Overall, the assessment shows that the planned transport infrastructure is sufficient to provide required transport capacity to enable the Drury East Plan Changes, albeit with several Points of Assessment at various stages, as outlined in Table 3-9. These Points of Assessment will inform the Plan Change Precinct Provisions that will provide surety on the coordination of land use and infrastructure.

Appendices

We design with community in mind

Appendix A Surveyed ADT Volumes on Arterial Routes

Road	Between	Road Classification	AADT (vpd)	Peak hour(s) (vph)	Configuration
Dominion Rd (July 2019)	Wembley Rd & Lambeth Rd	Arterial	21,755 (5-day)	1,675 (PM)	One lane + bus lane in each direction, separated by flush median
Dominion Rd (July 2019)	Marsden Ave & Halesowen Ave	Arterial	21,682 (5-day)	1,668 (PM)	One lane + bus lane in each direction, separated by flush median
Dominion Rd (July 2019)	Donald Cres & Louvain Ave	Arterial	22,403 (5-day)	1,696 (PM)	One lane + bus lane in each direction, separated by flush median
Dominion Road (Sept 2018)	St Albans Ave & Mont Le Grand Rd	Arterial	22,960 (5-day)	1,768 (PM)	One lane + bus lane in each direction, separated by flush median
Dominion Road (Sept 2018)	Lambeth Rd & Landscape Rd	Arterial	22,329 (5-day)	1,729 (PM)	One lane + bus lane in each direction, separated by flush median
Remuera Road (Oct 2019)	Upland Rd & Lucerne Rd	Arterial	24,225 (5-day)	1,893 (PM)	One lane + T3 lane (in one direction) and on-street parking (in other direction) separated by flush median
Remuera Road (Oct 2019)	Stonyroyd Gardens & Waiatarua Rd	Arterial	25,381 (5-day)	2,117 (PM)	One lane + T3/bus lane in both directions separated by flush median
Favona Road (Oct 2019)	Harania Ave & Forbes Rd	Arterial	20,282 (5-day)	2,167 (PM)	One lane in each direction separated by flush median

Favona Road (July 2019)	Norana Ave & Saville Dr	Arterial	25,953 (5-day)	2,126 (PM)	One lane in each direction separated by flush median
Onewa Road (Aug 2019)	Woodside Ave & Seaview Ave	Arterial	25,127 (5-day)	2,210 (mid-hr), then 2,053 (PM)	One lane + T3 lane in each direction separated by a solid white line
Onewa Road (Aug 2019)	Wernham Pl & Park Ave	Arterial	25,030 (5-day)	2,187 (mid-hr), then 2,063 (PM)	One lane + T3 lane in each direction separated by a solid white line
Onewa Road (Aug 2019)	Lake Rd & Church St	Arterial	27,214 (5-day)	2,293 (mid-hr), then 2,132 (PM)	One lane + T3 lane in each direction separated by a solid white line
Reagan Road (March 2019)	Meadowcourt Dr & motorway overbridge	Arterial	25,346 (5-day)	2,118 (PM)	One lane in each direction separated by a solid yellow line
Manukau Road (Aug 2019)	King George Ave & King Edward Ave	Arterial	23,631 (5-day)	2,436 (AM)	One lane + T3 lane in each direction separated by a flush median
Kepa Road (Sept 2019)	Width change & Dudley Rd	Arterial	22,032 (5-day)	1,904 (PM)	One lane in each direction separated by solid yellow line
Kepa Road (April 2018)	Orakei Rd RABT & Nehu St	Arterial	23,488 (5-day)	2,296 (mid-hr), then 1,943 (PM)	One lane in each direction separated by solid yellow line
Whangaparoa Road (not in AT spreadsheet)					
Kohimarama Road (Aug 2018)	St Heliers Bay Rd & Whytehead Cres	Arterial	25,118 (5-day)	2,279 (PM)	Two-lanes merging into one lane from south in both directions,

					separated by solid yellow line
Universal Drive (Sept 2018)	Zodiac St & Bittern Pl	Arterial	23,373 (5-day)	1,818 (PM)	One lane & on-street parking allowed in each direction separated by wide solid median
Universal Drive (Sept 2018)	Rathgar Rd & Penfold Pl	Arterial	28,340 (5-day)	2,245 (mid-hr), then 2,174 (PM)	One lane in each direction separated by flush median
Cascades Road (Oct 2016)	Bernie Edwards Pl & Solana Ct	Arterial	30,749 (5-day)	2,602 (PM)	One lane in each direction, however EBD lane splits into two lanes towards Solana Ct direction
Cascades Road (Nov 2016)	Aviemore Dr RABT & Bernie Edwards Pl	Arterial	29,689 (5-day)	2,542 (PM)	One lane in each direction, however WBD lane splits into two closer to the RABT
Bucklands Beach Road (Nov 2019)	Tangelo Pl & Damson Pl	Arterial	20,746 (5-day)	1,811 (PM)	One lane and on-street parking in each direction, separated by dashed / solid white line
Lake Road (Aug 2019)	Onepoto Rd & Bayview Rd	Arterial	29,170 (5-day)	2,248 (PM)	One lane and cycle lane in each direction

Appendix B   I11.5 Land Use Data

		HOUSEHOLD FORECASTS						EMPLOYMENT FORECASTS				
MSM Zone		2016	2028	2038	2048	SGA48+		2016	2028	2038	2048	SGA48+
540		1,644	1,916	2,044	2,154	2,154		612	694	729	761	790
541		1,210	1,261	1,273	1,301	1,301		465	471	473	476	495
542		1,293	1,319	1,321	1,336	1,336		218	226	231	237	246
543		1,446	1,502	1,569	1,620	1,620		327	331	333	335	348
544		408	459	483	503	503		1,834	1,899	1,860	1,844	1,914
545		847	1,022	1,107	1,180	1,204		392	397	399	402	424
546		1,404	1,537	1,576	1,608	1,608		544	594	606	620	644
547		1,197	1,210	1,206	1,253	1,253		640	649	651	656	681
548		511	2,433	2,892	2,876	2,876		413	672	658	652	677
549		320	2,724	3,299	3,282	3,282		119	790	756	749	778
550		438	783	1,263	1,443	1,847		1,169	1,230	1,232	1,241	1,382
551		99	270	1,069	1,711	2,415		32	70	795	1,606	1,727
552		384	464	513	547	547		252	331	387	428	445
553		248	273	285	294	294		125	260	369	448	465
554		148	1,919	4,207	4,804	5,400		69	416	1,599	1,585	3,139
555		128	1,024	1,453	2,295	2,905		117	175	389	545	701
556		109	866	912	954	1,000		156	2,125	4,776	5,580	6,296
557		79	80	400	755	803		65	171	257	343	441
558		76	76	74	73	75		51	52	369	724	767
559		59	60	916	1,864	2,298		134	138	368	687	736
560		13	13	852	1,780	2,195		70	70	251	438	550
561		70	1,606	2,427	3,097	3,819		100	429	578	690	873
562		60	363	1,936	3,235	3,991		144	158	523	762	955
563		79	79	78	77	77		46	50	52	54	56

564		200	222	270	315	315		122	141	171	200	208
565		76	145	153	160	160		170	182	190	198	206
566		53	83	148	209	209		67	83	109	135	140
567		58	454	758	849	1,583		21	112	173	186	358
568		48	1,704	2,959	3,426	3,617		74	451	704	775	857
569		75	493	810	928	974		97	145	254	272	296
570		58	71	81	90	90		24	40	72	103	107
571		45	827	1,659	1,663	3,162		88	274	458	439	807
572		93	148	257	359	359		41	69	125	178	185
573		423	423	417	411	411		606	618	624	631	655
574		972	1,656	2,513	3,097	3,346		296	433	594	683	776
575		1,354	1,562	1,669	1,695	1,940		976	1,422	1,939	2,174	2,258
576		1,298	1,675	1,881	1,938	2,240		298	361	384	379	463
577		332	547	705	818	818		2,331	2,680	2,861	3,004	3,120
578		974	1,953	2,289	2,352	3,099		517	594	595	594	945
579		221	397	502	534	873		171	317	615	774	834
580		63	747	1,047	1,120	1,862		73	263	548	685	727
581		2,640	2,720	2,742	2,737	2,737		3,750	4,006	4,187	4,291	4,456
582		48	48	47	46	46		56	60	63	65	68
583		56	386	575	631	848		155	252	448	552	594
584		588	624	801	969	969		478	501	505	514	534
585		275	322	405	483	483		149	185	248	309	321
586		108	107	106	104	104		173	175	176	177	184
587		169	632	1,560	2,430	2,430		152	288	564	824	856
588		317	398	450	488	488		201	252	285	311	323
589		751	750	740	729	729		375	381	382	385	400
590		1,319	2,099	2,600	2,960	2,960		1,412	1,462	1,432	1,419	1,474
591		3,551	3,920	4,127	4,270	4,270		3,085	3,251	3,235	3,242	3,366
592		1,104	1,102	1,087	1,070	1,070		663	672	675	680	706

593		1,735	1,733	1,710	1,683	1,683		1,413	1,463	1,433	1,420	1,474
594		602	2,334	2,916	3,221	3,221		530	620	613	609	633
595		2,020	3,256	4,043	4,480	4,480		1,462	1,677	1,681	1,686	1,751
596		4,580	4,989	5,207	5,374	5,374		4,127	4,272	4,185	4,147	4,307

Appendix C SGA's DIFF Report

Drury Infrastructure Funding and Financing Study (DIFF)

Transport Assessment

August 2021

Version 0.3

Document Status

Responsibility	Name
Author	Andrew Murray
Reviewer	Werner Pretorius
Approvers	Alastair Lovell

Revision Status

Version	Date	Reason for Issue
0.1		Early Draft for internal review
0.2		Draft Final Report
0.3		Final Report

Disclaimer

This is a draft document for review by specified persons at Auckland Transport and the New Zealand Transport Agency. This draft will subsequently be updated following consideration of the comments from the persons at Auckland Transport and the New Zealand Transport Agency. This document is therefore still in a draft form and is subject to change. The document should not be disclosed in response to requests under the Official Information Act 1982 or Local Government Official Information and Meetings Act 1987 without seeking legal advice.

Table of Contents

Appendices

Executive Summary

Purpose and Scope

This report presents the transport assessment element of the Drury Infrastructure Funding and Finance study (DIFF), being undertaken by Auckland Council. The transport assessment seeks to identify a potential Staging Schedule of transport infrastructure upgrades to support the growth proposed in the Drury area.

The purpose and context of the resulting Staging Schedule is important to note, including that:

- It is for the purpose of Council considering funding and financing options, and as such has not explicitly considered funding constraints or delivery mechanisms
- It is based on transport facilities to serve the full release of the proposed plan changes in Drury, using assumed yield and build-out rates derived from the Plan Change documents. It therefore has not considered land use approval, funding, network, economic or other constraints on growth
- It is based on application of SGA transport planning principles and processes in this context and hence does not reflect a committed infrastructure staging plan by Auckland Transport, Auckland Council or Waka Kotahi
- While the ultimate corridor forms are based on the SGA work, opportunities for potential interim stages remain conceptual options only, with the design, form and timing of any works remaining for agreement between developers and the relevant road controlling authority
- The Staging Schedule therefore does not have the status of committed projects endorsed by Auckland Transport or Waka Kotahi and is subject to change in response to funding methods, delivery mechanisms, land use decisions and regional investment priorities. Nor does the Staging Schedule reflect specific projects that Auckland Transport or Waka Kotahi would deliver.

By design, this assessment has not considered design, planning or submission detail related to the Private Plan changes in Drury. While it has utilised, information provided with the Plan Change applications in its assessment, it has focussed on a more strategic assessment of the bulk transport infrastructure needs. The work was progressed with liaison with the proponents and advisers for the plan changes, including sharing of staging principles, modelling, access strategies and the draft Staging Schedule.

The scope of projects considered in this assessment are new or upgraded transport infrastructure within the Drury area needed to support the plan changes. Key projects included in Drury West will also support later growth in Drury West Stage 2 (south of SH22), however the specific additional elements needed within that later growth area are not included. Some of the projects included also have wider growth or strategic transport functions, making ring-fencing of the Drury-specific projects very complex. The local street network design also has a key role in supporting the urban form and mode shift objectives sought for this area, however those elements were not included in this assessment as they are assumed to be the responsibility of developers for delivery. This work has not included construction traffic effects, maintenance, rehabilitation, renewals or services and omits transport projects needed for growth wider than the Plan Change areas of east and west Drury, some of which are located in Drury.

Approach

The Staging Schedule was developed based on the application of Staging Principles which sought the following outcomes:

- Transport systems that support quality, compact urban form, including through higher density around major public transport corridors
- Mutually supportive transport and land use systems that:
  - provide safe travel across all modes
  - provide a transformation in mode share to more sustainable modes, such as public transport, walking and cycling to support decarbonisation goals
  - provide improved choices of travel
  - provide efficient freight movement
  - provide high levels of accessibility to social and economic opportunities
- a resilient transport system

A key component of this approach is transport infrastructure that supports high mode shift to more sustainable modes, as well as supporting the land use activities and place function. A heavy emphasis was therefore placed on the provision of quality walking, cycling and PT infrastructure from the outset of development. Traffic data and modelling was then used to inform the assessment of key access points to the Drury West and East areas, including linkages between the two. The traffic modelling applied first-principle estimates of trip generation for the plan change areas, including mode share assumptions of up to 46% by walk/cycle or PT. These mode shares are significantly higher than traditional rates for such areas, and are considered feasible only with supporting infrastructure, land use planning, local street design, public transport services and land use planning provisions.

Although the focus has been on the plan change areas in Drury, the assessment has considered the cumulative effect of both this growth and ongoing growth in adjacent and wider areas.

During development of this assessment there was uncertainty regarding the outcomes of the re-baselining of the NZ Upgrade (NZUP) programme. As such, this assessment considered scenarios with and without key elements such as the Drury South Interchange, Mill Road and Drury West Station. The NZ Government announced in June 2021 the outcomes of that re-baselining, namely:

- Delivery of all three rail stations (Paerata, Drury West and Drury Central)
- Delivery of only a scaled-down version of Mill Road in Manukau (i.e. no delivery of Mill Road in this Drury area)
- Delivery of the Papakura-Drury upgrade of SH1, but not the subsequent stage from Drury to Drury South
- Funding of a (non-specified) local package of upgrades to support growth in Drury

Because of the early consideration of scenarios with and without key elements (such as Mill Road and the Drury South interchange), it was not considered necessary for the purposes of this assessment to revisit the basis of this work, beyond altering the indicated timing and staging opportunities of key projects in response to these decisions. The timing, alignment and form of the Mill Road corridor where it passes through these plan change areas also remains unconfirmed, with any potential timing and alignments shown here being indicative only.

Growth Inputs and Assumptions

Assumptions on the total yield and build-out rate for the plan change areas was derived from the Plan Change documents where possible. This assessment was based on the regional transport model (MSM) zones in which the plan changes fell, meaning they did include some adjacent areas of Future Urban Zoned (FUZ) land. For this assessment 'Drury West' includes the FUZ-zoned land north of SH22 but not the FUZ to the south of SH22, while 'Drury East' includes some adjacent FUZ in Drury East, but not Opaheke.

For these definitions, Drury East is indicated to provide some 8,500[1] dwellings and 186,000m2 GFA of business/community floor area, while Drury West provides some 8,500 dwellings and 12,000m2 GFA of business area. Even with the aggressive mode shift assumptions, total vehicle movements are expected to be some 65,000 trips per day associated with Drury East and 46,000 vehicles per day for Drury West. For context, SH1 north of Drury recently recorded some 62,000 vehicles per day while SH22 carries approximately 22,000 vehicles per day.

Drury East Movement and Access

Current access to Drury East is highly constrained, being only via the existing rural roads of Waihoehoe Road (into Drury Village) and Ramarama Road (south to Drury South industrial area). Those roads are typically rural roads, without suitable walking, cycling PT or other urban street functionality. The wider receiving network is also constrained for the scale of growth proposed, being only via the SH1, Gt South Road and Rail corridors.

The Drury Central rail station is considered the critical element in providing PT access to/from this development area, supported by feeder bus routes and quality walk/cycle access. A supporting network of internal arterial, collector and local streets is also required. The analysis confirmed that the two existing access corridors (Waihoehoe Road and Ramarama Road), are not sufficient to support development of this full Drury East area. A number of new access roads were indicated in the Plan Change Movement Plans, however not all were indicated as being delivered by the developers. This assessment has confirmed that a number of those access links are necessary to support full development of this site, namely that:

- A new access to the west (such as the Brookfield-Quarry Link) is required to provide alternative access to Waihoehoe Road and provide connections between East and West Drury
- Enhanced access from the north is needed to provide relief to Waihoehoe Road, such as via the proposed direct entry from the Drury southbound motorway off-ramp
- Additional access capacity to SH1 is required for travel south and north on SH1, such as via the Drury South Interchange and access roads
- An additional connection is needed north to Papakura to provide improved connectivity and to reduce traffic on SH1 and Gt South Road by allowing direct access to Papakura and communities east of SH1

[1] This includes the Plan Change areas as well as the remaining FUZ area within MSM Zone 555

The Brookfield-Quarry Road link and direct Drury access ramp were found to be needed both short and long-term, even with Mill Road in place. However, the estimated level of traffic on these links will require careful design to integrate with the internal street networks.

The high mode share aspirations for walking and cycling in these areas will also require careful design of local street networks to help increase their safety and attractiveness. It is therefore recommended that the local street network is developed with appropriate access controls and speed environments to both minimise through traffic and maximise the safety and attractiveness of walking and cycling within those internal street systems.

Drury West Movement and Access

The current primary access to Drury West is via SH22, which is a high-speed rural road providing strategic movement function connecting Drury to Pukekohe and surrounding areas. Its current form is unsuitable for adjacent urban development. Secondary access is via the Bremner Road crossing over SH1 into the Drury Village. That route into Drury Village is also constrained via poor walk/cycle connections and the low lying, single-lane bridge on Norrie Road that is susceptible to flooding.

The Drury West rail station will directly support the southern and central parts of Drury West, with the northern parts of the Auranga development having the choice of both the Drury West and Drury Central stations. The arterial networks have been developed with quality walk/cycle and frequent transit (bus) corridors to both access those stations and connect the east and west communities through the supporting network. SH22 is currently a critical movement corridor which is operating effectively at the capacity of a rural road, which will need to change to a low-speed urban environment as the areas to both the north and south develop. Upgrading that corridor to a 4-lane urban arterial form with segregated walk and cycle facilities is identified as being needed to support release and integration of further urban growth in Drury West.

The long-term recommended network for the Southern Auckland growth area also includes the Pukekohe expressway to aid the transition of SH22 from its current strategic movement function to a localised urban function. This includes a southern extension of Jesmond Road from SH22 to connect with the strategic expressway. Those elements south of SH22 (including the collector road network), are needed to support Drury West Stage 2 and wider regional growth. An initial stage of the Jesmond Road southern extension is included as part of access to the Drury West Station, but those strategic elements were not included in this assessment.

As with the Drury East network, it is recommended that the local street design within Drury West is developed with appropriate access controls and speed environments to both minimise through traffic and maximise the safety and attractiveness of walking and cycling within those internal street systems.

East West Connections

In addition to internal or access corridors for Drury west and east, a number of more strategic upgrades have been identified that are needed to improve connections between the two communities, including:

- Upgrades to Norrie Road (Bremner road east FTN)
- Regional active mode corridor between Drury and Pukekohe, of which the section between Drury Central and Drury West has been considered for this assessment; and

- Gt South Road between Karaka Road and Quarry Road

Network upgrades in Drury West south of SH22 have not been explicitly included in the scope of this assessment as there are no current plan changes. However, it is noted that the confirmation that NZUP will deliver this station early indicate that additional growth (and hence infrastructure needs) could occur in Drury West, outside the scope of projects included here.

Staging Schedule

A Staging Schedule has been developed with indicative time horizons and identifying the growth areas they support. As noted above, there are significant uncertainties as to the roll out of the development and the timing of key transport infrastructure. As such, this Staging Schedule provides one potential scenario for such development, to assist Council develop infrastructure funding methods. While this Staging Schedule is subject to change based on other decisions and economic or other drivers, the key principles applied, and outcomes sought are considered to remain valid underthe various possible scenarios of how this area will develop into a new urban community.

The detailed Schedule is provided later in this report, based on the network elements in the following Figure.

Conclusions

Key conclusions of this work include:

- Both the Drury East and Drury West areas constitute a significant scale of urban growth

- That Drury growth is itself only a sub-set of the total growth planned and expected in the southern parts of Auckland
- This scale of growth requires an extensive network of new or upgraded transport corridors, both within the immediate growth area and on the surrounding receiving environment. This network will need to comprise both strategic network and local network elements in order to deliver on the mode change aspirations
- The long-term arterial and strategic network to support this growth has been identified through the SGA IBC and is being further developed through SGA detailed business cases. The local network has been assumed to be represented by the master plan networks put forward for the Plan Change areas. Some opportunities for the staged implementation of the new or upgraded corridors has been identified in this assessment, however the feasibility, design, and timing of any such interim upgrades will remain to be agreed directly with the appropriate road controlling authority
- Drury is located where all movements between Auckland and the south must pass, meaning that the transport networks have been scaled for local, regional and inter-regional growth. This means it is not feasible to fully isolate the projects needed to support just the Drury plan change areas from growth in the wider network. While this assessment has focussed on the projects needed for Drury, it includes some elements in Drury to accommodate wider growth but excludes wider-network projects which will benefit the Drury area.

1 Purpose, Context and Scope

1.1 Purpose and Background

This report documents an assessment of the transport infrastructure needed to support the planned growth in Drury, with the desired land use and transport outcomes.

Auckland Council are undertaking the Drury Infrastructure Funding and Financing Study (DIFF), which seeks to:

- “*Provide for integrated and timely infrastructure delivery that enables and supports growth in the Drury area in a way that uses current and alternative funding, financing and delivery opportunities*”

Council commissioned the Te Tupu Ngatahi Supporting Growth Alliance (SGA), to undertake the transport infrastructure component of that study. Specifically, it requested SGA to identify sequencing/staging of transport infrastructure to support progressive urban development of Drury.

This work was similar to the previous DTIP study undertaken by Council, but with the following refinements to address feedback on the previous work:

- Use of new information, including ATAP, Private Plan Change Applications, NZUP, SGA Detailed Business cases etc
- More granular staging of infrastructure (physical and temporal), not just corridor sequencing
- More extensive liaison with key parties (including developers), on inputs, assumptions and methodologies

1.2 Relationship to Private Plan Change Regulatory Processes

This work is primarily targeted at Council’s consideration of funding options and is not intended to duplicate or replace Council’s, Auckland Transport’s, or Waka Kotahi’s detailed assessment of eachPrivate Plan Change. In regard to the Plan Change processes, this work:

- Has a broader-network focus than just the individual plan changes, looking at the cumulative growth across both the various plan changes and the wider growth pressures
- Has a focus on the ‘strategic’ rather than local elements of the network, and especially does not cover local street design or delivery
- Is not considering detailed plan change provisions or submission points
- Is focussed on ‘bulk’ transport infrastructure, not detailed provisions (e.g. parking policy, local street design, staging triggers etc)
- Is using different transport advisers (i.e. SGA) to those from Council[2], Auckland Transport or Waka Kotahi involved directly in the Plan Change process

2 Regulatory

1.3 Scope of Transport Elements Considered

The approved SGA Indicative Business Case (IBC) for the Southern Growth area of Auckland provides a range of projects and interventions between Manukau and Pukekohe to accommodate the long-term planned growth in this area, including inter-regional growth. The scope of projects included in this assessment are a sub-set of those projects involving new or upgraded transport infrastructure to support the Plan Changes. It is however noted that growth in adjacent and wider areas is still considered when estimating the required timing and scale of projects.

In addition to the SGA arterial and strategic projects, this study also includes key collector roads in Drury East and West, but not local streets.

Key projects included in Drury West will support later growth in Drury West (Stage 2, south of SH22), however the specific additional elements needed within that later growth area are not included (as there are no active plan changes and it was indicated for later development under FULSS). Some of the projects included also have wider growth or strategic transport functions, making ring-fencing of the Drury-specific projects very complex. The local street network design also has a key role in supporting the urban form and mode shift objectives sought for this area, however those elements were not included in this assessment as they are assumed to be the responsibility of developers for delivery.

It focusses on new or upgraded transport infrastructure needed to improve access, safety or capacity (by any mode), but has not considered any consideration of construction related traffic effects nor has it included any assessment on the existing carriageway quality to support the anticipated traffic flows.

Although focussed on the Drury area, other key strategic IBC projects identified to support the whole southern growth area that are omitted from this assessment include:

- Pukekohe Expressway and arterial connections
- Paerata rail station
- Pukekohe arterials
- Rail 4-tracking
- Takaanini rail crossings
- Opaheke and Gt South Road Frequent Transit Routes (FTNs) between Drury and Papakura
- Mill Road, north of Papakura, including associated connections
- SH1 FTN and other long-term upgrades north of Papakura
- Regional Active Mode Corridor (south of Drury)

This assessment therefore, represents a technical assessment by SGA (who are not parties to the Plan Change hearings), for a specific purpose and based on key assumptions. It therefore, does not represent a formal endorsement by Council, Auckland Transport or Waka Kotahi for any specific staging or sequencing of transport infrastructure.

1.4 Assumptions on NZ Upgrade Projects

A number of projects proposed for this area were incorporated in the NZ Upgrade Programme (NZUP) announced in early 2020, including (see):

- Mill Road

- Papakura to Drury South
- Drury Rail Stations
- Papakura to Pukekohe rail electrification

Figure 1-1 NZ Upgrade Projects in Southern Auckland

During the preparation of this assessment, NZUP was going through a re-baselining exercise for the whole programme. Due to this uncertainty on the exact scope and timing of elements of the NZUP programme that could emerge from the process, it was considered necessary to consider scenarios with and without key elements. Solely for the purposes of progressing an initial assessment ahead of decisions on the re-baselining, the following was assumed:

- Assume the rail electrification proceeds, due to progression of design and construction planning
- Consider scenarios with and without Mill Road (at least the parts south of Papakura of most relevance to this work)
- Assume Stage 1 of the Papakura-Drury South project (between Papakura and Drury only), due to progression of design and construction
- Stage 2 of the Papakura to Drury South project (the section between Drury to Drury South) is considered inter-related to assumptions on Mill Road
- Consider with and without the immediate delivery of Drury West Station

A decision was subsequently announced on the NZUP projects in June 2021 (just before completion of this study), and included:

- Delivery of all three rail stations (Paerata, Drury West and Drury Central)
- Delivery of only a scaled-down version of Mill Road in Manukau (i.e. no delivery of Mill Road in this Drury area)

- Delivery of the Papakura-Drury upgrade of SH1, but not the subsequent stage from Drury to Drury South
- Potential funding of a (non-specified) local package of upgrades to support growth in Drury

Although removed from the NZUP delivery programme, it is not confirmed that projects such as the Drury South Interchange and Mill Road should be removed from all future network planning. The key changes made to the initial Staging Schedule following the NZUP decisions were:

- An accelerated need for the full upgrade on Waihoehoe Road west, given this would remain the primary access into Drury East with the removal of the Drury South interchange and Mill Roads from NZUP delivery
- An acceleration of the need for the full upgrade to SH22 (east of Jesmond Road) to assist transition to an urban environment following the confirmation of the early delivery of the Drury West station south of SH22

It is noted that longer-term decisions on the alignment, form and timing of projects such as the Drury South interchange and Mill Road will remain influenced by regional or national priorities, rather than solely on the needs of local development in Drury. This means that any indication provided in this report regarding the timing of those elements remains highly uncertain. For reference, the technically preferred alignment option for Mill Road identified for public engagement in May 2020 is shown in **Figure 1-2** below.

Figure 1-2 Options Considered for Mill Road Corridor Alignment

1.5 Stakeholder Liaison

As noted above, the scope for this SGA assessment does not include detailed consideration of the Plan Change proposals or submissions but does include liaison with key parties. Liaison with external parties was managed by Council, and included:

- Attendance at steering group and technical (transport) meetings with:
  - Drury East developer group (Fulton Hogan, Kiwi Property and Oyster Capital)
  - Auranga development in Drury West
  - Waipupuke development in Drury West
- Representatives of Auckland Transport and Waka Kotahi were included in these meetings

Information shared with parties during this process included:
- Staging Principles (as described later in this report)
- Site trip generation estimates
- Emerging access strategies
- Traffic model scenarios
- Draft Staging Schedule

1.6 Report Structure

The remainder of his report is structured as follows:

Chapter 2:	Describes the approach to this assessment
Chapter 3:	Outlines the growth in this area
Chapter 4:	Considers the potential yield, travel movements and access requirements for the plan change areas
Chapter 5:	Discusses the purpose, form and opportunities for staging each key element of the network and presents the resulting Staging Schedule
Chapter 6:	Provides key conclusions

2 Assessment Approach

This Chapter describes the overall approach to this assessment, including the ongoing land use and transport system planning context. Detail on growth inputs are included in the subsequent chapter.

2.1 Full System Solution and Role of SGA

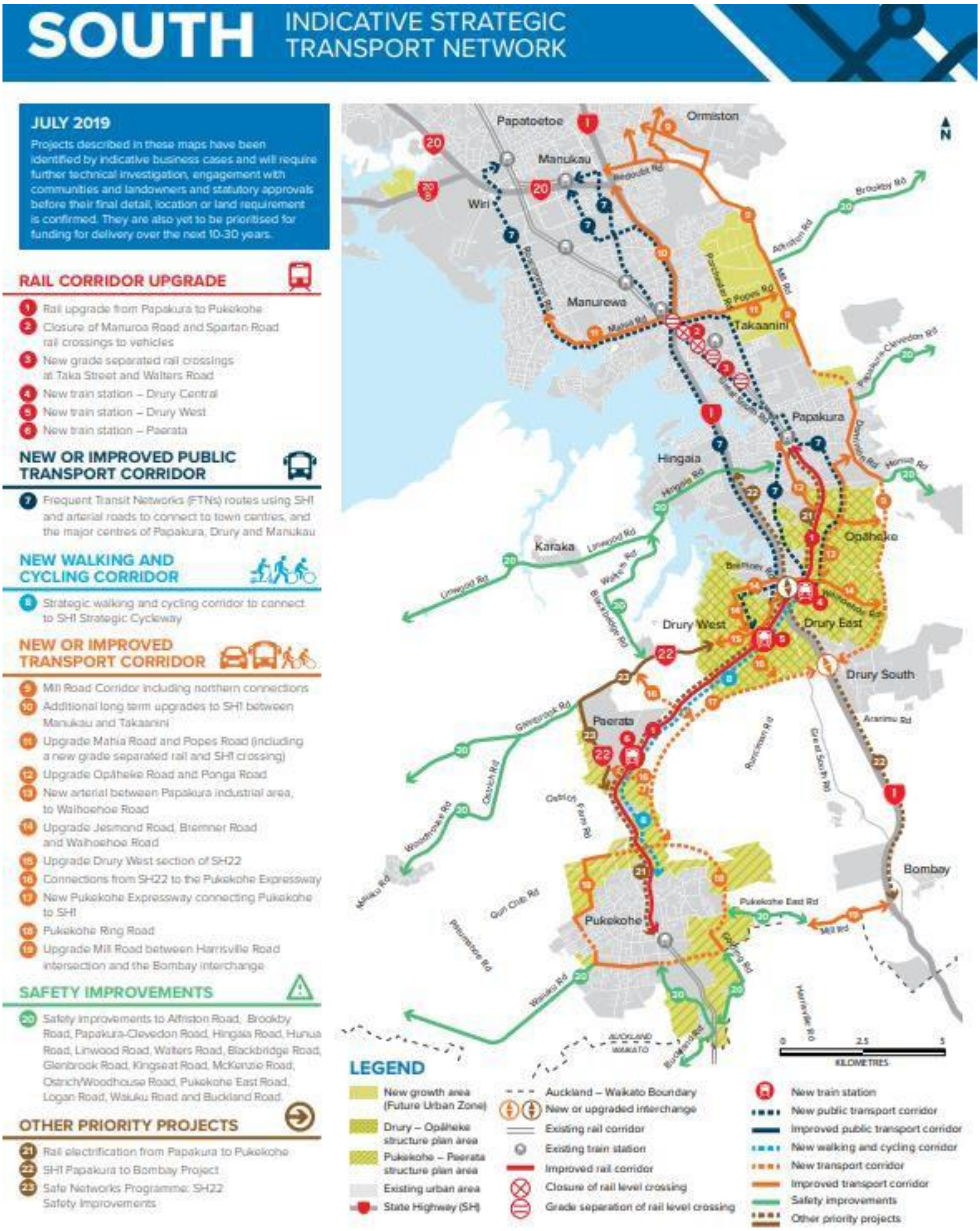
As noted above, the SGA IBC identified a full system solution to support the planned growth in southern Auckland, as indicated in **Figure 2-1**. In addition to the infrastructure projects shown in the Map, the business case identified the need for supporting initiatives related to demand management and land use-transport integration. The land-use-transport integration work has included continuous liaison between SGA and Council on planning for both the transport projects and the land use planning. This included the Drury Opaheke Structure Plan for which SGA prepared the Integrated Transport Assessment for Council.

The role of SGA is to achieve long-term route protection of the recommended networks, with subsequent project implementation decisions and processes remaining with Auckland Transport and Waka Kotahi. This means that the SGA work is focused on identifying required corridor footprints and does not imply any specific implementation status. SGA are progressing detailed business cases (DBCs) for elements of the network and have recently lodged a Notice of Requirement for the Drury Arterials package.

The SGA IBC/DBC work and the Council planning documents[3] therefore form the key basis for the planned growth, desired outcomes and strategic projects used in this work.

3 Including the Unitary Plan, Drury Opaheke Structure Plan and Future Urban Supply Strategy

Figure 2-1 SGA IBC Network



2.2 Approach to Plan Changes

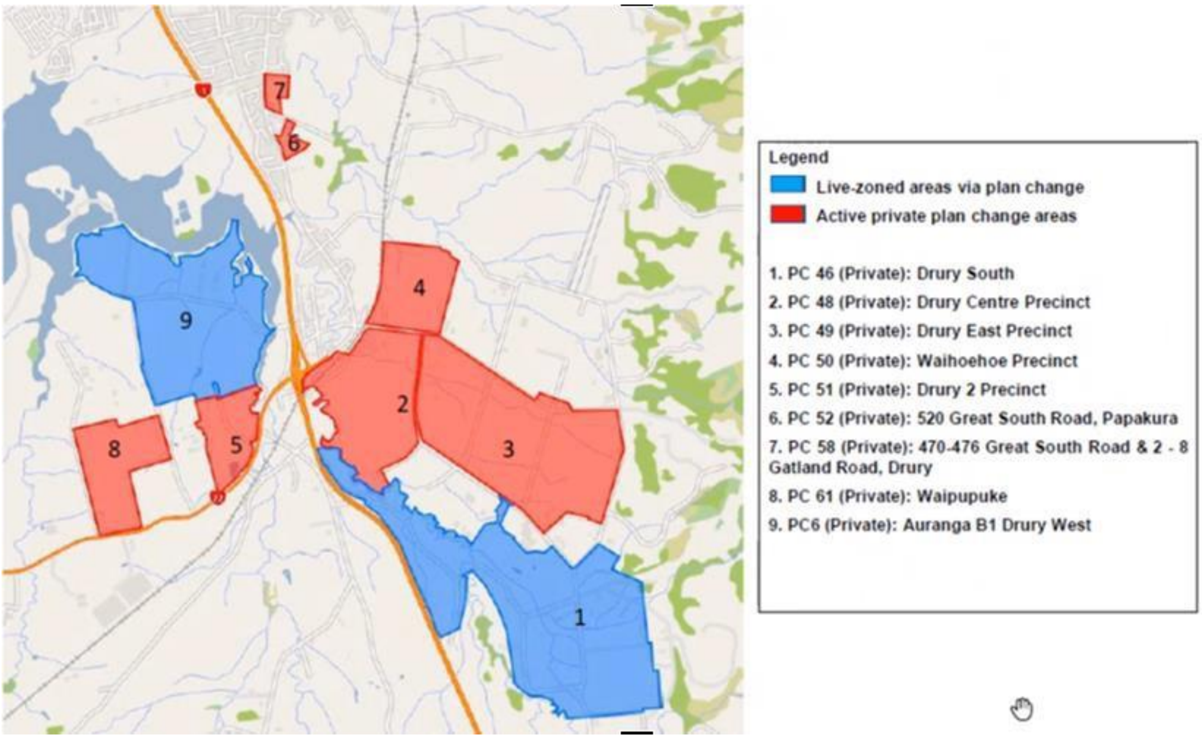
As noted above, this assessment has treated the lodged Plan Change documents at face value, and used their key elements for this assessment, including:

- proposed type, location and yield of indicated land use activities
- proposed transport connections
- Indications of potential land use sequencing

This work has not considered the detailed planning provisions proposed in the documents to manage transportation effects or specific transport policies, nor provided a view on the appropriateness of the proposals. The plan changes are indicated in **Figure 2-2** below. To avoid potential confusion from the multiple numbers, the Plan Changes are also referred to here by their proponent developer, namely:

- Kiwi Properties for PC48 (Drury Centre)
- Oyster Capital for PC50 (Waihoehoe)
- Fulton Hogan for PC49 (Drury East)

Figure 2-2 Recent and Current Plan Changes



Although the Drury 1 and Drury South Industrial precincts are live-zoned, they are only partially developed and include planning provisions (via AUP Precinct Plans) regarding the provision of key transportation elements to allow full development that are relevant to this work. Additionally, the Drury South Industrial area has a new Private Plan Change to revise some aspects of the existing Precinct Plan.

2.3 Transport Outcomes Sought

The transport and land use planning for this southern area has identified the need for a move away from low density, car-dependent developments in order to minimise adverse outcomes in terms of:

- Inefficient use of scarce land
- Poor environmental outcomes, including carbon emissions from car-dominated travel
- Poor urban form outcomes from dispersed development with car and movement-dominated transport systems
- Poor safety outcomes from conflicts with and between walking/cycling and high traffic flows in urban areas
- Poor economic outcomes from inefficient freight movement and poor business accessibility
- Poor social and economic outcomes from poor accessibility to social and economic opportunities and limited travel options
- Poor economic outcomes through a lack of resilience in the transport system

The key outcomes sought through the SGA business cases to address these issues include:

- Transport systems that support quality, compact urban form, including through higher density around major public transport corridors
- Mutually supportive transport and land use systems that:
    - provide safe travel across all modes
    - provide a transformation in mode share to more sustainable modes, such as public transport, walking and cycling to aide decarbonisation goals
    - provide improved choices of travel
    - provide efficient freight movement
    - provide high levels of accessibility to social and economic opportunities
- a resilient transport system

These outcomes are used in the SGA business cases and have also been used for this assessment.

2.4 Approach to Staging Assessment

This assessment is substantially based on design and timing principles that will help deliver the desired outcomes, particularly regarding mode shift and safety. It is acknowledged that there is significant uncertainty in growth planning in greenfield areas, including:

- The outcome of land use planning decisions, such as the various private Plan Changes
- The exact sequencing of how each site will develop, which is complicated by the large area and multiple land-owners
- The rate of development
- The timing of key infrastructure to support growth
- The growth demands that impact this area from other locations, such as Northern Waikato

Due to these uncertainties, it has not been possible to predict or model all possible interim scenarios. Instead, the assessment needed to consider general principles that would apply to growth in a specific area, a range of scenarios for provision of new connections or major infrastructure and the potential cumulative effects of growth across many areas.

The broad approach to this work is therefore as follows:

- Apply design and timing principles to identify key transport elements needed to support each area, especially as regards PT, walk and cycle facilities
- Consider key constraints to access to Drury West and Drury East
- Use traffic data and models where needed to identify access strategies/needs under different scenarios for key infrastructure
- Consider the cumulative effect of growth in both Drury east and west, including on the key east-west linkages
- Identify opportunities for interim stages of needed upgrades
- Develop indicative project sequencing strategy

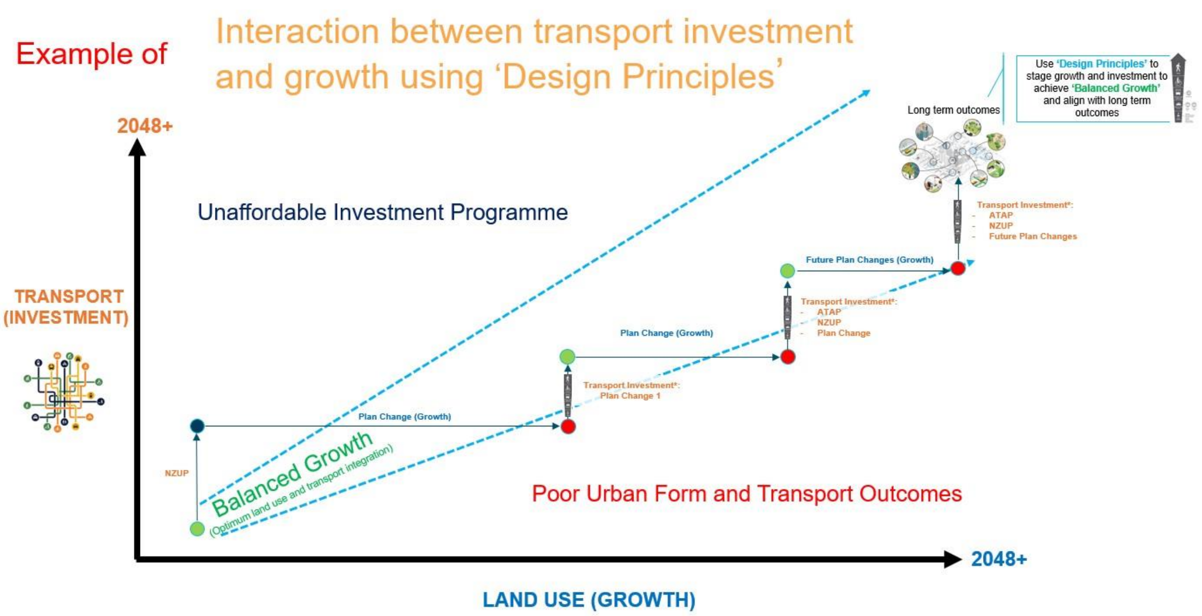
The assessment is based on provisions of high-quality walking/cycling and PT facilities from the outset of development, to support compact urban form, high mode shift and associated demand management and climate objectives. Transport modelling has been used to inform, rather than dictate this approach.

2.5 Staging Principles Overview

Due to the uncertainty regarding the timing and form of specific land-use activities staged over three decades surrounding Drury, a principle/design-based approach is regarded as the best way to manage and deliver the desired transport and land use outcomes consistently.

The 'Timing and Design Principles' are intended to provide guidance to stage transport infrastructure to achieve balanced growth, that aligns with the long-term outcomes and achieve optimum land use and transport integration over time. **Figure 2-3** provides an example of how the interaction between transport investment and growth using 'Timing and Design Principles' to help develop staging plan(s).

Figure 2-3 Example of desired outcomes over time



2.5.1 Timing and Design Principles

A set of timing and design principles were developed to guide the strategy development. These principles are based on the desired transport outcomes and reflect the need to stage the upgrades in an integrated way with land use development. The principles related to early provision of mode-shift and demand management initiatives are a key element of strategies to decarbonise the transport system.

Timing Principles:

1. On sites where urban development is occurring:
    a) Urbanise existing corridors within and adjacent to development concurrently with that development
    b) Provide for, or do not preclude, planned transport corridors within/adjacent to development, including through providing interim facilities as part of development
    c) Where transport improvements are provided in an interim form, ensure alignment with the full build-out network
2. Beyond sites where development is occurring, stage the form and capacity of the transport network progressively to match both development stages and system needs, including cumulative effects of urban development on transport demands on the network.
3. Provide safe and efficient public transport and active mode facilities from the outset of urban development to support a shift to more sustainable travel.
4. Sequence the provision of rail stations and facilities for gaining access to rail stations to coincide with and support:
    a) A commitment to adjacent land use of significant scale within walking distance
    b) The need to serve as a strategic PT hub to service a wider catchment with poor PT options
    c) Support significant mode shift to PT from early in the development cycle
    d) Noting a need to find a balance between criteria (4a and 4c)

Design Principles:

1. Include elements to support place function, not solely movement function (i.e. design standards change based on place value)
2. Provide safe travel by all modes
3. Provide walk and cycle connections <u>from the start of residential development</u> to the following key destinations/attractors within walk/cycle catchments:
    a) Closest train station
    b) Nearby education facilities
    c) Closest Major Centre
    d) Existing Centre
    e) Major employment area
4. Provide walk and cycle connections <u>from the start of non-residential development</u> to the following key locations within walk/cycle catchments:
    a) Closest train station
    b) Existing Centre
    c) Adjacent residential areas
5. FTN services & infrastructure provisions when needed to provide reliable, efficient & attractive frequent public transport
6. Provide local bus services and associated facilities to respond to timing, scale and location of urban development
7. General traffic improvement when needed for:
    a) Safety
    b) Wider network resilience
    c) Accessibility to key destination
    d) Inter-peak reliability & LoS for all modes
    e) Alleviation of severe peak-period congestion

    f) Alleviation of impact on public transport services
8. Coordination of adjacent projects for the purpose of practical construction staging

This process seeks opportunities to stage upgrades to match specific growth or system needs, however it is noted that such opportunities for interim stages may add to costs or difficulty in subsequent future upgrades. It is beyond the scope of this assessment to quantify and determine the economically optimal strategy for every part of the network, particularly given the uncertainty in how the various growth areas will indeed develop.

2.6 Transport Modelling

Transport modelling has been used to inform this work, however due to inherent uncertainties noted above, traffic modelling has not been the primary method to determine the recommended strategy.

Key points to note with the modelling include:

- Recommendations on walk/cycle and PT facilities have been driven by the Staging Principles, alignment with desired outcomes and considerations for long-term integration of land use and transport, and not directly by modelling
- The traffic models have been used to identify/assess the impact of potential new access links, rather than as specific forecasts of the future
- Transport modelling, especially in greenfield growth areas, has quite high levels of uncertainty, including the type and rate of growth, timing of infrastructure, the influence of policy decisions and the design and performance of key parts of the system. In such circumstances the models are considered least accurate at a disaggregate level (e.g. hourly turning flows and delays at key locations), and more likely to be accurate at aggregate levels (e.g. daily 2-way traffic flows)
- In some locations the lodged Plan Change documents indicate different type and scale of development than is indicated in the regional land use forecasts (which were informed in part by the Structure Plan for Drury). Subsequently, first-principle estimates of traffic generation were made for Drury East and West (north of SH22), based on the Plan Change documents. The 'standard'[4] traffic models were then adjusted to match these estimates
- Data was used from both the regional demand (MSM) and the local traffic (S3M) models

The specific assumptions on yield and trip generation in each area are discussed in the following Chapter.

A number of scenarios were used to test the effects of various network changes. Due to the significant number of potential combinations of network and land use inputs that could be considered, these tests were kept at a simple level to understand key effects. This included using fixed demand patterns for some tests with/without key links, rather than fully re-running both the regional demand and local traffic models in all cases. The limitations of this approach were acknowledged, and various other methods used to inform the analysis, including use of existing traffic count data, outcomes of similar corridors elsewhere and high-level assessments of the daily flows likely to want to head in each direction.

4 These are models using the regional growth forecasts

The various scenarios modelled are described in **Table 2-1** with resulting daily and maximum hourly flows at key locations shown in **Figure 2-4**. The locations of the key flow estimates are indicated in **Table 2-2.**

Table 2-1 Model Scenarios

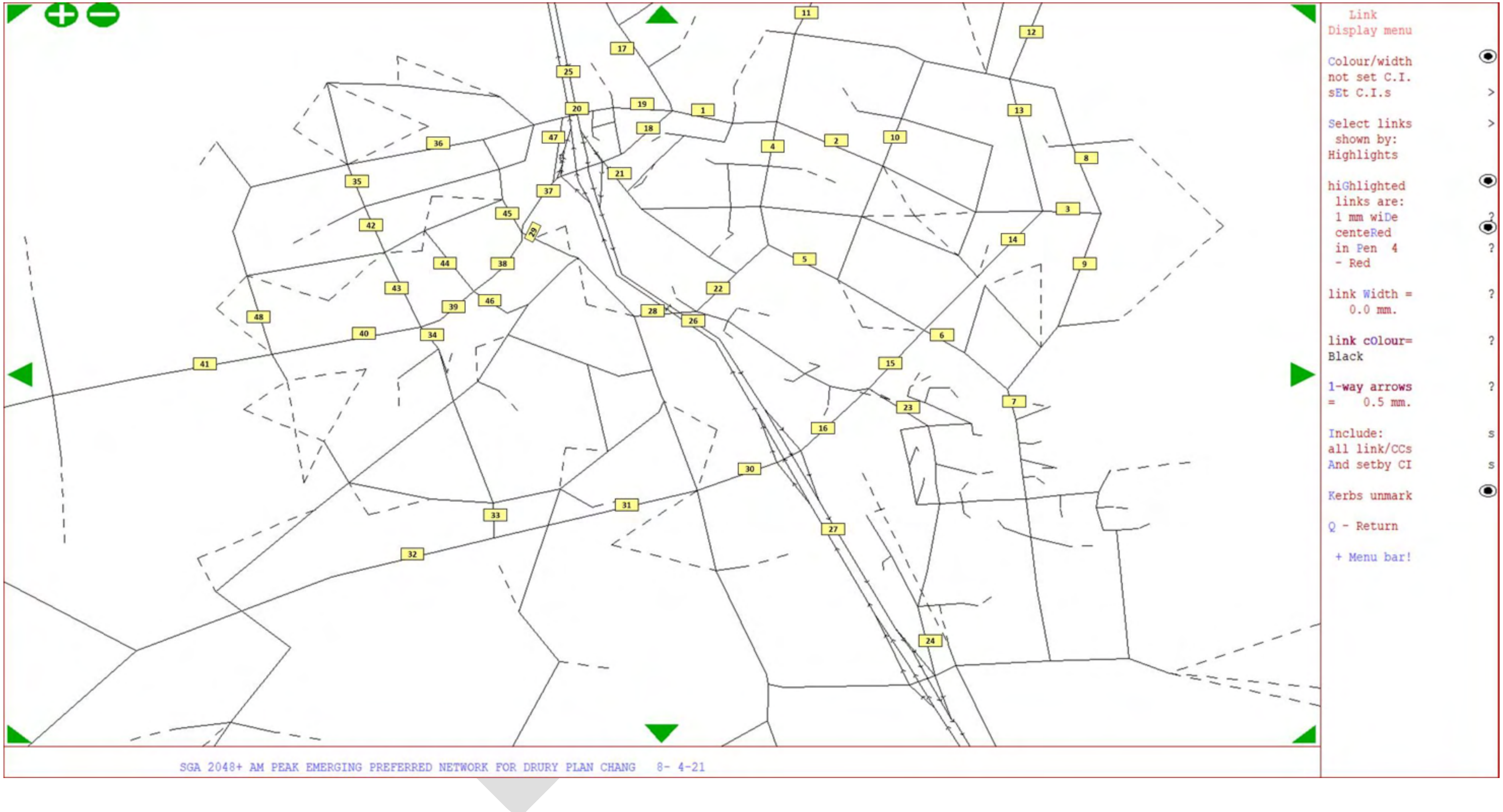
Scenario	Description	Purpose
2028 Models		
A	Reference Case Mill Road Models updated for DIFF 3.0 Study (Drury East and West land uses). These include full Mill Road and P2DS projects but do not include Brookfield-Quarry Link (BQL) or direct Drury-Kiwi ramp access (DKR)	A reference scenario similar to that used in the plan change assessments
B	Remove (Ban) Mill Road between Drury and Papakura, but still includes Drury South Interchange	To test the effect of only having the Drury South Interchange element of Mill Road
C	Remove all of Mill Road south of Papakura, but include Maketu-Waihoehoe Road internal collector roads	To test the effect of having no Mill Road
D	Scenario C + BQL + DKR	To test the effect of adding the additional Access Links
2038 Models		
A	Reference Case Mill Road Models updated for DIFF 3.0 Study (Drury East and West land uses). These include full Mill Road and P2DS projects and Opaheke North-South Arterial (with signals) but do not include Brookfield-Quarry Link (BQL) or direct Drury-Kiwi ramp access (DKR)	A reference scenario similar to that used in the plan change assessments
B	Scenario A+ BQL + DKR + change signals to roundabouts on North-South arterial	To test the effect of adding the additional Access Links
2048+ Models		
A	Reference Case Mill Road Models updated for DIFF 3.0 Study (Drury East and West land uses). These include full Mill Road and P2DS projects and Opaheke North-South Arterial (with signals) but do not include Brookfield-	A reference scenario with the full SGA network and full growth development

Scenario	Description	Purpose
	Quarry Link (BQL) or direct Drury-Kiwi ramp access (DKR)	
B	Scenario A+ BQL + DKR	To test the effect of adding the additional Access Links
C	Scenario A With the change to Roundabouts on North South Arterial	To test the effect of different intersection forms
D	Scenario B With the change to Roundabouts on North South Arterial	To test the effect of different intersection forms

Table 2-2 Modelled Traffic Flow Estimates

	Demand Flows (Vehicles)		2028								2038				2048+							
			Scenario A		Scenario B		Scenario C		Scenario D		Scenario A		Scenario B		Scenario A		Scenario B		Scenario C		Scenario D	
S.No	Road Name	Road Section	Max Peak Flow	ADT	Max Peak Flow	ADT	Max Peak Flow	ADT	Max Peak Flow	ADT	Max Peak Flow	ADT	Max Peak Flow	ADT	Max Peak Flow	ADT	Max Peak Flow	ADT	Max Peak Flow	ADT	Max Peak Flow	ADT
1	Waihoehoe Road	GSR-Kath Henry Lane	1,173	20,162	1,273	24,210	1,356	27,706	1,208	19,644	1,331	22,802	1,162	17,101	1,276	23,968	1,226	17,284	1,401	25,970	1,188	17,891
2	Waihoehoe Road	FitzgeraldRd-ApplebyRd	397	5,739	238	4,507	352	6,575	507	6,323	134	2,168	127	2,558	244	4,360	217	3,874	207	4,692	287	4,816
3	Waihoehoe Road	MillRd-DruryHillsRd	127	2,190	162	2,701	225	3,776	239	3,857	194	3,470	205	3,679	546	7,993	538	8,124	547	8,001	547	8,188
4	Fitzgerald Road	NewParallelRd-WaihohoeRd	214	3,736	281	4,857	361	6,710	259	4,501	429	7,421	524	8,632	415	7,118	478	7,141	607	10,556	771	10,203
5	Fitzgerald Road	BrookfieldRd-FieldingRd	349	6,025	499	6,623	581	8,213	481	8,681	539	11,857	359	8,265	640	10,531	349	6,659	666	11,119	361	7,204
6	Fitzgerald Road	CoseyRd-DruryHillsRd	249	6,193	277	6,547	181	4,818	234	5,699	419	10,837	480	10,777	360	7,790	411	8,127	386	7,939	454	8,185
7	Fitzgerald Road	QyarryRd-DruryHillsRd	185	4,036	141	3,223	166	3,374	175	4,096	341	7,314	392	7,408	449	8,425	476	8,291	449	8,426	465	8,376
8	Drury Hills Road	WaihohoeRd-ApplebyRd	70	1,373	140	2,582	168	3,234	193	3,297	78	1,835	100	2,063	248	4,993	259	5,136	236	4,981	260	5,139
9	Drury Hills Road	WaihohoeRd-MacwhinneryDr	66	955	28	257	63	687	55	706	132	1,899	138	1,873	415	5,567	401	5,258	417	5,445	410	5,244
10	Appleby Road	WaihohoeRd-HarryDoddRd	365	6,262	84	1,595	84	1,610	85	1,628	273	4,033	132	1,820	386	4,945	321	5,227	212	3,760	274	4,259
11	NorthSouthArterial	HarryDoddRd(NSArterial)-PongaRd	0	0	0	0	0	0	0	0	726	7,840	783	11,846	1,290	12,572	1,297	14,610	1,297	14,982	1,283	17,156
12	Mill Road	ApplebyRd-PongaRd	1,672	21,819	0	0	0	0	0	0	1,693	28,462	1,657	25,113	2,110	36,123	2,106	34,638	2,110	34,611	2,139	33,249
13	Mill Road	WaihohoeRd-ApplebyRd	1,220	14,679	9	195	6	122	5	115	1,527	24,489	1,495	23,242	1,914	30,516	1,829	29,361	1,918	30,142	1,870	28,696
14	Mill Road	FitzgeraldRd-WaihohoeRd	1,151	14,231	70	1,232	36	627	32	576	1,383	23,624	1,345	22,181	1,597	28,418	1,518	27,345	1,591	28,158	1,543	26,641
15	Mill Road	MaketuRd-FitzgeraldRd	1,496	20,789	649	11,044	581	8,649	284	5,115	1,853	36,067	1,573	28,812	2,366	39,975	1,891	32,193	2,340	39,613	1,913	31,755
16	Mill Road	DSIC-MaketuRd	1,314	18,070	824	14,752	0	0	0	0	1,481	30,494	1,432	25,751	1,855	33,946	1,694	30,035	1,846	33,588	1,698	29,784
17	Great South Road	EastSt-SuttonRd	741	17,488	1,400	25,748	1,410	26,758	1,420	25,410	1,060	19,577	1,051	17,940	1,473	22,909	1,502	22,255	1,474	22,387	1,504	21,547
18	Great South Road	FirthSt-WaihohoeRd	845	12,162	1,035	16,976	1,013	18,201	894	12,585	1,007	14,170	741	8,083	1,051	17,426	800	10,439	1,160	18,565	881	10,886
19	Norrie Road	FirthSt-GSR	610	12,079	945	13,931	944	15,448	963	15,734	1,031	16,349	1,009	16,663	1,409	19,750	1,321	20,076	1,344	19,409	1,355	19,562
20	Bremner Road	VictoriaSt-CreekSt	709	10,436	695	10,501	644	10,635	698	11,001	1,000	14,958	1,056	15,358	1,253	17,639	1,215	18,176	1,229	17,469	1,228	17,904
21	Drury Interchange SH1 Off Ramp	SH1OffRamp-FlanaganRd	0	0	0	0	0	0	522	7,564	0	0	441	6,000	0	0	523	5,554	0	0	494	5,302
22	Brookfield Road	MaketuRd-Brookfield Rd	0	0	0	0	0	0	529	7,962	0	0	916	11,396	0	0	921	14,394	0	0	953	15,250
23	Maketu Road	MaketuRd-MillRd	568	10,261	400	9,830	489	8,919	381	7,730	1,040	19,191	1,036	18,999	1,178	20,809	1,083	20,882	1,124	20,782	1,087	20,629
24	Maketu Road	Ararimu Rd-MceldownieRd	366	4,568	318	4,691	604	11,741	446	8,880	960	9,605	902	9,106	1,199	11,332	996	10,330	1,130	11,179	995	10,081
25	SH1	Drury I/C-Papakura I/C	4,374	106,802	5,151	117,833	5,156	116,019	5,152	117,618	5,480	128,626	5,488	129,296	6,237	144,183	6,207	144,792	6,186	143,995	6,184	144,357
26	SH1	Drury South I/C-Drury I/C	3,084	79,080	3,982	91,028	3,787	83,875	3,824	83,075	4,477	107,652	4,455	107,438	5,221	124,051	5,219	124,390	5,222	123,677	5,223	124,082
27	SH1	RamaRama I/C-Drury South I/C	3,900	82,598	3,946	82,911	3,786	83,873	3,824	83,074	3,312	88,272	3,346	88,171	4,313	110,894	4,362	110,890	4,351	110,695	4,357	111,095
28	Quarry Road	GSR-QuarryRd	259	3,427	176	3,063	433	6,904	737	10,097	490	3,978	1,110	11,592	606	5,750	1,175	14,782	530	5,449	1,204	15,566
29	Great South Road	SH22-GSR	262	5,297	245	5,736	502	9,300	712	10,807	408	6,349	570	6,827	797	11,572	611	10,308	704	11,359	616	10,048
30	GSR - Drury South I/C	GSR-Drury South I/C	0	0	0	0	0	0	0	0	1,944	39,159	1,845	36,824	1,933	41,316	1,830	40,071	1,904	41,235	1,814	39,713
31	Pukekohe Expressway	RunchimanRd-GSR	0	0	0	0	0	0	0	0	2,138	40,751	2,043	40,527	2,148	46,128	2,069	46,014	2,152	46,014	2,073	45,797
32	Pukekohe Expressway	BurttRd-RunchimanRd	0	0	0	0	0	0	0	0	2,162	38,594	2,195	39,610	2,172	43,648	2,216	44,695	2,165	43,544	2,208	44,632
33	Extension of Jesmond Road	Pukekohe Expway-Runchiman/Burtt	0	0	0	0	0	0	0	0	280	6,730	440	6,956	588	11,401	585	11,752	576	11,141	573	11,558
34	Extension of Jesmond Road	JesmondRd Extn-SH22	360	5,515	360	5,747	346	5,690	337	5,530	246	4,421	217	3,986	497	7,307	543	7,022	493	7,397	536	6,851
35	Jesmond Road	NewParallelRd-South of Bremner Ro	299	4,235	291	4,194	291	4,310	274	4,183	459	7,566	450	7,373	481	9,517	518	9,417	527	9,555	493	9,302
36	New Bremner Road	Jesmond Rd-Auranga Dr	335	4,401	322	4,260	312	4,025	297	4,022	591	9,307	588	9,361	611	10,898	691	11,091	627	10,406	707	11,479
37	SH22	GSR-SH1 OffRamp	1,554	27,471	1,434	27,185	1,406	28,578	1,388	26,230	1,200	17,711	871	12,944	1,408	23,587	1,236	17,741	1,516	24,435	1,217	17,927
38	SH22	McPhersonRd-GSR	1,567	26,492	1,359	25,429	1,354	24,901	1,339	24,906	1,168	15,341	1,040	13,422	1,257	18,410	1,115	17,221	1,274	19,265	1,124	17,751
39	SH22	JesmondRd-McPhersonRd	1,567	26,494	1,360	25,431	1,354	24,901	1,340	24,907	1,092	14,158	984	12,676	1,102	16,588	1,048	15,744	1,117	17,257	1,052	15,789
40	SH22	OiraRd-JesmondRd	1,354	23,428	1,133	22,123	1,134	21,389	1,124	21,506	993	14,712	926	13,169	997	18,020	1,043	17,278	1,047	18,513	1,080	17,383
41	SH22	Whangapouri Rd-OiraRd	1,362	23,822	1,144	22,521	1,144	21,795	1,137	21,907	922	14,434	893	13,123	850	16,762	921	16,521	912	17,077	942	16,591
42	Jesmond Road	NewParallelRd-South of Bremner Ro	280	4,150	275	4,112	276	4,286	261	4,035	438	7,501	410	7,243	522	9,346	523	9,197	503	9,380	490	8,931
43	Jesmond Road	SH22-NewParallelRd	351	5,371	326	5,364	330	5,712	300	5,751	515	8,933	519	8,924	681	11,734	715	11,566	695	11,731	674	11,441
44	NewNSRoad	SH22-NewNSRoad b/w JesmondRd/B	0	0	0	0	0	0	0	0	75	1,184	56	748	157	1,970	143	1,703	158	2,119	139	2,032
45	NewNSRoad	SH22-NewNSRoad East of BurberryR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	NewNSRoad	BruttRd-SH22	0	2	0	2	0	1	0	1	0	1	0	2	53	148	87	226	39	110	22	70
47	Victoria Street	Bremner Rd-SH22	125	3,004	139	2,736	180	2,931	156	3,291	198	4,296	175	4,359	164	3,786	173	4,290	171	3,864	146	3,613
48	Oira Road	SH22-NewEWRoad b/w OiraRd/Jesm	46	849	47	861	47	865	47	880	79	1,555	78	1,591	154	2,873	151	2,859	157	2,923	154	2,942

Figure 2-4 Location of Key Traffic Flow Estimates



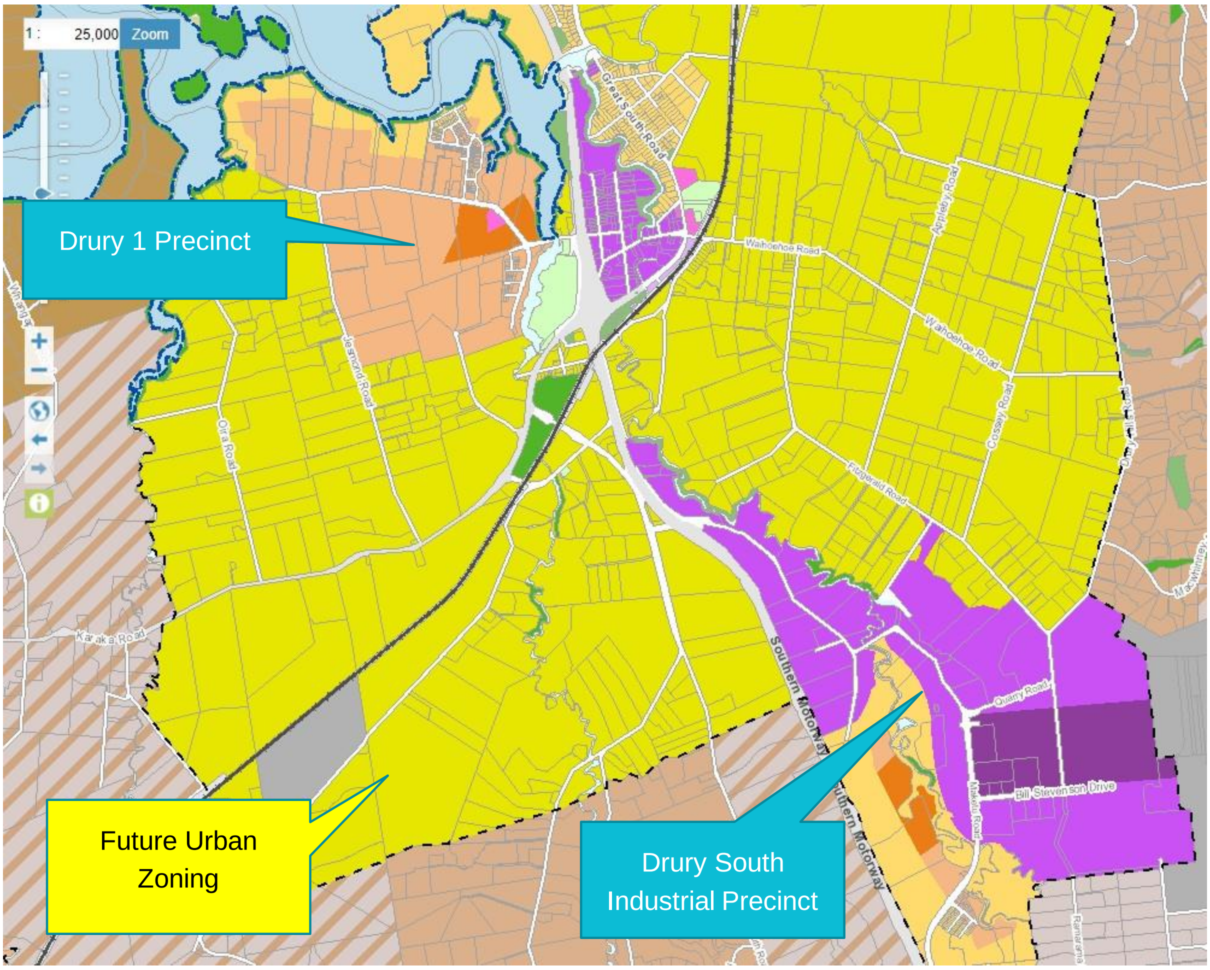
3 Growth Inputs

This chapter outlines the key growth inputs and assumptions used in this assessment.

3.1 Auckland Unitary Plan and Structure Plan

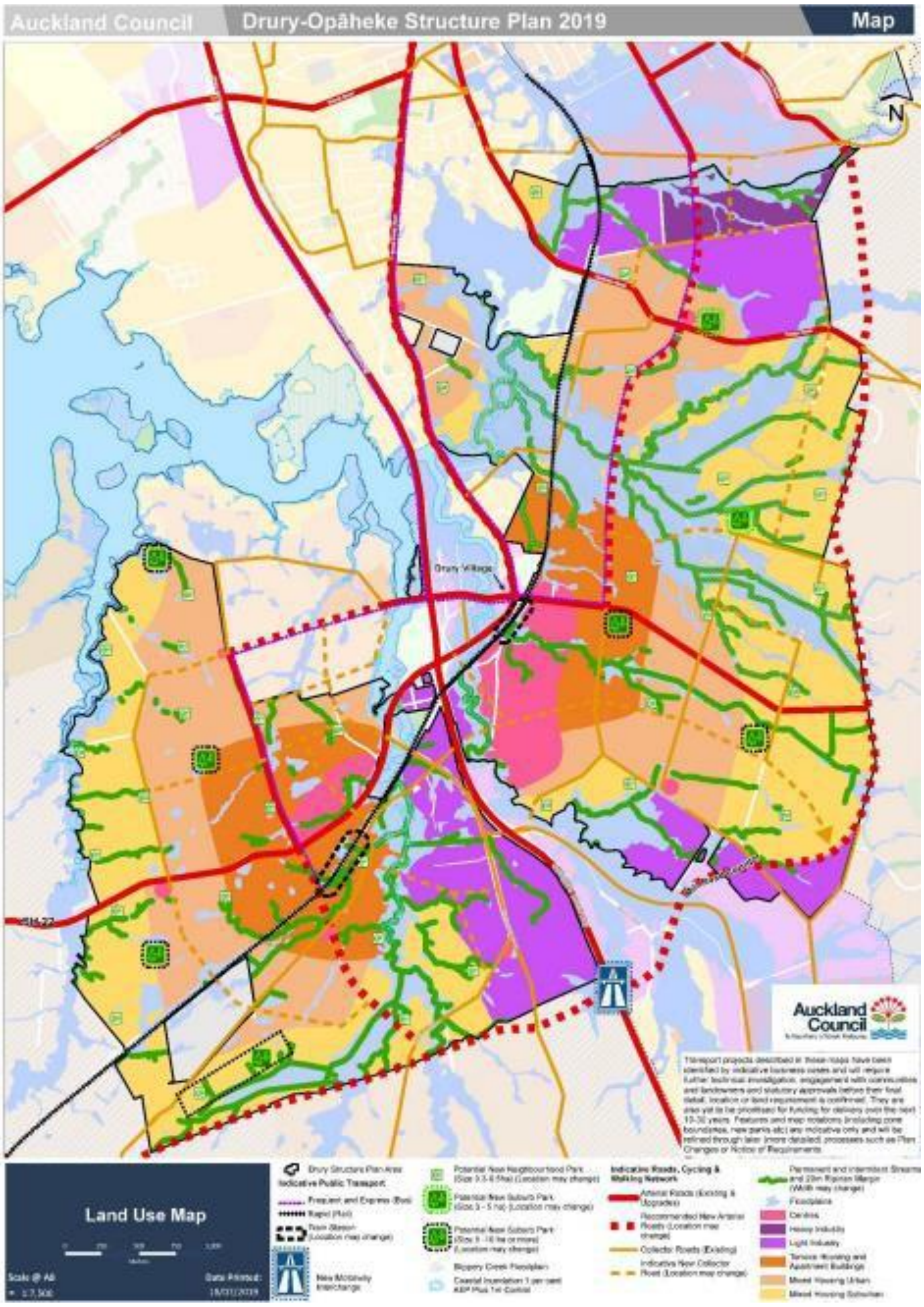
The AUP zoning for the Drury area is indicated in the following figure, highlighting the live-zoned areas and the extensive area of Future Urban Zone (FUZ, shown in yellow).

Figure 3-1 Auckland Unitary Plan Zoning and Precincts



Council progressed the next stage of land use planning by completing the Structure Plan for Drury and Opaheke in 2019. The resulting Structure Plan map (**Figure 3-2**), indicates the preferred type and location of land use activities, as well as the indicative transport network to support it. The indicative transport network indicated includes the SGA strategic network and indicative collector road network. Elements of the SGA network are currently being progressed through more detailed business case investigations.

Figure 3-2 Drury Opaheke Structure Plan



3.2 FULSS

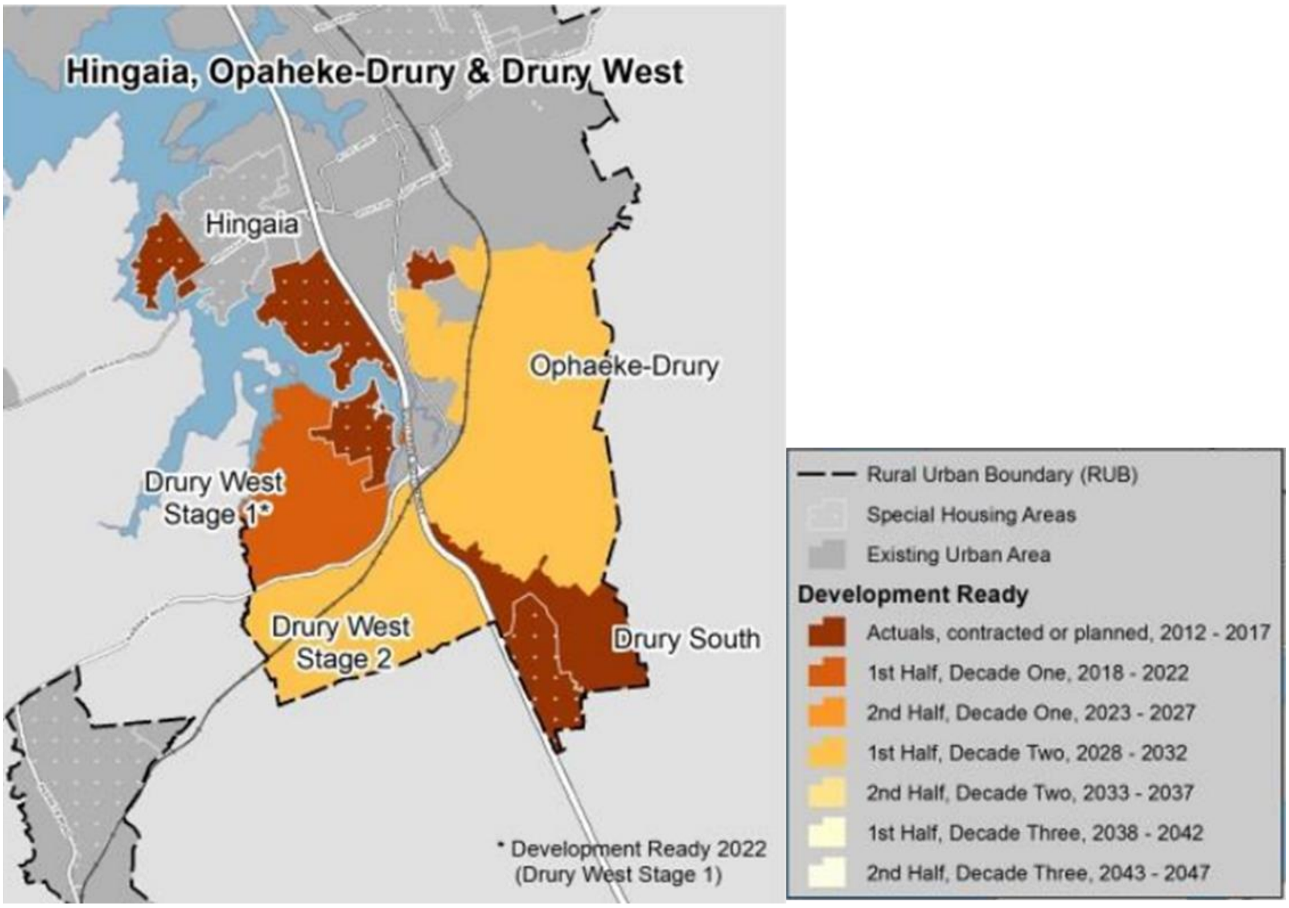
Another key land use planning document that informs both the SGA work and this assessment is Council's Future Urban Supply Strategy (FULSS, 2017). That strategy indicates the preferred sequencing of greenfield (FUZ) land. Relevant to this area is the staged sequencing of new urban areas indicated in **Figure 3-3**. Of relevant in this area is the following:

- Drury West Stage 1 (north of SH22) is indicated for the earliest development, by 2022
- Drury West Stage 2 (south of SH22) is indicated for being development ready by 2032
- Drury East and Opaheke are indicated for being development ready by 2032

It is noted that some of the private plan changes are aligned with this strategy, while those in Drury East involve acceleration ahead of the Strategy.

As noted earlier, this assessment has treated the seven plan changes at face value, assuming all could proceed immediately, regardless of the FULSS. However, the growth assumptions in the wider area remain generally aligned with FULSS (as reflected in the regional land use forecasts).

Figure 3-3 FULSS



3.3 Regional Growth Forecasts

Auckland Council, in liaison with Auckland Transport and Waka Kotahi[5], regularly update their regional land use forecasts. Those forecasts are estimates of long-term regional growth undertaken at a strategic level. They are not intended to provide precise predictions of future land use activities in all areas. Forecasting future land use activities has inherent uncertainty, particular in greenfield growth areas subject to such significant change.

The forecasts are developed from Statistics NZ population forecasts, and reflect various known developments, unitary plan zoning and strategies such as FULSS. The forecasts are used in the transport forecasting undertaken for the regional and sub-regional transport planning, including that undertaken by SGA. The current SGA assessments are based on forecast Scenario I11.5, albeit with

[5] This collaboration of agencies is reflected through the jointly owned Auckland Forecasting Centre

an additional horizon added with full build-out of the FUZ areas (and referred to as the 2048+ forecast). Scenario I11.6 was released in mid-2020 and is being progressively introduced into new SGA business cases. The updated regional scenarios typically reflect changes in the predicted rate of growth in various areas, with total yields in greenfield areas not typically changing unless subject to refined structure planning or plan changes[6]. The Scenario I11.6 forecasts were also created in 2020, with prevailing high levels of uncertainty regarding post-COVID economic and growth conditions.

This DIFF study has also used different assumptions for the Plan Change areas, relying on the regional forecasts only for wider-area growth. While the timing of development (both within and beyond the Plan Change areas), remains uncertain, the use of Scenario I11.5 rather scenario I11.6 is not considered likely to significantly impact the conclusions of this assessment.

3.4 Recent and Current Plan Changes

The following sections summarise the key yield and transport elements of the proposed plan changes, with more detailed estimates of growth rate and trip generation in the Subsequent Chapter 4.

3.4.1 Drury South

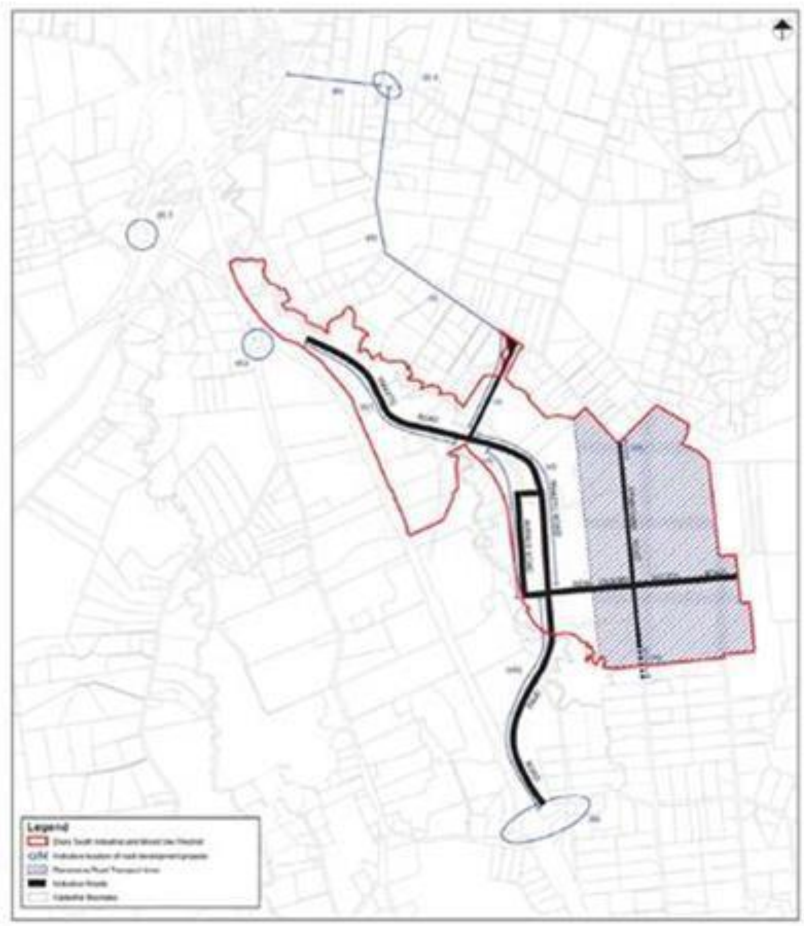
The Drury South Industrial Precinct includes around 185 hectares of Land Extensive Industrial Activities providing for heavy and light industrial activities. The adjacent Drury South Residential Precinct provides for residential development (approximately 750 dwellings). Plan Change 46 has recently been approved which has re-zoned the ‘Commercial Services’ area in the western part of the Industrial Precinct to Mixed Use.

This area was live-zoned prior to consideration of FUZ areas north and west of the Precinct, and that context is reflected in some of the precinct provisions. The Mill Road corridor with its connection through the Precinct to connect to SH1 was in its early stages of development and not reflected in the Precinct provisions. The transport network is indicated in **Figure 3-4** below. The key elements relevant to this assessment include:

- Use of Quarry Road / Gt South Road and Fitzgerald Rd as the access to the north, along with provisions requiring consideration of upgrades at the Quarry Road/Gt South Road and SH22/Gt South Road intersections. Interim safety upgrades have been implemented at both intersections
- Provisions requiring consideration of a minor upgrade at the Waihoehoe Road/Fitzgerald Road intersection (implemented) and a walk/cycle path on Fitzgerald Road (implemented)
- Creation of a new link road between Quarry Road and Fitzgerald Road to provide a new link to Fitzgerald Road. Note: As closure of Ramarama Road is no longer identified and the possibility of the NZ Upgrade Mill Road project using that same corridor, the provision of this new corridor is somewhat uncertain
- Provisions requiring consideration of upgrades to the Ramarama Interchange intersections, which provides the main access to the south. A full roundabout upgrade has been completed on the east side and an interim safety upgrade has already been provided on the west side.

[6] This comment relates to the regional forecasts and models. It is noted that the local traffic models used in this assessment did apply different assumptions on total yield and build-rate.

Figure 3-4 Drury South Industrial Precinct Transport Plan



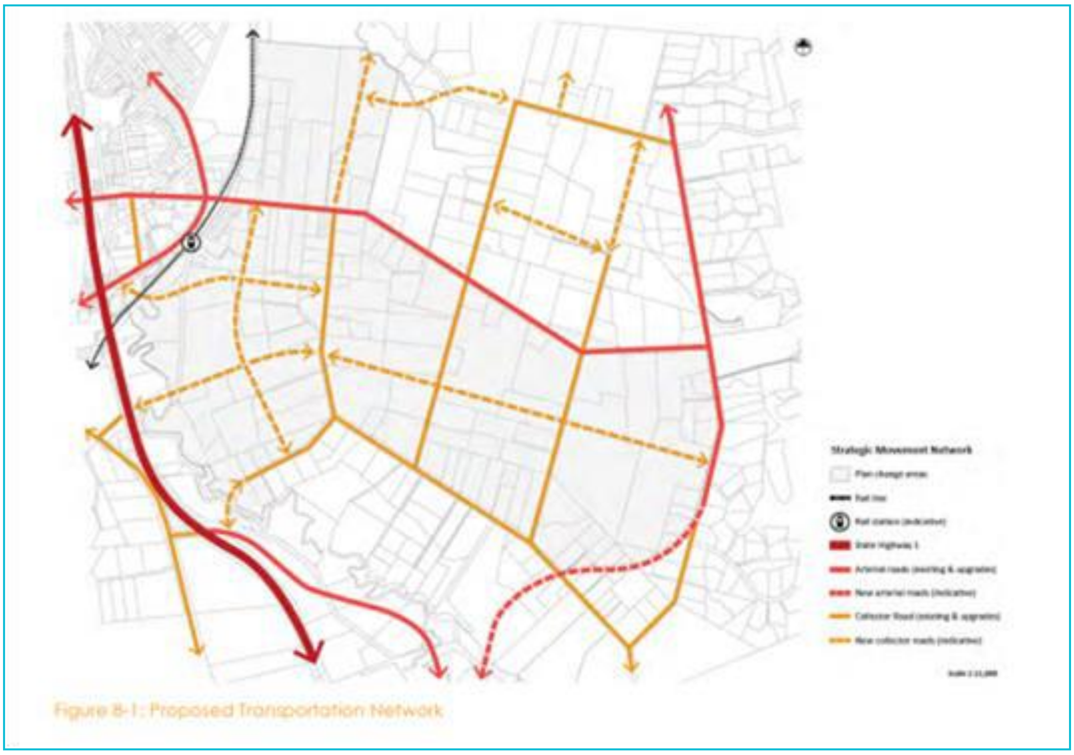
3.4.2 Drury East

Three private plan changes have been lodged covering the Drury East area. Those three Plan Changes have identified a common transport plan, indicated in **Figure 3-5** below.

Based on the plan change documents, the three plan changes suggest combined yield of:

- 7,000+ residential dwellings
- 100,000m^2 GFA of retail development
- 60,000m^2 GFA of commercial activity
- 16,000 m^2 GFA of community space

Figure 3-5 Drury East Proposed Transport Network[7]



3.4.3 Drury West

For this assessment, Drury West comprises the areas within the two MSM model zones north of SH22, including

- The live-zoned Aurunga A/B1 area (as included in the Drury 1 Precinct)
- The Aurunga B2 private Plan change 51
- The Waipupuke Private Plan Change 61
- Residual FUZ areas north of SH22

For this combined area, a yield of some 8,500 dwellings is indicated, along with a 12,000m2 GFA Centre. The network plans for the various plan change areas are indicated in the following figures (as sourced from the Plan Change documents or Unitary Plan).

[7] Background map sourced from Plan Change documents

Figure 3-6 Drury 1 Precinct Plan

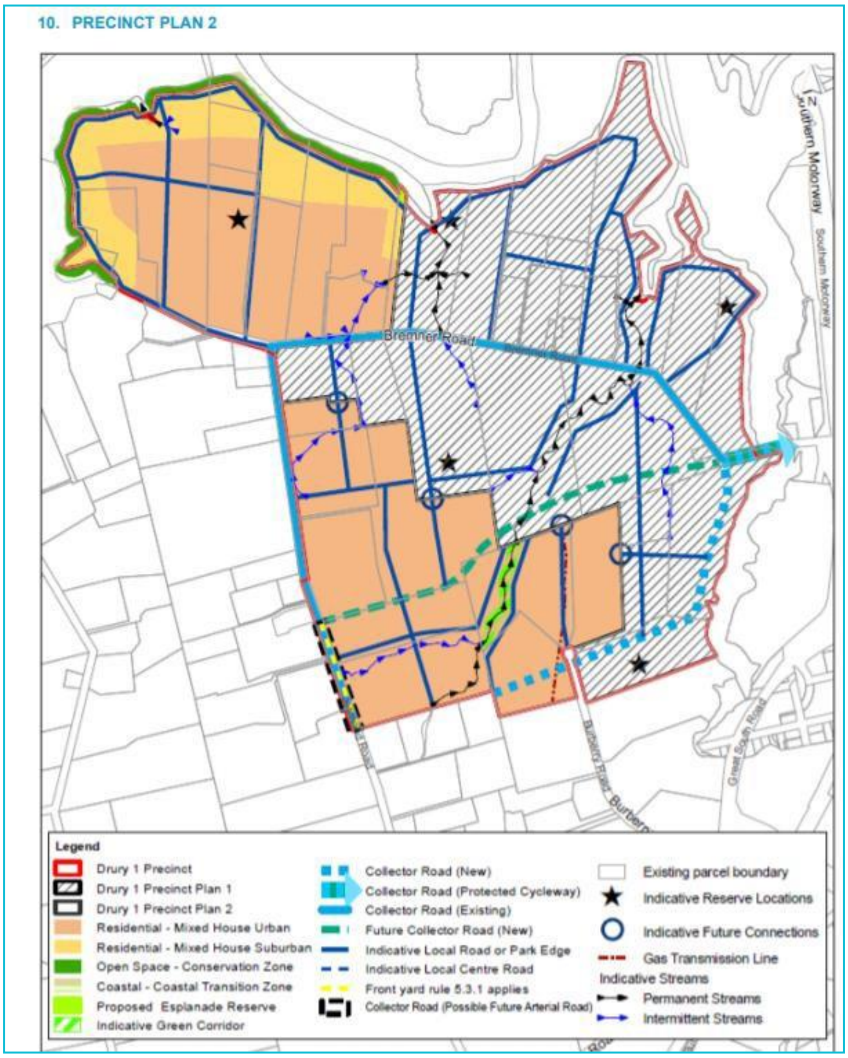


Figure 3-7 Plan Change 51 (Sourced from PC51 ITA Report)

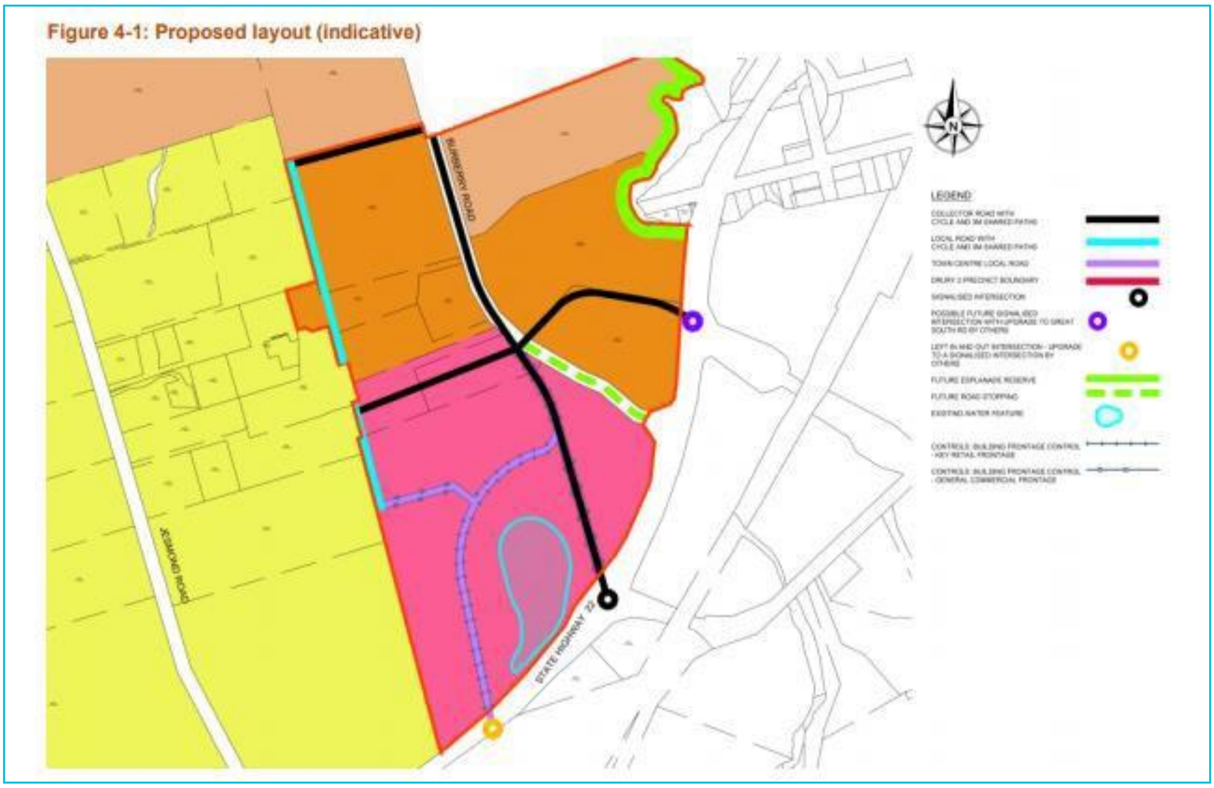


Figure 3-8 Plan Change 61 (Waipupuke) – Sourced from PC61 ITA Report

4 Movement and Access Assessments

This chapter considers likely traffic demands for Drury East and Drury West and key access requirements. The requirements and timing for PT, walking and cycling facilities were primarily derived from the Staging Principles. The traffic generation estimates used here are net, after assuming quite significant changes in traditional mode share.

4.1 Drury East

4.1.1 Trip Generation

For the purposes of this assessment, Drury East is defined as the area contained in MSM zones 554 and 555. These two zones cover the extent of the three plan changes for Drury East, but also includes a portion of future urban zone immediately north of Waihoehoe Road.

Detailed assumptions on development roll-out and the estimated vehicle trip generation for Drury East are contained in **Appendix A** and summarised in the following Figures. The figures also include estimates from the regional growth forecasts (Scenario I11.5). The Plan Change documents indicate total employment of some 6,000, which has been used here for comparison with the regional forecasts (with pro-rata from the floor area growth for interim years).

It can be seen that the total number of dwellings is some 18% higher than the regional forecasts, and with a faster/earlier growth rate. The total employment is however substantially higher than the regional forecasts[8].

The estimates of traffic generation, even after substantial assumptions of mode shift, indicate a very significant scale of demand, at nearly 65,000 vehicle movements per day. To put this in context, SH1 just north of Drury had 62,000 vpd in 2018. It is noted that these trip generation estimates are for future occupiers of the urban growth, and do not include construction-related traffic.

[8] It is possible that the Plan Change estimates use a different definition of jobs than the regional forecasts (e.g. employee counts versus full-time equivalents). The modelling check undertaken for this study used the estimated floor areas, rather than predicted employees.

Figure 4-1 Drury East Build Out Assumptions

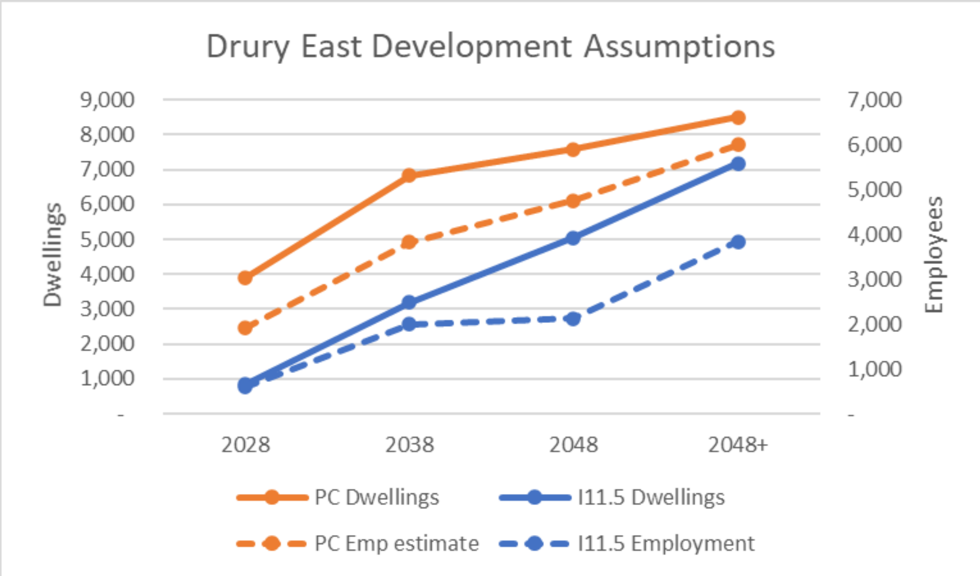
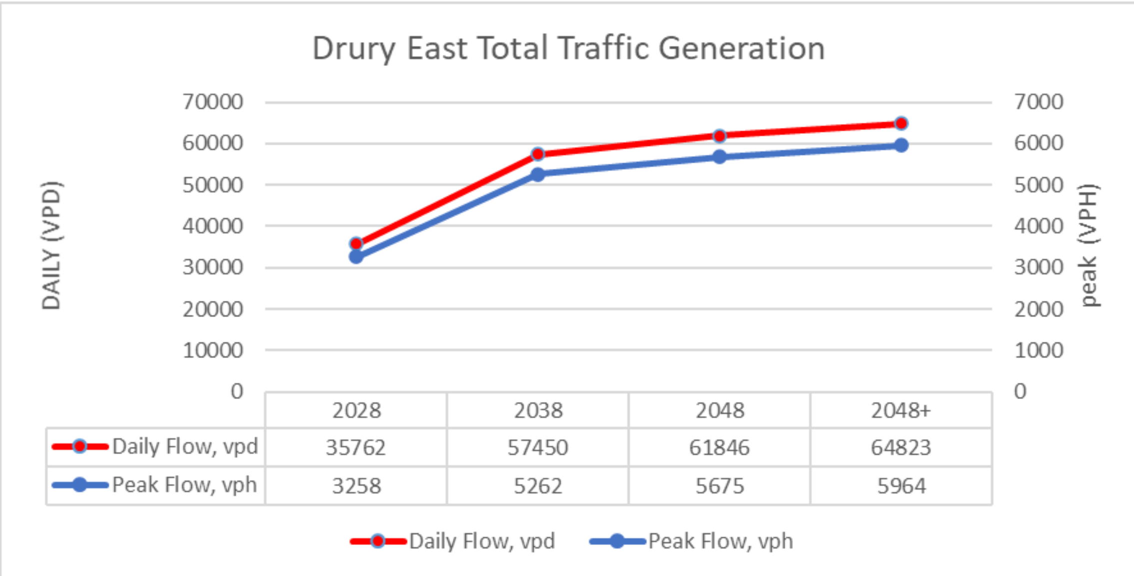


Figure 4-2 Drury East Vehicle Trip Generation Estimates



	2028	2038	2048	2048+
Daily Flow, vpd	35762	57450	61846	64823
Peak Flow, vph	3258	5262	5675	5964

4.1.2 Drury East Access

Drury East access is constrained by the SH1 and rail corridors and the undeveloped rural Opaheke area to the north. It is currently accessed only by two roads, being Waihoehoe Road to the west (into Drury Village), and Ramarama Road to the south (which can then connect to Quarry Road or south on Maketu Road).

The Drury East Plan Change documents indicate a number of potential new access points (**Figure 4-3**), including:

1. An access to SH1 at the Drury South interchange (it is understood that current options considered for this link involve a direct ramp into the site from the existing southbound off-ramp)
2. A new link over SH1 to the west to connect to Pitt Road
3. A new link from Brookfield Road to Quarry Road

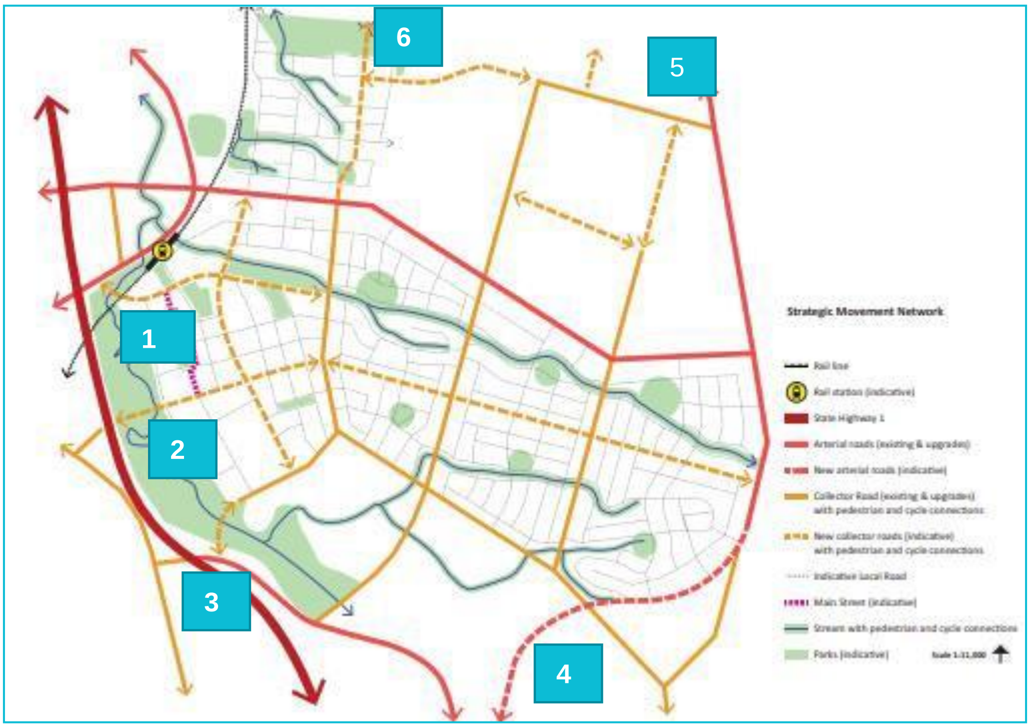
4. A new connection to SH1 via the proposed Mill Road corridor and the associated Drury South interchange
5. A new connection north to Papakura via the proposed Mill Road corridor
6. A new connection north to Opaheke via the proposed Opaheke North South arterial

Although shown in the Movement Map, the Plan Change assessments suggested that the Drury ramp, Pitt Road and Brookfield connections were not required for development. This assessment has however considered the case for additional connections, particularly due to uncertainty around strategic projects like Mill Road.

The Mill Road project would provide additional access north to Papakura and also south to SH1 (and then further south or north on SH1). The SGA work indicates that the Opaheke North-South arterial is likely to be a longer-term project dependent on full development of the Drury East and Opaheke areas. The Pitt Road connection appears useful in providing an access to/from the west, however, is considered less likely to be the preferred connection to the west given it would involve an extensive new structure spanning SH1.

The Brookfield-Quarry Link would provide a similar access to the west, (and the additional route to access SH1 at Drury via Quarry Road, Gt South Road and SH22), which would relieve traffic flows on Waihoehoe Road and allow easier east-west movement via routes that don't have motorway interchanges. The feasibility of that connection would however need to be confirmed, due to its crossing of the Hingaia stream.

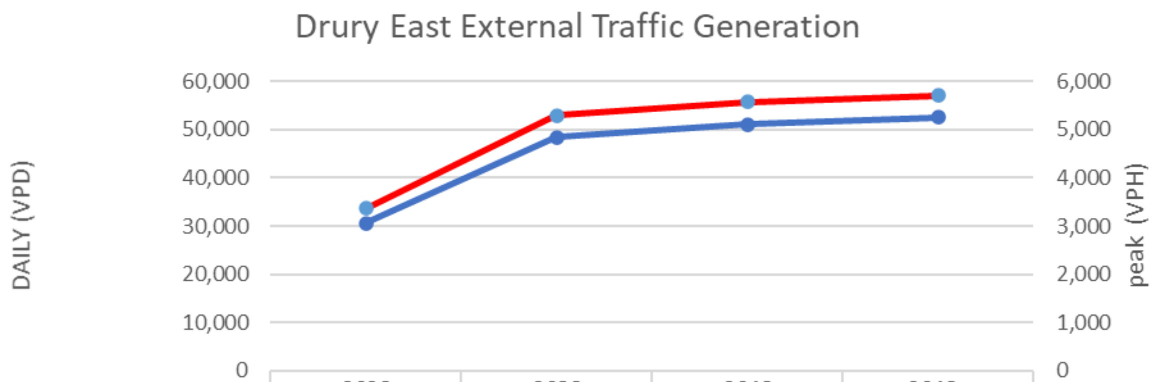
Figure 4-3 Drury East Access Links (Background map sourced from plan change documents)



Given the uncertainty of the timing of strategic links such as Mill Road, model tests were undertaken with and without the southern elements of Mill Road. Given the additional uncertainty of the scale and timing of growth, these were simple model tests, assuming the same travel demand patterns. While removing a key strategic link such as Mill Road would be expected to alter the distribution of trips, these tests have focussed on total trips entering/leaving the site. As such, the distribution of trips beyond the key access points is considered less critical.

The total daily and peak hourly traffic flow entering/leaving Drury East are indicated in **Figure 4-4** (note this differs from Figure 4-2 above as it excludes trips remaining within Drury East). This indicates some 33,600 movements per day accessing this area in 2028, rising to 57,000 movements per day at full build out. This 'external' trip generation only relates to generation from activities within Drury East, however the network to which it is applied will also include through traffic from other adjacent areas.

Figure 4-4 Drury East External Traffic



	2028	2038	2048	2048+
Ext Daily Flow, vpd	33,616	52,854	55,661	57,044
Ext Peak Flow, vph	3,063	4,841	5,107	5,248

The need for new access points has been identified by using estimates of maximum 'desirable' daily flows on the access points. These daily flows are used in preference to hourly delays as they are considered less sensitive to specific intersection or network design assumptions, and also more representative of the business periods outside commuter peaks[9].

Waihoehoe Road west has a current daily traffic flow of some 4,500 vehicles per day, which is expected to increase with the live-zoned growth occurring from Drury South. This road is planned as a key FTN route and a critical walk-cycle access from Gt South Road into both the Drury East area and the rail station. As such, a desirable daily flow of less than 15,000-18,000 vpd is considered suitable. The SGA planning proposes Waihoehoe Road to ultimately be a 4-lane corridor, however the intention is to retain 2 lanes for traffic, with the additional lanes for bus priority on this important FTN corridor.

Ramarama Road is the southern access to this area, with existing flows estimated at closer to some 2,000 vpd. As a rural collector road, a desirable maximum daily flow would be less than some 8,000 vpd, rising higher to maybe 10,000 vpd as an urban road. However, only a relatively small proportion of the Drury East traffic is expected to head south via Ramarama Road. This proportion would vary depending on what links are in the wider network, however 20% is assumed for this assessment.

[9] As noted in the Staging Principles, congestion in commuter peaks is considered generally less important than during interpeak periods (and in fact, some levels of congestion are useful to drive consideration of other modes)

Hence, Waihoehoe Road is estimated to have ‘spare’ capacity for maybe 10,000 vpd from Drury East (depending on the background growth from Drury South), while Ramarama Road could maybe take some 5,000 vpd. Therefore, the existing access points are considered only able to absorb up to 15,000 vpd from Drury East development. It is clearly apparent that the 33,000 vpd movements accessing the site by 2028 cannot be accommodated on the existing two access points.

It should be noted that these roads would need to be upgraded to urban roads to support growth in this area, so this assessment applies to the upgraded roads, not the existing, rural roads.

Selected traffic model flows are extracted for a cordon around the site indicated in **Figure 4-5**, with daily flows shown in **Table 4-1**.

Figure 4-5 Traffic Flows and Cordon for Drury East

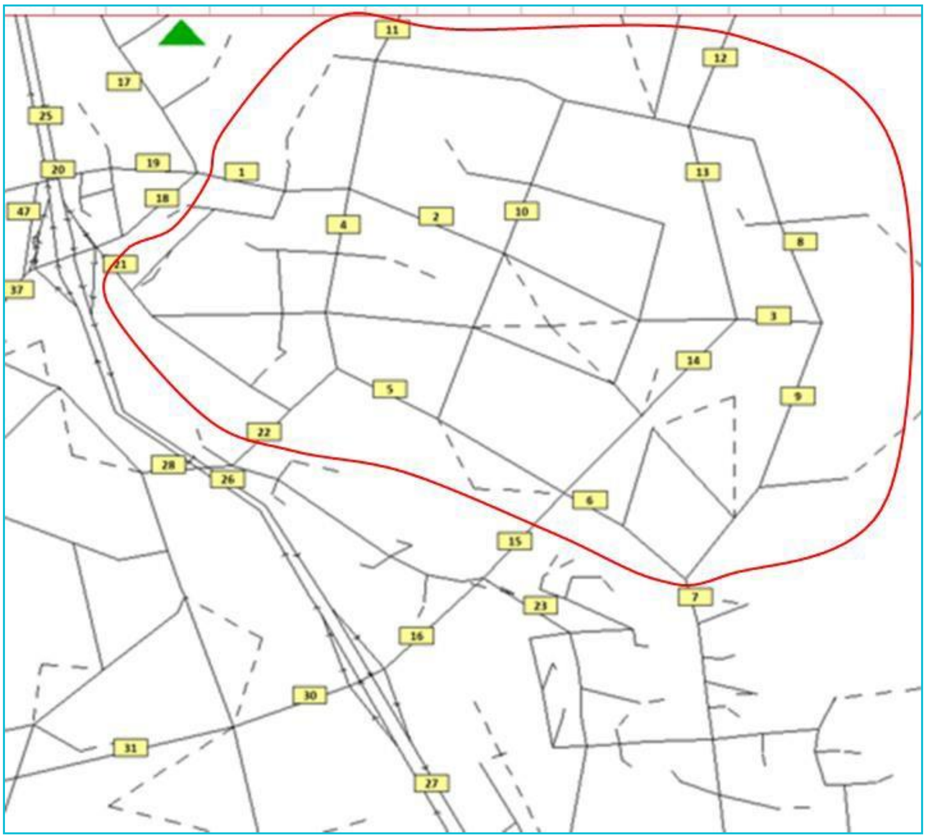


Table 4-1 Estimated Daily Traffic Flows

ID	Connection	2028				2038		2048+	
		Scenario A	Scenario B	Scenario C	Scenario D	Scenario A	Scenario B	Scenario A	Scenario D
		All Mill Rd	Only Drury South I/C	No Mill Rd	No Mill Rd + access links	All Mill Rd	All Mill rd + access links	All Mill Rd	All Mill rd + access links
1	Waihoehoe Road West	20,200	24,200	27,700	19,600	22,800	17,100	24,000	17,900
21	Drury I/C Access	-	-	-	7,600	-	6,000	-	5,300
22	Brookfield-Quarry Link	-	-	-	8,000	-	11,400	-	15,300
15	Mill rd Fitzgerald-Maketu	20,800	11,000	8,600	5,100	36,100	28,800	40,000	31,800
7	Ramarama Road	4,000	3,200	3,400	4,100	7,300	7,400	8,400	8,400
12	Mill Road North of Waihoehoe	21,800	-	-	-	28,500	25,100	36,100	33,200
11	Opaheke North-South Arterial	-	-	-	-	7,800	11,800	12,600	17,200
	Total Cordon	66,800	38,400	39,700	44,400	102,500	107,600	121,100	129,100
	Drury East External Traffic	33,600	33,600	33,600	33,600	52,900	52,900	57,000	57,000
	Other (through) traffic	33,200	4,800	6,100	10,800	49,600	54,700	64,100	72,100
17	Gt South Road	17,500	25,700	26,800	25,400	19,600	17,900	22,900	21,500
25	SH1	106,800	117,800	116,000	117,600	128,600	129,300	144,200	144,400

This analysis indicated:

2028 Models:

- Without Mill Road or the additional access links (Scenario C), resulted in flows on Waihoehoe Road west of 27,700 vpd which would significantly exceed the desired flow. The flow towards the south (Ramarama Road and the link road between Fitzgerald and Maketu Road) indicated a combined flow of 11,500 vpd, which also exceeds the desired flow on Ramarama Road
- Adding the two Additional Access links[10] (Scenario D) takes significant flow off Waihoehoe Road west, bringing it close to (but still exceeding) its desired level. Similarly, the flows likely on Ramarama Road (assuming Link 15 is not built), are 8,500, which near the desired maximum level
- With parts of Mill Road (scenarios A and B), but without the additional access links also shows flows on Waihoehoe Road significantly in excess of the desired level, but those on Ramarama Road (link 7 only) would be below the desired maximum
- The Brookfield-Quarry Link is estimated to have some 11,400 vpd, which is likley to exceed the desired maximum flow for a collector road
- This suggests that additional access links are required to relieve traffic on Waihoehoe Road, even with Mill Road in place
- It can also be seen that the flows on Gt South Road also increase without Mill Road, to levels that would be undesirable for its intended FTN function

2038 Models:

- These scenarios include both Mill Road and the Opaheke North South Arterial, which affects widernetwork flows, noting these are only modelling assumptions as neither project has committed funding.
- Even with Mill Road and the Opaheke North-south arterial, the flows on Waihoehoe Road west exceed the desired maximum if the additional Access Links are not provided
- The Brookfield-Quarry link serves some 8,500 vpd, and the Direct Drury Interchange access is estimated to serve some 7,800 vpd, reducing flows on Waihoehoe Road to desired levels
- This again suggests the Additional Access links are required to relieve traffic on Waihoehoe Road, even with Mill Road and the Opaheke North-South arterial in place
- Without the Opaheke arterial, the flows on Waihoehoe Road and Gt South Road would be expected to be higher than shown in these models

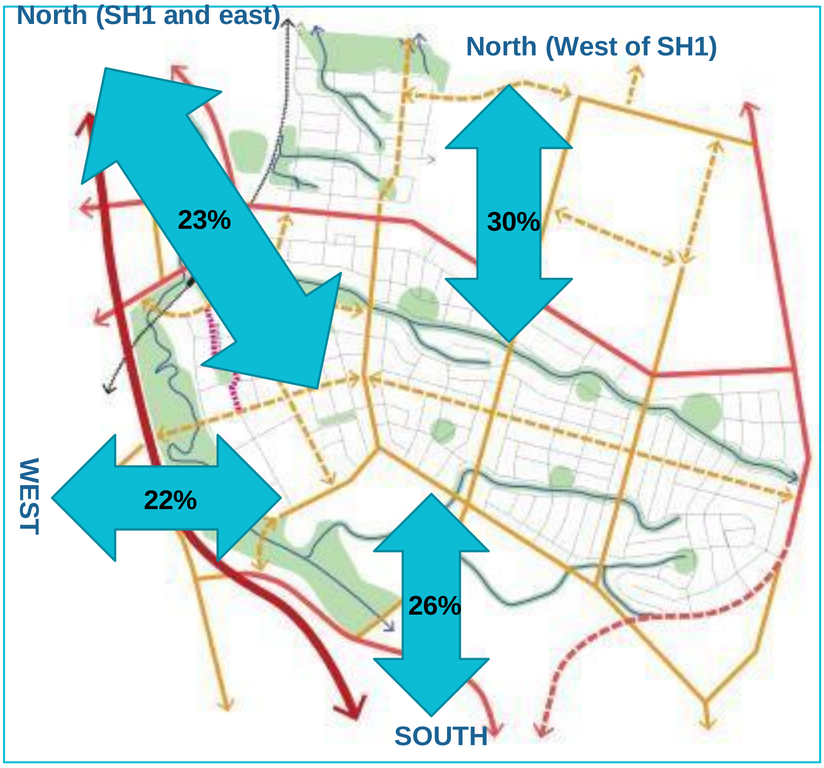
[10] This refers to both the Brookfield-Quarry Link and the Drury Interchange ramp

2048+ Models

- Again, the Additional Access links are required to bring Waihoehoe West to more desirable levels (this is consistent both short and long term)
- The Brookfield-Quarry Link is the most effective access, carrying nearly 3 times more traffic than the Drury Interchange access
- The Brookfield-Quarry Link is estimated to have some 15,400 vpd, which is likely to exceed the desired maximum flow for a collector road. This flow could be even higher if the direct Drury Interchange link was not in place

To further explore the need for access links, the potential distribution of site traffic was extracted from the models. This reduces the issues with the modelled flows on any link to a great extent depending on the assumed land use and network assumptions made for that scenario. This distribution of daily vehicle trips was estimated from the models and summarised in **Figure 4-6**. It is noted that these proportions are indicative only and would change somewhat with different network assumptions. However, the broad pattern is considered suitable for this analysis. These distributions were then applied to the total external trips estimated for Drury East, as indicated in **Table 4-2**.

Figure 4-6 Estimated General Distribution of Vehicle Trips[11]



[11] Background map sourced from Plan Change documents

Table 4-2 Estimated Distribution of Drury East Traffic Movements

Year	2028	2038	2048	2048+
Daily External Traffic Movement	33,600	52,900	55,700	57,000
North/East	9,900	15,600	16,400	16,800
North/West	7,700	12,200	12,800	13,100
South	8,600	13,600	14,300	14,600
West	7,300	11,500	12,100	12,400

As noted above, the ‘spare’ capacity on Waihoehoe Road access is estimated at some 10,000 vpd, with spare capacity on southern Ramarama Road access of some 5,000 vpd. This analysis does not directly consider through traffic on the key access roads, which will vary depending on what new access links are provided. However, this data indicates that for the full development of Drury East:

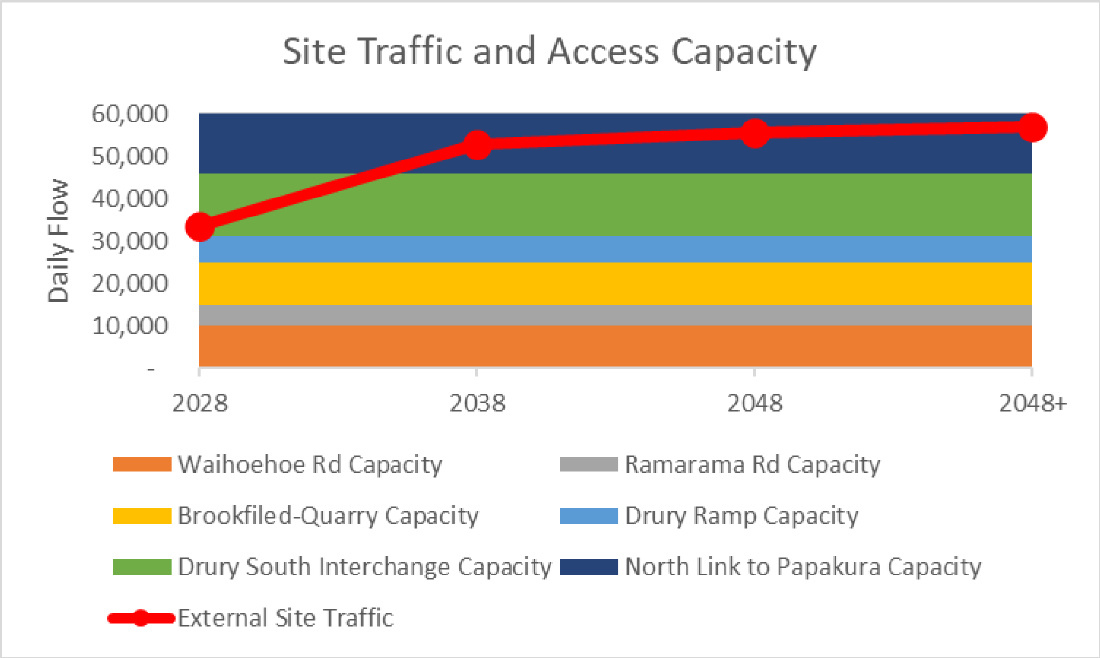
- A new access to the west is required, such as the Brookfield-Quarry Link
- An additional access to SH1 is required for travel south and north on SH1, such as the Drury South Interchange and access roads
- An additional connection is needed north to Papakura to reduce traffic on Waihoehoe Road, SH1 and Gt South Road

To demonstrate this outcome, the ‘available’ capacity on key link roads were estimated to identify the total access points required:

- Waihoehoe Road was estimated at some **10,000 vpd**, based on background/through traffic of some 8,000 vpd and a desirable maximum of 18,000 vpd
- Ramarama Road was estimated at **5,000 vpd**, based on background/through traffic of some 4,000 vpd and a desirable maximum of 10,000 vpd once urbanised
- The Brookfield-Quarry Link was estimated at up to **10,000 vpd**, for an urbanised route, andassuming upgrades to the receiving Gt South Road
- The direct Drury Interchange ramp was estimated to offer some **7,000 vpd**. This flow could vary depending on the design and how it connects into the local network within Drury East
- The SH1 Drury South access was estimated to offer some **15,000 vpd.** This value is indicative as it depends on whether the northern part of Mill Road is in place, and hence how much regional through traffic would be on the link. However, SH1 north would remain a key constraint on traffic that could be accommodated from Drury East via the Drury South interchange
- A northern link to Papakura was estimated to offer some **15,000 vpd.** This value is also indicative as it depends on which link is provided (Mill Road or the Opaheke North-South arterial), and hence how much regional through traffic would be on the link.

The cumulative access capacity and total (external) site generation is indicated in **Figure 4-7** below. It should be noted that this is indicative, as the traffic flows and ‘available’ capacity are dependent on which links are in place and wider-network assumptions. However, it confirms that multiple new connections are required to service the full development of Drury East, including new links to the west, south (SH1) and north.

Figure 4-7 Estimated Drury East External Traffic and Available Access Capacity



Overall, this analysis confirms that:

- Multiple additional Access points are needed to serve the full build-out of Drury East:
- The Brookfield-Quarry Road is needed to relieve traffic flows on Waihoehoe Road, even with Mill Road in place. This level of traffic may in fact be too high for a collector road and the models indicate potential through traffic on this route. This suggests that careful network design and traffic calming measures could be required to avoid this route having too much traffic
- An additional connection to SH1 (such as via the Drury South Interchange) is needed to reduce flows on Waihoehoe Road, as well as on the Brookfield-Quarry Link
- An additional connection north to Papakura is needed to allow full build out
- A number of these new access links would be needed by 2028 to accommodate the estimated level of initial development

4.2 Drury West

For the purposes of this assessment, Drury West is the area contained in MSM zones 561 and 562, north of SH22. These two zones cover the extent of the three plan changes for Drury west, as well as some future urban areas. Growth areas south of SH22 do not have specific plan changes for them, so relied on the regional growth forecasts.

4.2.1 Trip Generation

Detailed assumptions on development roll-out and the estimated vehicle trip generation for Drury West is contained in **Appendix A** and summarised in the following figures. The figures also include estimates from the regional growth forecasts (Scenario I11.5). The Plan Change documents provided indications of total business yield for the areas north of SH22, which allowed a comparison against regional land forecasts.

It can be seen that the total number of dwellings is some 9% higher than the regional forecasts, and an earlier/faster start to the growth. The estimated number of employees is also higher than regional forecasts, by about 26%[12]. It can be seen that the total estimated traffic generation reaches some 46,500 movements per day. For context, SH22 had some 20,000-24,000 vpd on this section of highway[13].

Figure 4-8 Drury West Land Use Assumptions (all FUZ areas north of SH22)

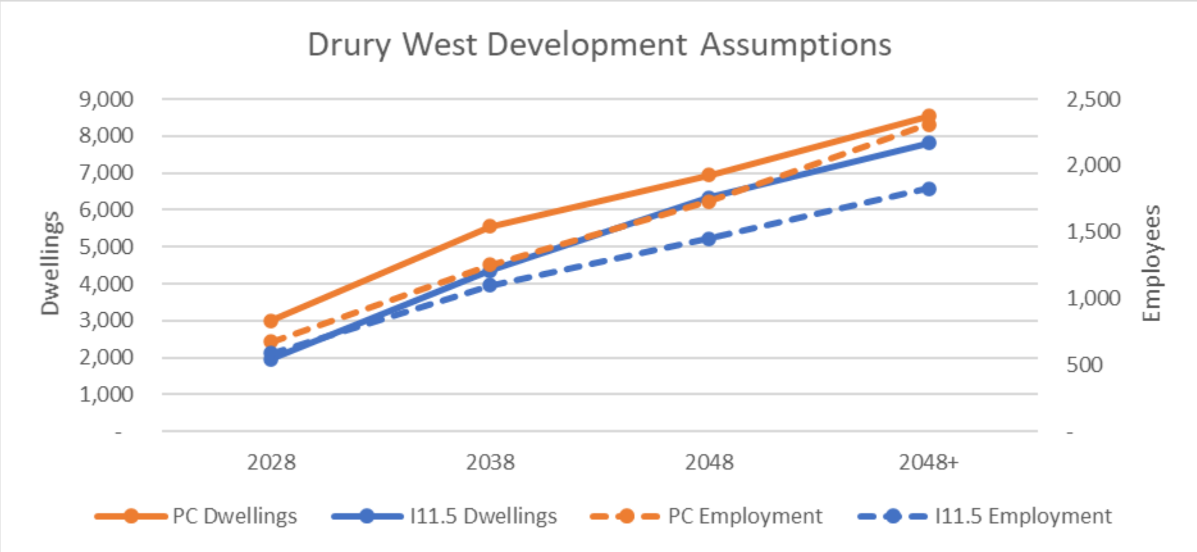
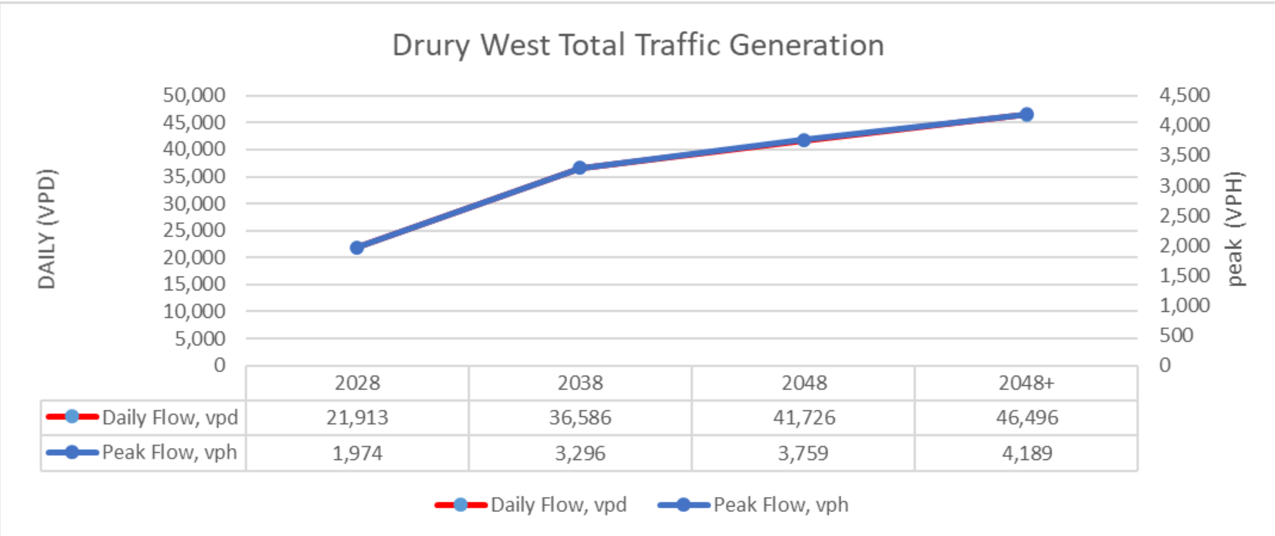


Figure 4-9 Drury West Total Vehicle Generation



4.3 Access

The access to Drury West is either south onto SH22, or east via Bremner Road, over SH1 to Gt South Road (see **Figure 4-10**).

[12] It is possible that the Plan Change estimates use a different definition of jobs than the regional forecasts (e.g. employee counts versus full-time equivalents). The modelling check undertaken for this study used the estimated floor areas, rather than predicted employees.

[13] Source: Waipupuke and Auranga transport Plan Change assessments

Bremner Road crosses over SH1 and connects to Gt South Road via either Firth Street or Norrie Road (which is constrained by a single-lane bridge). The SGA recommended network proposes Bremner Road to become an arterial road with a critical FTN function, which includes a new connection directly west to Jesmond Road and an upgraded route through the Drury industrial area to replace the Norrie Road bridge. The long-term proposal for this corridor involves 4 lanes, with 2 indicated for general traffic and two for bus or high-priority vehicles.

SH22 is a high-speed, rural road, with traffic flows of some 24,000 vpd. These flows are somewhat influenced by conditions on the nearby SH1, with some traffic from Paerata and west diverting north to the Hingaia Road access when congestion extents south of Papakura. This level of traffic flow is considered to be at or approaching the maximum flows than could be accommodated on this kind of road. The high volumes and speeds are such that the existing priority (Giveway) controlled roads connecting to SH22 are already considered potential crash risks. Any release of new growth areas north of SH22 are therefore considered essential to have controlled intersections (roundabouts, signals or restricted right turns), along with a lowered speed environment. The urbanisation adjacent to SH22 (initially to the north then also on the south), will require this section of SH22 to change in form to better suit this new environment. This is expected to include lower speed environment, segregated walk/cycle facilities, controlled pedestrian crossings and suitable kerb/channel and street facilities to improve the place function and environment for walk and cycle modes. This route will however also maintain its State Highway status and related movement and freight function, until the Pukekohe Expressway is available.

Figure 4-10 Key Access points to Drury West

Traffic count data from the Waipupuke Plan Change documents are shown in **Figure 4-11** below, which show directional hourly traffic flows of some 1,050 vph in the morning peak and nearly 1,400 vph in the evening peak. These flows are considered at or approaching the maximum capacity of such roads. This was checked by investigating SH16 east of Kumeu, which is a similar road environment but with regular queueing indicating it is at capacity. That analysis indicated that the rural form of road and key intersections resulted in maximum directional hourly flows of some 1,350 vph.

Figure 4-11 Traffic Counts on SH22 (Source: Waipupuke Traffic Assessment)

Figure 4-1: Traffic profile for westbound traffic on SH22

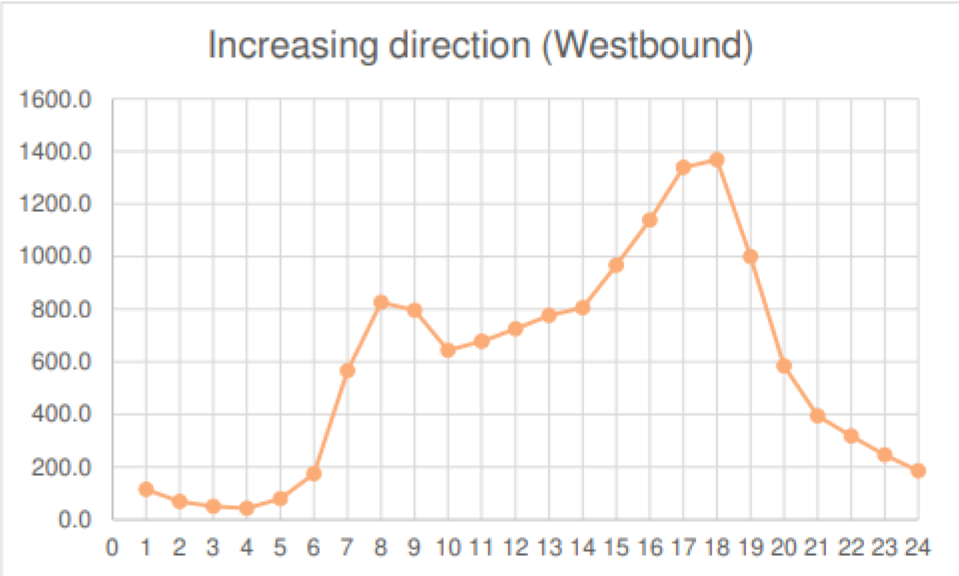
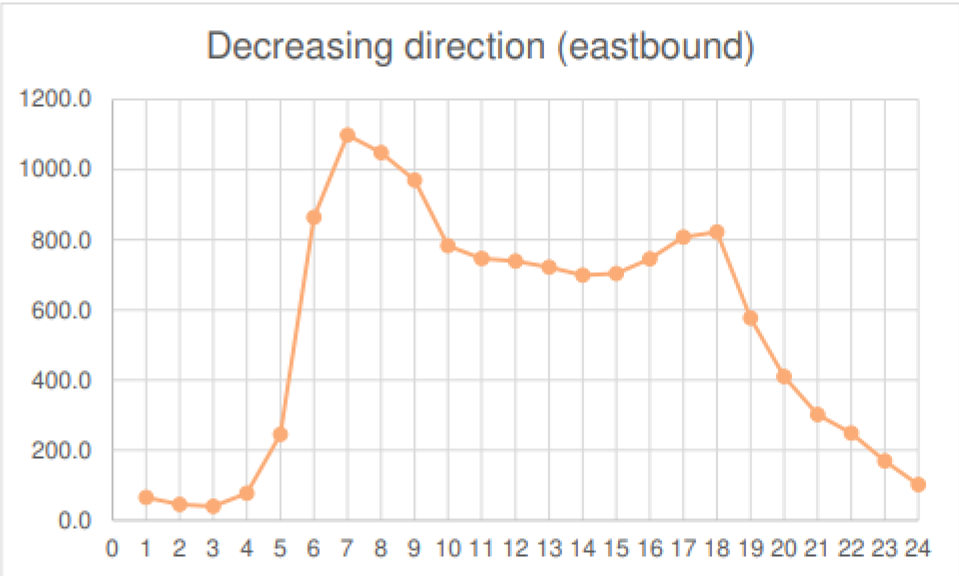


Figure 4-2: Traffic profile for Eastbound traffic on SH22



It is likely that the major intersections on SH16 contribute to this constrained capacity, due to the interruptions from turning and merging traffic. This suggests that while controlled intersections would be required to safely accommodate the expected traffic from Drury West, those intersections themselves are likely to reduce the throughput of SH22 below its current levels. Additional lanes on SH22 are therefore considered necessary to mitigate the additional access traffic, whilst maintaining the strategic function of the highway.

The specific location, form and timing of intersections with SH22 will remain to be agreed between developers and Waka Kotahi, however the following are indicated from the plan change documents:

- Oira Road – full controlled intersection, likely multi-lane roundabout
- Jesmond Road – full controlled, either roundabout or signals

- Town centre access (east of Jesmond Road) – likely to be controlled left-in/out movements only
- Realigned Burberry Road to near McPherson Road – controlled intersection suitable for walk/cycle crossing (it is noted that long-term with 4-tracking of the rail line, the height and width restrictions of the McPherson Road underpass mean it is likely to close to traffic
- Burberry Road – to be closed
- Gt South Road – full controlled, either signals or roundabout
- Victoria Street – no specific plans in Plan Changes, however the Papakura to Drury NZUP project has recently identified the need to install signals at this location for that project. The DIFF modelling indicated this road could attract high volumes of through traffic under some conditions on the wider network. As such, some traffic calming measures on Victoria Street may be needed to be considered if through traffic creates safety issues for the activities on Victoria Street

Model flows in Drury West are presented in **Table 4-3**, for the locations identified in **Figure 4-12**.

Figure 4-12 Location of Selected Model Flows in Drury West

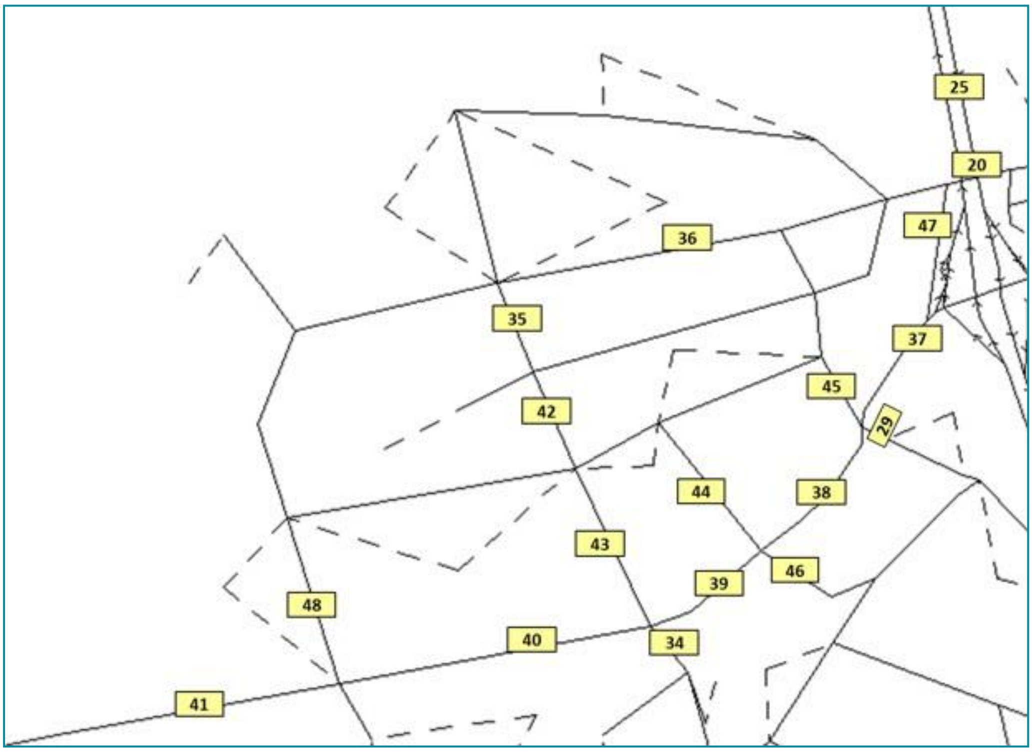


Table 4-3 Selected Daily Flows in Drury West

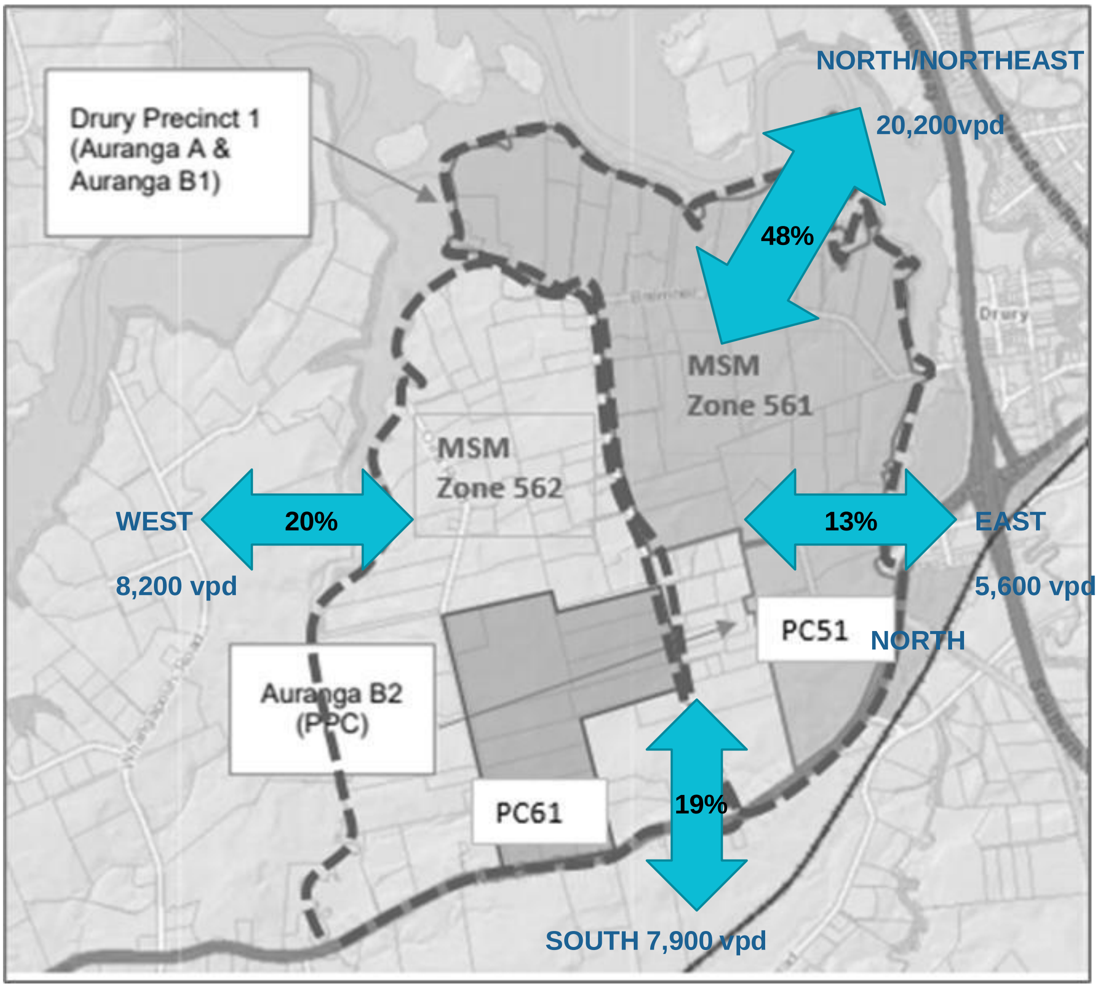
ID	Connection	2028				2038		2048+	
		Scenario A All Mill Rd	Scenario B Only Drury South I/C	Scenario C No Mill Rd	Scenario D No Mill Rd + access links	Scenario A All Mill Rd	Scenario B All Mill rd + access links	Scenario A All Mill Rd	Scenario D All Mill rd + access links
37	SH22	27,500	27,200	28,600	26,200	17,700	12,900	23,600	17,900
38	SH22	26,500	25,400	24,900	24,900	15,300	13,400	18,400	17,800
40	SH22	23,400	22,100	21,400	21,500	14,700	13,200	18,000	17,400
41	SH22	23,800	22,500	21,800	21,900	14,400	13,100	16,800	16,600
29	Great South Road	5,300	5,700	9,300	10,800	6,300	6,800	11,600	10,000
48	Oira Road	800	900	900	900	1,600	1,600	2,900	2,900
43	Jesmond Road	5,400	5,400	5,700	5,800	8,900	8,900	11,700	11,400
44	NewNSRoad	-	-	-	-	1,200	700	2,000	2,000
47	Victoria Street	3,000	2,700	2,900	3,300	4,300	4,400	3,800	3,600
20	Bremner Road	10,400	10,500	10,600	11,000	15,000	15,400	17,600	17,900

This data indicates:

- That except for Gt South Road, the presence of Mill Road has little impact on the traffic flows in Drury West
- The flows on SH22 are very high in 2028, but reduce in later years (due to the assumption that Pukekohe Expressway is included in those models)
- The flows on SH22 will require a four-lane facility to be accommodated
- The model indicates potential for high flows on Victoria Street
- Flows on other roads generally remain within desirable levels

The distribution and potential quantum of traffic from Drury West are indicated in **Figure 4-13**. This demonstrates the important role of SH22 in accessing Drury West for general traffic.

Figure 4-13 Estimated General Distribution of Vehicles



5 Infrastructure Project Assessments

This Chapter provides commentary on the main corridors, followed by presentation of the recommended staging plan.

5.1 Corridor Form and Function

Figure 5-1 indicates the corridors and project elements referred to in the Staging Schedule. **Table 5-1** summarises the intended function, form, staging opportunities and interdependencies of each corridor.

Figure 5-1 Corridors and Project Numbers

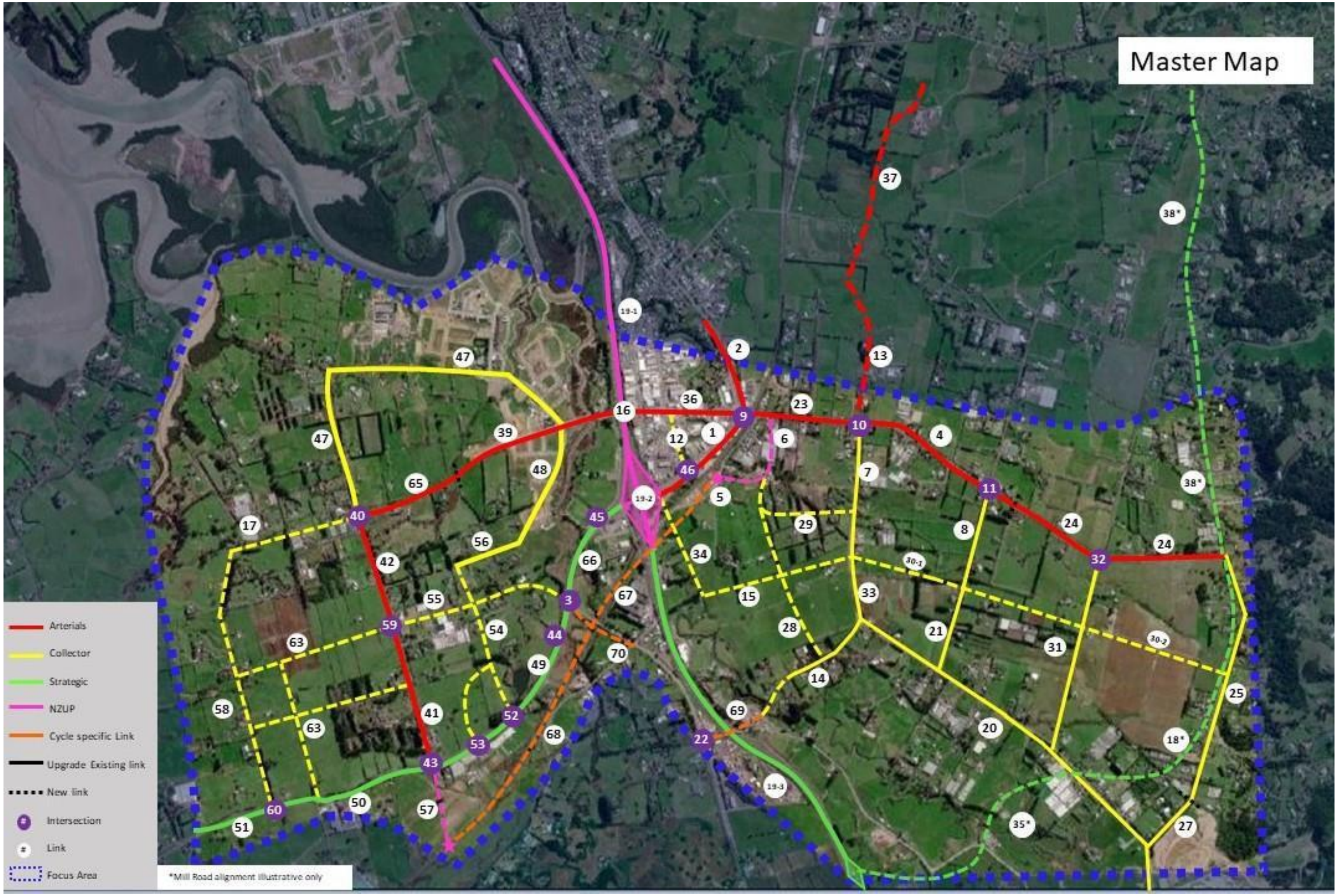


Table 5-1 Corridor Form and Function

No	Corridor	Future Function	Ultimate form[14] and staging opportunities	Inter-dependencies
Drury East				
23	Waihoehoe Road west (Gt South Road to North-South Arterial/Fitzgerald Road), including bridge replacement over the rail corridor	This is a key access link into Drury East for all modes (including to the Drury Central station), and part of the Jesmond-Bremner-Waihoehoe-Opaheke FTN	4-lane corridor with segregated walk/cycle and with widened/lengthened bridge over the rail. From an operational perspective there is some limited potential to have an interim upgrade focussed only on high-quality walk/cycle links (likely to require temporary bridges over the rail). However, the complexity of the design inter-dependencies suggests that this should be constructed directly to its ultimate form to avoid poor outcomes for the interim form, later re-work and traffic disruptions during construction. The potential need for major pavement rehabilitation and to manage concurrent traffic effects may also require the immediate formation of the ultimate form of key intersections, such as the Waihoehoe Road/Fitzgerald Road intersection.	Construction inter-dependencies with the station access road, closure of Flanagan Road, bridge lengthening for 4-tracks, vertical re-grading for sight distance, upgrade to adjacent Gt South Road intersection and urbanisation of the corridor and integration with adjacent land use development and timing and frequency of bus services. This will also be a key part of the network for managing effects during any concurrent development and road construction activities.
4, 24	Waihoehoe Road east (North-south arterial to Drury Hills Road	Arterial road linking Mill Road corridor into Drury and arterial corridor for walking/cycling movement and local bus services	2-lane urban corridor with segregated walk/cycle. The eastern extent will depend on the alignment for any Mill Road corridor. An NOR has been lodged that allows for a 24m corridor. Interim options within the existing 20m road reserve were considered, however Auckland Transport advised this would not be desirable, with direct development	Inter-dependencies include alignment of Mill Road, rate and location of development along the corridor and integration with earthworks/levels on adjacent development sites to optimise geometric profiles

[14] Note: While the proposed form of the arterial roads has been developed by SGA, the specific form of Collector and local streets will be determined between developers and Auckland Transport.

No	Corridor	Future Function	Ultimate form[14] and staging opportunities	Inter-dependencies
			of the ultimate form requested to deliver the desired urban form, transport, constructability and landform integration outcomes.	
7,33,20	Fitzgerald Road	Urban collector Road for Drury East and walk/cycle and local bus connectivity to Drury South	2-lane urban collector road with segregated walk/cycle. Staging opportunities were considered based on location of adjacent development, however urbanisation should be contiguous from the north (to provide continuous walk/cycle links to the town centre and station). Safe walk/cycle connections through to Ramarama Road would also be needed to connect to the jobs and services and residential area n Drury South	Adjacent cycle/walk networks, location of development along the corridor and earthworks on adjacent development sites to integrate and optimise geometric profiles
14	Brookfield Road (including link to Quarry Road)	Proposed as important collector access to Drury East, to provide resilience and capacity to access routes and walk/cycle and local bus routes connecting Drury East and West	2 lane urban collector road with segregated walk/cycle. Potential for initial urban upgrade on existing section of Brookfield Road, prior to construction of link across Hingaia Stream to Quarry Road	A connection to Quarry Road would likely require intersection upgrades to Quarry/Gt South and Gt South/SH22 intersections. Also dependent on adjacent cycle networks, such as on Fitzgerald Road, Quarry Road, Gt South Road and/or the SH1 Drury-to-Drury-South project's walk/cycle links
1,2	Gt South Road (north of Drury Interchange)	Regional north-south arterial, access to Drury East and FTN route	4-lane urban corridor with segregated walk/cycle. Opportunities for interim walk/cycle facilities between Firth Street and Waihoehoe Road	Form of interim works will depend on timing of Norrie Road upgrade. Also related to the timing of FTN north of Waihoehoe
37	Opaheke North-South Arterial	New arterial connection between Drury and Papakura with FTN function	4-lane urban arterial with segregated walk/cycle. Opportunity for interim 2-lane corridor, with bus lanes added when traffic conditions demand	Timing and scale of Opaheke development, timing of Mill Road (Papakura-Drury), Fitzgerald/Waihoehoe intersection capacity and timing and frequency of bus services

No	Corridor	Future Function	Ultimate form[14] and staging opportunities	Inter-dependencies
34	Drury Interchange Ramp	Provide direct access (entry-only) from SH1 into the Drury East area, via a new ramp from the southbound off ramp	Feasible options have been identified by NZUP to include this ramp into the upgrade of Drury interchange, however, the construction of the ramp is not within the defined scope of the NZUP project. This ramp would therefore be subject to new local funding, which if available could allow construction concurrently with the NZUP project, or at a later date. With the removal of the Drury South interchange from delivery within the NZUP programme, there would be benefits in this ramp being provided early to provide alternative access into Drury East and provide construction efficiencies.	Ability to co-ordinate delivery with the NZUP Papakura-Drury project and form of connection of the ramp into the local street network within Drury East.
35	Mill Road: Drury South Interchange to Fitzgerald Road	Regional strategic arterial and access to Drury East and Drury South developments	4-lane regional arterial with segregated walk/cycle. Interim 2-lane versions and only north-facing ramps to SH1 could be potentially considered for interim access to Drury East, prior to any strategic function for Mill Road	Timing of development in Drury East, timing, form and alignment of Mill Road and Papakura-Drury South SH1 upgrade and timing of other accesses to Drury East such as Opaheke North-South arterial, Brookfield-Quarry Link, Waihoehoe Road upgrade and the Drury interchange access ramp
18	Mill Road: Maketu Road to Waihoehoe Road	Regional strategic arterial. **Note: The alignment of this section has not been confirmed**	4-lane regional arterial. Interim use of existing roads could be suitable for any interim Drury South interchange (assuming no strategic Mill Road function to the north)	Timing of development, timing, form and alignment of Mill Road and Drury South interchange and timing of other accesses to Drury East such as Opaheke North-South arterial, Brookfield-Quarry Link, Waihoehoe Road upgrade and the Drury interchange access ramp

No	Corridor	Future Function	Ultimate form[14] and staging opportunities	Inter-dependencies
31	Cosey Road: Fitzgerald Road to Waihoehoe Road	Urban collector road. Desirable this would allow quality walk/cycle function but through traffic function would be managed. **Note: This link could be replaced by Mill Road, depending on its chosen alignment**	2lane urban collector road with quality walk/cycle facilities. This should be developed contiguously and concurrently with development.	Urban development and alignment for Mill Road
38	Mill Road: Drury to Papakura	Regional arterial and access to Drury East and Opaheke	4-lane regional arterial.	Timing of development in Drury East and Opaheke, timing, form and alignment of Mill Road and timing of Opaheke north-south arterial
30	East-West Collector	Urban collector road. Desirable this would allow quality east-west walk/cycle functions but east-west traffic function would be restricted to prioritise use of arterials and create low-traffic neighbourhood	2-lane urban collector road with quality walk/cycle facilities. This should be developed contiguously and concurrently with development.	Timing of urban development, alignment of Mill Road, timing of Waihoehoe Road upgrade
8,21	Fielding Road	Urban collector road. Desirable this would allow quality walk/cycle function but through traffic function managed	2lane urban collector road with quality walk/cycle facilities. This should be developed contiguously and concurrently with development.	Urban development.
25,27	Drury Hills Road	Urban collector road.	2lane urban collector road with quality walk/cycle facilities. This should be developed contiguously and concurrently with development.	Urban development.
28	North-south town centre Boulevard	Town centre local boulevard, prioritising walk/cycle movement	2-lane boulevard	Town centre development and station access needs

No	Corridor	Future Function	Ultimate form[14] and staging opportunities	Inter-dependencies
29	East-west town centre access	Town centre local boulevard, station access to Fitzgerald Road prioritising walk/cycle movement	2-lane boulevard	Town centre development and station access needs
Drury East-West Connections				
36, 12, 46, 16	Bremner Road East	Arterial corridor for access to Drury West and FTN connecting Drury West to Drury East and Papakura	4-lane arterial with segregated walk/cycle and new Norrie Road bridge alignment. Opportunities for interim walk/cycle upgrades between east and west Drury were identified via Firth Street and Gt South Road.	SH1 bridge upgrade as part of Papakura to Drury Project, and timing and frequency of bus services
3, 22	Gt South Road (west of SH21)	Arterial connection accessing adjacent development, east-west connection and alternative access to SH1 for Drury East	2-lane arterial with segregated walk/cycle. Interim version possible with major intersection upgrades prior to development of adjacent land use	Adjacent development, Brookfield/Quarry Link, SH22 upgrades
66, 67, 68, 69 and 70	Regional Active Mode Corridor (Drury West to Drury East)	Regional walk./cycle corridor connecting Drury East to Drury West, Paerata and Pukekohe	Separated walk/cycle facilities adjacent to rail corridor. Opportunity for interim stage for section between Drury East town centre/station and Drury West development station	Rail 4-track, Drury west station, development south of SH22 in Drury West
Drury West				
45,66,3,44,49, 52,53,43,50,60	SH22: Drury Interchange to west of Oira Road	Regional state highway (until any new Pukekohe expressway corridor) and local arterial road for Drury West development, providing walk/cycle, bus and vehicle access to SH1, Drury East, Opaheke and Papakura	4-lane urban arterial with segregated walk/cycle. Opportunities for interim versions were not considered suitable east of Jesmond Road, due to geometric reasons, scale of growth, the need to mitigate new access traffic and need to improve north-south crossings. This corridor will also transition to an urban form, so it would be desirable this was implemented concurrently with adjacent urban development, rather than after the	Pukekohe Expressway Rate and location of growth north of SH22 Rate and location of growth south of SH22, especially based around the Drury West station now committed for delivery through NZUP.

No	Corridor	Future Function	Ultimate form[14] and staging opportunities	Inter-dependencies
			development had occurred. A single-stage upgrade would also remove the need for traffic impacts during construction associated with multi-staged construction. Hence it is recommended that this section east of Jesmond Road progresses directly to its 4-lane ultimate arterial form with high quality walk and cycle facilities. Opportunities for interim upgrades west of Jesmond Road were identified, including intersection treatments (Oira Road), lowered speed environment, retaining 2 traffic lanes and walk/cycle facilities only on the north side	
39,65	Bremner Road/New Bremner Road	Arterial corridor for access to Drury West and FTN connecting Drury West to Drury East and Papakura	4-lane arterial with segregated walk/cycle (2 lanes for buses) Opportunities for interim 2-lane facility	Rate and location of development and timing and frequency of bus services
41,42	Jesmond Road	Arterial corridor for access to Drury West and FTN connecting Drury West to Drury East and Papakura	4-lane arterial with segregated walk/cycle (2 lanes for buses) Opportunities for interim 2-lane facility	Rate and location of development, Drury West station timing, timing and form of SH22 upgrades and timing and frequency of bus services
58	Oira Road	Collector road	2-lane collector with quality walk/cycle facilities and local bus services.	Rate and location of development and timing and form of SH22 upgrades
63, 17	Waipupuke area internal collector roads	Collector road	2-lane collector with quality walk/cycle facilities and local bus services. Desirably these would allow quality walk/cycle function but in some locations through traffic function could be restricted to prioritise use of arterials and support low-traffic neighbourhood	Rate and location of development, timing and form of SH22 upgrades and the timing and form of connections to Jesmond Road.

No	Corridor	Future Function	Ultimate form[14] and staging opportunities	Inter-dependencies
55,54,56	Auranga/Drury west collector roads	Collector roads	2-lane collector with quality walk/cycle facilities and local bus services. Desirably these would allow quality walk/cycle function but in some locations through traffic function could be restricted to prioritise use of arterials and support low-traffic neighbourhood	Rate and location of development and timing and form of SH22 upgrades
57	Drury West Station and access	Rail station and access and longer-term arterial south to Pukekohe Expressway	4-lane arterial with segregated walk/cycle. Opportunities for 2-lane interim prior to extension south of rail corridor	Development south of SH22 and timing and form of SH22 upgrades

5.2 Recommended Staging Schedule

5.2.1 Purpose and Context

An indicative staging schedule for the Drury projects has been developed from the preceding information. The context for this assessment is important, in that:

- It is for the purpose of Council considering funding and financing options, and as such has not explicitly considered funding constraints or delivery mechanisms
- It is based on transport facilities to serve the proposed plan changes in Drury, using assumed yield and build out rates. It therefore has not considered funding, network, economic or other constraints on growth
- It is based on SGA transport planning principles and processes, and hence does not reflect committed staging agreed by Auckland Transport, Auckland Council or Waka Kotahi
- The ultimate corridor forms are based on the SGA work. Opportunities for potential interim stages remain conceptual options only, with the design, form and timing of any works meaning for agreement between developers and relevant authority (Auckland Transport or Waka Kotahi)

The Staging Schedule is therefore likely to change in response to funding methods, delivery mechanisms, land use decisions and regional investment priorities.

5.2.2 Definitions

The proposed Staging Schedule provides the following information:

- Name of project/stage
- Description of ultimate or potential interim stage
- Corridor hierarchy
- The key growth areas/Developments for which the projects are needed
- An indicative timeframe for the works being needed
- The Staging Principles used in the assessment

Developer areas for which the projects are needed are designated as follows:

- Specific plan change areas
- Cumulative Development in Drury East
- Cumulative Development in Drury West
- Cumulative Development in Drury (being both east and west)
- Opaheke FUZ
- Drury West FUZ (excludes the plan change areas)
- Cumulative growth for Southwest (being Drury, Paerata, Pukekohe)
- Cumulative growth for South Auckland (being growth south of Manukau)

These designations refer to areas for which the project is needed to provide the outcomes identified in the Staging Principles. It is noted that the need, cause or beneficiary of the works may not be equal across all areas. That complexity could be addressed through funding mechanisms.

Timing is intended to be indicative rather than being specific to any year, as follows:

- ‘2022’ refers to being needed at the outset of Plan Change development
- ‘2026’ refers to within the first 5 years of development
- ‘2031’ refers to within the first 10 years of development
- ‘2036’ refers to within the first 15 years of development
- ‘2041’ refers to within the first 20 years of development
- ‘2046’ refers to within the first 25 years of development
- Under construction

5.2.3 Staging Schedule

The Staging Schedule is provided in the **Table 5-2** and following Figures.

Table 5-2 Staging Schedule

No	Location	Project	Project Stage	Project Description	Hierarchy	Developers	Indicative Timing
1a	DE	GSR improvements - Waihoehoe Rd to Drury Interchange	Interim	**2-lane urban**- with active modes on both sides + local intersection improvements (TDM)	Arterial	Cumulative Drury	2022
1b	DE	GSR improvements - Waihoehoe Rd to Drury Interchange	Ultimate	**4-lane urban**- upgrade 2-lane urban to 4-lane with active modes on both sides, (TDM)	Arterial	Cumulative Drury	2036
2a	DE	GSR improvements - From Drury School to Waihoehoe Rd	Interim	**2-lane urban**- with active modes on both sides + intersection improvements (TDM)	Arterial	Cumulative Drury East & local developments	2026
2b	DE	GSR improvements - From Drury School to Waihoehoe Rd	Ultimate	**4-lane urban**- upgrade 2-lane urban to 4-lane with active modes on both sides, (TDM)	Arterial	Cumulative All South (Depends on Mill Rd & N-S Arterial)	2036
3	DW	Intersection upgrade on GSR/Karaka Rd intersection	Ultimate	**Ultimate intersection form**	Strategic	Drury All South + Auranga + Cumulative South West	2022
4	DE	Waihoehoe Rd East upgrades- from Fitzgerald Rd to before Cossey Rd (depending on development boundary)	Ultimate	**2-lane urban** - upgrade with active modes on both sides, 24m cross-section	Arterial	Fulton Hogan	2022
5	DE	Drury Central Station	NZUP	NZUP Delivered Rail Station	Rail	Cumulative Drury East + Auranga	2022
6	DE	Drury Station Connection	NZUP	NZUP Delivered Rail Station Access Road	Collector	Cumulative Drury East + Auranga	2022
7	DE	Fitzgerald Rd upgrades (from Waihoehoe Rd to First Stage development boundary , north of Brookefield)	Ultimate	**2-lane urban** - upgrade with active modes on both sides	Collector	Fulton Hogan + Kiwi	2022
8	DE	Fielding Rd upgrades (from Waihoehoe Rd to development boundary)	Ultimate	**2-lane urban** - upgrade with active modes on both sides	Collector	Fulton Hogan	2022
9a	DE	Upgrade in GSR/Waihoehoe intersection/Norrie Rd	Interim	**Upgrade intersection** with active mode crossings and additional approach capacity, tieing into Waihoehoe Road upgrade and bridge replacement	Arterial	Cumulative Drury East + Auranga + Station Park & Ride	2022
9b	DE	Additional Upgrade for Norrioe Apporach to tie-in to Norrie FTN Upgrade	Ultimate	**multi-lane signalised intersection** with active mode crossings, SGA design	Arterial	Cumulative Drury East	2036
10a	DE	New intersection on Waihoehoe Rd/Fitzgerald Rd(including approach cross-sections)	Interim	**Earthwork and land form for 2-lane roundabout but potential initial use as single-lane intersection** - with active mode crossings from outset	Arterial	Oyster+ Fulton Hogan	2022
10b	DE	New intersection on Waihoehoe Rd/Fitzgerald Rd(including approach cross-sections)	Ultimate	**Upgrade to ultimate form**	Arterial	Cumulative Drury East	2031
11	DE	Intersection upgrade Waihoehoe Rd/Fielding Rd/Appleby Rd	Ultimate	**Roundabout as per SGA NOR design**	Arterial	Fulton Hogan	2022
12	DE	Interim walking, cycling and bus connections to Drury Centre (includes Bremner/Norrie/Firth Intersection upgrades, active mode on Norrie) -overlap with project 36 and 46	Interim	**Intersection improvements** on Bremner-Firth Rd, Norrie-Firth Rd, GSR-Firth Rd, Active mode facilities on both sides of Firth & Norrie Rd	Collector	Fulton Hogan + Kiwi + Oyster + Auranga	2022
13a	DE	N-S Opaheke Arterial across development (upto Waihoihoi Stream)	Interim	**2-lane urban**- new 2-lane arterial with active modes on both sides + intersection improvements (TDM)	Arterial	Oyster	2022
13b	DE	N-S Opaheke Arterial across development (upto Waihoihoi Stream)	Ultimate	**4-lane urban**- upgrade 2-lane arterial with SGA design + intersection improvements (TDM)	Arterial	Cumulative Drury East + Opaheke	2046
14	DE	Upgrade Brookefield Road from Fitzgerald to Quarry Rd+ New connection + Intersections on Quarry & Fitzgerald	Ultimate	**2-lane urban** upgrade with active modes on both sides + intersection improvements + new connection to Quarry Rd)	Collector	Cumulative Drury East	2026
15	DE	New Collector road E-W from Fitzgerald Rd (collector 1) + Intersections	Ultimate	**2-lane collector**- new collector with active mode on both sides + intersection improvements (TDM)	Collector	Kiwi (progress with development staging)	2026
16a	DE/DW	2-lane bridge over Bremner/Waihoehoe Rd **(included in NZUP project 19-1)**	NZUP	**2-lane urban** with active modes on both sides (replacing existing bridge as part of SH1 P2D NZUP)	Arterial	Cumulative Drury (funded through NZUP)	2022
16b	DE/DW	4-lane bridge over Bremner/Waihoehoe Rd	NZUP	**4-lane urban**- upgrade 2-lane urban with active modes on both sides (SGA design)	Arterial	Cumulative Drury	2046
19-1	DE/DW	SH1 3-laning and cycleway upgrades from Papakura to Drury Interchange	NZUP	NZUP Delivered upgrade to SH1	Strategic	NZUP	Under Construction
19-2	DE/DW	SH1 Drury Interchange including ramps	NZUP	NZUP Delivered upgrade to Drury Interchange	Strategic	depends on NZUP P2D re-baselining scope	2022
19-3	DE/DW	SH1 3-laning and cycleway upgrades from Drury Interchange To Drury South	NZUP	Papakura-Drury South Stage 2 (prev NZUP)	Strategic	depends on NZUP P2D & Mill Rd re-baselining	2036

No	Location	Project	Project Stage	Project Description	Hierarchy	Developers	Indicative Timing
20	DE	Upgrade Fitzgerald Rd from Brookefield to Ramarama Road	Ultimate	**2-lane urban**- upgrade with active modes on both sides + intersection upgrades (TDM)	Collector	Fulton Hogan (progress with development staging) + Cumulative Drury East	2026
21	DE	Fielding Rd upgrades for active modes (from Fitzgerald Rd to development boundary)	Ultimate	**Active mode upgrades**- existing road layout with active modes on both sides + intersection upgrades for active mode crossing	Collector	Fulton Hogan (progress with development staging)	2026
22	DE/DW	Upgrade Intersection at Quarry/ GSR	Ultimate	**Upgrade intersection** (roundabout) with active modes facilities(TDM)	Collector	Cumulative East+ Drury South	2022
23	DE	Waihoehoe Rd West upgrades- between GSR & Fitzgerald Rd, including bridge replacement over rail corridor	Ultimate	**4-lane urban FTN**- upgrade with active modes on both sides, SGA design	Arterial	Cumulative Drury East and Opaheke (depends on Mill Rd & N-S Arterial & Brookefield Rd and four-tracking)	2022
24	DE	Upgrades on Waihoehoe Rd east- from project 4 to Drury Hills + Drury Hills Intersection	Ultimate	**2-lane urban** - upgrade with active modes on both sides	Arterial	Fulton Hogan (progress with development staging)	2031
25	DE	Upgrades on Drury Hills from Waihoehoe Rd to Macwhinney Dr	Ultimate	**2-lane urban**- upgrade to 2-lane urban collector with active modes on both sides	Collector	Fulton Hogan (progress with development staging)	2036
27a	DE	Active mode facilities from Drury Hills and Fitzgerald to Maketu Road	Interim	**Active mode upgrades**- active modes on both sides + intersection upgrades for active mode crossing	Collector	Cumulative Drury East (progress with development staging)	2026
27b	DE	Urban road with active mode facilities from Drury Hills and Fitzgerald to Maketu Road	Ultimate	**2-lane urban**- upgrade to urban collector with active modes on both sides + intersection upgrades	Collector	Drury East FUZ (Southeast)	2036
28	DE	New collector in N-S direction parallel to Fitzgerald Rd (Boulevard)	Ultimate	**2-lane urban** - new collector with active mode on both sides + intersection improvements (TDM)	Collector	Kiwi (progress with Town Centre development staging)	2026
29	DE	New collector in E-W direction between Flanagan & Fitzgerald Rd (collector 2)	Ultimate	**2-lane urban** - new collector with active mode on both sides + intersection improvements (TDM)	Collector	Kiwi (progress with development staging)	2026
30-1	DE	2-lane internal collector between Fitzgerald & Fielding Rd E-W direction	Ultimate	**2-lane urban** - new collector with active mode on both sides + intersection improvements (TDM)	Collector	Fulton Hogan (progress with development staging)	2022
30-2	DE	2-lane internal collector between Fielding & Drury Hills E-W direction	Ultimate	**2-lane urban** - new collector with active mode on both sides + intersection improvements (TDM)	Collector	Fulton Hogan (progress with development staging)	2031
31	DE	Upgrades on Cossey Rd between Fitzgerald & Waihoehoe Rd (Depends on Mill Rd Alignment)	Ultimate	**2-lane urban** - upgrade with active modes on both sides (**depends on Mill Road alignment**)	Collector	depends on Mill Rd alignment & timing	2031
32	DE	New Intersection on Cossey Rd/Waihoehoe Rd	Ultimate	**SGA design (depends on Mill Road design)**	Arterial	Fulton Hogan (progress with development staging)+ depends on Mill Rd	2031
33	DE	Upgrade Fitzgerald Rd from project 7 to Brookefield Rd	Ultimate	**2-lane urban**- upgrade to 2-lane urban with active modes on both sides (TDM)	Collector	Fulton Hogan + Kiwi	2022
34	DE	New Drury Interchange connection to Kiwi development	Ultimate	new direct access from SH1 into Kiwi development, potentially coordinated with reconstruction of Drury Interchange	Collector	Kiwi (depends on pace of centre development and coordination with P2D)	2026
35a	DE	Mill Road : Drury South connection from Fitzgerald/Cossey intersection to SH1 + Interchange (north facing ramps only)	Interim	**2-lane**- new road layout with active modes on both sides (depends on Mill Road design and sequencing)	Strategic	Cumulative East + Strategic	2031
35b	DE	Mill Road : Drury South connection from Fitzgerald/Cossey intersection to SH1 + Interchange (north and south ramps)	Ultimate	**4-lane**- new road layout with active modes on both sides (depends on Mill Road design and sequencing)	Strategic	Strategic	2041
36	DE/DW	Bremner-Norrie Road east of SH1 up to GSR (overlap with project 12)	Ultimate	**4-lane urban**- new road layout with active modes on both sides	Arterial	Cumulative Drury	2036
37a	DE	N-S Opaheke Arterial from Oyster development to Ponga Rd (alternative project 38)	Interim	**2-lane urban**- new road layout with active modes on both sides (TDM, depends on timing of #37)	Arterial	Cumulative Drury East and Opaheke (timing dependent on Mill Rd)	2041
37b	DE	N-S Opaheke Arterial from Oyster development to Ponga Rd (alternative project 38)	Ultimate	**4-lane urban**- upgrade 2-lane urban with active modes on both sides (SGA design)	Arterial	Cumulative Drury East and Opaheke (timing dependent on Mill Rd)	2046
38a	DE	Mill Road: From Waihoehoe Rd to Papakura (alternative project 37)	Interim	**2-lane urban**- new road layout with active modes on both sides, TDM , (depends on Mill Rd and timing of #37)	Strategic	Cumulative Drury East + Cumulative All South	2036
38b	DE	Mill Road: From Waihoehoe Rd to Papakura (alternative project 37)	Ultimate	**4-lane urban**- with active modes on both sides, TDM , (depends on Mill Rd)	Strategic	Cumulative Drury East + Cumulative All South	2046

No	Location	Project	Project Stage	Project Description	Hierarchy	Developers	Indicative Timing
18a	DE	Mill Road: From Waihoehoe Rd to Fitzgerald Road (depends on Mill Road alignment)	Interim	**2-lane urban**- new road layout with active modes on both sides, TDM, (depends on Mill Rd)	Strategic	Cumulative Drury East + Cumulative All South	2036
18b	DE	Mill Road: From Waihoehoe Rd to Fitzgerald Road (depends on Mill Road alignment)	Ultimate	**4-lane urban**- with active modes on both sides, TDM, (depends on Mill Rd)	Strategic	Cumulative Drury East + Cumulative All South	2046
39a	DW	New Bremner Rd arterial from SH1 to Auranga development	Interim	**2-lane urban**- new road layout with active modes on both sides (Under construction)	Arterial	Drury Precinct	Under Construction
39b	DW	New Bremner Rd arterial from SH1 to Auranga development	Ultimate	**4-lane urban FTN**- upgrade 2-lane urban with active modes on both sides (TDM)	Arterial	Cumulative Drury	2046
40a	DW	New intersection on Jesmond/Bremner Rd	Interim	**single-lane controlled intersection** (new intersection with active mode crossings)	Arterial	Cumulative Drury West (depends on surrounding growth and timing of project 65)	2026
40b	DW	Upgrade intersection on Jesmond/Bremner Rd	Ultimate	**Ultimate lane intersection** form	Arterial	Cumulative Drury + Future Growth (depends on surrounding growth and timing of project 65)	2036
41a	DW	Jesmond Rd upgrades from SH22 to (and including) Waipupuke development boundary	Interim	**2-lane urban** - upgrade with active modes on both sides (TDM)	Arterial	Waipupuke	2022
41b	DW	Jesmond Rd from SH22 to Waipupuke development boundary	Ultimate	**4-lane urban FTN**- upgrade 2-lane urban to 4-lane with active modes on both sides, (TDM)	Arterial	Cumulative Drury West	2046
42a	DW	Jesmond Rd upgrades from project 41 to New Bremner Rd	Interim	**Interim active modes e.g. shared path on one side**	Arterial	Waipupuke	2022
42b	DW	Jesmond Rd upgrades from project 41 to New Bremner Rd	Ultimate	**2-lane urban- upgrade existing road with active mode facility on both sides (TDM)**	Arterial	Drury West FUZ	2031
42c	DW	Jesmond Rd upgrades from project 41 to New Bremner Rd	Ultimate	**4-lane urban FTN**- upgrade 2-lane urban to 4-lane with active modes on both sides, (TDM)	Arterial	Cumulative Drury	2046
43a	DW	Intersection upgrade on SH22 Rd/Jesmond Rd	Interim	**2-lane Roundabout** (active mode crossings) via NZUP Station access	Strategic	Cumulative Drury West + Station	2022
43b	DW	Intersection upgrade on SH22 Rd/Jesmond Rd	Ultimate	**Ultimate intersection form (for fully urbanised corridor)**	Strategic	Cumulative Drury West + subject to SH22 improvements and station timings	2031
44	DW	Intersection at SH22/Burberry Rd (likely to close entirely)	Ultimate	Aurunga develoment proposes intersection is closed	Strategic	Auranga B1	2022
45	DW	Upgrade intersection at SH22/Victoria Rd	Interim	Signals to be installed as part of Papakura-Drury Project	Strategic	Auranga B1	Under Construction
46	DW	Upgrades in GSR/Firth Rd intersection (overlap with project 12)	Interim	Possible signals for actve mode crossings, depending on Statuion Access signals	Arterial	Fulton Hogan + Kiwi + Oyster + Auranga	2022
47	DW	Old Bremner Road Upgrade from Jesmond Road to Auranga Precinct	Ultimate	**2-lane urban**- new road layout with active modes on both sides (Under construction)	Collector	Auranga	Under Construction
17	DW	Jesmond Road to Oira Road Collector	Ultimate	**2-lane urban**- new road layout with active modes on both sides	Collector	Drury West FUZ	2036
48	DW	Collector road south of New Bremner/ Old Bremner intersection	Ultimate	**2-lane urban**- new road layout with active modes on both sides (Under construction)	Collector	Auranga	Under Construction
49	DW	SH22 improvements from GSR Intersection to Jesmond Rd	Ultimate	**4-lane urban**- upgrade 2-lane urban to 4-lane with active modes on both sides	Strategic	Waipupuke + Auranga + Drury West FUZ + Cumulative South/West	2022
50a	DW	SH22 improvements from Jesmond Rd to Oira Rd- active mode upgrades	Interim	**2-lane urban** - upgrade with active modes and urban frontage on north side only	Strategic	Waipupuke	2022
50b	DW	SH22 improvements from Jesmond Rd to Oira Rd	Ultimate	**4-lane urban**- upgrade 2-lane urban to 4-lane with active modes and urban frontage on both sides	Strategic	Drury West FUZ + Cumulative South/West	2031
51	DW	SH22 improvements from Oira Rd to Oira Creek - subject to design, could be incorporated with project 60	Interim	Upgrade road layout to future urban boundary + active modes and urban frontage on both sides	Strategic	Drury West FUZ + Cumulative South/West	2036
52	DW	Intersection upgrade- on SH22/ McPherson Rd/Karaka Rd (Auranga B1)	Ultimate	**Ultimate intersection form (note that McPherson bridge under rail likley to close to vehicles with rail 4-track)**	Strategic	Auranga	2022
53	DW	New intersection east of Jesmond Rd (Auranga B1 main street)	Ultimate	**Ultimate intersection form (left-in left-out)**	Strategic	Auranga	2022
54	DW	New N-S collectors internal to Auranga B1 (2 links)+ Intersections	Ultimate	**2-lane urban**- new collector with active mode on both sides + intersection improvements (TDM)	Collector	Auranga B2 (depends on pace of development)	2022

No	Location	Project	Project Stage	Project Description	Hierarchy	Developers	Indicative Timing
55	DW	New E-W collector to Jesmond Rd	Ultimate	**2-lane urban** - new collector with active mode on both sides + intersection improvements (TDM)	Collector	Drury West FUZ	2031
56	DW	Burberry Rd north connection to Auranga Precinct	Ultimate	**2-lane urban** - new collector with active mode on both sides + intersection improvements (TDM)	Collector	Auranga	Under Construction
57	DW	Drury West Station + New access road	NZUP	**2-lane urban** road layout with active modes on both sides for access to station	Arterial	Cumulative Drury West	2026
58	DW	Oira Rd upgrades from SH22 to Waipupuke development boundary	Ultimate	**2-lane urban** - upgrade with active modes on both sides + intersection improvements (TDM)	Collector	Waipupuke	2022
59	DW	New Intersection on Jesmond Rd/collector (PC61)	Ultimate	**2/4-lane intersection** (new intersection + active mode crossings)	Arterial	Waipupuke	2022
60a	DW	SH22 Intersection upgrade - Oira Rd (3 leg)	Interim	**Interim Roundabout**	Strategic	Waipupuke	2022
60b	DW	SH22 Intersection upgrade - Oira Rd (4 leg)	Ultimate	**Ultimate intersection form**	Strategic	Drury West FUZ	2036
63	DW	New collectors internal to Waipupuke PC61 (3 links)+ Intersections	Ultimate	**2-lane urban** - new collector with active mode on both sides + intersection improvements (TDM)	Collector	Waipupuke	2022
65a	DW	New Bremner Rd arterial from Auranga development to Jesmond Rd	Interim	**2-lane urban** - new road layout with active modes on both sides (TDM)	Arterial	Cumulative Drury West	2036
65b	DW	New Bremner Rd arterial from Auranga development to Jesmond Rd	Ultimate	**4-lane urban FTN** - upgrade 2-lane urban to 4-lane with active modes on both sides, (TDM)	Arterial	Cumulative Drury	2046
66	DW	SH22 improvements - west of SH1 interchange to GSR	Ultimate	**4-lane urban** - upgrade 2-lane urban to 4-lane with active modes on both sides, (TDM)	Strategic	Waipupuke + Auranga + Drury West FUZ + Cumulative South/West	2022
67	DW/DE	Active mode corridor from Drury East Town Centre to GSR	Ultimate	Segregated active-modes corridor beside rail corridor	Strategic	Cumulative Drury + Cumulative South-West	2026
68	DW	Active mode corridor from GSR to Drury West Town Centre/ Station	Ultimate	Segregated active-modes corridor beside rail corridor	Strategic	Cumulative Drury + Cumulative South-West	2031
69	DW/DE	Quarry Road walking cycling bridge	Interim	Active-modes facility over SH1	Collector	Cumulative Drury	2026
70	DW/DE	GSR Road walking cycling bridge	Interim	Active-modes facility over Rail corridor	Arterial	Cumulative Drury	2026

Figure 5-2 Stage 1 Projects

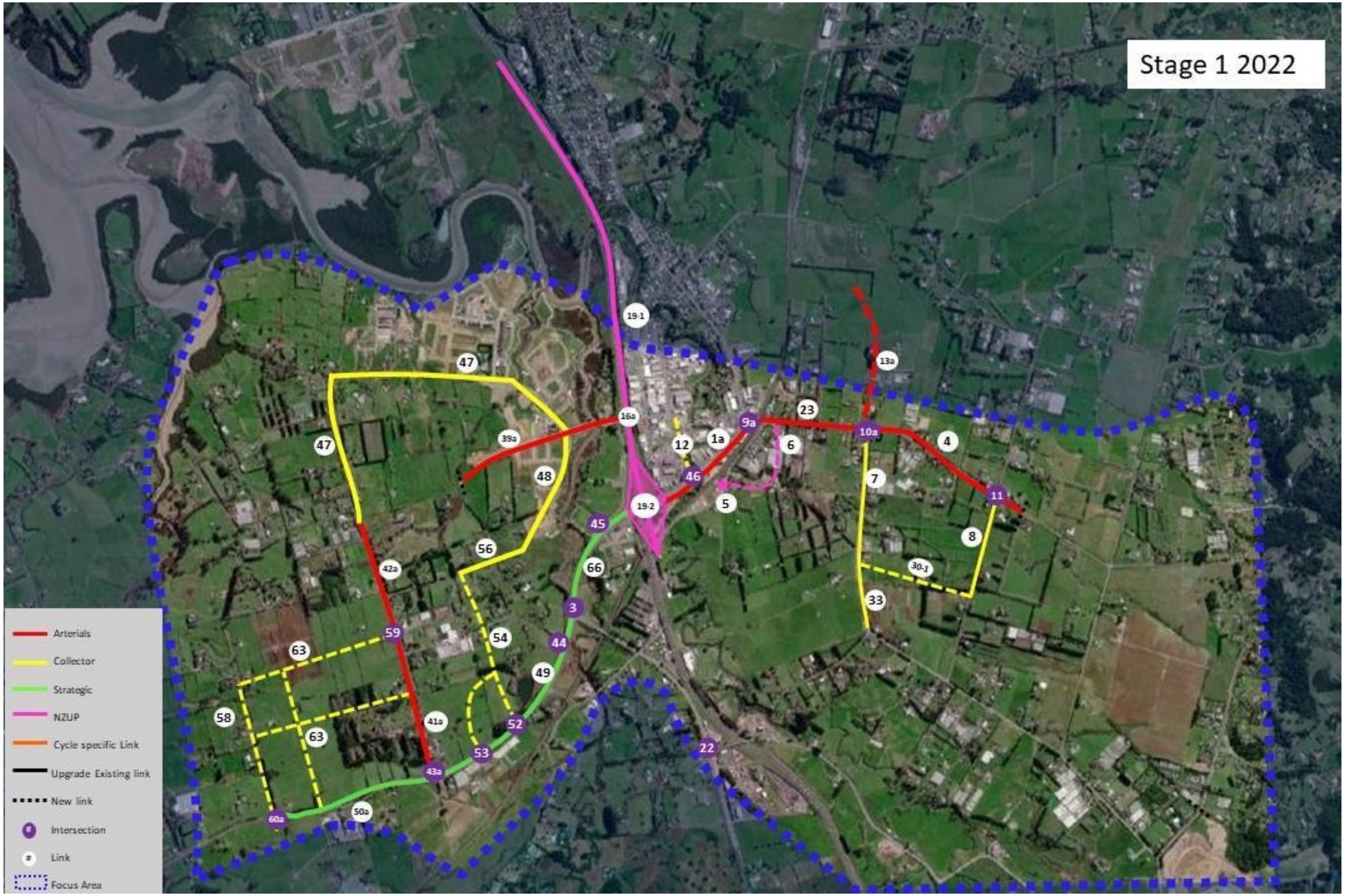


Figure 5-3 Stage 2 Projects

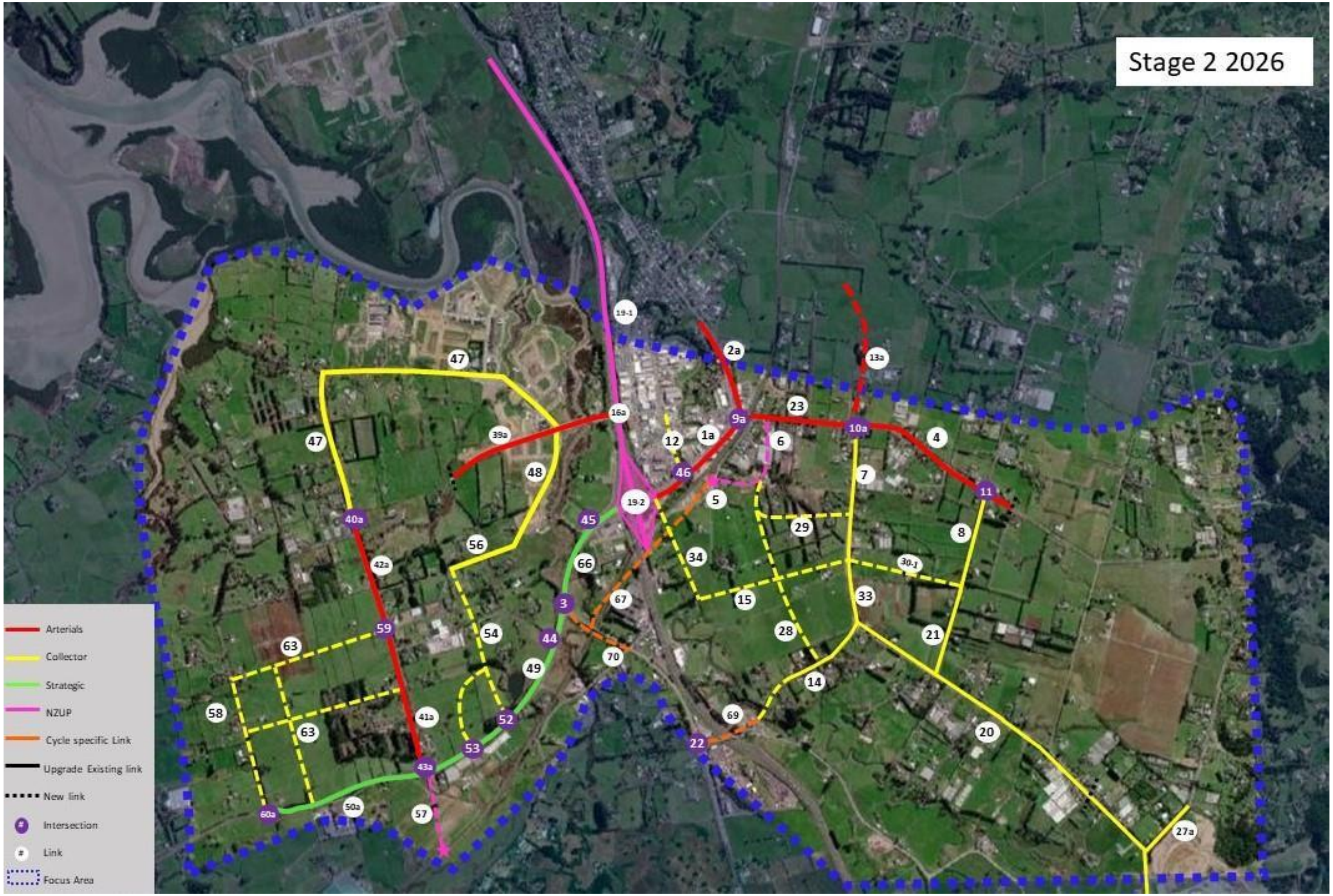


Figure 5-4 Stage 3 Projects

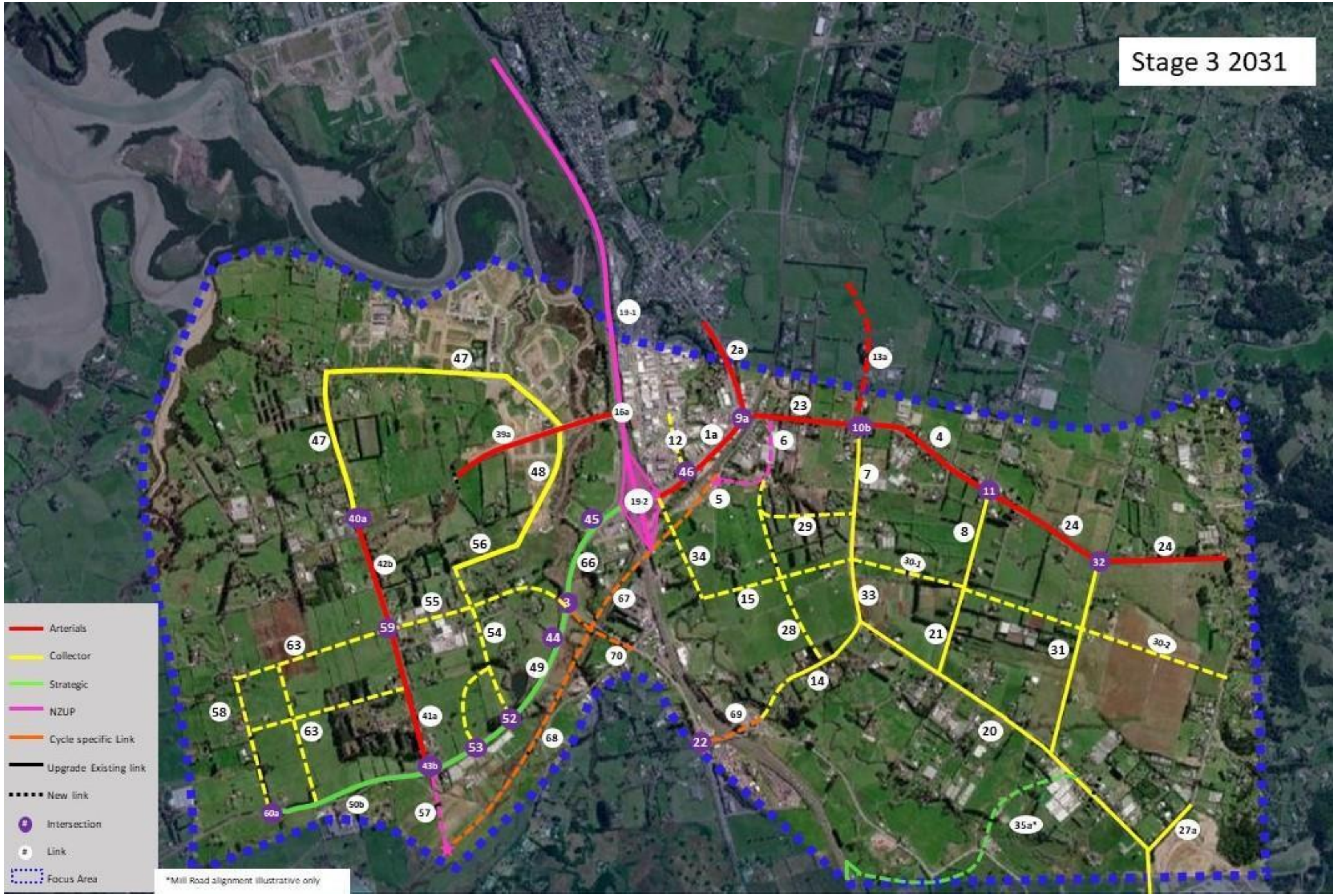


Figure 5-5 Stage 4 Projects

Figure 5-6 Stage 5 Projects

Figure 5-7 Stage 6 Projects

6 Conclusions

This assessment has identified a potential transport infrastructure Staging Schedule to support the plan changes in Drury. This has been developed with awareness of the uncertainties inherent in the timing of both the roll out of the development and the timing of major transport infrastructure. This assessment is to assist Council to consider funding and financing options, and as such has relied on inputs and assumptions that are subject to change. The Staging Schedule therefore is a technical assessment to inform subsequent decision making and should not be viewed as a committed programme of projects for delivery.

In reviewing this Schedule, the purpose, scope, and approach to the work should be kept in mind. Key conclusions of this work include:

- Both the Drury East and Drury West areas constitute a significant scale or urban growth
- That Drury growth is itself only a sub-set of the total growth planned and expected in the southern parts of Auckland
- This scale of growth requires an extensive network of new or upgraded transport infrastructure, both to the immediate growth area and the surrounding receiving environment
- The long-term arterial and strategic network to support this growth has been identified through the SGA IBC and is being further developed through SGA detailed business cases. Some opportunities for the staged implementation of those corridors has been identified in this assessment, however the feasibility, design and timing of any such interim upgrades will remain to be agreed directly with the appropriate road controlling authority
- It is not feasible to fully isolate the projects needed to support just the Drury plan change areas from growth in the wider network, as Drury is at the key location where all north-south movements must pass, including all movements between Auckland and the rest of the country to the south. While this assessment has focussed on the projects needed for Drury, the scale or need for some of those projects are to accommodate wider growth, while there are other wider-network projects which will benefit the Drury area

Appendix A Yield and Trip Generation Review

Technical Note

Date Prepared: 16/03/2021

Prepared by: Andrew Murray, Subramanyam Uppuluri

Transport Assessment

Purpose

This note details the model test undertaken of the potential trip generation associated with the Drury East and West Plan Changes.

Document Status

Responsibility	Name
Author	Subramanyam Uppuluri
Reviewer	Andrew Murray
Approver	Andrew Murray

Revision Status

Version	Date	Reason for Issue
1	Draft for comment send to parties	1/4/21
2	Include Drury West assessment	12/5/21

Disclaimer

This is a draft document for review by specified persons at Auckland Transport and the New Zealand Transport Agency. This draft will subsequently be updated following consideration of the comments from the persons at Auckland Transport and the New Zealand Transport Agency. This document is therefore still in a draft form and is subject to change. The document should not be disclosed in response to requests under the Official Information Act 1982 or Local Government Official Information and Meetings Act 1987 without seeking legal advice.

Table of Contents

Tables (items show up here from the table 'caption' style)

Figures (items show up here from the figure 'caption' style)

Appendices

No table of contents entries found.

1 Purpose

This technical note details the traffic models developed to inform the Drury Infrastructure Funding and Finance (DIFF) study. Specifically, it updates the SGA traffic models to include refined estimates of the traffic associated with the Private Plan Changes.

This note covers:

- Drury East plan changes: PC48 (Kiwi), PC49 (Fulton Hogan) and PC50 (Oyster)
- Drury West plan changes: PC51 (Auranga B2), PC61 (Waipupuke)

The Auranga A and B1 area is live-zoned but is adjacent to the above private plan changes, so has been included in this consideration.

1.1 SGA Models

The various business cases being developed by SGA are focused on long-term route-protection of the transport facilities/corridors needed to support the identified growth. This includes a series of transport models, including:

- MSM regional multi-modal model: which estimates travel patterns based on input land use and network assumptions
- S3M area traffic model: Which assigns the MSM traffic demands via a more detailed representation of the road network

The key land use inputs to the models are:

- Land use forecasts developed by Auckland Council and the Auckland Forecasting Centre (AFC). The forecasts currently used by SGA are referred to as Scenario I11.5
- Yield estimates in the FUZ areas estimated by Auckland Council for a full build model scenario referred to as 2048+

As such, the models used by SGA reflect Council's yield estimates (including from available Structure Plans) and growth timing reflecting the Future Urban Land Supply Strategy (FULSS), as reflected in the Scenario I11.5 forecasts. The model scenarios used by SGA are regularly updated as the project options are developed.

1.2 Drury East Plan Change Models

The three private plan changes lodged with Council (PC48, PC49 and PC50) have been developed in an integrated way, based on common modelling. That modelling was undertaken some time ago, using early versions of the SGA S3M models. Key updates made to the SGA versions[15] since those IBC versions include:

- Refined zone system and road networks for use in the Drury-Opaheke Structure Plan

[15] Although referred to here as the 'SGA' versions, the SH1 model validation check was undertaken jointly with the Papakura to Drury Project (P2D) team for ongoing use by both studies.

- Explicit inclusion of vehicle trips accessing rail stations
- Updates to the various SGA projects as business cases developed
- A 'stocktake' review of the models that expanded the simulation area near Pukekohe and reviewed the model validation for the 2016 base year, specifically on the SH1 corridor

Although based on older versions of the SGA S3M models, the PPC models were updated with demands from a specific MSM model run with their proposed yields and land use forecasts to inform the ITA for the PPCs.

The modelling report for the PPCs has directly relied on the trip generation for the area estimated in MSM. The report includes a check of the implied vehicle trip rate for residential activities but has not included a first-principle assessment of the likely trip generation associated with the commercial or retail elements of the site.

1.3 Drury West Models

The Integrated Transport Assessments (ITA's_ for Waipupuke and Auranga B2 included some localised intersection assessments but have not created or used be-spoke area-wide models. They have instead relied on local data and assessments and previous Structure Plan modelling.

2 Drury East Trip Generation Review

SGA have tested the possible traffic generation from the Drury East PPCs by:

- Undertaking their own estimate of likely traffic generation for the PPC area
- Factoring the demands in the SGA S3M models to match those first-principal estimates
- Comparing traffic flows against those in the PPC models

Rather than a simple review of the PPC models, these 'test' models were developed in the SGA version of the models to take advantage of the more refined zone and network system.

The vehicle trip generation estimates developed here assume that the full suite of projects identified to support the growth areas are implemented, including the full network of walking, cycling and PT facilities and the desired land use outcomes identified in the Structure Plan. <u>These vehicle trip rate estimates will therefore not be applicable for scenarios without those land use forms or supporting networks</u>.

2.1 Spatial Area and Full-Build Yield

The three PPCs fall within two MSM model zones as follows:

- PC48 (Kiwi) and PC49 (Fulton Hogan) are both contained within MSM zone 554, and effectively comprise the whole of that zone
- PC50 (Oyster) falls within MSM zone 555, comprising approximately 1/3rd of that zone at the western end.

The MSM zone system is indicated in Figure 2-1 and the three PPCs in Figure 2. The PPC Modelling Report and associated ITAs indicate the following yields:

Table 2-1 Yields Indicated for Plan Change Areas

PPC	Dwellings	Retail GFA, m2	Commercial GFA, m2	Community GFA, m2
PC50 Oyster	1,000	•	•	•
PC49 Fulton Hogan	2,500	•	•	•
PC48 Kiwi	3,000	107,000	63,000	16,000

Figure 2-1 MSM Spatial (Zone) System

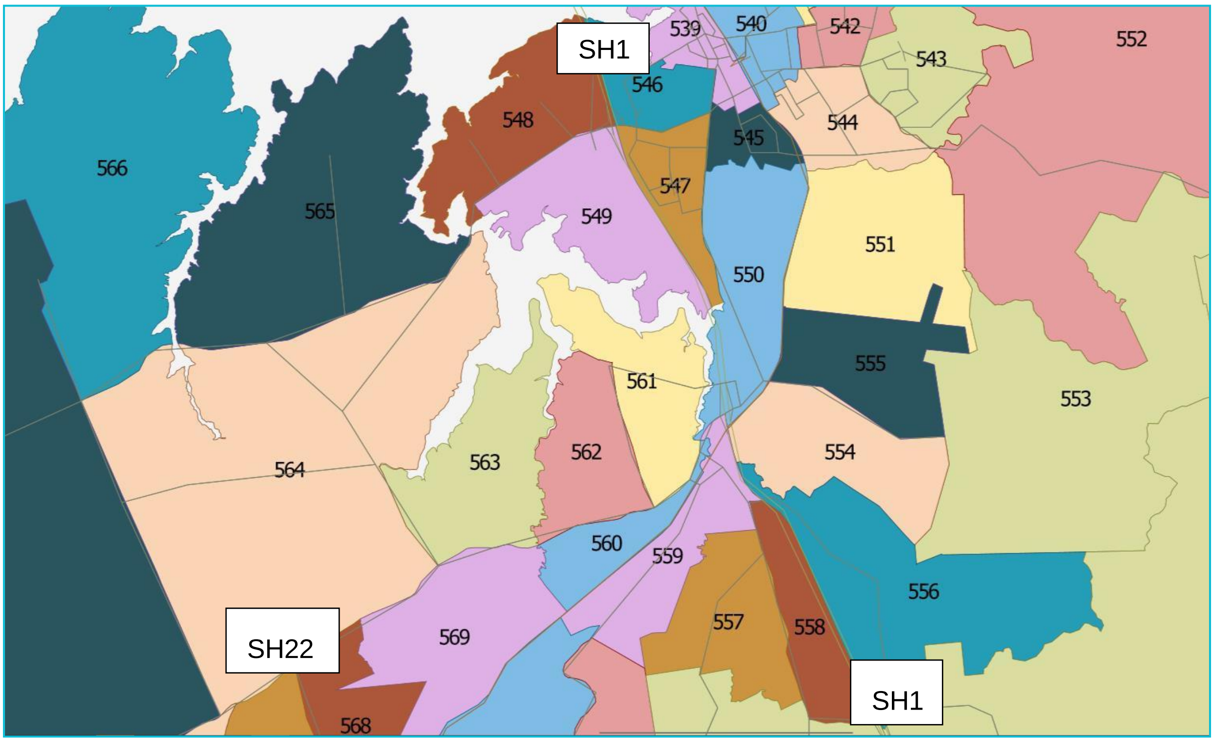
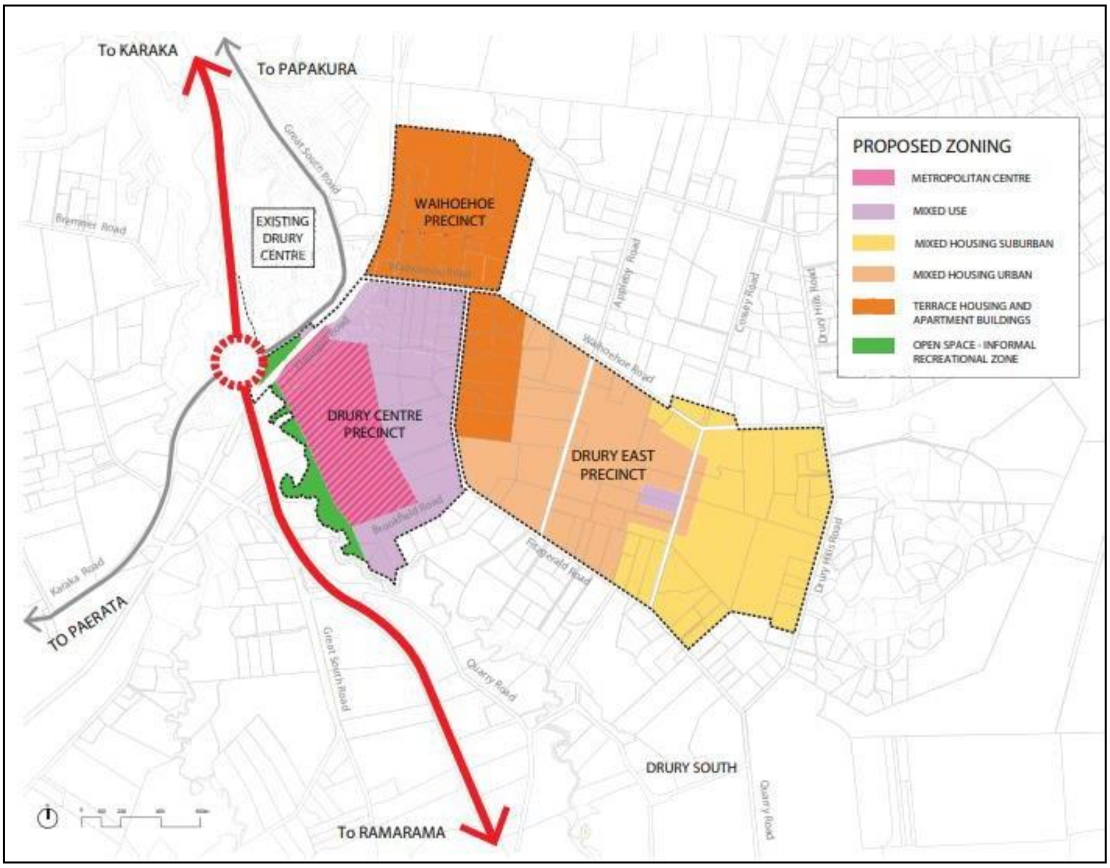


Figure 2-2 Drury East Plan Changes (Source: PC Documents)



The trip generation review has been undertaken for the complete area comprising MSM Zones 554 and 555. This therefore requires an estimate of the residential yield in MSM Zone 555 outside the Oyster Site. The Council's yield estimates for that zone are some 3,000 dwellings. With approximately 1,000 expected for the Oyster sites, 2,000 dwellings were assumed in the residual FUZ area. This assumption is considered plausible given that the Oyster site comprised approximately 1/3rd of that zone.

The trip generation estimates undertaken here are based on the detailed estimates of floor area contained in the PPCs. The regional modelling (via MSM) uses employment as the predictor for business generation, rather than floor areas. The Previous Structure Plan modelling included some 3,100 employees in the MSM Zone 554, which is noticeably larger than the 6,000[?] potential employees indicated in the PPC documents. For this test, the MSM has not been re-run with revised values, instead the traffic flow sin the S3M model have been directly factored to match the estimates.

2.2 Approach to Estimation of Trip Generation

The trip generation for Drury East area (MSM Zones 554 and 555) was estimated as follows:

- Estimate residential trip generation totals
- Estimate commercial/retail generation totals

- Apply 'pass-by' reductions to commercial/retail trips that are external to the Drury East Area (i.e. the pass-by reductions were not applied to internal trips)
- Increase the proportion of total trips expected to remain internal to the site from that estimated in MSM
- Derive target trip numbers for each zone for both total trips and external trips
- Develop factors to apply to the SGA demands to match the target trip totals

2.3 Residential Generation

Residential trip generation was estimated as follows:

7. Estimate average people per household for Low, Medium and High density dwellings
8. Apply a typical trip rate of 4.0 trips per person per day[16] to get person-trip generation estimates
9. Estimate PT/Active mode shares based on density and proximity to rail station
10. Subtract PT/Active trips to obtain estimated trip rates by vehicle
11. Apply average vehicle occupancy of 1.2 persons per vehicle to obtain daily vehicle trip rates
12. Apply percentages of the daily values to get AM (9%), interpeak (5.5%) and PM peak (9%) generation estimates

The total person trip rates and vehicle occupancies were kept constant over time, however other assumptions were varied through the modelled years as follows:

- The average people per household was reduced over time to reflect demographic trends (10% increase over 40 years was assumed)
- The PT/Active mode shares were increased over time to reflect expected increasing relative attractiveness of these modes relative to vehicle travel and completeness of the wide network.

The resulting daily person-trip rates (per dwelling) are provided in Table 2-2. Because the assumed mode shares varied by location, these are discussed further below.

Table 2-2 Estimated Daily Person Trip Rates

The potential active/PT mode shares were estimated based on density and proximity to key facilities. The S3M (yellow boxes) and MSM (red text) zone system is indicated in the following Figure 2-3. The assumed mode shares shown in Table 2-3. The mode shares were assumed to increase over time, based on the following broad assumptions:

- Low Density: 2018 Start value of 18%, increasing by 50% of that by full development (i.e. 9% point increase over 40 years)
- Medium Density: 2018 Start value of 20%, increasing by 80% of that by full development (i.e. 16% point increase over 40 years)

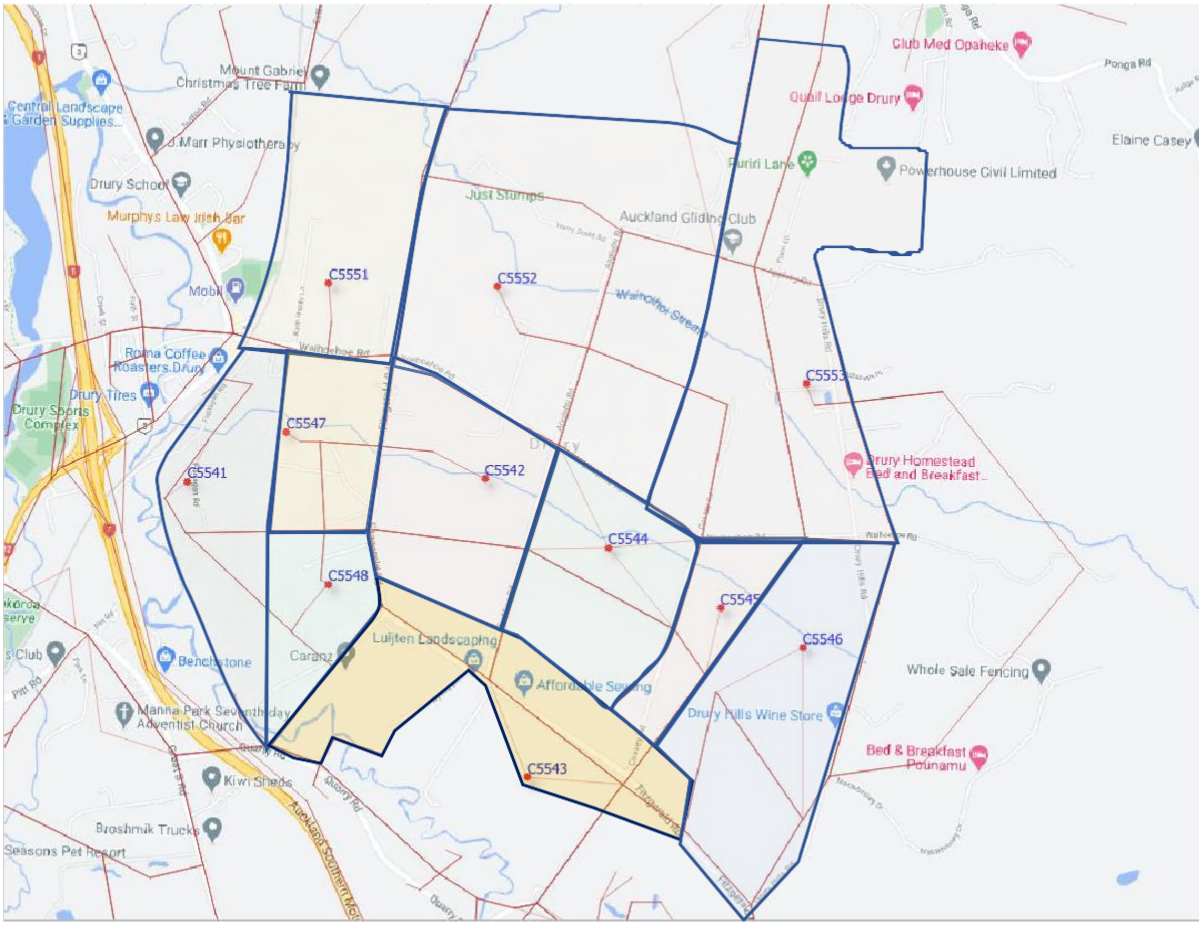
[16] This is based on typical combined rates in MSM

- High Density: 2018 Start value of 23%, increasing by 100% of that by full development (i.e. 23% point increase over 40 years)

Table 2-3 Activities Modelled for each S3M Model Zone and Assumed PT/Active mode share

MSM Model Zone	S3M Model Zone	Plan Change	Activity assumed (for modelling)	2028	2038	2048	2048+
554	5541	PC48 Kiwi	Retail/Commercial	See below for business trip generation			
	5547	PC48 Kiwi	High density residential	28.8%	34.5%	40.3%	46.0%
	5548	PC48 Kiwi	High density residential	28.8%	34.5%	40.3%	46.0%
	5542	PC49 Fulton Hogan	High density residential	22.8%	28.5%	34.3%	40.0%
	5543	PC49 Fulton Hogan	Medium density residential	13.0%	17.0%	21.0%	25.0%
	5544	PC49 Fulton Hogan	Medium density residential	18.0%	22.0%	26.0%	30.0%
	5545	PC49 Fulton Hogan	Medium density residential	13.0%	17.0%	21.0%	25.0%
	5546	PC49 Fulton Hogan	Low density residential	13.3%	15.5%	17.8%	20.0%
555	5551	PC50 Oyster	High density residential	22.8%	28.5%	34.3%	40.0%
	5552	N/A (FUZ)	Medium density residential	13.0%	17.0%	21.0%	25.0%
	5553	N/A (FUZ)	Low density residential	13.3%	15.5%	17.8%	20.0%

Figure 2-3 S3M Zone System for DIFF Test



The resulting peak-hour vehicle trip rates for each zone are therefore as indicated in Table 2-4. It should be noted that the resulting trip rates are heavily influenced by the assumptions on reducing household size and increasing active/PT mode share. As noted above, these vehicle trip rates could be expected to be significantly higher if those assumptions are not borne out, which could occur if the high-density land use with high quality network of active mode and PT facilities, and local employment and services does not occur.

Table 2-4 Residential Vehicle Peak Hour Trip Rates

	2028			2038			2048			2048+		
Zone	AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
5542	0.45	0.27	0.45	0.40	0.25	0.40	0.36	0.22	0.36	0.32	0.20	0.32
5543	0.68	0.42	0.68	0.63	0.39	0.63	0.59	0.36	0.59	0.54	0.33	0.54
5544	0.64	0.39	0.64	0.59	0.36	0.59	0.55	0.34	0.55	0.51	0.31	0.51
5545	0.68	0.42	0.68	0.63	0.39	0.63	0.59	0.36	0.59	0.54	0.33	0.54
5546	0.75	0.46	0.75	0.72	0.44	0.72	0.68	0.41	0.68	0.64	0.39	0.64
5547	0.41	0.25	0.41	0.37	0.23	0.37	0.33	0.20	0.33	0.29	0.18	0.29
5548	0.41	0.25	0.41	0.37	0.23	0.37	0.33	0.20	0.33	0.29	0.18	0.29
5551	0.45	0.27	0.45	0.40	0.25	0.40	0.36	0.22	0.36	0.32	0.20	0.32
5552	0.68	0.42	0.68	0.63	0.39	0.63	0.59	0.36	0.59	0.54	0.33	0.54
5553	0.75	0.46	0.75	0.72	0.44	0.72	0.68	0.41	0.68	0.64	0.39	0.64

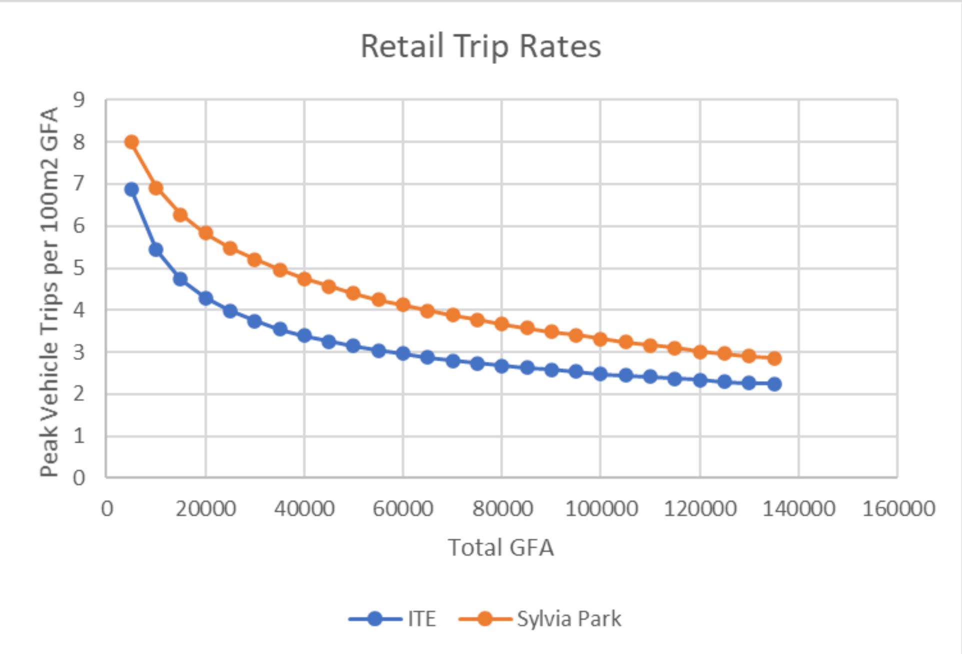
2.4 Business Trip Generation

The trip generation for the business areas were estimated as follows:

- Estimate peak-hour vehicle trip rates per 100m2 GFA from typical sources for each of the retail, commercial and community service activities
- Estimate the potential mode shift to active/PT modes for this location to derive reduced vehicle trip rates
- Apply the peak-hour trip rates to the relevant period (PM peak for retail, AM peak for Commercial and interpeak for community activities)
- Estimate trip rates for the other periods, as a percentage of the peak rates
- Apply pass-by discounts for the trips external to the site

Retail trip rates were based on data provided by Flow Transportation Ltd and used on other projects such as a plan change in Tauranga City. That data includes trip-rates from the ITE manual and also compiled from survey data from the Sylvia Park shopping Centre in Auckland. Both data are based on trip rates (per GFA) reducing as the scale of retail development increases, as shown in the Figure 2-4. The ITE data indicates rates lower than found at the Sylvia Park site. For the purposes of this analysis, rates half-way between the two data sets were adopted.

Figure 2-4 Retail Trip Rates



Peak hour vehicle trip rates for the commercial areas were assumed to be 1.8/100m2 GFA, while those for community services were assumed to be 1.0.

Mode share were then applied based on simple assumptions about potential mode share. The active/PT mode shares were assumed to grow from 0% in 2028 to 25% at full build-out (2048+).

The peak generation was then assigned to the respective model peaks and as assumed proportion applied for the other periods as indicated in the following Table 2-5. Because the starting trip rates were already vehicle trip rates, a factor for vehicle occupancy was not required.

Table 2-5 Proportion of Peak Generation

Activity Type	AM	Interpeak	PM
Retail	25%	80%	100%
Commercial	100%	30%	90%
Community	30%	100%	70%

Pass-by discounts were then applied to external trips as follows:

- Retail = 30%
- Commercial = 5%
- Community services = 40%

2.5 Combined Trip Generation

The total vehicle trip generation for the Drury East area (MSM zones 554 and 555) was therefore estimated as follows:

- Estimate the yield for each activity type/zone for each forecast year
- Combine the estimated residential and business trip generation
- Adjust the target value based on the expected level of internalisation

The build-out of the Drury East area was assumed based on the following information:

- Information provided by the Drury East developers of potential first stage of development, as indicated in the Figure 2-5
- Land use estimates for each year from Table A-1 of the PC Drury East Modelling Report

Figure 2-5 Potential Initial Stage of Development, as indicated by Drury East developers

Table 2-6 Assumed Business Build-out

Year	General Retail(sqm)	Commercial (sqm)	Community facilites(sqm)
2028	42%	20%	10%
2038	78%	50%	20%
2048	89%	70%	50%
2048+	100%	100%	100%

Table 2-7 Assumed Residential Build-out

Year	Zone 554	Zone 555
2028	36%	65%
2038	78%	85%
2048	89%	90%
2048+	100%	100%

The MSM-derived demands in the SGA models indicate some 6% of the trips generated within the two zones remain within the zone. While this could be plausible in early stages of development, it is considered potentially low for full build out. This could be influenced by the MSM having a lower number of jobs than is suggested by the plan change documents.

Although the proportion of total person trips remaining internal is expected to be relatively significant, a high proportion of those short internal trips are expected to be undertaken by active modes. Hence the proportion of vehicle trips remaining within the zone is not expected to be particularly high. To gauge a suitable value, the trip length distribution from MSM was investigated. Most internal trips within the two zones would be less than 2km, which the MSM data suggested would be about 12% of vehicle trips. Hence for full build-out, the internal and external target trip generation was modified to increase the internalisation from 6% to 12%. For modelling purposes, the rate of internalisation was assumed to be as follows:

- 6% in 2028
- 8% in 2038
- 10% in 2048
- 12% in 2048+

The target trip generation (inbound+outbound) was estimated for both total trips and external trips, as indicated in the Table 2-8.

Table 2-8 Target Trip Generation (Total Trips and Total External Trips)

			2028				2038				2048				2048+			
Plan Change Area	MSM Zone	S3M Zone	AM Trips	IP Trips	PM Trips	Daily	AM Trips	IP Trips	PM Trips	Daily	AM Trips	IP Trips	PM Trips	Daily	AM Trips	IP Trips	PM Trips	Daily
Total Trips (Includes Internal Trips and with Pass-by discounts)																		
Fulton Hogan	554	5542	57	35	57	635	113	69	113	1,256	116	71	116	1,284	115	71	115	1,282
		5543	87	53	87	966	177	108	177	1,968	188	115	188	2,083	195	119	195	2,163
		5544	82	50	82	910	167	102	167	1,850	176	107	176	1,951	182	111	182	2,019
		5545	87	53	87	966	177	108	177	1,968	188	115	188	2,083	195	119	195	2,163
		5546	257	157	257	2,854	535	327	535	5,938	579	354	579	6,425	616	376	616	6,835
		Total	**570**	**349**	**570**	**6,331**	**1,170**	**715**	**1,170**	**12,981**	**1,246**	**761**	**1,246**	**13,826**	**1,303**	**796**	**1,303**	**14,461**
Kiwi	554	5541	582	1,268	1,688	18,334	986	1,794	2,479	26,566	1,055	1,643	2,346	24,900	1,192	1,587	2,348	24,688
		5547	220	134	220	2,441	432	264	432	4,794	438	268	438	4,862	433	265	433	4,806
		5548	220	134	220	2,441	432	264	432	4,794	438	268	438	4,862	433	265	433	4,806
		Total	**1,022**	**1,537**	**2,128**	**23,217**	**1,850**	**2,322**	**3,343**	**36,155**	**1,931**	**2,178**	**3,222**	**34,624**	**2,058**	**2,116**	**3,214**	**34,300**
Oyster	555	5551	289	177	289	3,208	343	210	343	3,806	325	199	325	3,609	321	196	321	3,560
		5552	128	79	128	1,426	191	116	191	2,115	409	250	409	4,538	515	315	515	5,721
		5553	142	87	142	1,580	216	132	216	2,392	473	289	473	5,249	611	373	611	6,781
		Total	**560**	**342**	**560**	**6,214**	**749**	**458**	**749**	**8,314**	**1,207**	**738**	**1,207**	**13,396**	**1,447**	**884**	**1,447**	**16,062**
Grand Total Trips			**2,152**	**2,228**	**3,258**	**35,762**	**3,769**	**3,494**	**5,262**	**57,450**	**4,384**	**3,677**	**5,675**	**61,846**	**4,808**	**3,797**	**5,964**	**64,823**
Total External Trips (Excludes Internal Trips and with Pass-by discounts)																		
Fulton Hogan	554	5542	54	33	54	597	104	64	104	1,156	104	64	104	1,156	102	62	102	1,128
		5543	82	50	82	908	163	100	163	1,811	169	103	169	1,875	171	105	171	1,903
		5544	77	47	77	856	153	94	153	1,702	158	97	158	1,756	160	98	160	1,776
		5545	82	50	82	908	163	100	163	1,811	169	103	169	1,875	171	105	171	1,903
		5546	242	148	242	2,682	492	301	492	5,463	521	318	521	5,783	542	331	542	6,015
		Total	**536**	**328**	**536**	**5,951**	**1,076**	**658**	**1,076**	**11,942**	**1,121**	**685**	**1,121**	**12,443**	**1,147**	**701**	**1,147**	**12,726**
Kiwi	554	5541	547	1,192	1,587	17,234	908	1,650	2,281	24,441	950	1,479	2,111	22,410	1,049	1,396	2,066	21,726
		5547	207	126	207	2,295	397	243	397	4,411	394	241	394	4,376	381	233	381	4,229
		5548	207	126	207	2,295	397	243	397	4,411	394	241	394	4,376	381	233	381	4,229
		Total	**961**	**1,445**	**2,000**	**21,824**	**1,702**	**2,136**	**3,076**	**33,263**	**1,738**	**1,961**	**2,900**	**31,162**	**1,811**	**1,862**	**2,828**	**30,184**
Oyster	555	5551	272	166	272	3,015	316	193	316	3,502	293	179	293	3,248	282	172	282	3,133
		5552	121	74	121	1,340	175	107	175	1,946	368	225	368	4,084	454	277	454	5,035
		5553	134	82	134	1,485	198	121	198	2,201	426	260	426	4,725	538	329	538	5,967
		Total	**526**	**322**	**526**	**5,841**	**689**	**421**	**689**	**7,649**	**1,086**	**664**	**1,086**	**12,056**	**1,273**	**778**	**1,273**	**14,134**
Grand Total External Trips			**2,023**	**2,094**	**3,063**	**33,616**	**3,468**	**3,215**	**4,841**	**52,854**	**3,946**	**3,310**	**5,107**	**55,661**	**4,231**	**3,341**	**5,248**	**57,044**

2.5.1 Sensitivity Tests

A sensitivity test was undertaken on the vehicle trip generation by removing the future assumptions about mode share and demographic changes (that is, 2018 assumptions for people per household and active/PT mode share were retained in the future years. This implied daily residential vehicle trip rates similar to typical current values of between 5.1 (high density) and 8.1 (low density).

This indicated vehicle trip generation values are shown in Table 2-9.

Table 2-9 Total Daily Vehicle Trips in Drury East with 2018 Mode Share Assumptions

Scenario	2028	2038	2048	2048+
Base	35,800	57,400	61,800	64,800
Sensitivity test with 2018 parameters	36,100	60,800	69,000	76,800
Difference (Sensitivity Test- Base)	300	3,400	7,200	12,000
% Difference	0.8%	5.9%	11.7%	18.5%

An additional sensitivity test was undertaken using the retail trip rates assessed for the Sylvia Park shopping centre, rather than the average of those and the ITE rates. These indicate similar scale of impact as the mode share assumptions tested above.

Table 2-10 Total Daily Vehicle Trips in Drury East with 2018 Mode Share Assumptions

Scenario	2028	2038	2048	2048+
Base	35,800	57,400	61,800	64,800
Sensitivity test with Sylvia Park retail rates	38,400	61,200	67,300	76,800
Difference (Sensitivity Test- Base)	2,600	3,800	5,500	12,000
% Difference	7.3%	6.6%	8.9%	18.5%

Both tests indicate that the assumptions used for mode share, demographic trends and retail trip rates have resulted in significantly lower vehicle trip generation than would be the case with less optimistic assumptions. While the assumptions adopted here are considered plausible and suitable for the land use and transport systems proposed for those area assumed, it reinforces the fact that those assumptions are only valid if all the integrated waking, cycling, PT and land use outcomes are realised.

3 Comparison with Plan Change Models

The total trip generation from the Plan Change models provided by Stantec Ltd were compared for the same two MSM zones as shown in Table 3-1.

Table 3-1 Comparison of Total Trip Generation - DIFF Models vs Stantec Plan Change models

MSM Zone	SGA DIFF Models			Plan Change Models			Difference		
	2028	2038	2048+	2028	2038	2048+	2028	2038	2048+
AM Peak Hour									
554	1,593	3,020	3,361	1,989	3,510	3,800	-20%	-14%	-12%
555	560	749	1,447	374	575	1,299	50%	30%	11%
Total	**2,152**	**3,769**	**4,808**	**2,363**	**4,085**	**5,100**	**-9%**	**-8%**	**-6%**
PM Peak Hour									
554	2,698	4,513	4,517	2,059	3,735	4,088	31%	21%	10%
555	560	749	1,447	441	743	1,379	27%	1%	5%
Total	**3,258**	**5,262**	**5,964**	**2,500**	**4,478**	**5,467**	**30%**	**18%**	**9%**

Key points of note:

- The SGA DIFF models indicate different spatial allocation between the two MSM zones, especially in the morning peak
- The SGA DIFF models have higher trip generation in MSM Zone 555 in all peaks and all years. This is due to a higher total yield and an assumed faster build-out rate
- In the morning peak, the SGA DIFF models include slightly less potential traffic generation than the Plan Change models. The differences are small at full build-out but more pronounced in earlier years
- In the evening peak, the SGA DIFF models indicate significantly higher flows in the early years (2028), but only slightly higher at full build-out
- The differences are sensitive to key assumptions, such as mode share

Because the network detail of the models was so different, flow difference plots between the two models were not useful. Instead, predicted flows were compared at key locations on the network. Note that the differences will not just be due to the different trip generation estimates, but also due to differing assumptions about other projects in the wider network and differences in network and zonal detail.

4 Drury West Review

The same approach used for Drury East was adopted for Drury West, albeit without a specific Plan Change model to compare with.

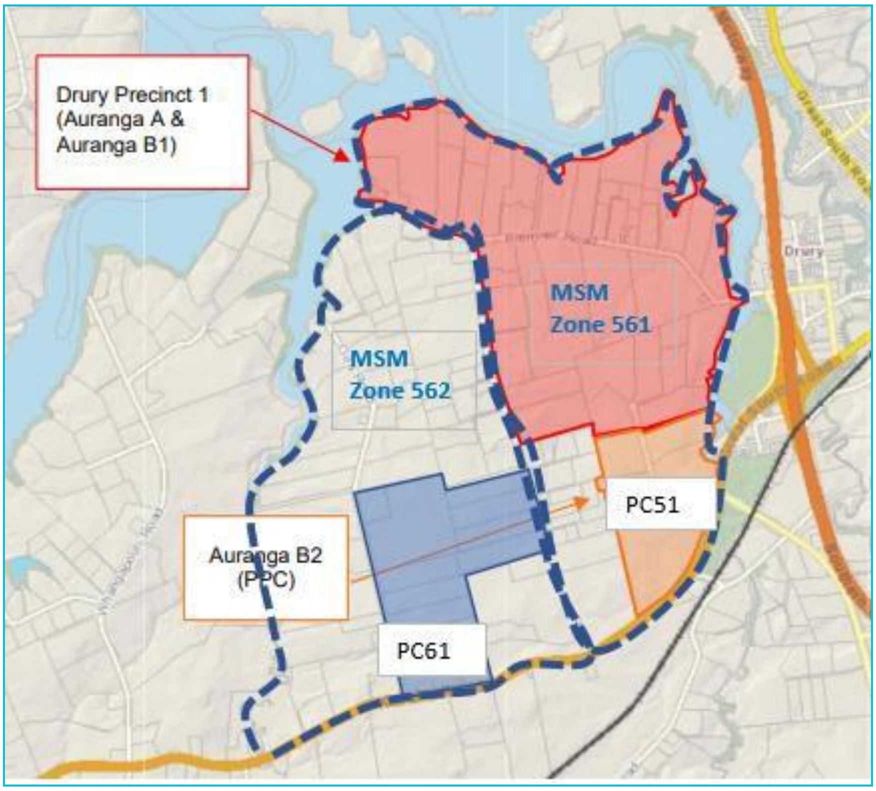
4.1 Spatial Area and Full-Build Yield

The live-zoned Auranga A/B1 area and the two new PPCs fall within two MSM model zones as follows:

The three PPCs fall within two MSM model zones as follows:

- Aurunga A and B1 and PPC 51 (Aurunga B2) fall within MSM zone 561. There is a residual area in zone 561 beside Jesmond Road not included in the plan changes
- PPC61 (Waipupuke) falls within MSM Zone 562, with residual areas north, west and south-east of the PPC

Figure 4-1 MSM Zones and Plan Change Areas



The MSM zone system is indicated in Figure 4-1 and the three PPCs in Figure 2. The PPC Modelling Report and associated ITAs indicate the following yields:

Table 4-1 Yields Indicated for Drury West Plan Change Areas

PPC	Dwellings	Centre GFA, m2	Source
Auranga A/B1	2,650	Local only	ITA for PC51
Auranga B2	890	7,000	ITA for PC51
Waipupuke	1,400-2,800	Local only	ITA and PC documents for PPC61

Figure 4-2 MSM Spatial (Zone) System

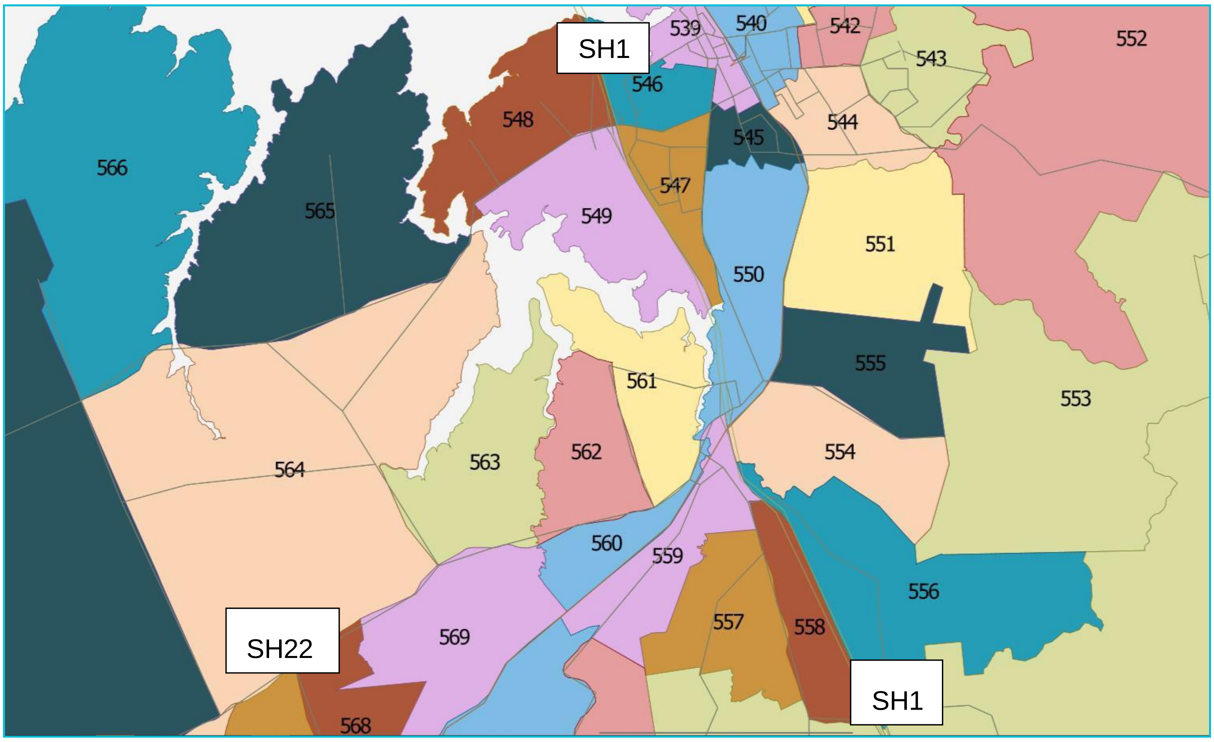


Figure 4-3 Aurunga B2 Plan Changes (Source: PC Documents)

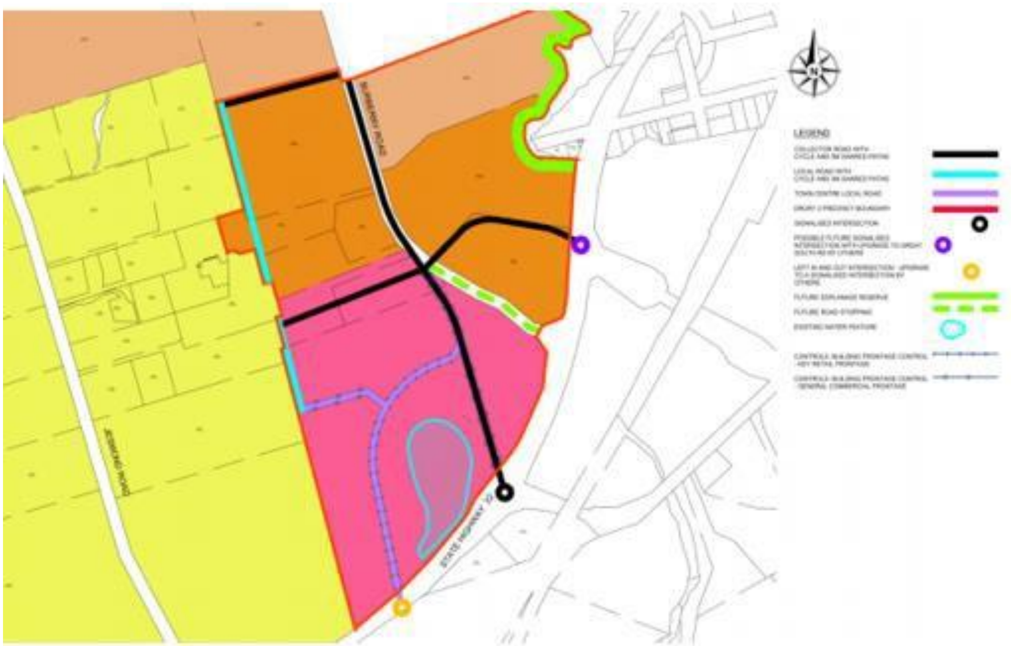


Figure 4-4 Waipupuke Plan Changes (Source: PC Documents)

The trip generation review has been undertaken for the complete area comprising MSM Zones 561 and 562. This therefore requires an estimate of the yield outside the plan change areas.

For Zone 562, the following data and assumptions were used:

- The PPC 61 ITA indicates 1,400 dwellings, although the Economics report indicates a range up to 2,800
- It also indicates that the Waipupuke plan change comprises some 56 ha, comprising 21ha of MHU residential zoning and 35ha of THAB
- The residual 175 ha of FUZ in that MSM zone area was suggested to have some 85ha of MHSU, 64ha of MHU and 24ha of THAB
- Net developable area was assumed at 50% of the gross area, and density rates (dwellings/net ha) were assumed to be 16, 33 and 56 for MHSU, MHU and THAB respectively. These were compared with rates used in the Structure Plan, which included rates of 28, 33 and 56 dwellings per ha
- These density rates provided a range of 1330-1416 dwellings for the plan change area, matching the 1,400 used in the ITA
- Using the same two sets of density rates for the residual area gives between 2,200 and 2,900 dwellings, from which an assumption of 2,600 was adopted
- The combined total for the MSM zone therefore had a range between 3,600 and 4,200, from which an estimate of 4,000 was adopted for this assessment
- This is close to the total Structure Plan estimate of 3,990 dwellings

For Zone 561, the following data and assumptions were used:

- 168ha for Aurunga A/B1 and 33.6ha for Aurunga B2
- Some 2,650 dwellings for Aurunga A and B1 and 890 dwellings and a 7,000m2 Centre proposed for Aurunga B2 based on the plan change ITA
- Approximately 80ha for the residual FUZ area adjacent to Jesmond Road
- Similar zoning type and area indicated in the Structure Plan for the residual area as in Aurunga B2

- Hence similar assumptions were used for the residual FUZ area, giving a range between 1000-2200 dwellings and approximately a 5,000m2 centre
- This gives a total for MSM 561 of between 4,540 and 5,700 dwellings, which is significantly higher than the estimate of 3,820 in the Structure Plan. As such, the lower level of 4540 dwellings was adopted for this assessment, along with a combined total of a 12,000m2 Centre

4.2 Approach to Estimation of Trip Generation

The trip generation for Drury West (MSM Zones 561 and 562) was estimated using the same method as used for Drury East. The planned Centre in Drury West is smaller in scale than that proposed in Drury East, however for this assessment that area was assumed to be predominantly retail development.

The MSM zones are sub-divided in the SATURN model, as shown in Figure 4-5. Because detailed plan changes have not been completed for this area, the sub-zones were sub-divided based on likely loading points to the network, rather than on specific spatial areas with fixed boundaries. Hence the map shows the centroid location and assumed loading point, rather than zone boundaries.

The assumed build-out rate is shown in Table 4-2. Mode share assumptions were based on proximity to the stations, as indicated in Table 4-3.

Note: It was noted that the SATURN model has transposed the loading of zones 561 and 562.The yield and traffic generation remains correct for each zone, however the numbering is transposed. The following figure and tables show the SATURN zone numbers as they should be to avoid confusion, however they are transposed in the actual model.

Figure 4-5 Drury West SATURN Model Zones

Table 4-2 Drury West Build-Out Assumptions

PC/Activity	MSM Zone	Saturn Zone	2028	2038	2048	2048+
RESIDENTIAL UNITS						
THAB	562	5621	800	1,400	1,400	1,400
THAB/Med	562	5622	400	600	1,000	1,100
Med/Low	562	5623	100	200	400	834
Med/Low	562	5624	50	100	200	333
Med/Low	562	5625	50	100	200	333
SUM	**562**		**1,400**	**2,400**	**3,200**	**4,000**
FUZ, Residential	561	5611	10	100	500	1,000
Aurunga B2	561	5612	100	400	600	890
Aurunga B1	561	5613	500	1,350	1,350	1,350
Aurunga A	561	5614	1,000	1,300	1,300	1,300
SUM	**561**		**1,610**	**3,150**	**3,750**	**4,540**
TOTAL	**561/562**		**3,010**	**5,550**	**6,950**	**8,540**
BUSINESS (GFA, m2)						
FUZ, Residential	561	5611	-	1,500	3,000	5,000
Aurunga B2	561	5612	3,500	5,000	6,000	7,000
SUM	**561**		**3,500**	**6,500**	**9,000**	**12,000**

Table 4-3 Drury West Mode Share Assumptions

PC/Activity	MSM Zone	Saturn Zone	2028	2038	2048	2048+
THAB	562	5621	23%	29%	34%	40%
THAB/Med	562	5622	18%	22%	26%	30%
Med/Low	562	5623	18%	22%	26%	30%
Med/Low	562	5624	13%	16%	18%	20%
Med/Low	562	5625	13%	17%	21%	25%
FUZ, Residential	561	5611	23%	29%	34%	40%
Aurunga B2	561	5612	8%	14%	19%	25%
Aurunga B1	561	5613	13%	17%	21%	25%
Aurunga A	561	5614	18%	21%	23%	25%

4.3 Combined Trip Generation

The total vehicle trip generation for the Drury West area (MSM zones 561 and 562) was therefore estimated as follows:

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Table 4-4 Drury West Target Trip Generation (Total Trips and Total External Trips)

			2028				2038				2048				2048+			
Plan Change Area	**MSM Zone**	**S3M Zone**	**AM Trips**	**IP Trips**	**PM Trips**	**Daily**	**AM Trips**	**IP Trips**	**PM Trips**	**Daily**	**AM Trips**	**IP Trips**	**PM Trips**	**Daily**	**AM Trips**	**IP Trips**	**PM Trips**	**Daily**
Total Trips (Includes Internal Trips and with Pass-by discounts)																		
	562	5621	358	219	358	3,972	565	345	565	6,269	506	309	506	5,613	449	274	449	4,984
		5622	256	157	256	2,846	357	218	357	3,957	549	335	549	6,092	556	340	556	6,168
		5623	64	39	64	712	119	73	119	1,319	220	134	220	2,437	421	257	421	4,676
		5624	38	23	38	418	72	44	72	794	136	83	136	1,505	214	131	214	2,371
		5625	34	21	34	377	63	39	63	702	117	72	117	1,301	180	110	180	2,001
		Total	**750**	**458**	**750**	**8,326**	**1,175**	**718**	**1,175**	**13,041**	**1,527**	**933**	**1,527**	**16,948**	**1,820**	**1,112**	**1,820**	**20,200**
	561	5611	4	3	4	50	49	54	77	851	195	155	236	2,622	339	256	395	4,388
		5612	82	125	169	1,880	225	216	316	3,511	294	252	377	4,189	383	302	461	5,120
		5613	340	208	340	3,775	854	522	854	9,474	791	483	791	8,780	731	447	731	8,110
		5614	710	434	710	7,882	875	535	875	9,709	828	506	828	9,186	782	478	782	8,678
		Total	**1,137**	**770**	**1,224**	**13,587**	**2,003**	**1,326**	**2,121**	**23,545**	**2,107**	**1,396**	**2,232**	**24,778**	**2,235**	**1,482**	**2,369**	**26,296**
Grand Total Trips			**1,887**	**1,228**	**1,974**	**21,913**	**3,178**	**2,044**	**3,296**	**36,586**	**3,634**	**2,329**	**3,759**	**41,726**	**4,055**	**2,594**	**4,189**	**46,496**
Total External Trips (Excludes Internal Trips and with Pass-by discounts)																		
	562	5621	337	201	336	3,688	521	312	519	5,718	465	279	463	5,105	407	246	407	4,489
		5622	241	144	241	2,643	329	197	328	3,609	504	303	503	5,541	504	304	503	5,555
		5623	60	36	60	661	110	66	109	1,203	202	121	201	2,216	382	231	382	4,211
		5624	35	21	35	388	66	40	66	724	125	75	124	1,369	194	117	194	2,135
		5625	32	19	32	350	58	35	58	640	108	65	107	1,183	163	99	163	1,802
		Total	**706**	**421**	**705**	**7,730**	**1,084**	**650**	**1,081**	**11,894**	**1,403**	**843**	**1,399**	**15,414**	**1,650**	**996**	**1,649**	**18,192**
	561	5611	4	3	4	46	46	49	70	775	179	140	216	2,383	308	229	358	3,950
		5612	78	115	159	1,741	208	195	291	3,198	270	227	346	3,807	347	270	418	4,609
		5613	320	191	319	3,505	788	472	785	8,641	727	436	725	7,985	663	400	662	7,304
		5614	669	399	667	7,318	807	484	804	8,856	761	457	758	8,355	709	428	708	7,815
		Total	**1,071**	**707**	**1,150**	**12,610**	**1,849**	**1,200**	**1,951**	**21,470**	**1,937**	**1,260**	**2,045**	**22,530**	**2,027**	**1,327**	**2,146**	**23,678**
Grand Total External Trips			**1,777**	**1,128**	**1,854**	**20,341**	**2,933**	**1,849**	**3,031**	**33,364**	**3,340**	**2,103**	**3,444**	**37,944**	**3,677**	**2,324**	**3,795**	**41,870**

Appendix D PT/Active Travel Mode Share

Daily MSM Mode Split

MSM Zone	2028			2038			2048			2048+		
	Car	PT	Active	Car	PT	Active	Car	PT	Active	Car	PT	Active
555	79%	13%	8%	74%	16%	10%	70%	18%	11%	70%	19%	12%
554	83%	10%	7%	76%	16%	8%	71%	18%	11%	71%	18%	10%
556	90%	5%	5%	92%	5%	3%	91%	6%	3%	91%	6%	3%
561	84%	7%	9%	82%	9%	10%	79%	10%	11%	78%	10%	11%
562	86%	9%	5%	79%	11%	10%	75%	13%	12%	75%	13%	13%
East	81%	11%	8%	75%	16%	9%	71%	18%	11%	71%	18%	11%
West	84%	8%	8%	81%	9%	10%	77%	11%	12%	76%	12%	12%
South	90%	5%	5%	92%	5%	3%	91%	6%	3%	91%	6%	3%
All	86%	7%	7%	83%	10%	7%	79%	12%	9%	78%	13%	9%

MSM Mode Split using car and public transport trips to factor the daily active mode trips

2028 Model

MSM Zone	AM			IP			PM		
	Car	PT	Active	Car	PT	Active	Car	PT	Active
555	73%	19%	8%	81%	10%	8%	74%	18%	8%
554	78%	15%	7%	84%	8%	7%	79%	14%	7%
556	87%	8%	5%	92%	3%	5%	88%	7%	5%
561	80%	11%	9%	85%	6%	9%	81%	10%	9%
562	81%	13%	5%	87%	7%	5%	83%	12%	5%
East	76%	17%	8%	83%	9%	8%	77%	15%	8%
West	80%	12%	8%	86%	6%	8%	82%	10%	8%
South	87%	8%	5%	92%	3%	5%	88%	7%	5%
All	82%	11%	7%	88%	6%	7%	83%	10%	7%

2038 Model

MSM Zone	AM			IP			PM		
	Car	PT	Active	Car	PT	Active	Car	PT	Active
555	68%	22%	10%	75%	15%	10%	69%	21%	10%
554	70%	21%	8%	77%	14%	8%	71%	21%	8%
556	90%	7%	3%	93%	4%	3%	90%	7%	3%
561	78%	12%	10%	83%	7%	10%	79%	11%	10%
562	75%	15%	10%	81%	9%	10%	76%	14%	10%
East	70%	21%	9%	77%	14%	9%	70%	21%	9%
West	77%	13%	10%	82%	8%	10%	78%	12%	10%
South	90%	7%	3%	93%	4%	3%	90%	7%	3%
All	78%	14%	8%	84%	9%	7%	79%	13%	7%

2048 Model

MSM Zone	AM			IP			PM		
	Car	PT	Active	Car	PT	Active	Car	PT	Active
555	63%	22%	10%	72%	17%	11%	64%	25%	11%
554	64%	25%	11%	73%	16%	11%	65%	24%	11%
556	88%	8%	3%	92%	5%	3%	89%	8%	3%
561	74%	15%	11%	80%	8%	11%	75%	14%	11%
562	70%	18%	12%	77%	11%	12%	71%	17%	12%
East	64%	25%	11%	72%	16%	11%	65%	24%	11%
West	72%	16%	12%	79%	10%	12%	73%	15%	12%
South	88%	8%	3%	92%	5%	3%	89%	8%	3%
All	73%	17%	9%	80%	11%	9%	75%	16%	9%

2048+ Model

MSM Zone	AM			IP			PM		
	Car	PT	Active	Car	PT	Active	Car	PT	Active
555	63%	22%	10%	71%	17%	12%	63%	25%	12%
554	65%	25%	10%	73%	16%	10%	65%	24%	10%
556	88%	8%	3%	92%	5%	3%	89%	8%	3%
561	73%	15%	11%	80%	9%	11%	74%	14%	11%
562	69%	18%	13%	76%	11%	13%	70%	17%	13%
East	64%	25%	11%	73%	17%	11%	64%	25%	11%
West	71%	17%	12%	78%	10%	12%	72%	16%	12%
South	88%	8%	3%	92%	5%	3%	89%	8%	3%
All	72%	18%	10%	79%	11%	9%	73%	18%	9%

MSM Mode Split using observed cycle counts to factor the daily active mode trips

2028 Model

MSM Zone	AM			IP			PM		
	Car	PT	Active	Car	PT	Active	Car	PT	Active
555	70%	18%	12%	85%	11%	4%	71%	17%	12%
554	75%	14%	11%	88%	9%	4%	76%	13%	11%
556	85%	8%	7%	94%	3%	2%	86%	7%	7%
561	77%	11%	12%	89%	6%	5%	78%	10%	13%
562	79%	13%	8%	90%	8%	3%	80%	12%	8%
East	73%	16%	11%	87%	10%	4%	74%	15%	11%
West	77%	11%	11%	89%	7%	4%	78%	10%	12%
South	85%	8%	7%	94%	3%	2%	86%	7%	7%
All	79%	11%	10%	91%	6%	3%	80%	10%	10%

2038 Model

MSM Zone	AM			IP			PM		
	Car	PT	Active	Car	PT	Active	Car	PT	Active
555	65%	21%	14%	79%	15%	5%	65%	20%	15%
554	67%	20%	12%	81%	15%	4%	68%	20%	12%
556	88%	7%	5%	94%	4%	2%	89%	6%	5%
561	75%	12%	14%	87%	8%	5%	75%	11%	14%
562	72%	14%	14%	85%	10%	5%	72%	13%	15%
East	67%	21%	13%	80%	15%	5%	67%	20%	13%
West	73%	13%	14%	86%	9%	5%	74%	12%	15%
South	88%	7%	5%	94%	4%	2%	89%	6%	5%
All	75%	14%	11%	87%	9%	4%	76%	13%	11%

2048 Model

MSM Zone	AM			IP			PM		
	Car	PT	Active	Car	PT	Active	Car	PT	Active
555	60%	24%	16%	76%	18%	6%	60%	23%	17%
554	61%	24%	16%	77%	17%	6%	61%	23%	16%
556	86%	8%	5%	93%	5%	2%	87%	8%	5%
561	70%	14%	16%	85%	9%	6%	71%	13%	17%
562	66%	17%	17%	82%	12%	7%	66%	16%	18%
East	61%	24%	16%	77%	17%	6%	61%	23%	16%
West	68%	16%	17%	84%	10%	6%	68%	14%	17%
South	86%	8%	5%	93%	5%	2%	87%	8%	5%
All	70%	17%	13%	84%	11%	5%	71%	16%	13%

2048+ Model

MSM Zone	AM			IP			PM		
	Car	PT	Active	Car	PT	Active	Car	PT	Active
555	59%	24%	17%	76%	18%	6%	59%	24%	17%
554	61%	24%	15%	77%	17%	5%	62%	23%	15%
556	87%	8%	5%	93%	5%	1%	87%	8%	5%
561	69%	15%	16%	85%	9%	6%	70%	13%	17%
562	65%	17%	18%	81%	12%	7%	65%	16%	19%
East	61%	24%	16%	77%	18%	6%	61%	23%	16%
West	67%	16%	17%	83%	10%	6%	67%	15%	18%
South	87%	8%	5%	93%	5%	1%	87%	8%	5%
All	69%	18%	14%	83%	12%	5%	69%	17%	14%

Appendix E GSR/Waihoehoe Road Intersection Modelling

Colour Code:

Passing Scenario

Failing Scenario

Test 1 - Prior to Drury Interchange and SH1 Widening - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Roundabout - AM - PT Offset 10% - Background 1% - Drury (80%)	LOS F	97	6	61	250	17	10	55	387	32
Roundabout - PM - PT Offset 10% - Background 1% - Drury (80%)	LOS C	26	20	10	8	72	91	4	19	63
Roundabout - AM - PT Offset 10% - Background 1% - Drury (70%)	LOS F	172	6	46	501	23	10	45	643	51
Roundabout - PM - PT Offset 10% - Background 1% - Drury (70%)	LOS E	56	43	12	10	159	157	5	24	167

Test 2 - Prior to Drury Central Rail Station - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Roundabout - AM - PT Offset 10% - Background 0% - Drury (30%)	LOS F	123	7	12	466	16	8	8	434	43
Roundabout - PM - PT Offset 10% - Background 0% - Drury (30%)	LOS F	89	13	9	209	151	36	9	238	239
Roundabout - AM - PT Offset 10% - Background 0% - Drury (20%)	LOS F	215	7	12	839	23	9	9	644	69
Roundabout - PM - PT Offset 10% - Background 0% - Drury (20%)	LOS F	130	15	9	275	241	40	9	315	374

Test 3 - Drury Central Rail Station - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Roundabout - AM - FY28pc58y - Drury (20%)	LOS F	105	6	13	362	17	9	9	383	40
Roundabout - IP - FY28pc58y - Drury (20%)	LOS A	9	7	7	10	11	9	4	8	17
Roundabout - PM - FY28pc58y - Drury (20%)	LOS D	36	8	9	61	81	23	9	67	124
Roundabout - AM - FY28pc58y - Drury (10%)	LOS F	173	6	13	622	23	9	9	556	61
Roundabout - IP - FY28pc58y - Drury (10%)	LOS A	10	7	7	12	12	10	5	11	21
Roundabout - PM - FY28pc58y - Drury (10%)	LOS E	64	8	9	61	177	26	9	70	260

Test 3A - Brookfield Road to Quarry Road Link - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Roundabout - AM - FY28pc62a - Drury (20%)	LOS B	15	6	14	34	15	8	20	35	34
Roundabout - IP - FY28pc62a - Drury (20%)	LOS A	8	6	6	10	12	8	4	5	18
Roundabout - PM - FY28pc62a - Drury (20%)	LOS E	52	6	8	23	140	16	8	18	240
Roundabout - AM - FY28pc62a - Drury (10%)	LOS C	25	6	20	79	19	8	27	69	47
Roundabout - IP - FY28pc62a - Drury (10%)	LOS A	9	6	6	10	13	8	4	6	22
Roundabout - PM - FY28pc62a - Drury (10%)	LOS F	82	6	8	23	226	17	8	19	374

Test 3B - Firth Street Overbridge - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Roundabout - AM - FY28pc68a - Drury (10%)	LOS B	16	7	17	36	15	8	24	38	31
Roundabout - IP - FY28pc68a - Drury (10%)	LOS A	8	6	6	11	11	7	5	5	16
Roundabout - PM - FY28pc68a - Drury (10%)	LOS D	49	7	8	27	133	17	10	21	235
Roundabout - AM - FY28pc68a - Drury 0%	LOS C	29	7	26	93	17	8	35	87	42
Roundabout - IP - FY28pc68a - Drury 0%	LOS A	9	6	7	12	12	8	5	6	20
Roundabout - PM - FY28pc68a - Drury 0%	LOS F	72	7	8	29	200	18	11	24	341

Test 4 - Waihoehoe Road ATAP Scheme - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Signals - AM - FY28pc78 - Drury 18%	LOS E	62	48	73	69	62	72	137	75	189
Signals - IP - FY28pc78 - Drury 18%	LOS C	35	34	27	40	36	49	22	29	80
Signals - PM - FY28pc78 - Drury 18%	LOS E	79	97	47	73	76	311	57	76	244
Signals - AM - FY28pc78 - Drury 20%	LOS E	65	48	73	72	68	72	137	79	210
Signals - IP - FY28pc78 - Drury 20%	LOS C	35	34	27	40	37	49	22	29	83
Signals - PM - FY28pc78 - Drury 20%	LOS F	81	97	47	77	81	311	57	79	261

Test 5 - Mill Road South - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Signals - AM - FY33pc98 - Drury 0%	LOS D	51	44	43	60	55	74	85	107	126
Signals - IP - FY33pc98 - Drury 0%	LOS C	34	35	28	39	35	60	29	21	73
Signals - PM - FY33pc98 - Drury 0%	LOS F	91	108	84	42	91	391	101	46	238
Signals - AM - FY33pc98 - Drury 10%	LOS E	56	47	54	61	60	83	102	107	151
Signals - IP - FY33pc98 - Drury 10%	LOS D	36	35	29	41	39	62	30	24	91
Signals - PM - FY33pc98 - Drury 10%	LOS F	100	125	83	49	99	433	99	47	278

Test 6 - Full Mill Road - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Signals - AM - FY38pc11 - Drury 0%	LOS D	41	40	41	41	43	67	157	30	48
Signals - IP - FY38pc11 - Drury 0%	LOS C	30	33	25	31	31	53	31	19	50
Signals - PM - FY38pc11 - Drury 0%	LOS D	42	52	26	40	44	114	53	24	179
Signals - AM - FY38pc11 - Drury 10%	LOS D	44	43	43	44	45	72	166	32	57
Signals - IP - FY38pc11 - Drury 10%	LOS C	31	35	26	32	31	57	32	21	58
Signals - PM - FY38pc11 - Drury 10%	LOS D	51	61	26	44	58	127	55	29	263

Test 7 - Full Mill Road and N-S Arterial - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Signals - AM - FY38pc11 - Drury 10%	LOS D	38	44	37	37	33	72	98	39	30
Signals - IP - FY38pc11 - Drury 10%	LOS C	28	33	23	30	27	50	29	21	50
Signals - PM - FY38pc11 - Drury 10%	LOS D	44	55	27	43	46	122	50	32	184
Signals - AM - FY38pc11 - Drury 20%	LOS D	38	44	37	39	34	73	99	43	35
Signals - IP - FY38pc11 - Drury 20%	LOS C	28	33	24	30	28	50	31	23	57
Signals - PM - FY38pc11 - Drury 20%	LOS D	53	60	27	45	62	131	53	37	261

Test 8 - Year 2048 - Scenarios	LOS	Delay					Worst Queue			
		All	North	West	South	East	North	West	South	East
Signals - AM - FY48pc13 - Drury 10%	LOS E	64	40	76	74	47	71	235	165	59
Signals - IP - FY48pc13 - Drury 10%	LOS C	29	31	25	28	30	45	38	16	45
Signals - PM - FY48pc13 - Drury 10%	LOS E	56	63	38	43	65	153	75	42	221
Signals - AM - FY48pc13 - Drury 20%	LOS E	73	40	99	80	47	71	295	185	63
Signals - IP - FY48pc13 - Drury 20%	LOS C	30	31	26	28	32	43	41	17	50
Signals - PM - FY48pc13 - Drury 20%	LOS E	66	71	38	44	82	170	80	45	287

Test	Infrastructure										Trip Threshold (before fail point)	Landuse Equivalent			
	Wider Waihoehoe/ GSR Roundabout	One-way SH1 to TC	Train Station	Brookfield	Firth Street	W/GSR Signals	Mill Rd South	Full Mill Road	N-S Arterial	Pukekohe Express		Residential	Retail	Commercial	Community
1 - Prior to Drury Interchange and SH1 Widening	Y										406	710	-	-	-
2 - Prior to Drury Central Rail Station	Y										2,300	1,500	28,000	7,400	900
3 - Drury Central Rail Station	Y	Y	Y								2,500	1,800	32,000	8,700	1,100
3A - Brookfield Road to Quarry Road Link	Y	Y	Y	Y							2,500	1,800	32,000	8,700	1,100
3B - Firth Street Overbridge	Y	Y	Y		Y						2,800	2,000	36,000	9,700	1,300
4 - Waihoehoe Road ATAP Scheme		Y	Y			Y					3,800	3,300	56,000	17,900	2,000
5 - Mill Road South		Y	Y			Y	Y				4,300	3,800	64,000	21,000	2,400
6 - Full Mill Road		Y	Y			Y	Y	Y			5,100	4,900	82,000	29,400	3,100
7 - Full Mill Road and N-S Arterial		Y	Y			Y	Y	Y	Y		5,600	5,800	97,000	47,600	10,700
8 - 2048 Year		Y	Y			Y	Y	Y	Y	Y	6,000	6,400	107,650	60,000	16,000

Test	Network Performance (at fail point)				
	Intersection Delay / Queue	Norrie Road	Waihoehoe Road	Great South Road North	Great South Road South
1 - Prior to Drury Interchange and SH1 Widening	AM Intersection LOS: (F) Intersection Delay: (172s) Worst Approach: South: (643m over 450m) PM Intersection LOS: (E) Intersection Delay: (56s)	-	-	-	-
2 - Prior to Drury Central Rail Station	AM Intersection LOS: (F) Intersection Delay: (215s) Worst Approach: South: (644m over 450m) PM Intersection LOS: (F) Intersection Delay: (130s) Worst Approach: East: (374m over 250m)	-	-	-	-
3 - Drury Central Rail Station	AM Intersection LOS: (F) Intersection Delay: (173s) Worst Approach: South: (556m over 450m) IP Intersection LOS: (A) Intersection Delay: (10s) PM Intersection LOS: (E) Intersection Delay: (64s) Worst Approach: East: (260m over 250m)	10,300	19,900	25,600	11,400
3A - Brookfield Road to Quarry Road Link	AM Intersection LOS: (C) Intersection Delay: (25s) IP Intersection LOS: (A) Intersection Delay: (9s) PM Intersection LOS: (F) Intersection Delay: (82s) Worst Approach: East: (374m over 250m)	10,700	17,800	25,600	7,900
3B - Firth Street Overbridge	AM Intersection LOS: (C) Intersection Delay: (29s) IP Intersection LOS: (A) Intersection Delay: (9s) PM Intersection LOS: (F) Intersection Delay: (72s) Worst Approach: East: (341m over 250m)	11,600	18,500	26,300	7,000
4 - Waihoehoe Road ATAP Scheme	AM Intersection LOS: (E) Intersection Delay: (65s) IP Intersection LOS: (C) Intersection Delay: (35s) PM Intersection LOS: (F) Intersection Delay: (81s) Worst Approach: East: (261m over 250m)	11,000	26,300	28,000	15,000
5 - Mill Road South	AM Intersection LOS: (E) Intersection Delay: (56s) IP Intersection LOS: (D) Intersection Delay: (36s) PM Intersection LOS: (F) Intersection Delay: (100s) Worst Approach: East: (278m over 250m)	12,300	25,400	30,600	15,400
6 - Full Mill Road	AM Intersection LOS: (D) Intersection Delay: (44s) IP Intersection LOS: (C) Intersection Delay: (31s) PM Intersection LOS: (D) Intersection Delay: (51s) Worst Approach: East: (263m over 250m)	16,800	21,100	20,100	13,100
7 - Full Mill Road and N-S Arterial	AM Intersection LOS: (D) Intersection Delay: (38s) IP Intersection LOS: (C) Intersection Delay: (28s) PM Intersection LOS: (D) Intersection Delay: (53s) Worst Approach: East: (261m over 250m)	17,200	22,000	18,700	14,000
8 - 2048 Year	AM Intersection LOS: (E) Intersection Delay: (73s) IP Intersection LOS: (C) Intersection Delay: (30s) PM Intersection LOS: (E) Intersection Delay: (66s) Worst Approach: East: (287m over 250m)	19,100	22,500	23,300	16,800

Appendix F SIDRA Results

Appendix F Scenario (SIDRA Results)	Year	Pc (SATURN Scenario)
65	2025	52a
65a	2025	58a
65b	2025	68a
66	2026	52a
66a	2026	58a
66b	2026	68a
62	2028	52y
62a	2028	58y
62b	2028	68a
62c	2028	72
62d	2028	78
62e	2028	84
62f	2028	88
63	2030	78
63a	2030	84
63b	2030	88
63c	2030	98
63d	2030	104
63e	2030	108
64	2033	78
64a	2033	84
64b	2033	88
64c	2033	98
64d	2033	104
64e	2033	108
67	2038	118
67a	2038	119
67b	2038	98
68	2048	138
68a	2048	139
68b	2048	138b
68c	2048	139b

SIDRA Results AM

AM

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2025	52a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario65 : AM 2025 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.8	6.8	0.0	0.0	0.4	2.3
		Scenario65 : AM 2025 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	17.2	0.0	39.5	39.2	46.3	0.0	79.2	41.3

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2025	58a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario65a : AM 2025 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.6	0.0	5.6	6.6	0.0	0.0	0.4	2.3
		Scenario65a : AM 2025 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	16.5	0.0	40.6	39.1	46.2	0.0	79.0	41.1

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2025	68a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	0.0	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	0.0	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	0.0	14.3	108.6	6.3	16.6
		Scenario65b : AM 2025 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.6	0.0	5.6	0.0	0.0	0.0	0.4	2.3
		Scenario65b : AM 2025 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	17.2	0.0	39.5	40.5	47.0	0.0	76.8	43.4

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2026	52a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario66 : AM 2026 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.9	6.9	0.0	0.0	0.5	2.6
		Scenario66 : AM 2026 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	17.2	0.0	40.8	39.1	46.4	0.0	85.9	45.2

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2026	58a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario66a : AM 2026 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.6	0.0	5.7	6.8	0.0	0.0	0.4	2.7
		Scenario66a : AM 2026 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	18.1	0.0	39.6	39.7	49.0	0.0	85.8	47.1

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2026	68a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario66b : AM 2026 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.6	0.0	5.7	6.8	0.0	0.0	0.5	2.6
		Scenario66b : AM 2026 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	17.3	0.0	40.8	39.0	47.9	0.0	86.6	44.9

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario62 : AM 2028 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		25.9	32.5	14.4	0.0	9.3	6.9	42.7	0.0
		Scenario62 : AM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS B	LOS B	LOS A	LOS C	LOS A	12.1	7.8	26.5	13.1	3.1	10.3	67.2	8.6
		Scenario62 : AM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS D	LOS E	LOS D	LOS B	LOS D	60.7	49.1	50.1	62.6	37.8	126.5	76.7	59.6
2028	52y	Scenario62 : AM 2028 - GSR / Waihoehoe - Roundabout	LOS F	LOS A	LOS B	LOS F	LOS C	8.8	15.6	1005.2	31.4	9.5	9.8	698.5	90.5
		Scenario62 : AM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		23.6	23.8	21.5	0.0	6.6	2.3	43.5	0.0
		Scenario62 : AM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS D	LOS C	63.4	56.3	53.4	53.4	9.8	149.8	4.3	152.6
		Scenario62 : AM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	21.5	0.0	23.6	29.9	7.4	0.0	43.5	2.4
		Scenario62 : AM 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	40.1	38.6	37.2	44.1	27.5	66.7	6.3	11.3
		Scenario62 : AM 2028 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	6.5	7.4	0.0	0.0	0.6	2.8
		Scenario62 : AM 2028 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	17.3	0.0	38.9	41.8	48.5	0.0	83.1	43.1

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario62a : AM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS B		23.6	27.9	21.5	0.0	11.9	27.1	40.4	0.0
		Scenario62a : AM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS B	LOS A	LOS A	LOS B	LOS A	10.2	7.9	20.1	10.8	2.3	5.7	46.5	6.8
		Scenario62a : AM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	46.4	39.0	37.1	40.1	28.1	53.1	55.5	38.5
2028	58y	Scenario62a : AM 2028 - GSR / Waihoehoe - Roundabout	LOS F	LOS A	LOS B	LOS F	LOS D	8.2	15.1	952.9	43.7	8.3	9.7	713.6	108.1
		Scenario62a : AM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	7.7	1.8	34.7	0.0
		Scenario62a : AM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	54.7	57.1	46.5	46.5	8.5	68.7	3.7	155.7
		Scenario62a : AM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	22.6	0.0	23.6	33.5	9.3	0.0	32.8	2.4
		Scenario62a : AM 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	37.3	43.7	37.2	44.1	35.2	67.8	6.3	15.8
		Scenario62a : AM 2028 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.6	0.0	6.2	7.3	0.0	0.0	0.4	3.1
		Scenario62a : AM 2028 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	18.2	0.0	39.9	42.3	51.7	0.0	97.1	52.1

					LOS			Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62b : AM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS C		25.9	33.9	23.4	0.0	17.7	47.2	49.3	0.0
		Scenario62b : AM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.0	7.9	13.9	11.2	2.2	6.1	24.1	6.7
		Scenario62b : AM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	43.5	41.1	37.1	43.3	24.9	62.0	38.6	38.8
2028	68a	Scenario62b : AM 2028 - GSR / Waihoehoe - Roundabout	LOS C	LOS A	LOS C	LOS F	LOS B	8.7	30.7	97.1	18.0	8.0	34.9	87.1	41.5
		Scenario62b : AM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS C		21.3	21.5	24.0	0.0	11.1	2.2	42.7	0.0
		Scenario62b : AM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	44.7	41.9	41.9	7.6	76.8	3.3	124.4
		Scenario62b : AM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	21.5	0.0	23.6	29.9	12.8	0.0	35.8	2.3
		Scenario62b : AM 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	38.2	34.9	38.9	44.1	10.1	50.8	17.5	8.6
		Scenario62b : AM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.2	0.0	8.6	8.1	4.2	0.0	3.2	3.2
		Scenario62b : AM 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.6	0.0	24.4	29.8	28.4	0.0	63.0	14.6

					LOS			Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62c : AM 2028 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		23.6	29.9	14.1	0.0	5.9	7.1	28.9	0.0
		Scenario62c : AM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS B	LOS A	11.6	7.8	14.9	12.0	2.7	10.2	30.4	7.1
		Scenario62c : AM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	51.8	43.5	42.8	48.3	27.5	89.2	49.8	42.0
2028	72	Scenario62c : AM 2028 - GSR / Waihoehoe - Roundabout	LOS E	LOS A	LOS C	LOS F	LOS B	10.1	28.9	234.9	14.9	9.9	29.7	288.6	31.6
		Scenario62c : AM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.5	24.2	0.0	3.3	2.3	28.5	0.0
		Scenario62c : AM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS D	LOS B	60.4	53.7	51.1	51.1	9.4	155.7	4.1	110.2
		Scenario62c : AM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	23.9	0.0	21.3	27.4	3.9	0.0	28.5	2.1
		Scenario62c : AM 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	40.8	34.4	39.4	47.7	13.7	114.7	6.7	14.6
		Scenario62c : AM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.3	0.0	9.6	8.0	5.9	0.0	3.9	4.7
		Scenario62c : AM 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.5	0.0	26.9	29.7	27.0	0.0	63.1	20.0

					LOS			Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62d : AM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS B		25.9	30.9	22.4	0.0	15.7	47.3	41.8	0.0
		Scenario62d : AM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	10.1	7.8	16.2	10.7	1.9	5.3	34.4	6.3
		Scenario62d : AM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	41.9	37.1	37.1	39.4	22.3	48.9	50.5	36.9
2028	78	Scenario62d : AM 2028 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS C	LOS D	LOS D	LOS D	49.1	53.3	51.7	45.7	44.7	105.5	49.0	107.0
		Scenario62d : AM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.5	24.0	0.0	9.3	2.2	32.4	0.0
		Scenario62d : AM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	54.7	48.6	46.5	46.5	8.5	70.0	3.7	136.4
		Scenario62d : AM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	23.7	0.0	23.6	29.9	11.6	0.0	32.9	2.2
		Scenario62d : AM 2028 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	41.2	35.7	39.4	47.5	15.8	67.8	6.7	12.8
		Scenario62d : AM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.2	0.0	9.2	8.0	4.2	0.0	3.5	4.2
		Scenario62d : AM 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.6	0.0	24.4	31.5	26.7	0.0	58.4	19.2

					LOS			Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62e : AM 2028 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		23.6	29.9	15.2	0.0	14.8	14.1	34.8	0.0
		Scenario62e : AM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.4	7.8	11.9	10.0	1.8	4.1	16.2	5.9
		Scenario62e : AM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS C	LOS B	LOS C	37.0	44.4	32.7	33.4	19.2	36.0	28.2	31.2
2028	84	Scenario62e : AM 2028 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS C	LOS D	LOS D	LOS D	49.2	44.6	49.9	43.2	49.0	89.9	51.4	84.3
		Scenario62e : AM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.5	24.0	0.0	10.7	2.1	36.8	0.0
		Scenario62e : AM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	43.6	41.9	41.9	7.6	62.1	3.3	99.8
		Scenario62e : AM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	22.4	0.0	23.6	33.5	12.9	0.0	34.3	2.4
		Scenario62e : AM 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	34.7	36.5	36.2	40.1	8.7	42.9	22.0	5.9
		Scenario62e : AM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	9.0	8.0	4.7	0.0	3.3	3.9
		Scenario62e : AM 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	23.9	0.0	25.6	30.7	26.5	0.0	61.4	17.3

					LOS			Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62f : AM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS C		25.9	27.9	26.5	0.0	16.4	41.3	50.6	0.0
		Scenario62f : AM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.9	13.0	10.8	2.0	5.6	20.5	6.5
		Scenario62f : AM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	41.9	38.6	37.1	39.8	22.3	52.3	34.6	37.7
2028	88	Scenario62f : AM 2028 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS C	LOS D	LOS D	LOS D	45.1	48.7	48.0	46.4	45.0	96.9	54.9	94.0
		Scenario62f : AM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS C		21.3	21.5	24.0	0.0	9.9	2.2	38.5	0.0
		Scenario62f : AM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	43.6	41.9	41.9	7.6	68.0	3.3	110.6
		Scenario62f : AM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	21.5	0.0	23.6	29.9	11.4	0.0	33.4	2.3
		Scenario62f : AM 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	37.1	35.1	38.5	42.2	9.7	49.6	22.7	8.4
		Scenario62f : AM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.2	0.0	9.0	8.0	4.3	0.0	3.6	3.6
		Scenario62f : AM 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.6	0.0	24.4	30.4	29.2	0.0	59.8	16.6

					LOS			Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63 : AM 2030 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS C		25.9	32.6	24.7	0.0	17.3	55.3	42.2	0.0
		Scenario63 : AM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	10.4	7.8	19.1	11.0	2.2	6.0	43.6	6.8
		Scenario63 : AM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	43.7	40.8	37.1	40.3	25.1	56.6	56.8	38.8
2030	78	Scenario63 : AM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS D	LOS D	LOS D	59.3	51.0	48.0	49.4	51.5	96.3	69.8	101.3
		Scenario63 : AM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.7	24.2	0.0	9.5	2.9	29.7	0.0
		Scenario63 : AM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	57.5	51.7	48.8	48.8	8.9	79.1	3.9	144.8
		Scenario63 : AM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	11.1	0.0	29.8	2.6
		Scenario63 : AM 2030 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	42.1	36.8	40.5	49.9	19.5	74.7	6.9	18.2
		Scenario63 : AM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.3	0.0	9.6	8.1	5.1	0.0	4.1	5.3
		Scenario63 : AM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.9	0.0	25.7	31.1	29.0	0.0	69.8	23.1

					LOS			Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63a : AM 2030 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		23.6	29.9	14.1	0.0	17.8	12.9	28.5	0.0
		Scenario63a : AM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.6	7.8	11.7	10.5	2.1	5.1	13.8	6.8
		Scenario63a : AM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	43.5	36.0	37.1	38.2	24.8	41.1	27.8	39.4
2030	84	Scenario63a : AM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS C	LOS D	LOS D	LOS D	53.7	48.1	49.6	47.1	55.4	94.3	80.0	82.8
		Scenario63a : AM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.6	24.0	0.0	13.0	2.4	28.3	0.0
		Scenario63a : AM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS C	LOS C	46.7	41.5	39.6	39.6	7.2	84.3	3.1	103.5
		Scenario63a : AM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	23.9	0.0	21.3	27.4	15.3	0.0	28.3	2.2
		Scenario63a : AM 2030 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS C	35.1	42.9	38.3	40.4	11.9	53.8	46.7	6.8
		Scenario63a : AM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.2	0.0	9.2	8.1	5.3	0.0	3.8	4.3
		Scenario63a : AM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	23.1	0.0	26.8	32.1	27.5	0.0	66.6	20.3

					LOS			Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63b : AM 2030 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS C		25.9	34.7	24.1	0.0	18.0	53.5	45.9	0.0
		Scenario63b : AM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.0	7.9	13.3	11.1	2.3	6.2	19.9	7.3
		Scenario63b : AM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	43.7	41.8	37.1	42.3	25.1	58.4	33.2	42.6
2030	88	Scenario63b : AM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS D	LOS D	LOS D	57.4	53.3	50.4	47.9	56.0	106.6	73.3	95.8
		Scenario63b : AM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.7	24.3	0.0	10.5	2.7	34.3	0.0
		Scenario63b : AM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	44.0	41.9	41.9	7.6	80.0	3.3	109.5
		Scenario63b : AM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	22.6	0.0	23.6	33.5	12.6	0.0	32.5	2.4
		Scenario63b : AM 2030 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	38.4	37.3	41.7	44.3	12.5	55.2	39.0	8.9
		Scenario63b : AM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.3	0.0	9.3	8.1	5.0	0.0	4.1	4.3
		Scenario63b : AM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	23.8	0.0	25.6	31.6	28.8	0.0	64.9	19.4

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63c : AM 2030 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	17.3	0.0	7.0	14.1	30.3	0.0
		Scenario63c : AM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.7	7.8	15.7	10.2	2.0	4.2	34.1	5.4
		Scenario63c : AM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	38.6	41.9	32.7	34.3	21.6	38.6	51.6	27.8
2030	98	Scenario63c : AM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS C	LOS D	LOS D	LOS D	48.7	55.6	54.3	47.8	55.6	124.9	64.1	112.0
		Scenario63c : AM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.6	24.0	0.0	3.8	2.7	27.5	0.0
		Scenario63c : AM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	54.7	49.1	46.5	46.5	8.5	57.1	3.7	134.3
		Scenario63c : AM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	4.4	0.0	27.5	2.6
		Scenario63c : AM 2030 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	42.1	36.7	39.4	47.6	23.3	71.7	6.7	15.3
		Scenario63c : AM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.2	0.0	8.0	8.0	3.9	0.0	3.5	1.8
		Scenario63c : AM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.4	0.0	24.4	28.9	28.8	0.0	63.7	11.6

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63d : AM 2030 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		23.6	33.5	16.0	0.0	8.0	7.6	32.9	0.0
		Scenario63d : AM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.0	7.7	12.2	9.5	1.8	2.7	18.2	5.1
		Scenario63d : AM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS C	LOS B	LOS C	34.1	33.6	29.8	33.4	19.2	17.8	29.8	27.4
2030	104	Scenario63d : AM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS C	LOS D	LOS D	LOS D	51.6	53.3	53.8	48.7	51.0	117.0	69.5	98.4
		Scenario63d : AM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.6	24.0	0.0	4.6	2.5	31.6	0.0
		Scenario63d : AM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	44.0	41.9	41.9	7.6	46.2	3.3	108.3
		Scenario63d : AM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	21.3	0.0	23.6	29.9	5.3	0.0	28.8	2.4
		Scenario63d : AM 2030 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	38.7	35.6	39.9	44.4	14.3	54.1	25.9	7.2
		Scenario63d : AM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	8.1	8.0	3.9	0.0	3.4	1.8
		Scenario63d : AM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.5	0.0	24.4	29.0	29.6	0.0	68.9	11.7

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63e : AM 2030 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		23.6	33.5	15.8	0.0	8.2	11.3	32.1	0.0
		Scenario63e : AM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.5	7.9	12.5	10.4	2.0	4.6	19.3	5.7
		Scenario63e : AM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	40.2	36.1	35.8	38.0	23.5	41.6	34.3	33.2
2030	108	Scenario63e : AM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS C	LOS D	LOS D	LOS D	49.1	57.9	53.7	53.7	51.2	120.2	78.8	105.3
		Scenario63e : AM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.6	24.0	0.0	4.8	2.6	30.1	0.0
		Scenario63e : AM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	44.0	41.9	41.9	7.6	59.2	3.3	105.3
		Scenario63e : AM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	5.6	0.0	30.1	2.4
		Scenario63e : AM 2030 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	38.9	35.5	40.0	44.3	15.3	56.8	26.5	10.2
		Scenario63e : AM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.3	0.0	8.2	8.0	4.1	0.0	3.6	1.9
		Scenario63e : AM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.5	0.0	24.5	28.9	30.7	0.0	65.7	11.2

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64 : AM 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS C		25.9	34.7	27.5	0.0	20.5	64.3	42.3	0.0
		Scenario64 : AM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	10.8	7.9	19.1	11.4	2.7	7.5	46.0	6.2
		Scenario64 : AM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	47.6	47.8	37.4	39.9	29.2	72.9	57.8	32.6
2033	78	Scenario64 : AM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS E	LOS E	LOS D	70.3	70.4	58.6	61.4	66.7	124.6	118.6	123.3
		Scenario64 : AM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.9	24.3	0.0	10.4	7.5	26.7	0.0
		Scenario64 : AM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	57.5	53.1	48.8	48.8	8.9	94.3	3.9	143.1
		Scenario64 : AM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	21.5	0.0	23.6	29.9	12.0	0.0	36.6	3.3
		Scenario64 : AM 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS C	38.2	48.8	42.7	51.3	49.6	89.0	7.3	15.9
		Scenario64 : AM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.4	0.0	9.9	8.3	6.4	0.0	4.8	6.6
		Scenario64 : AM 2033 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	25.5	0.0	27.4	29.8	29.8	0.0	58.1	25.2

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64a : AM 2033 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	17.4	0.0	19.8	8.7	30.5	0.0
		Scenario64a : AM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	11.5	10.8	2.4	5.7	13.9	6.4
		Scenario64a : AM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	41.4	40.1	35.8	39.1	26.1	50.6	28.6	36.0
2033	84	Scenario64a : AM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS E	LOS E	LOS E	60.8	65.9	57.9	67.6	69.2	125.9	132.9	109.4
		Scenario64a : AM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.7	24.0	0.0	13.8	3.1	27.6	0.0
		Scenario64a : AM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	44.7	41.9	41.9	7.6	99.9	3.3	92.2
		Scenario64a : AM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	16.2	0.0	27.6	2.7
		Scenario64a : AM 2033 - Firth / GSR - Signalised	LOS D	LOS C	LOS D	LOS D	LOS C	38.6	39.0	47.1	45.7	13.7	92.7	65.0	11.0
		Scenario64a : AM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.4	0.0	9.3	8.4	7.7	0.0	4.1	5.1
		Scenario64a : AM 2033 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.6	0.0	28.9	30.2	29.7	0.0	60.8	21.2

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64b : AM 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS C		25.9	29.6	26.8	0.0	21.1	49.8	45.8	0.0
		Scenario64b : AM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.3	8.0	12.6	11.6	2.7	7.6	17.3	7.1
		Scenario64b : AM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	47.1	51.9	37.4	43.3	28.8	78.5	29.7	38.8
2033	88	Scenario64b : AM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS E	LOS C	LOS E	LOS E	LOS E	58.2	73.4	63.8	68.2	67.1	140.2	142.3	110.4
		Scenario64b : AM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.8	25.5	0.0	11.6	3.4	28.1	0.0
		Scenario64b : AM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	52.0	47.4	44.2	44.2	8.0	103.1	3.5	88.7
		Scenario64b : AM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	13.6	0.0	28.1	2.7
		Scenario64b : AM 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS D	LOS C	41.1	43.3	45.7	47.5	17.4	70.1	63.1	11.5
		Scenario64b : AM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.4	0.0	9.3	8.3	6.2	0.0	4.2	5.1
		Scenario64b : AM 2033 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.2	0.0	27.1	29.9	30.8	0.0	56.1	20.3

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64c : AM 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS B		21.3	27.4	22.2	0.0	8.8	26.6	31.9	0.0
		Scenario64c : AM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.9	7.9	15.2	10.6	2.3	5.2	31.0	5.5
		Scenario64c : AM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	41.6	35.5	36.0	39.3	26.4	44.6	47.0	31.1
2033	98	Scenario64c : AM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS E	LOS E	LOS D	57.9	67.1	59.5	62.0	63.1	129.3	99.9	125.8
		Scenario64c : AM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.8	24.0	0.0	4.1	3.7	24.0	0.0
		Scenario64c : AM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	52.0	47.4	44.2	44.2	8.0	66.6	3.5	135.8
		Scenario64c : AM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	4.8	0.0	24.0	2.4
		Scenario64c : AM 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	40.8	37.5	39.4	47.6	30.5	74.2	6.7	17.3
		Scenario64c : AM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.4	0.0	8.1	8.1	4.7	0.0	3.7	2.1
		Scenario64c : AM 2033 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.7	0.0	24.5	28.9	30.1	0.0	66.3	11.6

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64d : AM 2033 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	17.3	0.0	10.1	16.2	30.2	0.0
		Scenario64d : AM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.1	7.7	11.8	9.8	2.0	3.3	16.6	5.0
		Scenario64d : AM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS C	LOS B	LOS C	35.6	46.7	29.8	32.3	21.7	30.1	28.2	24.6
2033	104	Scenario64d : AM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS C	LOS D	LOS D	LOS E	51.7	63.0	60.3	60.4	58.8	124.1	98.9	110.2
		Scenario64d : AM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.8	24.0	0.0	5.9	3.3	27.3	0.0
		Scenario64d : AM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	44.7	41.9	41.9	7.6	55.9	3.3	101.4
		Scenario64d : AM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	7.0	0.0	27.3	2.4
		Scenario64d : AM 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	37.7	34.8	38.8	42.8	15.3	67.3	25.2	7.4
		Scenario64d : AM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.4	0.0	8.1	8.2	5.1	0.0	3.8	2.1
		Scenario64d : AM 2033 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.8	0.0	24.6	28.9	32.0	0.0	75.7	11.2

					LOS				Worst Delay				Worst Queue		
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64e : AM 2033 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		23.6	27.9	18.2	0.0	10.4	22.1	30.9	0.0
		Scenario64e : AM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	8.0	12.4	10.8	2.4	5.7	18.7	5.7
		Scenario64e : AM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	41.5	37.9	36.3	39.5	26.4	50.8	32.4	31.6
2033	108	Scenario64e : AM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS C	LOS E	LOS E	LOS E	53.3	67.1	60.1	64.0	56.9	138.5	102.9	113.3
		Scenario64e : AM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.8	24.1	0.0	5.3	3.4	25.4	0.0
		Scenario64e : AM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	44.7	41.9	41.9	7.6	72.9	3.3	99.5
		Scenario64e : AM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	6.3	0.0	25.4	2.3
		Scenario64e : AM 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	39.3	36.9	39.6	45.0	19.3	68.5	22.7	13.3
		Scenario64e : AM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.5	0.0	8.1	8.1	5.0	0.0	3.9	2.1
		Scenario64e : AM 2033 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	23.7	0.0	25.6	28.8	31.2	0.0	64.9	11.2

					LOS				Worst Delay				Worst Queue		
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario67 : AM 2038 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	23.9	19.5	0.0	9.0	32.1	18.5	0.0
		Scenario67 : AM 2038 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.1	8.2	9.5	10.6	2.2	5.0	14.3	3.9
		Scenario67 : AM 2038 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS D	LOS B	LOS C	34.5	58.8	32.7	33.3	18.8	58.5	20.5	17.8
2038	118	Scenario67 : AM 2038 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS D	LOS D	LOS D	LOS D	LOS D	43.4	50.9	45.2	59.7	67.0	156.7	30.1	48.3
		Scenario67 : AM 2038 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS B		19.0	19.8	26.3	0.0	2.1	5.0	9.8	0.0
		Scenario67 : AM 2038 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	46.7	39.6	39.6	39.6	7.2	84.9	3.1	62.6
		Scenario67 : AM 2038 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	2.8	0.0	10.2	2.0
		Scenario67 : AM 2038 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	45.3	38.2	39.4	46.4	42.0	72.0	6.7	16.4
		Scenario67 : AM 2038 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	8.2	7.6	5.9	0.0	1.8	2.1
		Scenario67 : AM 2038 - SH22/GSR - Full Signals	LOS B	LOS C		LOS B	LOS C	30.4	0.0	21.3	28.8	18.3	0.0	51.2	11.6

					LOS				Worst Delay				Worst Queue		
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario67a : AM 2038 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	23.9	19.4	0.0	9.1	22.8	18.5	0.0
		Scenario67a : AM 2038 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.0	9.5	9.7	11.1	3.1	7.1	16.9	3.3
		Scenario67a : AM 2038 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS C	LOS B	LOS C	36.3	44.8	32.7	33.4	24.9	46.4	35.6	12.5
2038	119	Scenario67a : AM 2038 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS C	LOS D	LOS C	LOS C	LOS C	49.3	44.1	37.6	53.4	62.9	86.1	32.9	27.3
		Scenario67a : AM 2038 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS B		19.0	19.8	26.3	0.0	2.6	5.0	9.5	0.0
		Scenario67a : AM 2038 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	54.7	46.5	46.5	46.5	8.5	133.0	3.7	54.7
		Scenario67a : AM 2038 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	2.8	0.0	13.5	2.0
		Scenario67a : AM 2038 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	45.0	39.0	37.2	44.1	41.5	66.0	6.3	17.9
		Scenario67a : AM 2038 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	8.2	7.6	5.4	0.0	1.8	2.1
		Scenario67a : AM 2038 - SH22/GSR - Full Signals	LOS B	LOS C		LOS B	LOS C	30.4	0.0	21.0	28.9	19.0	0.0	55.3	12.2

					LOS				Worst Delay				Worst Queue		
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario67b : AM 2038 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS B		21.3	24.0	22.7	0.0	15.4	34.1	22.9	0.0
		Scenario67b : AM 2038 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.6	7.9	13.2	11.4	2.7	7.8	23.1	6.1
		Scenario67b : AM 2038 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	45.3	48.9	37.3	39.7	27.0	74.4	38.2	31.8
2038	98	Scenario67b : AM 2038 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS E	LOS D	LOS D	LOS E	LOS E	116.6	53.4	77.3	92.8	93.6	101.2	187.9	159.7
		Scenario67b : AM 2038 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS B		19.0	20.3	25.9	0.0	3.6	8.4	14.6	0.0
		Scenario67b : AM 2038 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	41.9	41.9	41.9	7.6	118.2	3.3	107.7
		Scenario67b : AM 2038 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	25.6	0.0	21.3	30.7	4.5	0.0	14.4	2.7
		Scenario67b : AM 2038 - Firth / GSR - Signalised	LOS D	LOS D	LOS D	LOS D	LOS C	45.5	48.3	51.5	59.7	76.0	163.9	8.9	32.9
		Scenario67b : AM 2038 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	4.4	0.0	8.9	8.3	10.0	0.0	8.5	3.8
		Scenario67b : AM 2038 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	31.4	0.0	27.4	34.2	33.6	0.0	83.5	27.7

					LOS				Worst Delay				Worst Queue		
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario68 : AM 2048 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		25.9	25.2	27.3	0.0	21.3	53.9	32.1	0.0
		Scenario68 : AM 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.7	8.0	10.5	11.4	1.4	6.1	16.8	8.8
		Scenario68 : AM 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	46.7	45.5	45.3	51.9	14.4	68.7	32.7	56.3
2048	138	Scenario68 : AM 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS E	LOS D	LOS F	LOS E	LOS E	48.1	82.6	68.0	93.5	85.6	309.5	160.1	51.4
		Scenario68 : AM 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	22.9	25.1	0.0	5.2	9.6	16.1	0.0
		Scenario68 : AM 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	41.9	41.9	41.9	7.6	99.6	3.3	80.6
		Scenario68 : AM 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	6.6	0.0	17.5	2.0
		Scenario68 : AM 2048 - Firth / GSR - Signalised	LOS E	LOS E	LOS E	LOS D	LOS C	80.2	73.3	54.8	64.1	96.7	295.1	9.5	34.0
		Scenario68 : AM 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	4.1	0.0	7.9	8.7	10.9	0.0	12.2	1.6
		Scenario68 : AM 2048 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	32.7	0.0	32.6	34.7	37.6	0.0	67.4	42.0

					LOS				Worst Delay				Worst Queue		
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario68a : AM 2048 - Brookfield / Fitzgerald - Signalised	LOS B	LOS C	LOS C	LOS B		23.6	21.3	22.2	0.0	10.6	37.7	26.7	0.0
		Scenario68a : AM 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	10.5	12.2	15.4	12.6	4.2	16.8	29.0	10.8
		Scenario68a : AM 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS C	LOS C	LOS D	44.3	46.6	37.3	44.4	30.5	45.9	59.9	34.0
2048	139	Scenario68a : AM 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS F	LOS D	LOS F	LOS F	LOS D	55.1	135.9	109.2	92.4	85.1	370.1	185.0	47.8
		Scenario68a : AM 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS B		19.0	19.8	26.7	0.0	3.2	4.9	8.3	0.0
		Scenario68a : AM 2048 - P&R / Waihoehoe - Signalised	LOS E	LOS F	LOS F	LOS E	LOS B	98.3	88.3	67.3	64.1	14.0	447.2	5.4	51.1
		Scenario68a : AM 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	25.4	0.0	21.3	30.7	3.2	0.0	14.8	2.2
		Scenario68a : AM 2048 - Firth / GSR - Signalised	LOS E	LOS D	LOS F	LOS D	LOS B	58.2	104.2	54.8	67.6	31.7	427.5	9.5	19.5
		Scenario68a : AM 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	4.2	0.0	7.7	8.7	10.6	0.0	8.3	1.4
		Scenario68a : AM 2048 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	29.8	0.0	31.2	33.2	39.0	0.0	50.9	29.4

					LOS				Worst Delay				Worst Queue		
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario68b : AM 2048 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		25.9	28.7	27.6	0.0	19.6	58.0	37.3	0.0
		Scenario68b : AM 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.3	8.0	12.5	11.7	1.7	7.0	23.9	10.2
		Scenario68b : AM 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	54.8	45.2	50.6	46.3	19.7	74.9	44.5	62.7
2048	138b	Scenario68b : AM 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS E	LOS E	LOS F	LOS E	LOS E	113.1	118.5	74.2	86.2	130.7	223.1	184.1	101.6
		Scenario68b : AM 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	22.7	25.1	0.0	5.7	8.7	19.4	0.0
		Scenario68b : AM 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	52.0	44.2	44.2	44.2	8.0	118.4	3.5	96.5
		Scenario68b : AM 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	7.2	0.0	21.7	2.1
		Scenario68b : AM 2048 - Firth / GSR - Signalised	LOS D	LOS D	LOS D	LOS C	LOS C	44.2	47.3	49.4	57.0	67.2	154.0	8.5	18.8
		Scenario68b : AM 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	4.2	0.0	7.8	8.7	10.4	0.0	11.3	1.5
		Scenario68b : AM 2048 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	30.4	0.0	33.4	32.0	36.1	0.0	58.0	35.6

					LOS				Worst Delay				Worst Queue		
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario68c : AM 2048 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS B		23.6	27.8	21.8	0.0	11.7	46.2	27.1	0.0
		Scenario68c : AM 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS B	LOS A	LOS A	LOS B	LOS A	10.3	12.6	21.4	13.3	4.1	16.6	46.7	12.6
		Scenario68c : AM 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS C	LOS D	48.1	51.3	39.8	44.5	30.4	45.9	67.9	33.8
2048	139b	Scenario68c : AM 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS E	LOS D	LOS E	LOS E	LOS D	45.4	76.8	68.6	73.8	70.0	229.7	144.6	55.2
		Scenario68c : AM 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS B		19.0	19.8	26.9	0.0	4.4	8.0	15.5	0.0
		Scenario68c : AM 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS E	LOS B	74.6	67.4	67.3	67.3	11.8	233.8	5.4	58.8
		Scenario68c : AM 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	23.9	0.0	21.3	27.4	4.2	0.0	27.5	2.0
		Scenario68c : AM 2048 - Firth / GSR - Signalised	LOS D	LOS E	LOS E	LOS D	LOS B	60.6	71.3	54.8	68.1	58.0	340.7	9.5	19.9
		Scenario68c : AM 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	4.3	0.0	7.7	8.7	11.0	0.0	8.5	1.4
		Scenario68c : AM 2048 - SH22/GSR - Full Signals	LOS B	LOS C		LOS B	LOS C	31.7	0.0	30.1	33.6	38.0	0.0	49.3	27.0

SIDRA Results PM

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2025	52a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario65 : PM 2025 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.8	6.8	0.0	0.0	0.3	4.1
		Scenario65 : PM 2025 - SH22/GSR - Interim Signals	LOS C	LOS C		LOS B	LOS D	24.8	0.0	54.3	55.6	184.6	0.0	36.2	60.1

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2025	58a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario65a : PM 2025 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.7	6.7	0.0	0.0	0.3	4.0
		Scenario65a : PM 2025 - SH22/GSR - Interim Signals	LOS C	LOS C		LOS B	LOS D	23.2	0.0	60.7	53.9	180.2	0.0	36.3	58.2

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2025	68a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario65b : PM 2025 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.7	6.7	0.0	0.0	0.3	3.4
		Scenario65b : PM 2025 - SH22/GSR - Interim Signals	LOS C	LOS C		LOS B	LOS D	26.4	0.0	51.0	54.3	191.2	0.0	31.2	51.5

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2026	52a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario66 : PM 2026 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.9	7.8	0.0	0.0	0.3	8.5
		Scenario66 : PM 2026 - SH22/GSR - Interim Signals	LOS D	LOS D		LOS B	LOS E	58.4	0.0	68.4	81.9	305.2	0.0	41.8	100.2

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2026	58a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario66a : PM 2026 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.9	7.8	0.0	0.0	0.3	9.0
		Scenario66a : PM 2026 - SH22/GSR - Interim Signals	LOS D	LOS D		LOS B	LOS E	58.0	0.0	65.7	76.2	297.5	0.0	42.8	100.0

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario65 : AM 2025 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	27.4	18.2	0.0	13.8	2.9	22.7	0.0
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	7.8	9.1	10.3	1.0	6.2	9.0	3.7
		Scenario65 : AM 2025 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	45.9	38.5	36.3	10.1	75.2	16.2	19.9
2026	68a	Scenario65 : AM 2025 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	9.8	11.2	12.8	10.1	9.6	6.6	17.2	8.5
		Scenario65 : AM 2025 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.0	0.0	9.9	1.8	18.9	0.0
		Scenario65 : AM 2025 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	45.0	41.9	40.5	7.6	94.5	3.3	54.4
		Scenario65 : AM 2025 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.4	0.0	21.3	27.4	12.7	0.0	21.0	2.0
		Scenario65 : AM 2025 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS B	38.8	36.3	37.2	44.1	14.3	108.6	6.3	16.6
		Scenario66b : PM 2026 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.8	7.0	0.0	0.0	0.3	4.5
		Scenario66b : PM 2026 - SH22/GSR - Interim Signals	LOS C	LOS C		LOS B	LOS D	36.5	0.0	53.1	66.7	235.3	0.0	32.5	64.4

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario62 : PM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		31.7	26.0	23.2	0.0	29.8	74.9	7.1	0.0
		Scenario62 : PM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS B	15.5	8.0	9.0	14.1	3.1	19.7	16.8	3.4
		Scenario62 : PM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS E	LOS F	LOS F	LOS B	LOS D	102.5	99.1	67.3	59.6	33.1	313.5	44.8	16.7
2028	52y	Scenario62 : PM 2028 - GSR / Waihoehoe - Roundabout	LOS F	LOS B	LOS B	LOS F	LOS F	16.3	12.7	371.8	274.9	34.9	9.6	416.9	363.4
		Scenario62 : PM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		21.3	22.0	24.7	0.0	12.0	12.1	5.0	0.0
		Scenario62 : PM 2028 - P&R / Waihoehoe - Signalised	LOS D	LOS F	LOS E	LOS E	LOS B	98.3	67.3	76.8	67.3	14.0	396.2	31.7	75.7
		Scenario62 : PM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	25.7	0.0	21.3	30.7	12.6	0.0	14.0	2.2
		Scenario62 : PM 2028 - Firth / GSR - Signalised	LOS C	LOS D	LOS D	LOS C	LOS B	44.5	39.3	40.5	48.7	32.7	138.1	6.9	30.1
		Scenario62 : PM 2028 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS C	4.7	0.0	6.2	16.6	0.0	0.0	0.3	56.3
		Scenario62 : PM 2028 - SH22/GSR - Interim Signals	LOS F	LOS F		LOS C	LOS F	146.5	0.0	77.3	224.6	487.0	0.0	64.4	316.4

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario62a : PM 2028 - Brookfield / Fitzgerald - Signalised	LOS D	LOS D	LOS D	LOS B		40.7	39.1	31.2	0.0	46.1	165.5	9.4	0.0
		Scenario62a : PM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	11.5	7.9	9.0	11.2	1.9	10.9	15.4	2.3
		Scenario62a : PM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS D	54.5	28.1	50.2	52.1	19.3	73.2	34.0	12.4
2028	58y	Scenario62a : PM 2028 - GSR / Waihoehoe - Roundabout	LOS F	LOS A	LOS A	LOS E	LOS F	11.9	12.1	69.6	325.3	28.2	8.9	79.7	402.1
		Scenario62a : PM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		21.3	22.1	24.7	0.0	13.5	11.9	4.5	0.0
		Scenario62a : PM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	57.5	48.8	52.5	48.8	8.9	158.3	26.7	73.4
		Scenario62a : PM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	25.6	0.0	21.3	30.7	14.6	0.0	12.7	2.2
		Scenario62a : PM 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	39.7	33.2	36.1	41.8	28.2	73.9	6.0	27.5
		Scenario62a : PM 2028 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS C	4.7	0.0	6.1	22.4	0.0	0.0	0.2	78.5
		Scenario62a : PM 2028 - SH22/GSR - Interim Signals	LOS F	LOS F		LOS C	LOS F	154.9	0.0	95.4	236.7	488.0	0.0	68.5	352.9

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62b : PM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS C		25.9	28.6	26.5	0.0	23.9	62.0	30.7	0.0
		Scenario62b : PM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.9	8.1	10.0	11.9	2.0	10.1	15.1	5.0
		Scenario62b : PM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	57.4	40.7	50.2	44.8	22.8	100.6	30.9	27.6
2028	68a	Scenario62b : PM 2028 - GSR / Waihoehoe - Roundabout	LOS F	LOS A	LOS A	LOS C	LOS F	8.8	10.9	31.9	242.8	17.6	10.6	24.2	341.8
		Scenario62b : PM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.9	24.4	0.0	12.4	2.4	17.3	0.0
		Scenario62b : PM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	54.7	46.5	47.7	46.5	8.5	122.1	29.6	70.4
		Scenario62b : PM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	15.7	0.0	18.9	2.0
		Scenario62b : PM 2028 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	38.5	40.1	39.7	41.8	21.9	50.1	45.0	28.8
		Scenario62b : PM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	9.7	8.9	4.6	0.0	2.7	7.2
		Scenario62b : PM 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS D	17.9	0.0	37.0	40.9	84.7	0.0	23.6	23.7

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62c : PM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		21.3	26.4	18.2	0.0	19.4	38.9	11.0	0.0
		Scenario62c : PM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS B	LOS B	LOS A	LOS B	LOS A	15.0	7.9	19.3	14.7	2.8	17.9	73.8	5.8
		Scenario62c : PM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS D	LOS F	LOS E	LOS B	LOS E	119.1	76.1	67.3	67.6	37.8	240.4	102.5	33.6
2028	72	Scenario62c : PM 2028 - GSR / Waihoehoe - Roundabout	LOS F	LOS B	LOS A	LOS B	LOS F	16.4	11.3	19.0	517.8	32.2	8.0	23.5	700.2
		Scenario62c : PM 2028 - Fitzgerald / Pitt - Signalised	LOS C	LOS C	LOS C	LOS C		21.6	26.0	33.2	0.0	32.1	76.2	8.4	0.0
		Scenario62c : PM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS E	LOS B	74.6	67.3	72.1	67.3	11.8	278.3	38.6	141.7
		Scenario62c : PM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS C	LOS D	17.1	0.0	32.7	44.8	51.5	0.0	106.6	3.3
		Scenario62c : PM 2028 - Firth / GSR - Signalised	LOS C	LOS D	LOS D	LOS C	LOS C	46.2	43.3	40.5	49.9	38.5	75.8	6.9	49.3
		Scenario62c : PM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	10.8	8.8	5.3	0.0	3.0	11.9
		Scenario62c : PM 2028 - SH22/GSR - Full Signals	LOS C	LOS B		LOS B	LOS D	19.6	0.0	38.9	39.7	93.4	0.0	26.0	31.5

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62d : PM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		31.9	31.6	25.2	0.0	31.7	98.1	12.5	0.0
		Scenario62d : PM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	11.9	7.9	13.8	11.7	1.8	10.3	46.8	3.8
		Scenario62d : PM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	55.1	46.0	50.0	44.8	20.1	113.7	71.3	20.8
2028	78	Scenario62d : PM 2028 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS C	LOS E	LOS D	73.5	67.1	75.9	68.8	209.7	38.3	49.6	138.4
		Scenario62d : PM 2028 - Fitzgerald / Pitt - Signalised	LOS D	LOS C	LOS B	LOS F		21.4	20.4	434.5	0.0	20.7	59.2	40.4	0.0
		Scenario62d : PM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	54.7	46.5	48.4	46.5	8.5	142.2	25.7	151.1
		Scenario62d : PM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS D	18.0	0.0	30.4	41.9	17.8	0.0	73.4	3.1
		Scenario62d : PM 2028 - Firth / GSR - Signalised	LOS C	LOS D	LOS D	LOS C	LOS C	44.9	42.8	40.5	48.7	34.5	69.3	6.9	53.6
		Scenario62d : PM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	11.4	8.9	4.3	0.0	3.0	14.3
		Scenario62d : PM 2028 - SH22/GSR - Full Signals	LOS C	LOS B		LOS B	LOS C	20.1	0.0	36.5	37.3	85.1	0.0	28.2	32.8

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62e : PM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		21.3	31.3	20.8	0.0	22.9	41.4	24.4	0.0
		Scenario62e : PM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.8	7.8	9.6	10.9	1.8	9.0	11.9	4.1
		Scenario62e : PM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	48.5	36.7	44.2	41.1	19.1	76.3	26.1	23.2
2028	84	Scenario62e : PM 2028 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS C	LOS E	LOS D	59.8	63.9	77.0	59.3	169.2	48.6	44.2	126.3
		Scenario62e : PM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.4	0.0	14.9	1.8	17.0	0.0
		Scenario62e : PM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	54.7	46.5	48.3	46.5	8.5	134.1	25.7	65.0
		Scenario62e : PM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	19.2	0.0	18.6	2.0
		Scenario62e : PM 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS B	LOS C	32.1	40.7	35.7	40.3	15.2	25.3	40.0	25.8
		Scenario62e : PM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	9.8	8.9	4.8	0.0	2.3	7.4
		Scenario62e : PM 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS D	18.1	0.0	36.9	41.5	90.3	0.0	23.5	24.3

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario62f : PM 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS C		26.5	27.4	26.2	0.0	30.7	59.5	30.2	0.0
		Scenario62f : PM 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	11.2	8.1	9.8	11.8	2.0	10.6	13.4	4.9
		Scenario62f : PM 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	56.7	47.6	50.2	44.7	22.2	118.8	27.9	26.4
2028	88	Scenario62f : PM 2028 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS D	LOS D	LOS D	49.5	62.5	65.4	56.0	141.0	73.8	45.6	112.3
		Scenario62f : PM 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	22.5	24.4	0.0	14.1	3.6	17.1	0.0
		Scenario62f : PM 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	54.7	46.5	48.3	46.5	8.5	127.9	25.7	65.4
		Scenario62f : PM 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	18.1	0.0	18.7	2.0
		Scenario62f : PM 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS C	36.1	41.0	38.0	46.2	20.4	37.8	46.1	31.5
		Scenario62f : PM 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	9.7	8.9	4.6	0.0	2.5	7.2
		Scenario62f : PM 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS D	17.9	0.0	37.3	40.7	89.4	0.0	22.9	23.6

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63 : PM 2030 - Brookfield / Fitzgerald - Signalised	LOS C	LOS D	LOS C	LOS B		40.2	32.2	30.1	0.0	35.3	127.6	16.0	0.0
		Scenario63 : PM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	12.0	7.9	14.2	11.6	1.9	10.9	49.3	3.8
		Scenario63 : PM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	55.8	50.9	50.0	44.8	20.9	124.7	72.5	20.5
2030	78	Scenario63 : PM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS E	LOS E	LOS C	LOS E	LOS E	106.4	67.1	93.6	90.5	253.0	43.8	53.3	188.1
		Scenario63 : PM 2030 - Fitzgerald / Pitt - Signalised	LOS C	LOS B	LOS C	LOS C		19.0	25.6	33.5	0.0	17.3	72.7	7.8	0.0
		Scenario63 : PM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS D	LOS B	60.4	51.1	52.2	51.1	9.4	151.8	33.2	135.2
		Scenario63 : PM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS D	18.0	0.0	30.4	41.9	21.6	0.0	80.2	3.1
		Scenario63 : PM 2030 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS C	37.6	40.0	33.9	44.0	28.5	54.3	5.7	51.0
		Scenario63 : PM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	12.7	9.2	4.6	0.0	3.8	20.0
		Scenario63 : PM 2030 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	21.2	0.0	37.4	39.0	86.2	0.0	28.8	39.8

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63a : PM 2030 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		21.3	32.8	23.1	0.0	24.8	43.4	28.3	0.0
		Scenario63a : PM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	11.1	7.8	9.7	11.2	2.0	9.8	12.7	4.4
		Scenario63a : PM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	49.3	40.9	44.2	41.2	20.3	87.9	28.0	23.8
2030	84	Scenario63a : PM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS C	LOS E	LOS E	77.0	67.1	76.5	71.5	207.2	44.4	61.1	143.5
		Scenario63a : PM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.5	0.0	15.7	1.8	18.6	0.0
		Scenario63a : PM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	57.5	48.8	50.8	48.8	8.9	153.8	26.6	68.6
		Scenario63a : PM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	20.5	0.0	20.8	2.0
		Scenario63a : PM 2030 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS C	35.6	46.2	39.2	40.3	17.0	33.9	54.0	31.6
		Scenario63a : PM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	10.0	9.1	5.2	0.0	2.9	8.5
		Scenario63a : PM 2030 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	21.5	0.0	38.4	37.8	108.1	0.0	25.3	24.5

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63b : PM 2030 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS C		28.7	31.4	29.8	0.0	33.7	68.7	35.2	0.0
		Scenario63b : PM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	11.7	8.1	10.0	12.3	2.3	12.0	15.2	5.3
		Scenario63b : PM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS D	LOS E	LOS D	LOS B	LOS D	61.9	47.6	54.4	49.5	26.0	136.5	34.5	30.2
2030	88	Scenario63b : PM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS C	LOS E	LOS D	57.2	67.1	71.3	65.6	175.3	46.4	65.0	136.5
		Scenario63b : PM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	22.6	24.5	0.0	14.7	3.9	18.6	0.0
		Scenario63b : PM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	57.5	48.8	50.8	48.8	8.9	149.4	26.6	71.6
		Scenario63b : PM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	19.0	0.0	20.7	2.0
		Scenario63b : PM 2030 - Firth / GSR - Signalised	LOS C	LOS D	LOS D	LOS C	LOS C	38.4	46.3	40.7	48.5	21.4	42.9	57.1	33.3
		Scenario63b : PM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	10.0	8.9	4.8	0.0	2.7	8.4
		Scenario63b : PM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	19.3	0.0	38.5	37.2	98.5	0.0	24.1	23.6

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63c : PM 2030 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		29.8	23.4	26.4	0.0	22.9	70.2	15.8	0.0
		Scenario63c : PM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS A	11.7	7.8	15.8	11.2	1.8	9.4	58.4	3.5
		Scenario63c : PM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	48.3	42.6	44.2	41.4	18.4	91.7	106.0	18.4
2030	98	Scenario63c : PM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS E	LOS E	LOS C	LOS E	LOS E	125.3	67.1	122.3	107.0	307.1	39.3	44.6	206.0
		Scenario63c : PM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS C	LOS B	LOS C		24.3	26.0	39.1	0.0	17.0	62.8	9.0	0.0
		Scenario63c : PM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	57.5	48.8	50.4	48.8	8.9	119.9	28.0	160.1
		Scenario63c : PM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS D	17.0	0.0	32.7	44.8	20.2	0.0	92.7	3.3
		Scenario63c : PM 2030 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS C	42.2	39.8	37.2	45.3	34.3	48.1	6.3	63.3
		Scenario63c : PM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	9.0	8.7	4.1	0.0	2.7	5.7
		Scenario63c : PM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	17.9	0.0	36.2	34.8	94.9	0.0	28.8	22.1

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63d : PM 2030 - Brookfield / Fitzgerald - Signalised	LOS B	LOS C	LOS C	LOS B		21.3	23.9	20.2	0.0	20.1	27.9	18.0	0.0
		Scenario63d : PM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.8	7.8	9.4	11.1	1.8	8.9	11.8	3.6
		Scenario63d : PM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	48.4	38.1	44.2	40.7	18.8	80.3	25.3	19.4
2030	104	Scenario63d : PM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS C	LOS E	LOS E	64.5	63.9	74.2	65.2	193.7	47.7	45.9	136.0
		Scenario63d : PM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.5	0.0	12.2	1.8	11.7	0.0
		Scenario63d : PM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	54.7	46.5	48.3	46.5	8.5	124.4	25.1	63.6
		Scenario63d : PM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	25.6	0.0	21.3	30.7	15.0	0.0	12.2	2.2
		Scenario63d : PM 2030 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS B	LOS C	38.0	41.0	42.0	43.7	18.2	42.4	47.7	33.8
		Scenario63d : PM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	8.8	8.9	4.4	0.0	2.6	4.4
		Scenario63d : PM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	18.6	0.0	38.7	34.5	100.9	0.0	26.3	21.6

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario63e : PM 2030 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		23.6	23.9	21.2	0.0	21.8	41.9	19.7	0.0
		Scenario63e : PM 2030 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	11.3	8.1	9.6	11.8	2.1	10.8	13.7	4.2
		Scenario63e : PM 2030 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	56.4	47.2	50.2	44.2	21.8	117.5	27.7	21.9
2030	108	Scenario63e : PM 2030 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS C	LOS E	LOS E	65.7	63.9	70.6	71.0	200.3	44.3	51.2	142.7
		Scenario63e : PM 2030 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.5	0.0	12.4	1.8	11.9	0.0
		Scenario63e : PM 2030 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	54.7	46.5	48.3	46.5	8.5	130.9	25.1	64.6
		Scenario63e : PM 2030 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	25.6	0.0	21.3	30.7	15.2	0.0	12.6	2.2
		Scenario63e : PM 2030 - Firth / GSR - Signalised	LOS C	LOS D	LOS D	LOS C	LOS C	39.8	42.1	46.1	48.7	23.7	59.4	49.9	34.0
		Scenario63e : PM 2030 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	8.8	8.9	4.6	0.0	2.7	4.5
		Scenario63e : PM 2030 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	20.2	0.0	38.1	34.5	108.2	0.0	25.3	21.5

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64 : PM 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS D	LOS C	LOS C		48.0	34.1	42.5	0.0	32.4	197.9	17.0	0.0
		Scenario64 : PM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	12.4	7.9	12.5	11.4	2.2	12.0	42.9	2.9
		Scenario64 : PM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	57.5	46.2	50.0	44.3	22.8	111.8	72.8	15.4
2033	78	Scenario64 : PM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS E	LOS F	LOS C	LOS E	LOS E	156.2	67.1	121.4	111.8	354.7	42.1	69.7	199.8
		Scenario64 : PM 2033 - Fitzgerald / Pitt - Signalised	LOS C	LOS B	LOS C	LOS C		19.3	26.4	32.9	0.0	11.3	73.9	9.2	0.0
		Scenario64 : PM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS D	LOS B	66.7	55.7	56.9	55.7	10.3	180.5	35.6	122.7
		Scenario64 : PM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS D	18.0	0.0	30.4	41.9	20.1	0.0	78.3	3.1
		Scenario64 : PM 2033 - Firth / GSR - Signalised	LOS C	LOS D	LOS D	LOS C	LOS C	44.2	44.8	40.5	50.9	31.5	89.5	6.9	58.6
		Scenario64 : PM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS B	LOS A		LOS B	LOS B	3.1	0.0	15.7	13.1	5.8	0.0	7.3	48.4
		Scenario64 : PM 2033 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS D	26.3	0.0	41.2	42.3	97.4	0.0	34.1	53.9

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64a : PM 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		23.6	27.6	20.9	0.0	30.1	45.9	23.8	0.0
		Scenario64a : PM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	11.6	7.9	10.4	11.8	2.2	10.8	17.8	4.7
		Scenario64a : PM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	49.9	53.4	44.2	41.4	21.1	108.6	36.7	24.5
2033	84	Scenario64a : PM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS E	LOS E	LOS C	LOS E	LOS E	114.5	67.1	88.1	85.9	292.5	40.1	100.4	149.2
		Scenario64a : PM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.5	24.6	0.0	16.8	2.0	15.0	0.0
		Scenario64a : PM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS D	LOS B	63.4	53.4	55.6	53.4	9.8	165.4	28.5	81.9
		Scenario64a : PM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.7	0.0	21.3	27.4	22.2	0.0	17.4	2.0
		Scenario64a : PM 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS C	38.0	44.2	45.0	43.7	18.2	50.8	70.3	38.7
		Scenario64a : PM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	10.7	9.2	5.5	0.0	3.4	11.9
		Scenario64a : PM 2033 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	28.2	0.0	40.8	39.0	126.6	0.0	28.1	30.7

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64b : PM 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		30.4	30.0	25.4	0.0	42.0	79.1	32.6	0.0
		Scenario64b : PM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	12.5	8.2	11.6	13.1	2.9	14.4	23.0	6.1
		Scenario64b : PM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS D	LOS E	LOS D	LOS B	LOS D	71.1	52.8	62.9	60.7	32.1	159.9	50.9	38.2
2033	88	Scenario64b : PM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS D	LOS C	LOS D	LOS E	78.5	67.1	74.0	78.9	237.5	39.8	84.5	144.3
		Scenario64b : PM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	22.8	24.9	0.0	15.3	6.5	15.3	0.0
		Scenario64b : PM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS D	LOS B	66.7	55.7	58.0	55.7	10.3	172.8	30.2	83.8
		Scenario64b : PM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	17.9	0.0	20.5	2.0
		Scenario64b : PM 2033 - Firth / GSR - Signalised	LOS D	LOS D	LOS E	LOS D	LOS D	58.4	82.7	99.1	88.1	33.5	86.7	134.7	75.1
		Scenario64b : PM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	10.6	9.1	5.3	0.0	3.5	11.1
		Scenario64b : PM 2033 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	20.9	0.0	41.5	36.6	100.1	0.0	27.6	27.2

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64c : PM 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS D	LOS B		32.9	37.1	28.8	0.0	25.2	135.1	13.1	0.0
		Scenario64c : PM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	12.3	7.9	14.3	11.7	2.2	11.5	52.6	3.4
		Scenario64c : PM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS E	LOS C	LOS B	LOS D	61.4	30.6	54.2	56.6	25.2	78.0	85.7	20.9
2033	98	Scenario64c : PM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS E	LOS F	LOS C	LOS E	LOS E	175.1	67.9	103.1	117.6	391.1	41.0	62.5	216.9
		Scenario64c : PM 2033 - Fitzgerald / Pitt - Signalised	LOS C	LOS B	LOS C	LOS C		19.7	28.6	32.9	0.0	14.4	89.4	9.2	0.0
		Scenario64c : PM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS D	LOS B	63.4	53.4	54.5	53.4	9.8	165.5	33.8	134.7
		Scenario64c : PM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS C	LOS D	18.0	0.0	30.4	41.9	24.8	0.0	89.7	3.1
		Scenario64c : PM 2033 - Firth / GSR - Signalised	LOS D	LOS D	LOS E	LOS D	LOS C	61.4	75.5	54.8	74.0	46.9	126.3	9.5	78.6
		Scenario64c : PM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	9.5	8.8	4.4	0.0	3.3	7.3
		Scenario64c : PM 2033 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	18.2	0.0	36.6	35.7	95.8	0.0	32.0	25.5

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64d : PM 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		21.3	26.6	19.6	0.0	20.4	39.2	16.2	0.0
		Scenario64d : PM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.9	7.8	9.5	11.3	2.0	9.2	12.7	3.8
		Scenario64d : PM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	49.5	47.8	44.2	40.8	20.6	100.5	27.3	19.8
2033	104	Scenario64d : PM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS D	LOS E	LOS C	LOS D	LOS E	95.6	65.4	71.4	75.4	268.0	44.9	67.6	144.7
		Scenario64d : PM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.5	24.6	0.0	12.0	2.0	9.9	0.0
		Scenario64d : PM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	57.5	48.8	50.7	48.8	8.9	137.9	25.5	66.8
		Scenario64d : PM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	25.6	0.0	21.3	30.7	14.7	0.0	10.5	2.2
		Scenario64d : PM 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS C	41.6	51.2	46.6	46.6	21.0	47.7	65.0	44.9
		Scenario64d : PM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	9.1	9.2	5.1	0.0	2.9	5.7
		Scenario64d : PM 2033 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	24.4	0.0	41.5	35.1	125.0	0.0	27.7	23.5

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario64e : PM 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		25.5	23.8	24.3	0.0	23.6	46.6	21.6	0.0
		Scenario64e : PM 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	11.8	8.2	9.9	12.3	2.5	12.6	16.9	4.6
		Scenario64e : PM 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS E	LOS C	LOS B	LOS D	62.3	33.4	54.4	58.9	26.3	99.1	36.1	28.3
2033	108	Scenario64e : PM 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS E	LOS E	LOS C	LOS D	LOS E	97.4	67.1	72.3	88.6	269.2	45.2	71.2	167.9
		Scenario64e : PM 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.6	24.6	0.0	11.9	3.6	11.5	0.0
		Scenario64e : PM 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS D	LOS B	60.4	51.1	52.9	51.1	9.4	157.3	27.8	74.0
		Scenario64e : PM 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	15.2	0.0	16.9	2.0
		Scenario64e : PM 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS D	LOS C	LOS C	38.5	44.3	42.5	47.9	22.0	39.7	61.0	39.3
		Scenario64e : PM 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	9.1	9.0	5.0	0.0	3.0	5.8
		Scenario64e : PM 2033 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS C	23.0	0.0	41.5	34.8	119.5	0.0	26.5	23.7

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario67 : PM 2038 - Brookfield / Fitzgerald - Signalised	LOS C	LOS D	LOS C	LOS C		48.2	32.1	51.5	0.0	15.7	195.8	38.3	0.0
		Scenario67 : PM 2038 - Fitzgerald / Waihoehoe - Roundabout	LOS C	LOS A	LOS A	LOS D	LOS A	10.9	8.0	48.2	12.3	3.7	4.5	151.3	3.8
		Scenario67 : PM 2038 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS C	LOS D	48.1	42.6	42.4	49.2	51.3	51.5	144.4	20.8
2038	118	Scenario67 : PM 2038 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS D	LOS D	LOS C	LOS D	LOS D	58.1	57.1	44.8	62.9	114.2	52.7	23.7	179.4
		Scenario67 : PM 2038 - Fitzgerald / Pitt - Signalised	LOS C	LOS B	LOS B	LOS D		25.3	39.4	40.3	0.0	20.3	83.2	22.6	0.0
		Scenario67 : PM 2038 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS B	LOS D	LOS C	63.4	53.4	53.4	53.4	9.8	61.3	12.1	175.2
		Scenario67 : PM 2038 - Fulton Access / Fitzgerald - Signalised	LOS C	LOS B		LOS C	LOS D	18.0	0.0	30.4	41.9	19.9	0.0	102.1	3.1
		Scenario67 : PM 2038 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	37.9	35.0	33.9	41.0	29.7	37.3	5.7	80.1
		Scenario67 : PM 2038 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	2.9	0.0	10.0	7.8	3.0	0.0	2.0	6.5
		Scenario67 : PM 2038 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	18.1	0.0	35.7	34.4	66.2	0.0	27.0	46.2

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario67a : PM 2038 - Brookfield / Fitzgerald - Signalised	LOS C	LOS D	LOS C	LOS C		39.6	32.5	40.0	0.0	13.6	140.7	29.7	0.0
		Scenario67a : PM 2038 - Fitzgerald / Waihoehoe - Roundabout	LOS F	LOS A	LOS A	LOS F	LOS A	10.2	8.9	202.2	13.6	5.8	5.2	464.3	6.3
		Scenario67a : PM 2038 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS C	LOS D	43.9	45.6	36.8	41.7	66.0	45.4	96.1	26.2
2038	119	Scenario67a : PM 2038 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS D	LOS D	LOS C	LOS D	LOS D	53.9	56.3	42.4	68.0	110.2	47.2	26.7	119.6
		Scenario67a : PM 2038 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		14.6	39.5	40.2	0.0	25.3	96.5	24.6	0.0
		Scenario67a : PM 2038 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS B	LOS D	LOS C	60.4	51.1	51.1	51.1	9.4	61.2	11.5	161.7
		Scenario67a : PM 2038 - Fulton Access / Fitzgerald - Signalised	LOS C	LOS A		LOS C	LOS D	14.3	0.0	46.0	57.9	35.6	0.0	197.6	4.5
		Scenario67a : PM 2038 - Firth / GSR - Signalised	LOS C	LOS D	LOS D	LOS C	LOS B	47.9	43.2	40.5	49.6	47.6	90.7	6.9	78.6
		Scenario67a : PM 2038 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	10.1	7.9	3.0	0.0	2.0	6.9
		Scenario67a : PM 2038 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	18.9	0.0	33.5	34.3	61.6	0.0	27.3	44.1

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario67b : PM 2038 - Brookfield / Fitzgerald - Signalised	LOS C	LOS D	LOS C	LOS C		54.1	34.1	56.9	0.0	32.0	238.8	36.3	0.0
		Scenario67b : PM 2038 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	13.0	7.9	13.5	11.5	2.4	13.7	49.6	3.2
		Scenario67b : PM 2038 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS D	57.2	32.2	50.0	52.0	22.5	83.4	80.7	17.4
2038	98	Scenario67b : PM 2038 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS F	LOS F	LOS D	LOS E	LOS F	181.6	51.9	163.6	139.8	431.6	82.2	72.5	213.3
		Scenario67b : PM 2038 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		15.2	33.8	34.9	0.0	16.8	65.1	18.4	0.0
		Scenario67b : PM 2038 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS E	LOS B	71.9	65.0	65.0	65.0	11.4	223.2	14.8	129.1
		Scenario67b : PM 2038 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS C	LOS C	18.1	0.0	30.5	41.9	27.3	0.0	96.0	3.1
		Scenario67b : PM 2038 - Firth / GSR - Signalised	LOS E	LOS D	LOS F	LOS D	LOS D	60.1	110.7	54.8	114.3	42.4	190.5	9.5	106.9
		Scenario67b : PM 2038 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS B	3.4	0.0	12.0	12.6	8.7	0.0	7.8	28.8
		Scenario67b : PM 2038 - SH22/GSR - Full Signals	LOS C	LOS C		LOS B	LOS D	24.8	0.0	45.6	43.6	122.5	0.0	44.8	69.5

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario68 : PM 2048 - Brookfield / Fitzgerald - Signalised	LOS C	LOS D	LOS D	LOS C		53.7	37.5	55.6	0.0	11.2	232.5	52.9	0.0
		Scenario68 : PM 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS D	LOS A	LOS A	LOS F	LOS A	10.7	8.2	76.6	11.3	2.6	5.0	197.2	6.5
		Scenario68 : PM 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS C	LOS C	42.9	37.7	39.2	38.4	28.9	38.3	109.8	35.6
2048	138	Scenario68 : PM 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS E	LOS E	LOS C	LOS D	LOS E	74.5	63.9	44.7	74.1	151.7	90.8	28.4	238.7
		Scenario68 : PM 2048 - Fitzgerald / Pitt - Signalised	LOS C	LOS B	LOS B	LOS D		25.1	38.9	41.4	0.0	20.3	84.2	24.9	0.0
		Scenario68 : PM 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS B	LOS D	LOS C	60.4	51.1	51.1	51.1	9.4	75.9	16.1	175.1
		Scenario68 : PM 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS C	LOS D	17.0	0.0	32.7	44.8	19.0	0.0	103.4	3.3
		Scenario68 : PM 2048 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS C	42.7	37.1	39.4	50.4	28.5	68.1	6.7	88.7
		Scenario68 : PM 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	10.2	9.3	4.3	0.0	3.6	12.6
		Scenario68 : PM 2048 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	23.1	0.0	28.6	29.5	43.3	0.0	13.4	27.0

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario68a : PM 2048 - Brookfield / Fitzgerald - Signalised	LOS C	LOS D	LOS C	LOS C		46.0	33.0	53.7	0.0	12.1	176.9	52.7	0.0
		Scenario68a : PM 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS F	LOS A	LOS A	LOS F	LOS A	10.3	8.9	262.3	13.4	5.3	5.5	521.0	9.7
		Scenario68a : PM 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS C	LOS C	39.6	43.5	33.8	39.7	55.5	33.2	88.4	37.6
2048	139	Scenario68a : PM 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS E	LOS E	LOS C	LOS D	LOS E	87.9	63.9	46.7	78.0	165.6	69.3	38.4	163.0
		Scenario68a : PM 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		14.8	39.2	39.1	0.0	21.8	88.9	24.7	0.0
		Scenario68a : PM 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS B	LOS D	LOS C	60.4	51.1	51.1	51.1	9.4	80.4	16.1	162.9
		Scenario68a : PM 2048 - Fulton Access / Fitzgerald - Signalised	LOS C	LOS A		LOS C	LOS D	15.5	0.0	37.3	50.7	26.7	0.0	143.8	3.8
		Scenario68a : PM 2048 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	44.3	38.0	40.5	50.3	32.1	79.4	6.9	94.1
		Scenario68a : PM 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	2.9	0.0	10.1	9.3	4.3	0.0	3.6	12.8
		Scenario68a : PM 2048 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	22.7	0.0	28.6	29.7	44.2	0.0	13.7	26.1

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario68b : PM 2048 - Brookfield / Fitzgerald - Signalised	LOS C	LOS D	LOS C	LOS C		55.9	35.0	60.6	0.0	15.1	228.3	61.2	0.0
		Scenario68b : PM 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS B	LOS A	LOS A	LOS C	LOS A	10.7	8.2	37.2	11.4	3.0	5.2	119.0	4.4
		Scenario68b : PM 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS C	LOS D	40.9	35.4	36.9	42.1	30.6	39.0	102.9	23.5
2048	138b	Scenario68b : PM 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS D	LOS E	LOS D	LOS D	LOS E	68.7	53.0	47.6	70.8	147.1	80.4	29.4	183.5
		Scenario68b : PM 2048 - Fitzgerald / Pitt - Signalised	LOS C	LOS B	LOS C	LOS C		24.1	39.4	39.2	0.0	21.6	87.1	24.9	0.0
		Scenario68b : PM 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS B	LOS D	LOS C	60.4	51.1	51.1	51.1	9.4	80.2	16.1	152.9
		Scenario68b : PM 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS C	LOS D	17.0	0.0	32.7	44.8	19.3	0.0	104.3	3.3
		Scenario68b : PM 2048 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	40.4	38.5	36.1	43.3	30.6	50.6	6.0	61.7
		Scenario68b : PM 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	2.9	0.0	10.8	9.4	4.2	0.0	4.0	15.0
		Scenario68b : PM 2048 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	22.2	0.0	28.6	29.9	45.6	0.0	13.5	32.2

			LOS					Worst Delay				Worst Queue			
		Extracted Site name	Intersection	North Approach	West Approach	South Approach	East Approach	North	West	South	East	North	West	South	East
		Scenario68c : PM 2048 - Brookfield / Fitzgerald - Signalised	LOS C	LOS D	LOS C	LOS C		46.0	35.1	52.6	0.0	13.3	186.1	51.6	0.0
		Scenario68c : PM 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS F	LOS A	LOS A	LOS F	LOS A	10.2	9.0	165.6	12.9	5.3	5.5	363.6	7.7
		Scenario68c : PM 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS C	LOS C	42.8	39.5	34.6	38.1	52.4	30.9	72.6	27.5
2048	139b	Scenario68c : PM 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS D	LOS E	LOS D	LOS D	LOS D	63.9	55.2	46.5	67.9	134.1	71.0	38.1	167.1
		Scenario68c : PM 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		15.6	33.6	36.5	0.0	21.2	78.4	22.1	0.0
		Scenario68c : PM 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS B	LOS D	LOS C	57.5	48.8	48.8	48.8	8.9	82.3	15.3	145.7
		Scenario68c : PM 2048 - Fulton Access / Fitzgerald - Signalised	LOS C	LOS B		LOS C	LOS D	16.3	0.0	35.0	47.7	27.2	0.0	125.2	3.6
		Scenario68c : PM 2048 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS C	36.8	41.6	33.9	43.8	25.4	51.0	5.7	63.9
		Scenario68c : PM 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	2.9	0.0	10.7	9.4	4.3	0.0	4.0	14.7
		Scenario68c : PM 2048 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	22.3	0.0	28.6	29.9	46.4	0.0	14.0	30.7

SIDRA Results IP

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario62 : IP 2028 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	30.7	15.5	0.0	13.3	12.8	15.4	0.0
		Scenario62 : IP 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS B	LOS A	LOS A	LOS A	13.7	7.9	10.0	14.0	1.9	14.7	23.1	5.5
		Scenario62 : IP 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS D	LOS E	LOS E	LOS B	LOS D	73.7	67.3	67.3	59.5	21.5	250.7	54.5	31.1
2028	52y	Scenario62 : IP 2028 - GSR / Waihoehoe - Roundabout	LOS B	LOS B	LOS B	LOS D	LOS B	13.5	13.6	38.4	13.7	16.9	7.7	51.7	24.7
		Scenario62 : IP 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.6	21.4	24.0	0.0	10.1	8.2	13.6	0.0
		Scenario62 : IP 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS E	LOS C	LOS E	LOS B	71.9	65.0	65.0	65.0	11.4	243.8	5.2	92.6
		Scenario62 : IP 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	14.9	0.0	23.2	2.0
		Scenario62 : IP 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	38.1	32.7	36.1	41.8	17.2	88.8	6.0	26.7
		Scenario62 : IP 2028 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.9	6.9	0.0	0.0	0.2	4.8
		Scenario62 : IP 2028 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	21.7	0.0	45.3	29.2	58.6	0.0	56.0	47.8

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario62a : IP 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS B		21.3	24.3	20.2	0.0	13.1	33.7	17.6	0.0
		Scenario62a : IP 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.2	7.9	9.9	10.3	1.1	6.8	21.9	3.4
		Scenario62a : IP 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.4	43.2	38.5	36.2	11.4	70.9	39.6	18.0
2028	58y	Scenario62a : IP 2028 - GSR / Waihoehoe - Roundabout	LOS B	LOS A	LOS A	LOS B	LOS B	9.0	10.3	16.2	15.8	10.1	5.2	13.7	27.0
		Scenario62a : IP 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.3	0.0	8.6	9.4	13.1	0.0
		Scenario62a : IP 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	41.9	41.9	41.9	7.6	88.4	3.3	106.1
		Scenario62a : IP 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	10.2	0.0	24.0	2.0
		Scenario62a : IP 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	35.9	35.6	33.9	39.5	16.6	37.6	5.7	31.3
		Scenario62a : IP 2028 - Great South Rd / Quarry Rd - Give-Way	LOS NA	LOS NA		LOS A	LOS A	4.7	0.0	5.9	7.0	0.0	0.0	0.2	4.9
		Scenario62a : IP 2028 - SH22/GSR - Interim Signals	LOS B	LOS B		LOS B	LOS C	21.9	0.0	44.6	30.1	62.0	0.0	54.6	48.4

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario62b : IP 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS B		21.3	26.5	23.4	0.0	16.5	38.0	23.4	0.0
		Scenario62b : IP 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.7	7.9	9.1	10.4	1.0	6.6	9.9	3.3
		Scenario62b : IP 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.2	51.9	38.6	36.8	10.8	84.4	18.3	16.7
2028	68a	Scenario62b : IP 2028 - GSR / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS B	LOS B	8.5	9.4	13.3	12.6	7.6	5.0	6.2	19.5
		Scenario62b : IP 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.5	0.0	10.5	1.8	15.9	0.0
		Scenario62b : IP 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS B	49.3	41.9	41.9	41.9	7.6	87.7	3.3	53.3
		Scenario62b : IP 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	13.4	0.0	17.4	2.0
		Scenario62b : IP 2028 - Firth / GSR - Signalised	LOS B	LOS C	LOS C	LOS B	LOS B	34.0	33.5	33.4	37.2	10.1	24.5	14.3	9.1
		Scenario62b : IP 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	9.2	8.4	3.5	0.0	2.2	5.0
		Scenario62b : IP 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	24.5	0.0	27.5	25.7	30.6	0.0	33.7	14.6

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario62d : IP 2028 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		23.6	22.0	25.1	0.0	15.8	40.1	22.2	0.0
		Scenario62d : IP 2028 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.9	7.9	9.5	10.0	1.0	6.0	19.7	3.2
		Scenario62d : IP 2028 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	40.2	37.4	38.5	36.1	10.6	59.3	37.4	17.2
2028	78	Scenario62d : IP 2028 - GSR / Waihoehoe - Signalised DDO Phasing	LOS C	LOS C	LOS C	LOS D	LOS C	43.1	41.8	45.2	37.2	37.6	29.0	17.8	58.6
		Scenario62d : IP 2028 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	21.4	24.7	0.0	9.0	7.0	13.4	0.0
		Scenario62d : IP 2028 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS C	LOS C	46.7	39.6	39.6	39.6	7.2	78.4	3.1	108.4
		Scenario62d : IP 2028 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.0	0.0	21.3	27.4	10.6	0.0	21.2	2.0
		Scenario62d : IP 2028 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	35.7	35.6	33.9	39.5	15.8	37.6	5.7	27.3
		Scenario62d : IP 2028 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	9.4	8.3	3.5	0.0	2.3	5.6
		Scenario62d : IP 2028 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	25.6	0.0	27.5	24.7	31.5	0.0	34.9	15.3

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario64 : IP 2033 - Brookfield / Fitzgerald - Signalised	LOS C	LOS C	LOS C	LOS B		25.9	28.6	25.6	0.0	21.7	61.7	28.3	0.0
		Scenario64 : IP 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.9	7.8	12.7	10.9	1.4	8.1	38.7	3.9
		Scenario64 : IP 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	47.1	40.1	44.2	40.9	15.3	86.3	61.1	21.2
2033	78	Scenario64 : IP 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS C	LOS C	LOS C	LOS D	LOS C	46.5	44.1	51.2	40.8	55.3	37.9	23.0	81.0
		Scenario64 : IP 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS B		21.3	19.3	30.5	0.0	15.1	27.7	16.1	0.0
		Scenario64 : IP 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	54.7	46.5	46.5	46.5	8.5	100.9	3.7	133.1
		Scenario64 : IP 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	19.2	0.0	28.1	39.1	13.8	0.0	58.7	2.9
		Scenario64 : IP 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	38.1	34.3	36.1	43.4	17.5	46.0	6.0	30.6
		Scenario64 : IP 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.2	0.0	9.9	8.4	4.6	0.0	3.1	7.1
		Scenario64 : IP 2033 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	25.1	0.0	28.9	25.1	33.2	0.0	36.5	19.1

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario64c : IP 2033 - Brookfield / Fitzgerald - Signalised	LOS B	LOS B	LOS C	LOS B		21.3	23.9	18.7	0.0	11.0	24.0	15.2	0.0
		Scenario64c : IP 2033 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.3	7.8	9.9	10.4	1.3	6.9	24.0	2.9
		Scenario64c : IP 2033 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS C	40.7	47.5	38.5	36.6	13.2	77.8	46.2	14.5
2033	98	Scenario64c : IP 2033 - GSR / Waihoehoe - Signalised DDO Phasing	LOS C	LOS C	LOS C	LOS D	LOS C	50.8	41.8	47.0	38.6	48.4	36.6	20.7	63.3
		Scenario64c : IP 2033 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS B		21.3	19.3	28.1	0.0	8.4	20.6	8.7	0.0
		Scenario64c : IP 2033 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	49.3	41.9	41.9	41.9	7.6	92.4	3.3	116.8
		Scenario64c : IP 2033 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	21.5	0.0	23.6	29.9	7.6	0.0	35.5	2.2
		Scenario64c : IP 2033 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	38.6	33.8	36.1	42.2	20.9	43.6	6.0	31.5
		Scenario64c : IP 2033 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.1	0.0	8.4	8.4	4.0	0.0	2.6	3.1
		Scenario64c : IP 2033 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	23.5	0.0	25.4	28.6	32.8	0.0	33.1	10.5

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario67 : IP 2038 - Brookfield / Fitzgerald - Signalised	LOS B	LOS C	LOS C	LOS B		23.6	24.0	20.5	0.0	9.1	46.9	23.0	0.0
		Scenario67 : IP 2038 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.0	7.9	9.2	10.4	1.8	4.9	16.8	2.4
		Scenario67 : IP 2038 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	41.3	33.8	38.6	37.4	18.0	49.4	34.3	10.7
2038	118	Scenario67 : IP 2038 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS C	LOS C	LOS C	LOS C	LOS C	41.2	39.1	33.8	45.6	52.8	31.4	19.1	50.0
		Scenario67 : IP 2038 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		19.0	19.4	26.4	0.0	4.5	7.6	4.5	0.0
		Scenario67 : IP 2038 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS C	LOS C	44.0	37.3	37.3	37.3	6.8	71.7	2.9	90.5
		Scenario67 : IP 2038 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	25.6	0.0	21.3	30.7	4.5	0.0	13.9	2.2
		Scenario67 : IP 2038 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	40.9	34.6	36.1	41.8	31.8	47.6	6.0	27.4
		Scenario67 : IP 2038 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	2.9	0.0	8.6	7.7	3.0	0.0	2.4	2.9
		Scenario67 : IP 2038 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	27.2	0.0	22.4	27.3	22.3	0.0	32.6	11.2

Year	pc(SATURN)	Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario67a : IP 2038 - Brookfield / Fitzgerald - Signalised	LOS B	LOS C	LOS C	LOS B		23.6	21.3	20.6	0.0	9.6	36.9	22.6	0.0
		Scenario67a : IP 2038 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	10.0	8.7	9.6	11.3	2.8	5.6	19.7	2.7
		Scenario67a : IP 2038 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS C	LOS B	LOS C	43.6	32.8	38.6	37.4	27.5	45.8	29.7	10.8
2038	119	Scenario67a : IP 2038 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS C	LOS C	LOS C	LOS C	LOS C	43.0	37.2	32.7	40.8	49.8	27.0	19.4	44.5
		Scenario67a : IP 2038 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS B		19.0	19.4	26.4	0.0	4.7	14.6	4.3	0.0
		Scenario67a : IP 2038 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS C	LOS C	44.0	37.3	37.3	37.3	6.8	72.8	2.9	76.0
		Scenario67a : IP 2038 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	24.2	0.0	21.3	27.4	4.6	0.0	23.5	2.1
		Scenario67a : IP 2038 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	41.1	34.5	36.1	41.8	32.3	47.1	6.0	27.0
		Scenario67a : IP 2038 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	2.9	0.0	8.6	7.7	2.9	0.0	2.5	2.8
		Scenario67a : IP 2038 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	27.2	0.0	22.4	27.4	22.1	0.0	33.1	11.1

		Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario67b : IP 2038 - Brookfield / Fitzgerald - Signalised	LOS C	LOS B	LOS C	LOS B		21.3	28.6	20.6	0.0	15.3	42.0	20.4	0.0
		Scenario67b : IP 2038 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	11.1	7.9	13.3	11.1	1.4	8.9	41.1	4.3
		Scenario67b : IP 2038 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS D	LOS D	LOS B	LOS D	47.2	45.8	44.4	41.2	15.5	97.9	62.4	22.4
2038	98	Scenario67b : IP 2038 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS D	LOS D	LOS C	LOS D	LOS D	53.7	38.6	46.2	50.2	79.9	44.2	30.7	93.8
		Scenario67b : IP 2038 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS B		19.0	19.4	26.3	0.0	10.3	34.0	11.4	0.0
		Scenario67b : IP 2038 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS D	LOS C	54.7	46.5	46.5	46.5	8.5	117.4	3.7	141.1
		Scenario67b : IP 2038 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	19.3	0.0	28.1	39.1	9.8	0.0	61.4	3.0
		Scenario67b : IP 2038 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	39.3	34.6	36.1	42.6	26.0	47.4	6.0	37.7
		Scenario67b : IP 2038 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.5	0.0	9.3	8.5	6.2	0.0	5.3	5.9
		Scenario67b : IP 2038 - SH22/GSR - Full Signals	LOS B	LOS C		LOS B	LOS C	26.8	0.0	25.1	28.1	43.0	0.0	40.4	15.1

		Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario68 : IP 2048 - Brookfield / Fitzgerald - Signalised	LOS B	LOS C	LOS C	LOS B		25.9	21.8	23.8	0.0	10.3	51.8	20.0	0.0
		Scenario68 : IP 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.9	8.0	9.7	10.5	2.1	5.2	14.6	3.9
		Scenario68 : IP 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS D	LOS B	LOS C	35.3	47.5	33.0	37.5	17.3	49.3	25.8	16.8
2048	138	Scenario68 : IP 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS C	LOS D	LOS C	LOS C	LOS C	45.4	41.3	33.4	50.8	71.3	43.2	15.8	36.6
		Scenario68 : IP 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		21.3	22.3	25.6	0.0	3.5	3.9	8.3	0.0
		Scenario68 : IP 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS C	LOS C	46.7	39.6	39.6	39.6	7.2	74.9	3.1	71.4
		Scenario68 : IP 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	3.8	0.0	8.2	2.0
		Scenario68 : IP 2048 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	41.6	35.2	37.2	44.1	32.2	52.2	6.3	27.3
		Scenario68 : IP 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	8.1	8.4	3.5	0.0	2.8	2.4
		Scenario68 : IP 2048 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	21.9	0.0	28.3	27.6	19.0	0.0	21.4	12.7

		Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario68a : IP 2048 - Brookfield / Fitzgerald - Signalised	LOS B	LOS C	LOS C	LOS B		23.6	23.3	20.9	0.0	8.4	44.2	22.1	0.0
		Scenario68a : IP 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.6	8.9	11.1	11.7	3.1	5.3	20.8	3.9
		Scenario68a : IP 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS C	LOS B	LOS C	39.6	35.7	33.0	33.7	27.0	34.8	31.0	14.0
2048	139	Scenario68a : IP 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS C	LOS C	LOS C	LOS C	LOS C	39.4	41.8	31.7	48.3	58.3	37.5	17.3	35.6
		Scenario68a : IP 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		19.0	19.5	28.5	0.0	3.8	9.1	7.7	0.0
		Scenario68a : IP 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	46.7	39.6	39.6	39.6	7.2	74.1	3.1	64.1
		Scenario68a : IP 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	4.0	0.0	16.1	2.0
		Scenario68a : IP 2048 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	41.8	35.0	37.2	44.1	32.7	51.0	6.3	29.2
		Scenario68a : IP 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	8.1	8.4	3.5	0.0	2.8	2.3
		Scenario68a : IP 2048 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	22.0	0.0	28.3	27.7	19.5	0.0	21.6	12.9

		Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario68b : IP 2048 - Brookfield / Fitzgerald - Signalised	LOS B	LOS C	LOS C	LOS B		25.9	22.6	23.9	0.0	10.0	54.7	19.7	0.0
		Scenario68b : IP 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.8	8.0	9.8	10.6	2.0	4.9	14.9	4.0
		Scenario68b : IP 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS C	LOS B	LOS C	35.9	40.8	33.0	38.7	17.4	42.2	28.0	17.4
2048	138b	Scenario68b : IP 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS C	LOS C	LOS C	LOS C	LOS C	45.1	36.8	34.1	43.5	49.3	40.5	15.7	34.0
		Scenario68b : IP 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		21.3	22.3	25.6	0.0	3.1	4.0	8.3	0.0
		Scenario68b : IP 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS C	LOS C	44.0	37.3	37.3	37.3	6.8	74.0	2.9	80.5
		Scenario68b : IP 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	3.4	0.0	7.9	2.0
		Scenario68b : IP 2048 - Firth / GSR - Signalised	LOS C	LOS D	LOS C	LOS C	LOS B	40.8	34.3	36.1	43.3	31.4	46.3	6.0	27.7
		Scenario68b : IP 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	8.1	8.4	3.5	0.0	2.8	2.4
		Scenario68b : IP 2048 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	21.9	0.0	28.3	27.6	19.0	0.0	21.5	12.8

		Extracted Site name	LOS Intersection	LOS North Approach	LOS West Approach	LOS South Approach	LOS East Approach	Worst Delay North	Worst Delay West	Worst Delay South	Worst Delay East	Worst Queue North	Worst Queue West	Worst Queue South	Worst Queue East
		Scenario68c : IP 2048 - Brookfield / Fitzgerald - Signalised	LOS B	LOS C	LOS C	LOS B		23.6	22.9	20.9	0.0	8.3	42.9	22.3	0.0
		Scenario68c : IP 2048 - Fitzgerald / Waihoehoe - Roundabout	LOS A	LOS A	LOS A	LOS A	LOS A	9.6	8.9	12.2	11.9	3.2	5.1	23.4	4.1
		Scenario68c : IP 2048 - Fitzgerald / Waihoehoe - Signalised with Bus Lane	LOS C	LOS C	LOS C	LOS B	LOS C	40.2	38.5	31.7	34.0	28.1	34.6	31.0	14.5
2048	139b	Scenario68c : IP 2048 - GSR / Waihoehoe - Signalised v9 Opposed Phasing	LOS C	LOS C	LOS C	LOS C	LOS C	37.6	37.2	32.1	41.4	45.1	35.5	15.4	41.1
		Scenario68c : IP 2048 - Fitzgerald / Pitt - Signalised	LOS B	LOS B	LOS B	LOS C		19.0	19.5	28.1	0.0	3.7	9.7	7.3	0.0
		Scenario68c : IP 2048 - P&R / Waihoehoe - Signalised	LOS C	LOS D	LOS C	LOS C	LOS C	44.0	37.3	37.3	37.3	6.8	75.6	2.9	75.4
		Scenario68c : IP 2048 - Fulton Access / Fitzgerald - Signalised	LOS B	LOS B		LOS B	LOS C	27.6	0.0	21.3	27.4	3.9	0.0	17.2	2.0
		Scenario68c : IP 2048 - Firth / GSR - Signalised	LOS C	LOS C	LOS C	LOS C	LOS B	37.5	37.9	33.9	40.2	27.7	45.1	5.7	29.7
		Scenario68c : IP 2048 - Great South Rd / Quarry Rd - Roundabout	LOS A	LOS A		LOS A	LOS A	3.0	0.0	8.1	8.4	3.6	0.0	2.8	2.4
		Scenario68c : IP 2048 - SH22/GSR - Full Signals	LOS B	LOS B		LOS B	LOS C	22.0	0.0	28.3	27.7	19.6	0.0	21.8	12.9

Appendix G SATURN Plots

CREATING COMMUNITIES

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of belonging. That's why at Stantec, we always **design with community in mind**.

We care about the communities we serve—because they're our communities too. We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

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Appendix B PLAN CHANGE MODELLING UPDATE

Drury East Traffic Memorandum

Modelling Update

Plan Changes 48,49 & 50

We design with community in mind

Stantec

Revision Schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)			
			Prepared by	**Checked by**	**Reviewed by**	**Approved by**
0	16/11/21	Final	SV/EM	HP	DH	DH

Quality Statement

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Contents

List of Appendices

List of Tables

List of Figures

1 Background

As a result of discussions at the Drury East Plan Changes 48,49 & 50 Traffic Expert Caucusing, Stantec NZ has updated the modelling results for the Drury East development. This update covers the early development years prior to the introduction of the proposed ATAP improvements in the area, specifically, three scenarios – Test 1, 2 and 3, discussed in the modelling report. This update supersedes previous results for these scenarios reported in the Modelling Report dated 30th September 2021.

The key change for this updated modelling assessment is the introduction of an interim signalised intersection at the Great South Road (**GSR**)/Waihoehoe Road intersection. The interim signalised intersection replaces the previously proposed upgraded roundabout layout and is now considered a preferred layout based on discussions held in the expert conferencing meetings between September through October 2021.

Three tests that were remodelled are described below:

- **Test 1** – models the first development years, prior to Drury Central station and prior to completion of SH1 widening between Drury and Papakura, with improvements to the GSR/Waihoehoe Road intersection (signalised interim layout). This incorporates a lower Public Transport (PT) mode share uptake percentage assumption, as it would occur prior to Drury Central rail station construction.
- **Test 2** – assesses the impact of the SH1 widening and Drury Interchange improvements. As with Test 1, this model includes lower PT mode share uptake percentage without the train station.
- **Test 3** – assesses the impact of Drury Central station and models the impact of the immediate larger PT % mode share uptake that it enables. It also includes the impact of the direct connection from SH1 (in the vicinity of the Drury interchange) to the Kiwi Property development site.

The updated modelling also provides additional information on the Drury East development traffic impact on the road network in Drury South and assess additional intersection of Fitzgerald Road/Road 8/Jack Stevenson Road.

The additional data also provides more information on Drury East traffic wider network rerouting and assess the SH22/SH1 interchange in more detail.

2 GSR / Waihoehoe Rd Intersection Layout

The interim signalised layout takes into account existing private property boundaries and provides active mode facilities on all approaches. The layout concept drawing is shown below in Figure 1.

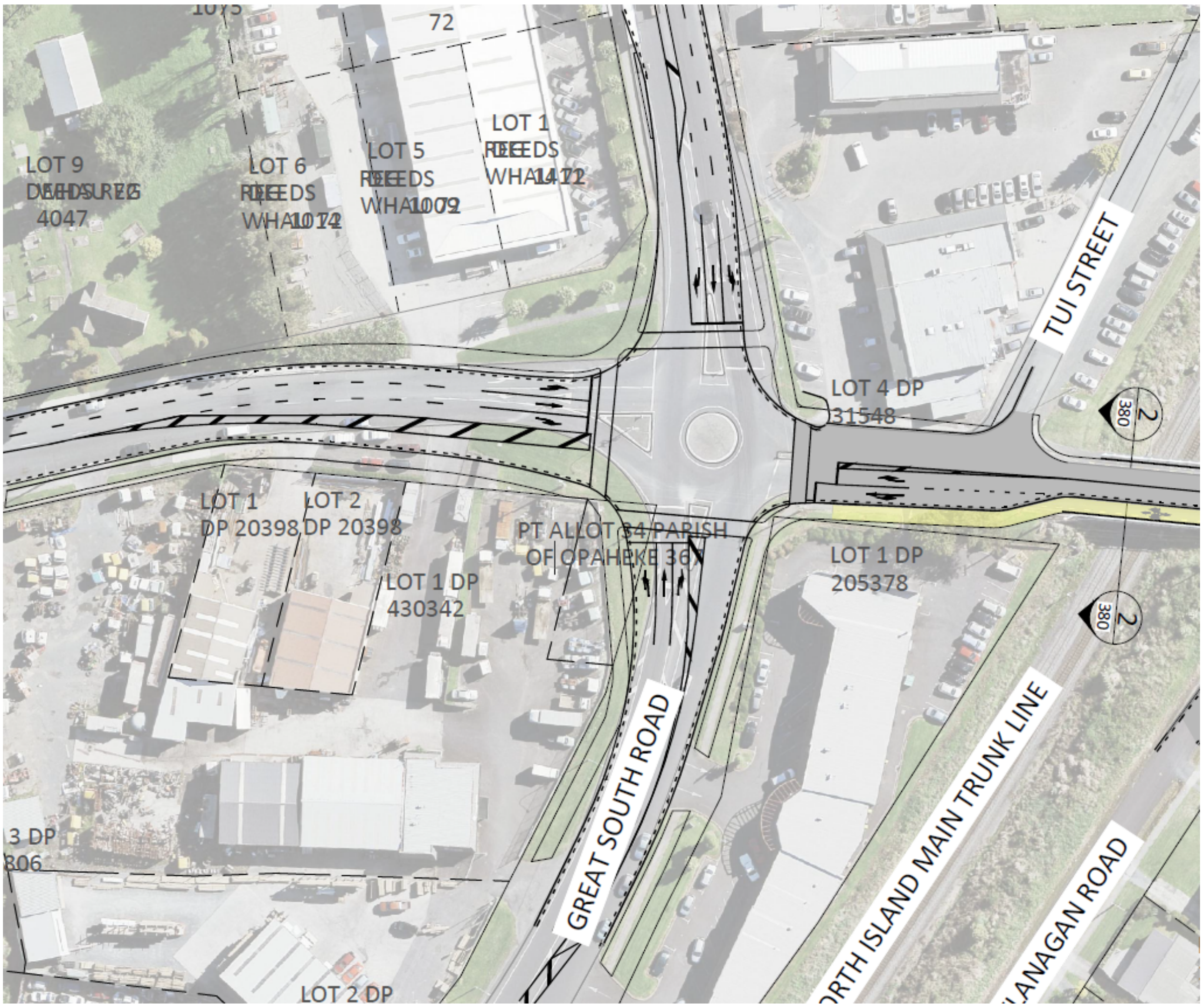


Figure 1: Great South Road / Waihoehoe Road Intersection

3 SH22 / SH1 Interchange Modelling

The SH22/SH1 Interchange was modelled in more detail, as a network in SIDRA, to assess the operation of AM and PM peaks. Previously this interchange was only assessed in SATURN. The critical model for this interchange is Test 2, where due to lack of the direct SH 1 – Drury East town centre connection the traffic at the southbound off-ramp during the PM peak are higher than in other early year scenarios.

The SIDRA model for the interchange is shown below in Figure 2.

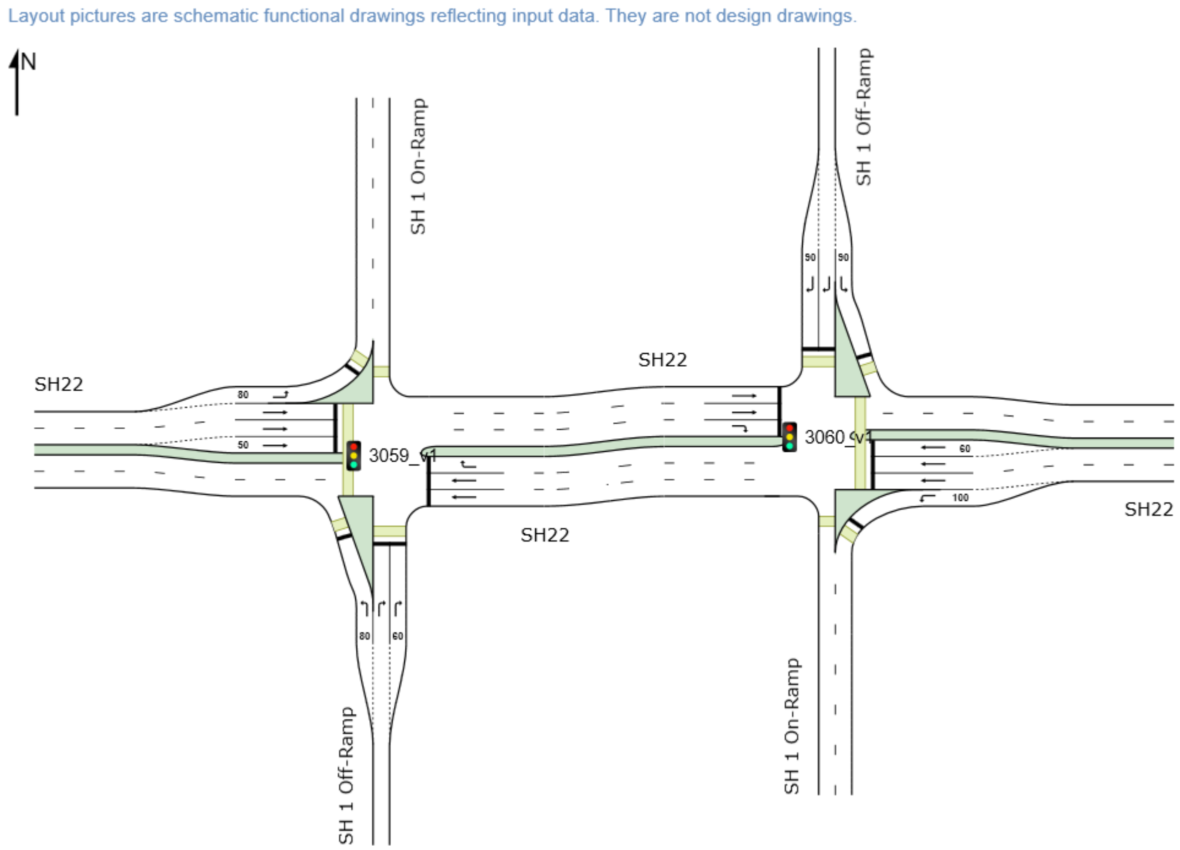


Figure 2: SH22 / SH1 Interchange SIDRA Network

4 Modelling Outputs

All three scenarios were modelled in SIDRA. In addition, Test 2 and Test 3 previously defined '*pass*' scenarios were remodelled in SATURN to capture potential wider area rerouting. Test 1 was not rerun in SATURN as there is no strategic model available model from SGA developed for the base year.

4.1 SATURN modelling results for Test 2 and Test 3

The strategic model results for Test 2 and Test 3 show noticeably lower rerouting of Drury East traffic through Drury South network after introduction of the signalised intersection at the GSR/Waihoehoe Road intersection. This is mainly due to additional capacity provided by the interim signalised intersection when compared to the roundabout and lower delays at the Waihoehoe Road approach to the GSR/Waihoehoe Road intersection.

The figure showing PM peak model traffic distribution along Fitzgerald Road link (southbound section of Fitzgerald Road between Drury Hills Road and Quarry Road) is shown below – Test 2 results are shown in Figure 1 and Test 3 results are in Figure 2.

These results show that slightly larger volumes use Fitzgerald Road southern connection to Drury South in Test 3 however overall traffic volumes on Quarry Road and within Drury South are similar.

Detailed traffic distribution from the SATURN model is shown in **Appendix A**.

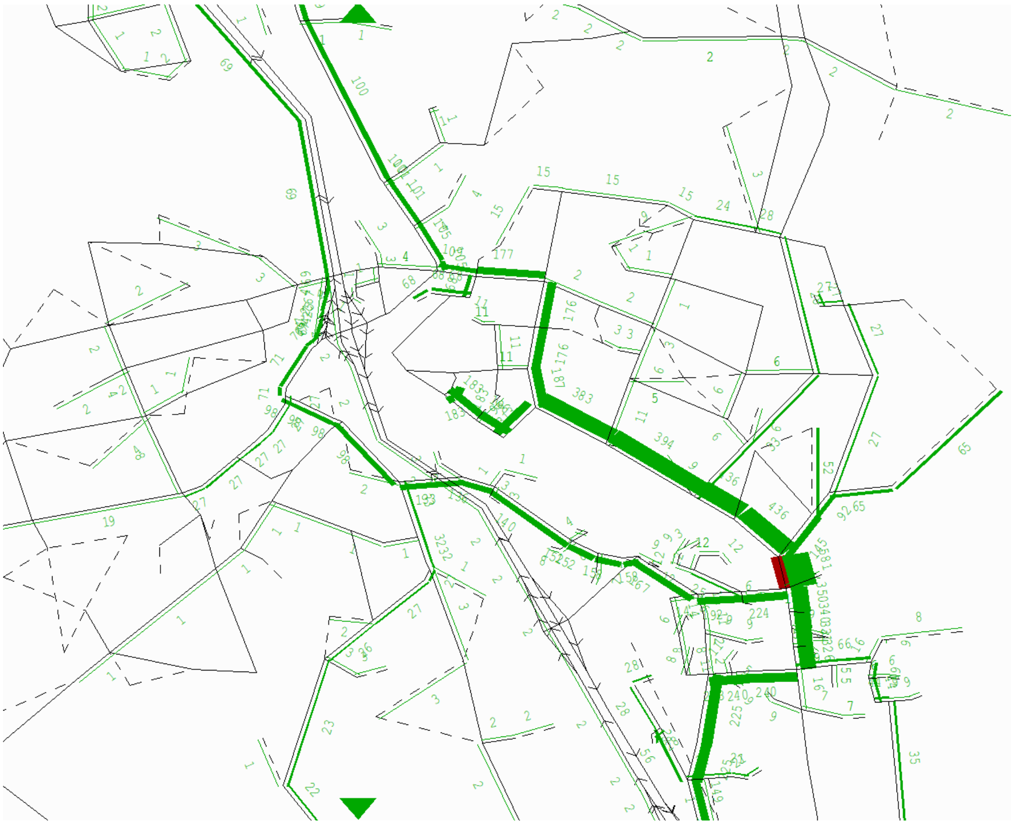


Figure 3: SATURN Results, Test 2, PM Peak

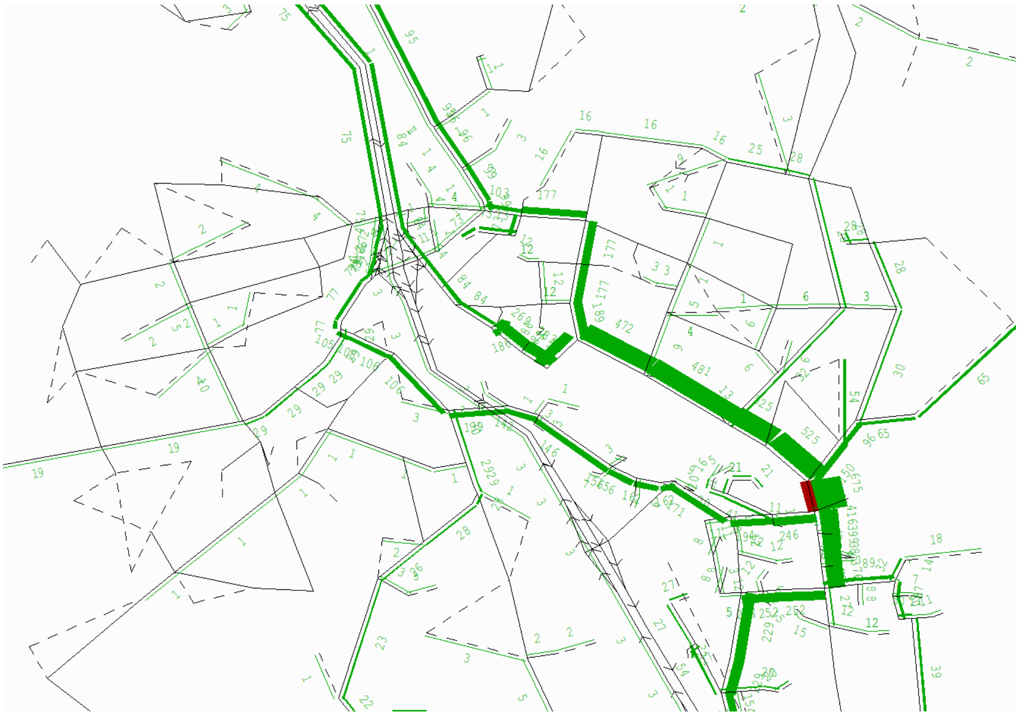


Figure 4: SATURN Results, Test 3, PM Peak

The wider network routing data of Drury East development traffic is discussed below. The map with the location references is shown in Figure 3.

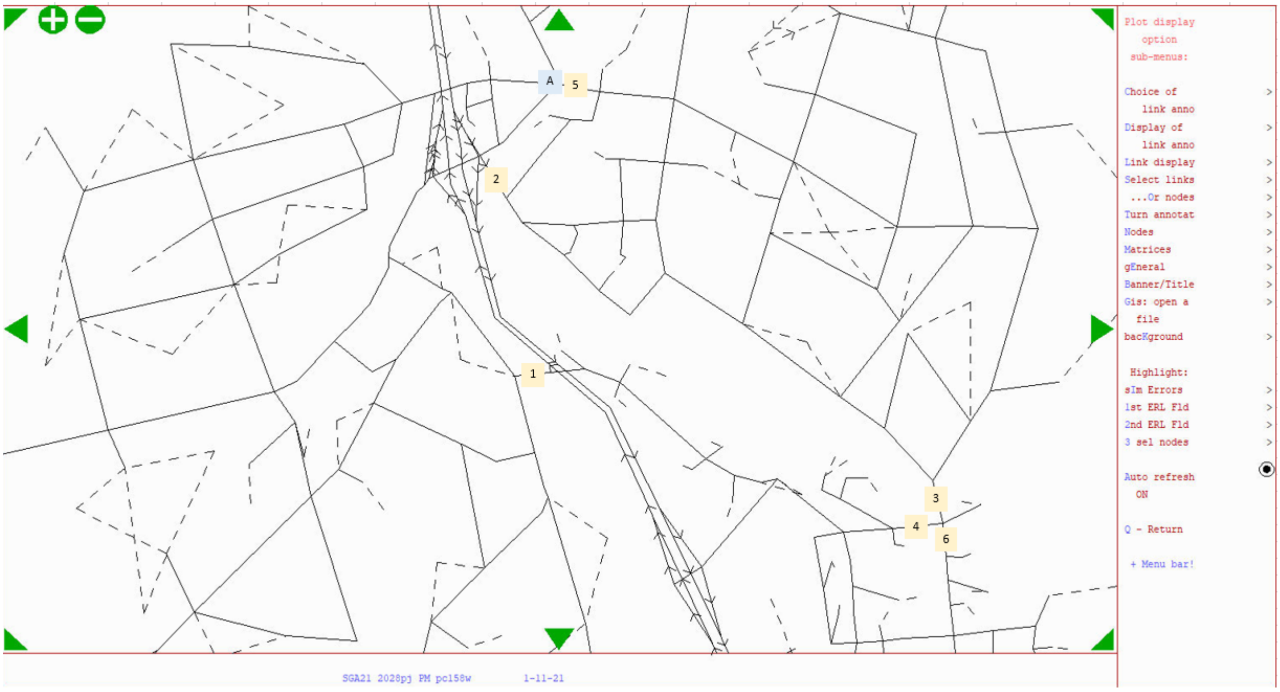


Figure 5: SATURN Network, Drury East

In Test 2, the scenario without the direct SH 1 connection to the Drury East town centre, around 70% of the development traffic travel through the GSR/Waihoehoe Road intersection, 20% through Fitzgerald Road connection to the south and approximately 10% remain internally. This data is shown in Table 1 below.

Table 1: Test 2 Trips

Drury East Trips (incl. zones 5552 and 5553)	**Trip counts**					**Trip Proportions**		
Cross-section Location (as per map above)	**AM**	**PM**	**IP**	**ADT**		**AM**	**PM**	**IP**
A. GSR/Waihoehoe	1198	1713	1062	17686		71%	69%	71%
2. SH1 SB Off-ramp connection	0	0	0	0		0%	0%	0%
3. Fitzgerald Rd (Sth) SB	186	335	137	2643		11%	13%	9%
3. Fitzgerald Rd (Sth) NB	156	245	142	2397		9%	10%	10%
Internal	140	207	154			8%	8%	10%
Drury East Vol	**1680**	**2500**	**1495**			**100%**	**100%**	**100%**

In Test 3, around 55% of the development traffic travel through the GSR/Waihoehoe Road intersection, 15% of traffic use SH1 – Town Centre connection, 20% through Fitzgerald Road connection to the south and approximately 10% remain internally. As shown in Table 2: Test 3 Trips below.

Table 2: Test 3 Trips

Drury East Trips (incl. zones 5552 and 5553)	Trip counts					Trip Proportions		
Cross-section Location (as per map above)	**AM**	**PM**	**IP**	**ADT**		**AM**	**PM**	**IP**
A. GSR/Waihoehoe	949	1461	829	14311		56%	58%	55%
2. SH1 SB Off-ramp connection	270	299	238	3806		16%	12%	16%
3. Fitzgerald Rd (Sth) SB	181	335	133	2617		11%	13%	9%
3. Fitzgerald Rd (Sth) NB	137	195	141	2237		8%	8%	9%
Internal	143	210	154			9%	8%	10%
Drury East Vol	**1680**	**2500**	**1495**			**100%**	**100%**	**100%**

4.2 SIDRA modelling results

4.2.1 GSR/Waihoehoe Test 1

This test assessed the modelling of the early development years, prior to the construction of SH1 widening. No SATURN modelling was completed for this scenario (as the base year was not available) therefore the base year SIDRA model for the GSR/Waihoehoe Road intersection was used and development traffic added. The traffic survey data from 2017, during the construction of SH 1 section between Papakura and Manukau, was used. This is considered a conservative scenario as volumes on GSR are likely to be higher than post SH1 construction due to traffic bypassing congestion on SH1 and using GSR as an alternative route.

Same development yield of 710 houses was used as identified in the modelling report for Test 1 assessment point. The modelled intersection layout is shown below in Figure 6.

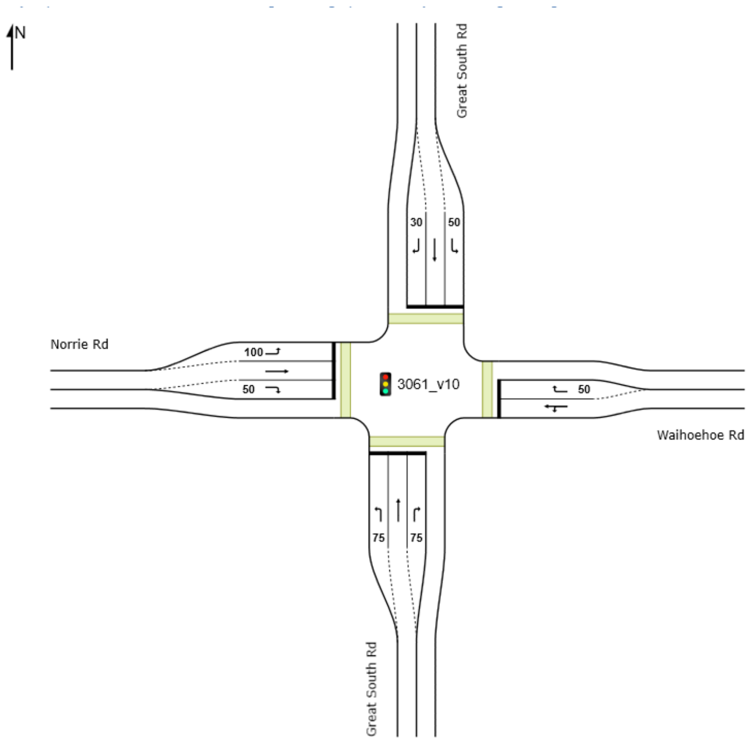


Figure 6: Great South Road / Waihoehoe Road SIDRA Layout, Signalised

The modelled intersection phasing for Test 1 is shown in Figure 7.

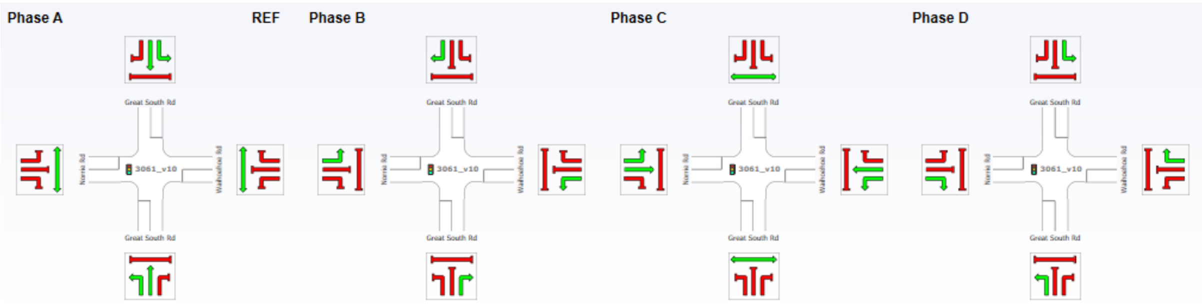


Figure 7: SIDRA Phasing, Test 1

Modelling results show that the intersection will be operating close to its capacity and the critical peak is expected to be the morning peak. The largest queues and delays are expected on the southern and eastern approaches of the GSR/Waihoehoe Road intersection, however, the intersection performance parameters are within the defined modelling thresholds (for modelling thresholds see Section 2.3 in the modelling report).

SIDRA results for the GSR/Waihoehoe Road intersection for Test 1 (AM peak) is shown in Figure 8.

Vehicle Movement Performance										
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m
South: Great South Rd										
1	L2	20	0	20	0.0	0.014	10.0	LOS A	0.2	1.5
2	T1	674	49	674	7.3	* 1.019	110.0	LOS F	42.3	314.2
3	R2	106	7	106	6.6	0.551	70.5	LOS E	4.3	32.1
Approach		800	56	800	7.0	1.019	102.2	LOS F	42.3	314.2
East: Waihoehoe Rd										
4	L2	83	8	83	9.6	0.885	85.8	LOS F	6.1	46.4
5	T1	47	4	47	8.5	0.885	81.1	LOS F	6.1	46.4
6	R2	528	34	528	6.4	* 1.024	122.5	LOS F	34.0	251.1
Approach		658	46	658	7.0	1.024	114.9	LOS F	34.0	251.1
North: Great South Rd										
7	L2	125	10	125	8.0	0.097	10.4	LOS B	1.5	11.1
8	T1	356	35	356	9.8	0.631	38.3	LOS D	11.8	89.4
9	R2	115	13	115	11.3	0.943	96.1	LOS F	5.8	44.3
Approach		596	58	596	9.7	0.943	43.6	LOS D	11.8	89.4
West: Norrie Rd										
10	L2	373	20	373	5.4	* 1.028	128.6	LOS F	23.4	171.5
11	T1	32	3	32	9.4	0.303	71.7	LOS E	1.4	10.2
12	R2	22	2	22	9.1	0.037	37.6	LOS D	0.6	4.6
Approach		427	25	427	5.9	1.028	119.6	LOS F	23.4	171.5
All Vehicles		2481	185	2481	7.5	1.028	94.5	LOS F	42.3	314.2

Figure 8: GSR / Waihoehoe Road SIDRA Results, Test 1, AM Peak

PM peak results presented below (Figure 9) show that the most congested approach during the afternoon peak is expected to be the eastern approach, however, same as in the AM peak model, the intersection is operating within the acceptable performance limits.

Vehicle Movement Performance										
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m
South: Great South Rd										
1	L2	20	0	20	0.0	0.015	10.1	LOS B	0.2	1.4
2	T1	438	19	438	4.3	0.470	19.3	LOS B	9.1	65.7
3	R2	210	9	210	4.3	* 0.989	91.3	LOS F	9.2	67.0
Approach		668	28	668	4.2	0.989	41.7	LOS D	9.2	67.0
East: Waihoehoe Rd										
4	L2	167	10	167	6.0	0.939	74.0	LOS E	8.2	60.3
5	T1	42	3	42	7.1	* 0.939	69.4	LOS E	8.2	60.3
6	R2	266	12	266	4.5	* 1.013	104.0	LOS F	12.8	93.2
Approach		475	25	475	5.3	1.013	90.4	LOS F	12.8	93.2
North: Great South Rd										
7	L2	270	10	270	3.7	0.214	11.1	LOS B	3.1	22.1
8	T1	846	30	846	3.5	* 0.986	70.2	LOS E	37.6	271.2
9	R2	85	8	85	9.4	0.422	52.6	LOS D	2.6	19.4
Approach		1201	48	1201	4.0	0.986	55.6	LOS E	37.6	271.2
West: Norrie Rd										
10	L2	121	2	121	1.7	0.289	41.2	LOS D	3.2	22.5
11	T1	44	3	44	6.8	0.403	54.6	LOS D	1.4	10.5
12	R2	32	0	32	0.0	0.108	45.8	LOS D	0.9	6.1
Approach		197	5	197	2.5	0.403	45.0	LOS D	3.2	22.5
All Vehicles		2541	106	2541	4.2	1.013	57.6	LOS E	37.6	271.2

Figure 9: GSR / Waihoehoe Road SIDRA Results, Test 1, PM Peak

Overall, the optimised signal controlled interim GSR/Waihoehoe intersection layout operates better previously tested improved roundabout layout.

4.2.2 Test 2 and Test 3 modelling results

Test 2 and 3 SIDRA models are based on traffic flows from the strategic SATURN model and as such all key intersection in the area are assessed. The summary of intersection performance is shown in Tables Table 3 through Table 8 overleaf. A detailed summary of intersection SIDRA performance is shown in **Appendix B**, with Test 2 and Test 3 results (intersection model layouts and movement summaries) shown in **Appendix C** and **D** respectively.

Different signal phasing (shown in Figure 10 below) was used for GSR/Waihoehoe intersection as traffic flow patterns changed with the completion of the SH 1 widening.

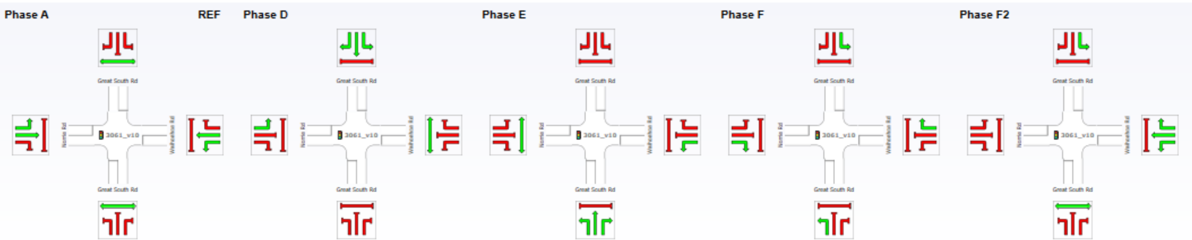


Figure 10: SIDRA Phasing, Test 2/3

Table 3: Test 2 AM Peak SIDRA Results

	LOS					Worst Delay				Worst Queue				DoS				
Extracted Site name	Intersection	North	West	South	East	North	West	South	East	North	West	South	East	Intersection	North	West	South	East
Oyster / Waihoehoe - LILO_Give Way	NA	A	NA		NA	8	5	0	0	0	0	0	0	0.4	0.0	0.4		0.4
Fitzgerald / Waihoehoe - Signalised	C	D	C	C	D	45	34	42	44	20	78	73	41	0.8	0.6	0.8	0.7	0.7
Brookfield / Fitzgerald - Signalised	B	B	C	B		21	27	15	0	12	4	20	0	0.5	0.3	0.2	0.5	
GSR / Waihoehoe - Signalised	C	C	D	D	C	45	45	39	42	40	84	71	58	0.8	0.8	0.8	0.8	0.8
Fitzgerald / Pitt - Signalised	B	B	C	B		27	27	19	0	10	2	18	0	0.3	0.2	0.1	0.3	
P&R / Waihoehoe - Roundabout	A	B	A	A	A	14	8	13	9	2	20	2	25	0.7	0.1	0.6	0.1	0.7
Fulton Access / Fitzgerald - Signalised	B	B		B	C	28	0	21	27	12	0	21	2	0.6	0.4		0.6	0.2
Firth / GSR - Signalised	C	C	D	C	B	42	40	41	49	16	140	7	21	0.9	0.3	0.9	0.1	0.2
Great South Rd / Quarry Rd - Give-Way	NA	NA		A	A	5	0	6	8	0	0	0	4	0.3	0.2		0.1	0.3
SH22/GSR - Signalised	B	B		B	C	16	0	37	41	42	0	72	36	0.7	0.4		0.7	0.7
Fitzgerald / Jack Stevenson / Rd 8 / Rd 9	C	C	C	C	C	34	30	28	30	54	41	36	5	0.8	0.8	0.5	0.8	0.2

Table 4: Test 2 Interpeak SIDRA Results

Extracted Site name	LOS					Worst Delay				Worst Queue				DoS				
	Intersection	North	West	South	East	North	West	South	East	North	West	South	East	Intersection	North	West	South	East
Oyster / Waihoehoe - LILO_Give Way	NA	A	NA		NA	8	5	0	0	0	0	0	0	0.4	0.0	0.4		0.4
Fitzgerald / Waihoehoe - Signalised	C	D	C	C	D	44	32	42	44	12	91	74	22	0.8	0.4	0.8	0.7	0.7
Brookfield / Fitzgerald - Signalised	B	B	C	B		21	27	16	0	13	9	13	0	0.4	0.4	0.3	0.4	
GSR / Waihoehoe - Signalised	C	C	C	D	C	40	38	42	34	36	30	45	60	0.8	0.8	0.5	0.8	0.8
Fitzgerald / Pitt - Signalised	B	B	B	B		21	21	24	0	10	2	12	0	0.3	0.3	0.1	0.3	
P&R / Waihoehoe - Roundabout	A	B	A	B	A	13	8	13	8	2	18	2	18	0.5	0.1	0.5	0.1	0.5
Fulton Access / Fitzgerald - Signalised	B	B		B	C	28	0	21	27	12	0	13	2	0.4	0.4		0.4	0.2
Firth / GSR - Signalised	C	C	C	C	B	36	36	34	39	20	56	6	21	0.7	0.4	0.7	0.1	0.2
Great South Rd / Quarry Rd - Give-Way	NA	NA		A	A	5	0	6	7	0	0	0	5	0.3	0.2		0.0	0.3
SH22/GSR - Signalised	B	B		B	C	16	0	44	34	49	0	44	31	0.5	0.5		0.5	0.5
Fitzgerald / Jack Stevenson / Rd 8 / Rd 9	C	C	C	C	C	32	30	27	30	40	30	34	6	0.7	0.7	0.4	0.7	0.2

Table 5:Test 2 PM Peak SIDRA Results

Extracted Site name	LOS					Worst Delay				Worst Queue				DoS				
	Intersection	North	West	South	East	North	West	South	East	North	West	South	East	Intersection	North	West	South	East
Oyster / Waihoehoe - LILO_Give Way	NA	B	NA		NA	11	5	0	0	0	0	0	0	0.5	0.0	0.5		0.5
Fitzgerald / Waihoehoe - Signalised	C	D	D	C	E	61	46	59	67	20	168	141	39	0.9	0.5	0.9	0.8	0.8
Brookfield / Fitzgerald - Signalised	B	B	C	B		21	27	15	0	23	22	7	0	0.7	0.7	0.7	0.2	
GSR / Waihoehoe - Signalised	E	D	D	F	D	85	49	145	74	88	59	85	134	1.1	1.0	0.9	1.1	1.0
Fitzgerald / Pitt - Signalised	B	B	B	B		21	20	25	0	20	25	3	0	0.6	0.6	0.6	0.1	
P&R / Waihoehoe - Roundabout	A	B	A	C	A	18	9	29	8	3	33	17	35	0.8	0.2	0.8	0.6	0.7
Fulton Access / Fitzgerald - Signalised	B	B		B	C	23	0	24	33	20	0	35	2	0.7	0.4		0.7	0.5
Firth / GSR - Signalised	C	D	C	C	B	41	38	37	46	32	64	6	41	0.8	0.7	0.8	0.1	0.5
Great South Rd / Quarry Rd - Give-Way	NA	NA		A	A	5	0	6	9	0	0	0	13	0.6	0.2		0.1	0.6
SH22/GSR - Signalised	C	C		B	D	22	0	58	47	178	0	33	56	0.9	0.9		0.8	0.8
Fitzgerald / Jack Stevenson / Rd 8 / Rd 9	C	C	C	C	C	28	38	37	37	74	43	19	8	0.7	0.7	0.3	0.5	0.4

Table 6: Test 3 AM Peak SIDRA Results

Extracted Site name	LOS					Worst Delay				Worst Queue				DoS				
	Intersection	North	West	South	East	North	West	South	East	North	West	South	East	Intersection	North	West	South	East
Oyster / Waihoehoe - LILO_Give Way	NA	A	NA		NA	6	5	0	0	0	0	0	0	0.5	0.0	0.2		0.5
Fitzgerald / Waihoehoe - Signalised	C	C	D	C	C	39	38	34	39	17	44	87	36	0.9	0.6	0.8	0.9	0.8
Brookfield / Fitzgerald - Signalised	B	B	C	B		21	27	19	0	12	24	25	0	0.7	0.4	0.7	0.7	
GSR / Waihoehoe - Signalised	C	C	D	D	C	38	40	38	38	36	79	50	59	0.9	0.8	0.9	0.9	0.8
Fitzgerald / Pitt - Signalised	B	B	C	B		27	27	19	0	9	2	20	0	0.3	0.2	0.1	0.3	
P&R / Waihoehoe - Roundabout	A	A	A	B	A	11	8	13	9	1	11	2	26	0.7	0.1	0.4	0.1	0.7
Fulton Access / Fitzgerald - Signalised	B	B		B	C	24	0	21	27	10	0	21	2	0.5	0.3		0.5	0.2
Firth / GSR - Signalised	C	C	C	C	B	39	37	37	44	14	61	6	20	0.7	0.3	0.7	0.1	0.2
Great South Rd / Quarry Rd - Give-Way	NA	NA		A	A	5	0	6	7	0	0	0	3	0.3	0.2		0.1	0.3
SH22/GSR - Signalised	B	B		B	C	16	0	39	41	44	0	71	34	0.7	0.4		0.7	0.7
Fitzgerald / Jack Stevenson / Rd 8 / Rd 9	C	C	C	C	C	33	33	34	34	65	39	43	7	0.7	0.7	0.4	0.7	0.3

Table 7: Test 3 Interpeak SIDRA Results

Extracted Site name	LOS					Worst Delay				Worst Queue				DoS				
	Intersection	North	West	South	East	North	West	South	East	North	West	South	East	Intersection	North	West	South	East
Oyster / Waihoehoe - LILO_Give Way	NA	A	NA		NA	6	5	0	0	0	0	0	0	0.4	0.0	0.2		0.4
Fitzgerald / Waihoehoe - Signalised	C	C	C	C	D	39	35	30	40	10	49	77	20	0.7	0.3	0.7	0.7	0.7
Brookfield / Fitzgerald - Signalised	B	B	C	B		21	24	20	0	12	25	16	0	0.7	0.5	0.7	0.6	
GSR / Waihoehoe - Signalised	C	C	C	D	C	36	37	38	29	35	30	16	54	0.7	0.7	0.5	0.5	0.7
Fitzgerald / Pitt - Signalised	B	B	B	B		21	21	24	0	9	2	12	0	0.3	0.2	0.1	0.3	
P&R / Waihoehoe - Roundabout	A	A	A	B	A	10	8	13	8	1	9	2	18	0.5	0.1	0.4	0.1	0.5
Fulton Access / Fitzgerald - Signalised	B	B		B	C	28	0	21	27	11	0	13	2	0.4	0.4		0.4	0.2
Firth / GSR - Signalised	C	C	C	C	B	36	36	34	39	20	37	6	23	0.7	0.4	0.7	0.1	0.3
Great South Rd / Quarry Rd - Give-Way	NA	NA		A	A	5	0	6	7	0	0	0	5	0.3	0.1		0.0	0.3
SH22/GSR - Signalised	B	B		B	C	17	0	42	35	53	0	42	31	0.5	0.5		0.5	0.5
Fitzgerald / Jack Stevenson / Rd 8 / Rd 9	C	C	C	C	C	30	31	28	30	44	29	27	6	0.7	0.7	0.3	0.6	0.2

Table 8: Test 3 PM Peak SIDRA Results

Extracted Site name	LOS					Worst Delay				Worst Queue				DoS				
	Intersection	North	West	South	East	North	West	South	East	North	West	South	East	Intersection	North	West	South	East
Oyster / Waihoehoe - LILO_Give Way	NA	A	NA		NA	8	5	0	0	0	0	0	0	0.5	0.0	0.4		0.5
Fitzgerald / Waihoehoe - Signalised	C	D	C	C	D	53	39	41	56	17	98	144	32	0.8	0.4	0.8	0.8	0.8
Brookfield / Fitzgerald - Signalised	C	C	C	B		24	31	18	0	26	57	6	0	0.9	0.8	0.9	0.2	
GSR / Waihoehoe - Signalised	E	E	D	E	E	121	44	73	104	122	65	49	175	1.1	1.1	0.8	1.0	1.0
Fitzgerald / Pitt - Signalised	B	B	B	B		19	19	25	0	19	27	2	0	0.7	0.7	0.6	0.1	
P&R / Waihoehoe - Roundabout	A	B	A	C	A	13	8	27	8	2	18	15	32	0.7	0.1	0.6	0.6	0.7
Fulton Access / Fitzgerald - Signalised	B	B		B	C	21	0	24	30	17	0	35	2	0.7	0.4		0.7	0.2
Firth / GSR - Signalised	C	D	C	C	B	44	36	39	48	34	71	7	46	0.7	0.7	0.7	0.1	0.4
Great South Rd / Quarry Rd - Give-Way	NA	NA		A	A	5	0	6	9	0	0	0	14	0.6	0.2		0.1	0.6
SH22/GSR - Signalised	C	C		B	D	26	0	55	50	198	0	33	63	0.9	0.9		0.8	0.9
Fitzgerald / Jack Stevenson / Rd 8 / Rd 9	C	C	C	C	C	27	37	38	37	75	30	18	8	0.7	0.7	0.2	0.5	0.4

Overall, in both scenarios results show that the GSR/Waihoehoe interim signalised intersection layout provides slightly more capacity than the previously tested improved roundabout layout

Modelling results show that in both scenarios all intersections are operating within acceptable limits except for the SH22/GSR intersection. The model with the single right turn lane from GSR can result in long queues (400m+) on both the northern approach of SH 22 and the GSR approach (see *SH22/GSR v3* results in Appendix **D**). To mitigate this the second short right turn lane is proposed at the GSR approach (see *SH22/GSR - Signalised* in the results tables above).

SH22/SH1 interchange modelling for Test 2 scenario showed that both AM and PM peaks operate within the available queueing storage capacity. Summary of the results is shown below in Figure 11 and Figure 12, and detailed results in Appendix **C**.

AM Peak

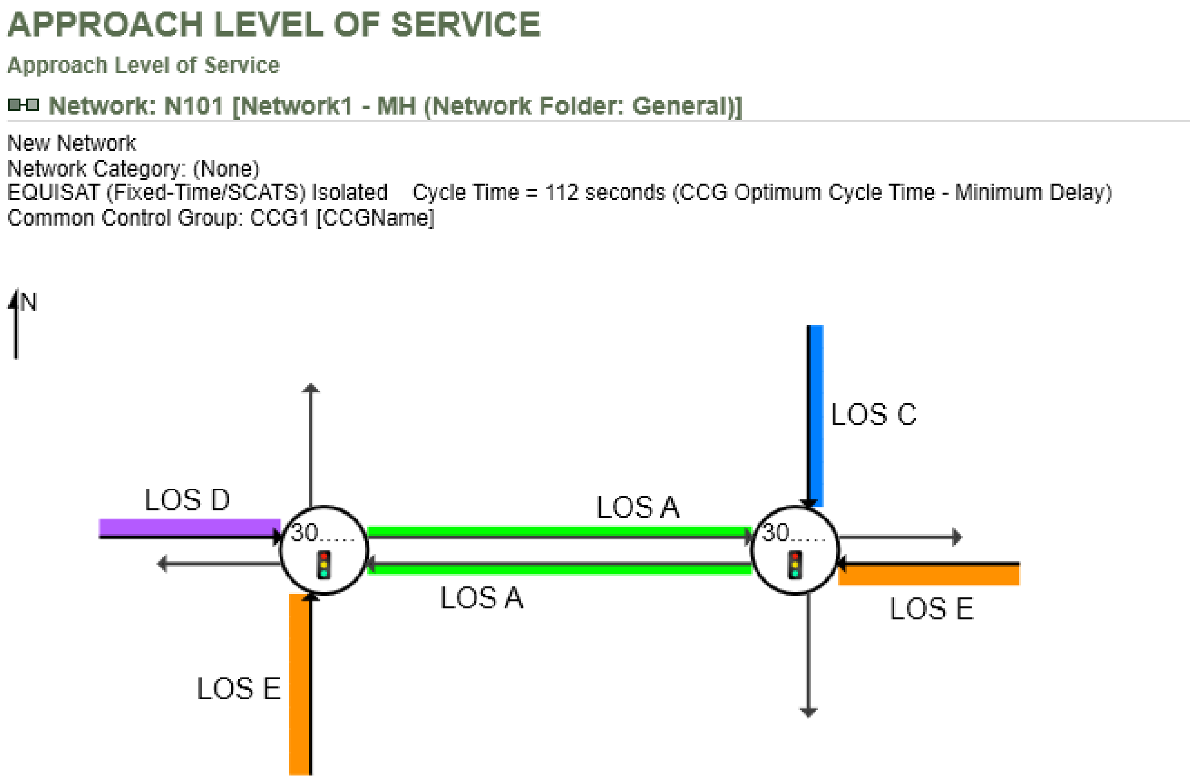


Figure 11: SH22/SH1 Interchange Network SIDRA LOS Results, Test 2, AM Peak

PM Peak

APPROACH LEVEL OF SERVICE

Approach Level of Service

Network: N101 [Network1 - MH (Network Folder: General)]

New Network
Network Category: (None)
EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 86 seconds (CCG Optimum Cycle Time - Minimum Delay)
Common Control Group: CCG1 [CCGName]

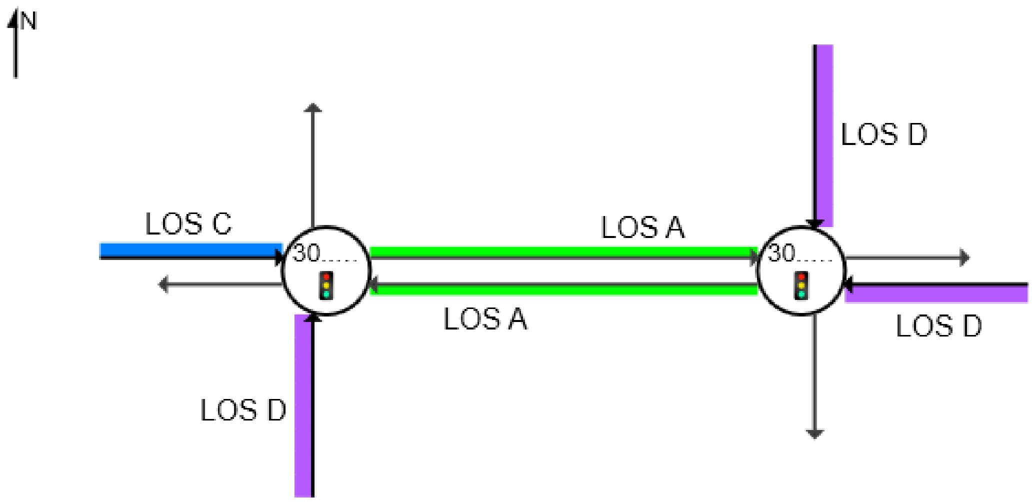


Figure 12: SH22/SH1 Interchange Network SIDRA LOS Results, Test 2, PM Peak

Detailed SIDRA results are presented in **Appendix C** (Test 2) and **Appendix D** (Test 3).

5 Conclusion

The early years of the development have been remodelled to assess the impact of Drury East development with the signalised GSR/Waihoehoe Road intersection. The results also included more detailed assessment of the development on the Drury South network operation.

Overall, the results showed that the pre-ATAP improvements, the signalised intersection layout at the GSR/Waihoehoe intersection will operate slightly better than the previously tested roundabout layout and as such these results supersede the results in the Modelling Report dated 30/09/2021 for Tests 1, 2 and 3. The development yield levels remain unchanged and are reported in the Modelling Report.

Appendices

We design with community in mind

Appendix A SATURN Traffic Distribution

Test 2

					Drury East SZA – Test 2								Link	%age
					pcu				vehs			veh	Total	Drury
					AM	PM	IP	Daily	AM	PM	IP	Daily	ADT	East
a_b	**Location (see Map sheet)**	**Anode**	**Bnode**											
3056_3035	1. Quarry Rd WB	3056	3035		37	96	25	584	27	85	19	470	5511	9%
3035_3056	1. Quarry Rd EB	3035	3056		40	34	11	297	35	28	9	250	3590	7%
_														
9143_9141	2. SH1 SB Off-ramp connection	9143	9141		0	0	0	0	0	0	0	0	0	0%
_														
3039_6106	3. Fitzgerald Rd (Sth) SB	3039	6106		207	365	170	3130	186	334	135	2643	5861	45%
6106_3039	3. Fitzgerald Rd (Sth) NB	6106	3039		173	280	183	2956	156	244	140	2397	5273	45%
_														
6106_6141	4. Road 8 WB	6106	6141		168	133	125	2007	139	125	96	1617	5201	31%
6141_6106	4. Road 8 EB	6141	6106		151	226	140	2339	137	201	108	1928	3926	49%
_														
9144_3061	5. Waihoehoe WB	9144	3061		699	1060	662	11000	626	961	532	9277	13355	69%

3061_9144	5. Waihoehoe EB	3061	9144		611	833	637	9967	564	754	525	8534	12931	66%
_														
6106_6176	6. Jack Stevenson SB	6106	6176		36	229	42	1081	30	201	31	884	2539	35%
6176_6106	6. Jack Stevenson NB	6176	6106		22	50	40	578	17	41	28	427	3227	13%
	A. GSR/Waihoehoe								1198	1707	1044	17686	40786	43%
9144_3061	GSR/Waihoehoe - Waihoehoe Appr	9144	3061		699	1060	662	11000	626	961	532	9277	13355	69%
9901_3061	GSR/Waihoehoe - GSR Sth Appr	9901	3061		306	243	280	4164	267	207	219	3369	7519	45%
4553_3061	GSR/Waihoehoe - GSR Nth Appr	4553	3061		254	453	292	4686	226	407	237	3951	13713	29%
3069_3061	GSR/Waihoehoe - Norrie Appr	3069	3061		85	141	65	1210	79	131	56	1088	6199	18%

Test 3

					Drury East SZA - Test 3							Drury East	Link	%age
					pcu				vehs			veh	Total	Drury
					AM	PM	IP	Daily	AM	PM	IP	Daily	ADT	East
a_b	**Location (see Map sheet)**	**Anode**	**Bnode**											
3056_3035	1. Quarry Rd WB	3056	3035		37	105	25	610	27	92	19	490	5610	9%
3035_3056	1. Quarry Rd EB	3035	3056		21	18	11	208	19	15	9	179	3064	6%
_														
9143_9141	2. SH1 SB Off-ramp connection	9143	9141		300	349	293	4550	270	301	238	3806	6778	56%
_														
3039_6106	3. Fitzgerald Rd (Sth) SB	3039	6106		208	383	172	3193	181	337	133	2617	7824	33%
6106_3039	3. Fitzgerald Rd (Sth) NB	6106	3039		154	227	183	2779	137	196	141	2237	5106	44%
_														
6106_6141	4. Road 8 WB	6106	6141		168	138	126	2021	139	124	102	1678	4918	34%
6141_6106	4. Road 8 EB	6141	6106		130	173	140	2156	118	154	109	1765	3857	46%
_														
9144_3061	5. Waihoehoe WB	9144	3061		715	1069	676	11208	641	973	544	9465	13650	69%
3061_9144	5. Waihoehoe EB	3061	9144		346	559	358	5839	316	504	290	4946	8612	57%
_														

6106_6176	6. Jack Stevenson SB	6106	6176		37	243	43	1129	30	210	31	912	4297	21%
6176_6106	6. Jack Stevenson NB	6176	6106		22	49	41	585	17	41	31	452	2642	17%
	A. GSR/Waihoehoe								949	1467	829	14311	37757	38%
9144_3061	GSR/Waihoehoe - Waihoehoe Appr	9144	3061		715	1069	676	11208	641	973	544	9465	13650	69%
9901_3061	GSR/Waihoehoe - GSR Sth Appr	9901	3061		104	106	101	1536	87	85	74	1171	4360	27%
4553_3061	GSR/Waihoehoe - GSR Nth Appr	4553	3061		161	380	191	3257	142	339	153	2727	13306	20%
3069_3061	GSR/Waihoehoe - Norrie Appr	3069	3061		84	74	66	1057	78	69	58	947	6441	15%

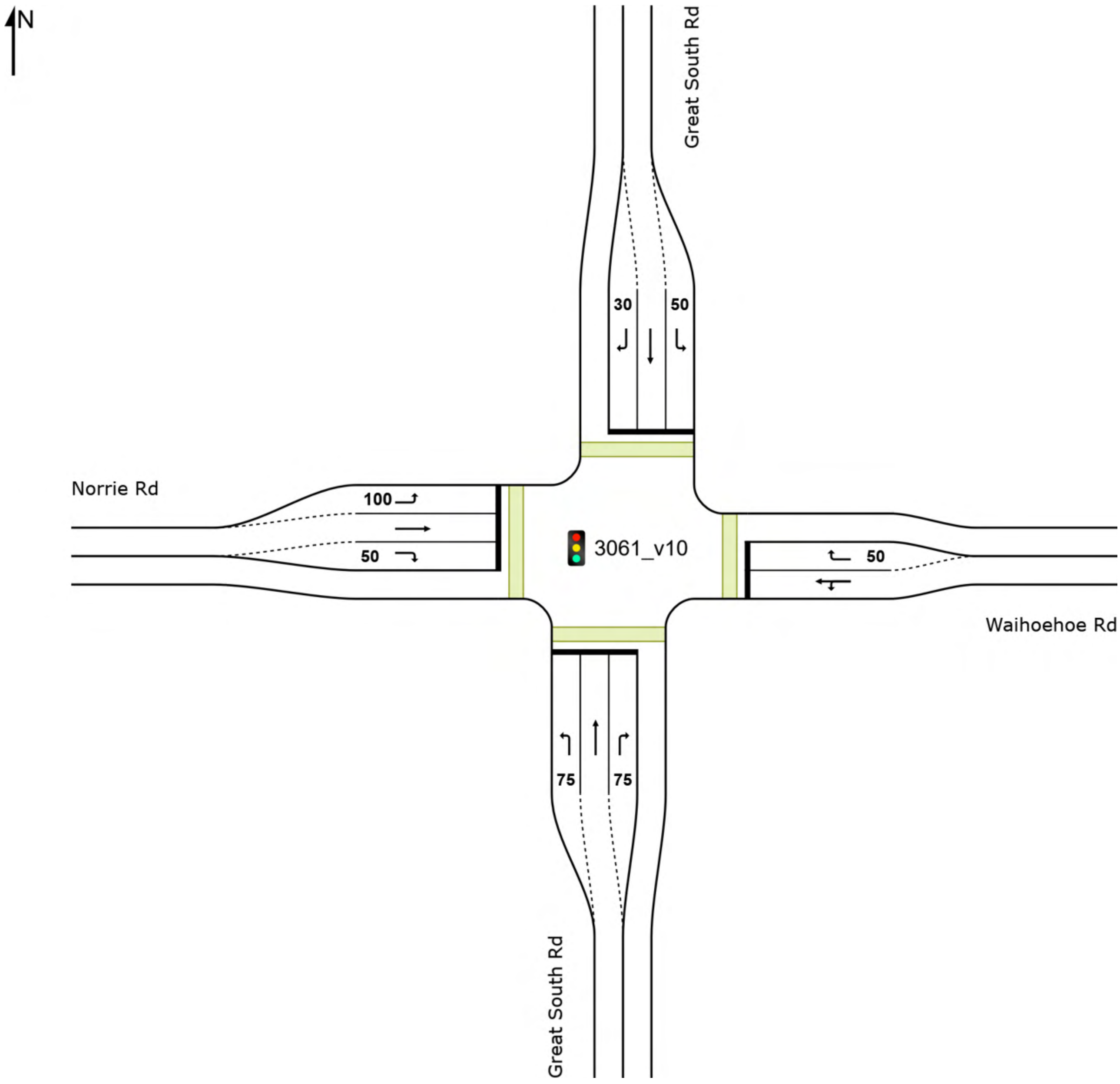
Appendix B Test 2 SIDRA Results

SITE LAYOUT

Site: 3061_v10 [Scenario62n : AM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62n : AM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 3061_v10 [Scenario62n : AM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62n : AM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 82 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Rd														
1	L2	20	0	20	0.0	0.036	26.8	LOS C	0.3	2.4	0.74	0.67	0.74	34.1
2	T1	353	34	353	9.6	0.826	38.5	LOS D	9.4	70.9	1.00	1.01	1.22	32.8
3	R2	301	17	301	5.6	0.716	38.1	LOS D	7.2	52.9	0.98	0.87	1.05	29.0
Approach		674	51	674	7.6	0.826	38.0	LOS D	9.4	70.9	0.98	0.94	1.13	31.3
East: Waihoehoe Rd														
4	L2	247	12	247	4.9	* 0.687	24.3	LOS C	5.8	42.1	0.94	0.86	0.97	34.7
5	T1	112	5	112	4.5	* 0.687	19.7	LOS B	5.8	42.1	0.94	0.86	0.97	31.7
6	R2	306	24	306	7.8	0.785	41.6	LOS D	7.8	58.5	1.00	0.93	1.16	28.1
Approach		665	41	665	6.2	0.785	31.5	LOS C	7.8	58.5	0.97	0.89	1.06	30.9
North: Great South Rd														
7	L2	390	15	390	3.8	* 0.692	20.3	LOS C	4.8	34.7	0.94	0.85	0.95	35.9
8	T1	132	22	132	16.7	0.481	35.3	LOS D	3.1	24.6	0.96	0.77	0.96	33.8
9	R2	210	13	210	6.2	0.790	45.2	LOS D	5.5	40.4	1.00	0.94	1.23	28.2
Approach		732	50	732	6.8	0.790	30.2	LOS C	5.5	40.4	0.96	0.86	1.03	32.9
West: Norrie Rd														
10	L2	447	18	447	4.0	0.828	39.8	LOS D	11.6	84.2	1.00	0.95	1.18	29.6
11	T1	103	3	103	2.9	0.358	35.2	LOS D	2.4	16.9	0.94	0.74	0.94	26.5
12	R2	20	0	20	0.0	* 0.142	45.2	LOS D	0.5	3.4	0.97	0.69	0.97	28.3
Approach		570	21	570	3.7	0.828	39.2	LOS D	11.6	84.2	0.99	0.91	1.13	29.1
All Vehicles		2641	163	2641	6.2	0.828	34.4	LOS C	11.6	84.2	0.97	0.90	1.08	31.1

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Great South Rd												
P1	Full	50	53	29.9	LOS C	0.1	0.1	0.86	0.86	59.2	38.0	0.64
East: Waihoehoe Rd												

P2 Full	50	53	35.3	LOS D	0.1	0.1	0.93	0.93	61.5	34.0	0.55
North: Great South Rd											
P3 Full	50	53	35.3	LOS D	0.1	0.1	0.93	0.93	64.5	38.0	0.59
West: Norrie Rd											
P4 Full	50	53	34.4	LOS D	0.1	0.1	0.92	0.92	63.6	38.0	0.60
All Pedestrians	0	211	33.7	LOS D	0.1	0.1	0.91	0.91	62.2	37.0	0.59

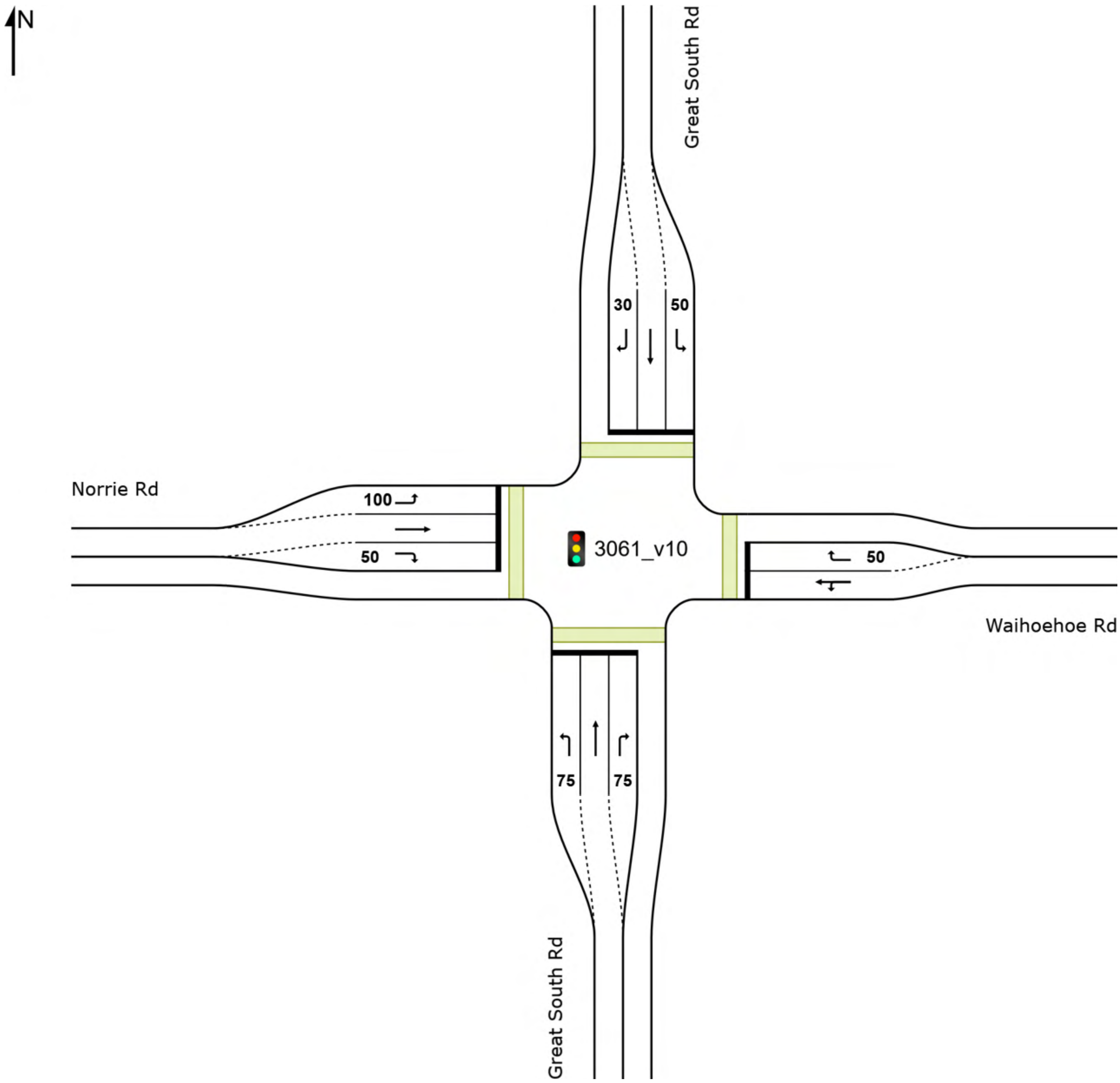
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 3061_v10 [Scenario62n : IP 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62n : IP 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 3061_v10 [Scenario62n : IP 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62n : IP 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 70 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Rd														
1	L2	20	0	20	0.0	0.043	26.5	LOS C	0.3	2.3	0.79	0.68	0.79	34.1
2	T1	97	26	97	26.8	0.355	28.9	LOS C	1.9	16.2	0.92	0.73	0.92	35.9
3	R2	245	29	245	11.8	0.837	42.3	LOS D	5.8	45.0	1.00	1.00	1.35	27.7
Approach		362	55	362	15.2	0.837	37.9	LOS D	5.8	45.0	0.97	0.91	1.21	30.3
East: Waihoehoe Rd														
4	L2	244	40	244	16.4	* 0.612	16.7	LOS B	3.3	25.9	0.90	0.80	0.90	38.2
5	T1	70	7	70	10.0	* 0.612	12.0	LOS B	3.3	25.9	0.90	0.80	0.90	35.9
6	R2	357	46	357	12.9	0.778	34.2	LOS C	7.7	60.1	0.98	0.93	1.14	30.5
Approach		671	93	671	13.9	0.778	25.5	LOS C	7.7	60.1	0.94	0.87	1.03	33.4
North: Great South Rd														
7	L2	362	44	362	12.2	* 0.620	18.4	LOS B	3.9	30.2	0.89	0.84	0.89	36.8
8	T1	126	31	126	24.6	0.494	30.7	LOS C	2.6	21.6	0.96	0.76	0.96	35.2
9	R2	215	17	215	7.9	0.771	39.6	LOS D	4.8	36.2	1.00	0.93	1.23	29.8
Approach		703	92	703	13.1	0.771	27.1	LOS C	4.8	36.2	0.93	0.86	1.00	34.0
West: Norrie Rd														
10	L2	223	16	223	7.2	0.485	29.1	LOS C	4.1	30.3	0.90	0.80	0.90	33.1
11	T1	64	7	64	10.9	0.307	32.5	LOS C	1.3	10.0	0.96	0.72	0.96	27.4
12	R2	20	0	20	0.0	* 0.121	38.3	LOS D	0.4	2.9	0.95	0.69	0.95	30.3
Approach		307	23	307	7.5	0.485	30.4	LOS C	4.1	30.3	0.91	0.78	0.91	31.9
All Vehicles		2043	263	2043	12.9	0.837	29.0	LOS C	7.7	60.1	0.94	0.86	1.03	32.8

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Great South Rd												
P1	Full	50	53	26.6	LOS C	0.1	0.1	0.87	0.87	55.9	38.0	0.68
East: Waihoehoe Rd												

P2	Full	50	53	29.3	LOS C	0.1	0.1	0.92	0.92	55.5	34.0	0.61
North: Great South Rd												
P3	Full	50	53	29.3	LOS C	0.1	0.1	0.92	0.92	58.6	38.0	0.65
West: Norrie Rd												
P4	Full	50	53	29.3	LOS C	0.1	0.1	0.92	0.92	58.6	38.0	0.65
All Pedestrians		0	211	28.7	LOS C	0.1	0.1	0.91	0.91	57.1	37.0	0.65

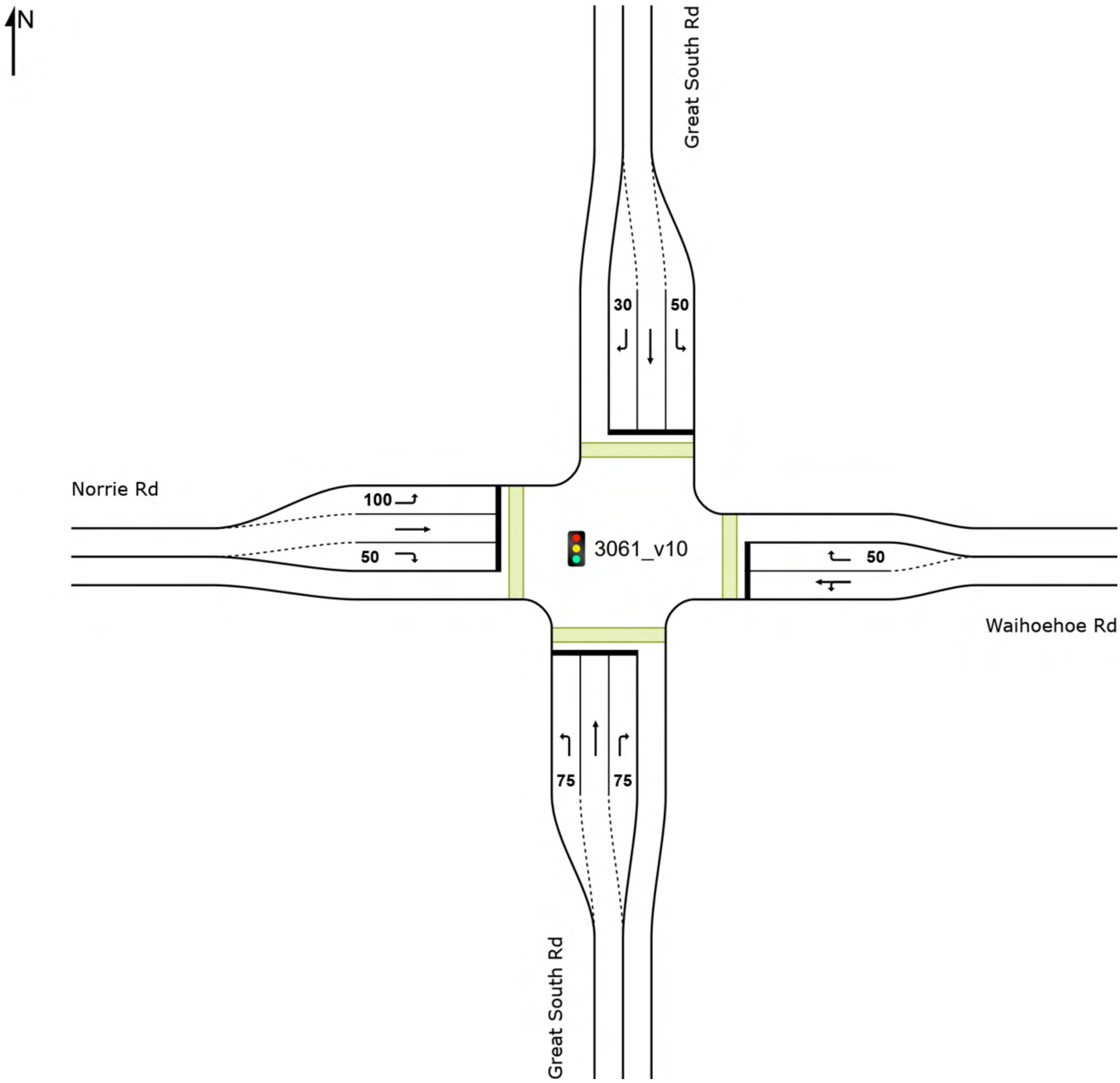
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 3061_v10 [Scenario62n : PM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62n : PM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 3061_v10 [Scenario62n : PM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62n : PM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 84 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Rd														
1	L2	22	2	22	9.1	0.075	37.1	LOS D	0.5	3.6	0.87	0.69	0.87	30.4
2	T1	212	23	212	10.8	1.085	135.3	LOS F	11.1	84.8	1.00	1.62	2.53	17.3
3	R2	209	15	209	7.2	1.092	145.1	LOS F	11.2	83.1	1.00	1.56	2.58	13.2
Approach		443	40	443	9.0	1.092	135.0	LOS F	11.2	84.8	0.99	1.55	2.47	15.7
East: Waihoehoe Rd														
4	L2	470	25	470	5.3	* 0.769	24.4	LOS C	10.8	79.0	0.91	0.93	0.96	34.5
5	T1	130	6	130	4.6	0.769	19.8	LOS B	10.8	79.0	0.91	0.93	0.96	31.4
6	R2	493	28	493	5.7	* 0.983	74.0	LOS E	18.2	133.8	0.86	1.20	1.60	21.0
Approach		1093	59	1093	5.4	0.983	46.2	LOS D	18.2	133.8	0.89	1.05	1.25	26.4
North: Great South Rd														
7	L2	533	29	533	5.4	* 0.586	15.3	LOS B	5.7	41.8	0.76	0.82	0.76	38.5
8	T1	291	22	291	7.6	1.008	84.8	LOS F	11.8	87.8	1.00	1.43	1.97	23.1
9	R2	204	10	204	4.9	0.830	48.3	LOS D	5.6	40.8	1.00	0.98	1.32	27.4
Approach		1028	61	1028	5.9	1.008	41.5	LOS D	11.8	87.8	0.87	1.03	1.21	29.5
West: Norrie Rd														
10	L2	320	14	320	4.4	0.770	41.1	LOS D	8.2	59.5	0.99	0.91	1.12	29.2
11	T1	140	4	140	2.9	* 0.855	49.2	LOS D	4.0	28.8	1.00	1.00	1.45	22.3
12	R2	20	0	20	0.0	0.145	46.3	LOS D	0.5	3.5	0.97	0.69	0.97	28.0
Approach		480	18	480	3.8	0.855	43.6	LOS D	8.2	59.5	1.00	0.93	1.21	27.3
All Vehicles		3044	178	3044	5.8	1.092	57.1	LOS E	18.2	133.8	0.92	1.10	1.41	24.7

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Great South Rd												
P1	Full	50	53	21.5	LOS C	0.1	0.1	0.72	0.72	50.7	38.0	0.75
East: Waihoehoe Rd												

P2	Full	50	53	36.3	LOS D	0.1	0.1	0.93	0.93	62.4	34.0	0.54
North: Great South Rd												
P3	Full	50	53	36.3	LOS D	0.1	0.1	0.93	0.93	65.5	38.0	0.58
West: Norrie Rd												
P4	Full	50	53	36.3	LOS D	0.1	0.1	0.93	0.93	65.5	38.0	0.58
All Pedestrians		0	211	32.6	LOS D	0.1	0.1	0.88	0.88	61.1	37.0	0.61

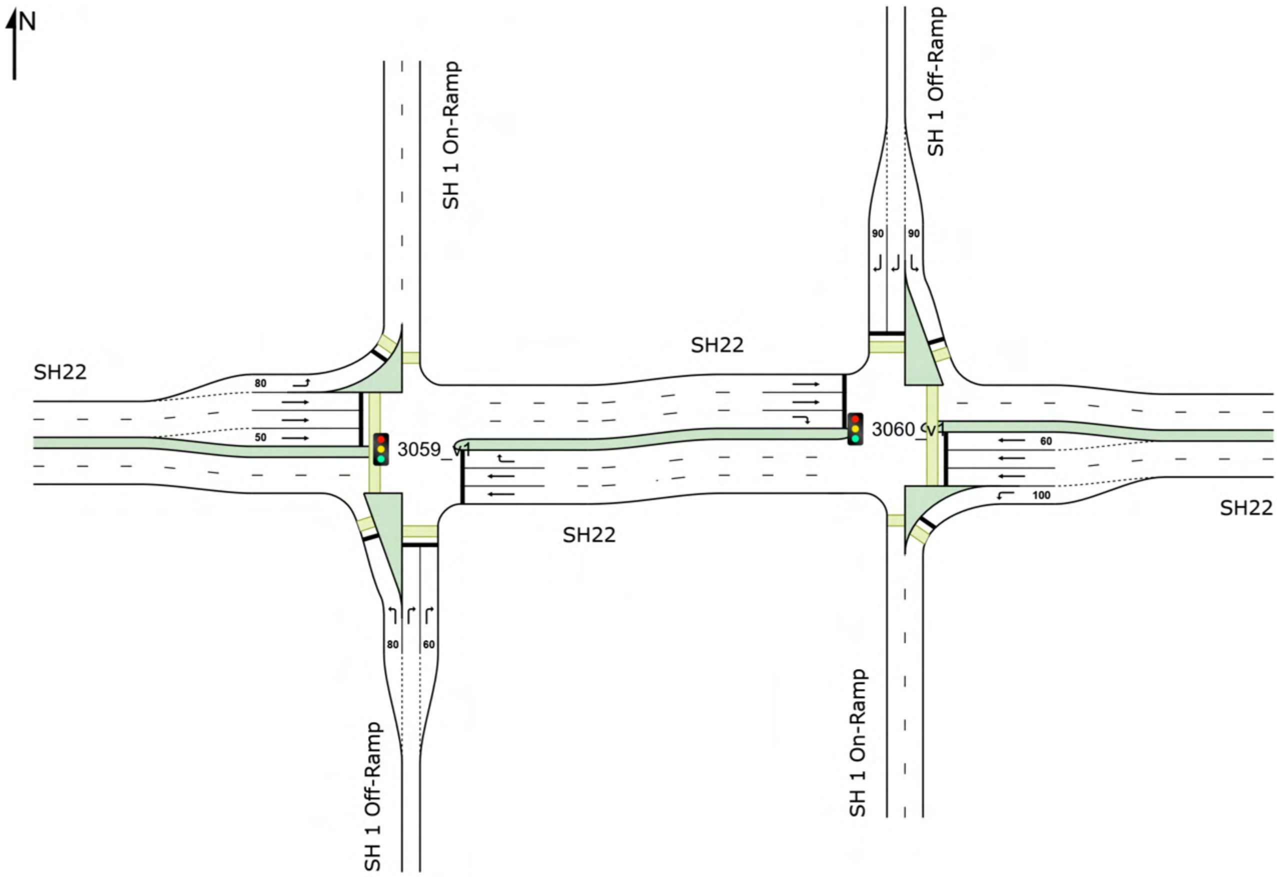
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

NETWORK LAYOUT

Network: N101 [Network1 - MH (Network Folder: General)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
3059_v1	CCG1	Scenario62n : AM 2028 - 3059_SH1_SH22_Interchange_West
3060_v1	CCG1	Scenario62n : AM 2028 - 3060_SH1_SH22_Interchange_East

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [CCGName]

Network: N101 [Network1 - MH (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 112 seconds (CCG Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance (CCG)

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
Site: 3059_v1 [Scenario62n : AM 2028 - 3059_SH1_SH22_Interchange_West]														
South: SH 1 Off-Ramp														
7	L2	62	1.6	62	1.6	0.540	63.2	LOS E	3.5	25.0	1.00	0.76	1.02	18.2
9	R2	104	9.6	104	9.6	0.479	63.2	LOS E	2.9	22.3	1.00	0.75	1.00	14.7
Approach		166	6.6	166	6.6	0.540	63.2	LOS E	3.5	25.0	1.00	0.75	1.01	16.1
East: SH22														
11	T1	688	8.6	688	8.6	0.224	0.3	LOS A	0.5	3.5	0.03	0.02	0.03	49.3
9	R2	169	4.1	169	4.1	0.148	5.1	LOS A	0.2	1.5	0.02	0.54	0.02	43.3
Approach		857	7.7	857	7.7	0.224	1.2	LOS A	0.5	3.5	0.03	0.13	0.03	47.1
West: SH22														
1	L2	1189	12.9	1189	12.9	* 0.938	33.8	LOS C	59.3	460.6	0.68	0.90	0.86	27.6
5	T1	348	11.8	348	11.8	0.598	49.5	LOS D	8.2	63.0	0.98	0.79	0.98	8.6
Approach		1537	12.6	1537	12.6	0.938	37.3	LOS D	59.3	460.6	0.75	0.87	0.88	23.9
All Vehicles		2560	10.6	2560	10.6	0.938	26.9	LOS C	59.3	460.6	0.52	0.61	0.61	26.4
Site: 3060_v1 [Scenario62n : AM 2028 - 3060_SH1_SH22_Interchange_East]														
East: SH22														
1	L2	85	13.6	85	13.6	0.061	6.3	LOS A	0.8	6.3	0.19	0.53	0.19	44.9
5	T1	373	9.3	373	9.3	* 0.970	69.2	LOS E	10.2	77.3	1.00	1.01	1.42	6.1
Approach		458	10.1	458	10.1	0.970	57.5	LOS E	10.2	77.3	0.85	0.92	1.19	11.2
North: SH 1 Off-Ramp														
7	L2	519	5.5	519	5.5	0.581	25.6	LOS C	19.8	145.2	0.76	0.80	0.76	29.7
9	R2	528	6.6	528	6.6	0.298	22.1	LOS C	8.4	61.9	0.63	0.74	0.63	28.2
Approach		1047	6.0	1047	6.0	0.581	23.8	LOS C	19.8	145.2	0.69	0.77	0.69	29.0
West: SH22														
11	T1	462	11.6	462	11.6	0.324	1.5	LOS A	0.7	5.7	0.05	0.05	0.05	46.3
9	R2	21	0.0	21	0.0	0.044	11.8	LOS B	0.2	1.3	0.17	0.56	0.17	39.2
Approach		483	11.1	483	11.1	0.324	1.9	LOS A	0.7	5.7	0.06	0.07	0.06	45.5
All Vehicles		1988	8.2	1988	8.2	0.970	26.2	LOS C	19.8	145.2	0.57	0.63	0.65	24.9

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance (CCG)

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
Site: 3059_v1 [Scenario62n : AM 2028 - 3059_SH1_SH22_Interchange_West]											

South: SH 1 Off-Ramp										
P3 Full	5	50.2	LOS E	0.0	0.0	0.95	0.95	210.6	208.6	0.99
P3B Slip/ Bypass	5	50.2	LOS E	0.0	0.0	0.95	0.95	207.3	204.3	0.99
North: SH 1 On-Ramp										
P4 Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	210.7	208.6	0.99
West: SH22										
P2 Full	5	50.2	LOS E	0.0	0.0	0.95	0.95	219.8	220.5	1.00
P2B Slip/ Bypass	5	50.2	LOS E	0.0	0.0	0.95	0.95	207.3	204.3	0.99
All Pedestrians	74	50.2	LOS E	0.2	0.2	0.95	0.95	210.9	208.8	0.99
Site: 3060_v1 [Scenario62n : AM 2028 - 3060_SH1_SH22_Interchange_East]										
South: SH 1 On-Ramp										
P4 Full	53	50.3	LOS E	0.2	0.2	0.95	0.95	210.7	208.6	0.99
East: SH22										
P2 Full	5	50.2	LOS E	0.0	0.0	0.95	0.95	219.8	220.5	1.00
P2B Slip/ Bypass	5	50.2	LOS E	0.0	0.0	0.95	0.95	207.3	204.3	0.99
North: SH 1 Off-Ramp										
P3 Full	5	50.2	LOS E	0.0	0.0	0.95	0.95	210.6	208.6	0.99
P3B Slip/ Bypass	5	50.2	LOS E	0.0	0.0	0.95	0.95	207.3	204.3	0.99
All Pedestrians	74	50.2	LOS E	0.2	0.2	0.95	0.95	210.9	208.8	0.99

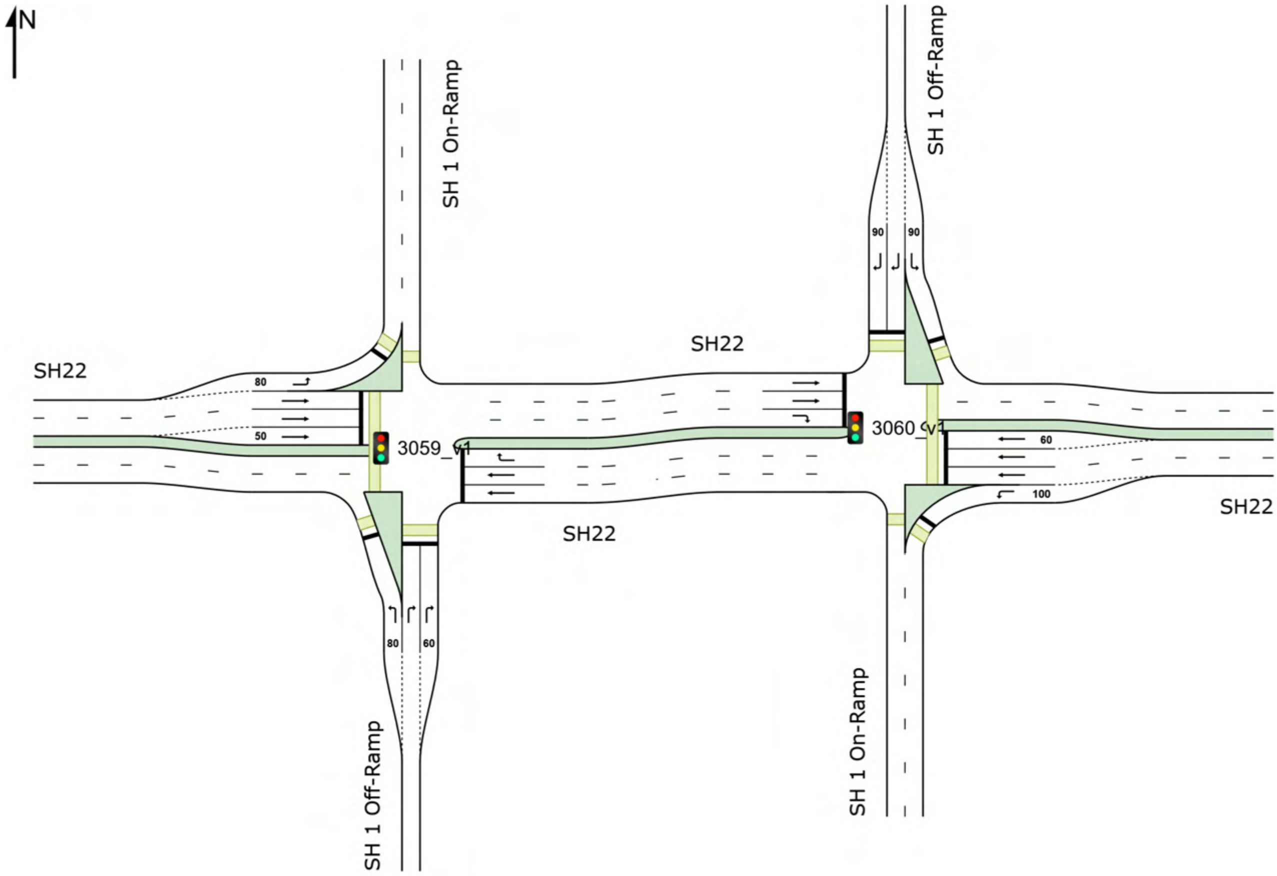
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

NETWORK LAYOUT

Network: N101 [Network1 - MH (Network Folder: General)]

New Network
Network Category: (None)
EQUISAT (Fixed-Time/SCATS) Isolated
Common Control Group: CCG1 [CCGName]

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
3059_v1	CCG1	Scenario62n : PM 2028 - 3059_SH1_SH22_Interchange_West
3060_v1	CCG1	Scenario62n : PM 2028 - 3060_SH1_SH22_Interchange_East

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [CCGName]

Network: N101 [Network1 - MH (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 86 seconds (CCG Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance (CCG)														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
Site: 3059_v1 [Scenario62n : PM 2028 - 3059_SH1_SH22_Interchange_West]														
South: SH 1 Off-Ramp														
7	L2	83	3.6	83	3.6	* 0.657	50.9	LOS D	3.7	27.0	1.00	0.83	1.14	20.8
9	R2	56	26.8	56	26.8	0.257	49.0	LOS D	1.2	10.4	0.98	0.72	0.98	17.5
Approach		139	12.9	139	12.9	0.657	50.1	LOS D	3.7	27.0	0.99	0.78	1.08	19.6
East: SH22														
11	T1	1497	5.5	1497	5.5	0.503	0.4	LOS A	1.2	9.0	0.04	0.04	0.04	49.1
9	R2	351	7.1	351	7.1	0.305	5.0	LOS A	0.4	3.1	0.03	0.54	0.03	43.3
Approach		1848	5.8	1848	5.8	0.503	1.3	LOS A	1.2	9.0	0.04	0.13	0.04	47.0
West: SH22														
1	L2	912	10.0	912	10.0	0.839	21.3	LOS C	32.0	242.9	0.80	0.87	0.87	33.3
5	T1	139	13.7	139	13.7	* 0.494	44.7	LOS D	2.7	21.1	1.00	0.74	1.00	9.4
Approach		1051	10.5	1051	10.5	0.839	24.4	LOS C	32.0	242.9	0.83	0.86	0.89	30.4
All Vehicles		3038	7.8	3038	7.8	0.839	11.5	LOS B	32.0	242.9	0.36	0.41	0.38	35.6
Site: 3060_v1 [Scenario62n : PM 2028 - 3060_SH1_SH22_Interchange_East]														
East: SH22														
1	L2	167	4.8	167	4.8	0.118	6.6	LOS A	1.6	11.5	0.25	0.56	0.25	44.7
5	T1	697	6.7	697	6.7	* 0.951	47.3	LOS D	20.6	152.6	0.96	1.02	1.27	8.4
Approach		864	6.4	864	6.4	0.951	39.4	LOS D	20.6	152.6	0.82	0.93	1.07	15.0
North: SH 1 Off-Ramp														
7	L2	538	5.8	538	5.8	0.811	35.2	LOS D	22.4	164.9	0.96	0.93	1.08	25.8
9	R2	1152	5.4	1152	5.4	* 0.915	49.7	LOS D	31.9	233.8	0.98	1.05	1.34	18.2
Approach		1690	5.5	1690	5.5	0.915	45.1	LOS D	31.9	233.8	0.98	1.01	1.25	20.5
West: SH22														
11	T1	178	18.5	178	18.5	0.105	0.5	LOS A	0.1	0.7	0.02	0.02	0.02	48.7
9	R2	21	4.8	21	4.8	0.056	9.2	LOS A	0.1	0.8	0.13	0.56	0.13	41.0
Approach		199	17.1	199	17.1	0.105	1.4	LOS A	0.1	0.8	0.04	0.08	0.04	46.7
All Vehicles		2753	6.6	2753	6.6	0.951	40.2	LOS D	31.9	233.8	0.86	0.92	1.11	19.7

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance (CCG)										
Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
Site: 3059_v1 [Scenario62n : PM 2028 - 3059_SH1_SH22_Interchange_West]											

South: SH 1 Off-Ramp										
P3 Full	5	37.2	LOS D	0.0	0.0	0.93	0.93	197.7	208.6	1.06
P3B Slip/ Bypass	5	37.2	LOS D	0.0	0.0	0.93	0.93	194.4	204.3	1.05
North: SH 1 On-Ramp										
P4 Full	53	37.3	LOS D	0.1	0.1	0.93	0.93	197.8	208.6	1.05
West: SH22										
P2 Full	5	37.2	LOS D	0.0	0.0	0.93	0.93	206.8	220.5	1.07
P2B Slip/ Bypass	5	37.2	LOS D	0.0	0.0	0.93	0.93	194.4	204.3	1.05
All Pedestrians	74	37.3	LOS D	0.1	0.1	0.93	0.93	197.9	208.8	1.06
Site: 3060_v1 [Scenario62n : PM 2028 - 3060_SH1_SH22_Interchange_East]										
South: SH 1 On-Ramp										
P4 Full	53	37.3	LOS D	0.1	0.1	0.93	0.93	197.8	208.6	1.05
East: SH22										
P2 Full	5	37.2	LOS D	0.0	0.0	0.93	0.93	206.8	220.5	1.07
P2B Slip/ Bypass	5	37.2	LOS D	0.0	0.0	0.93	0.93	194.4	204.3	1.05
North: SH 1 Off-Ramp										
P3 Full	5	37.2	LOS D	0.0	0.0	0.93	0.93	197.7	208.6	1.06
P3B Slip/ Bypass	5	37.2	LOS D	0.0	0.0	0.93	0.93	194.4	204.3	1.05
All Pedestrians	74	37.3	LOS D	0.1	0.1	0.93	0.93	197.9	208.8	1.06

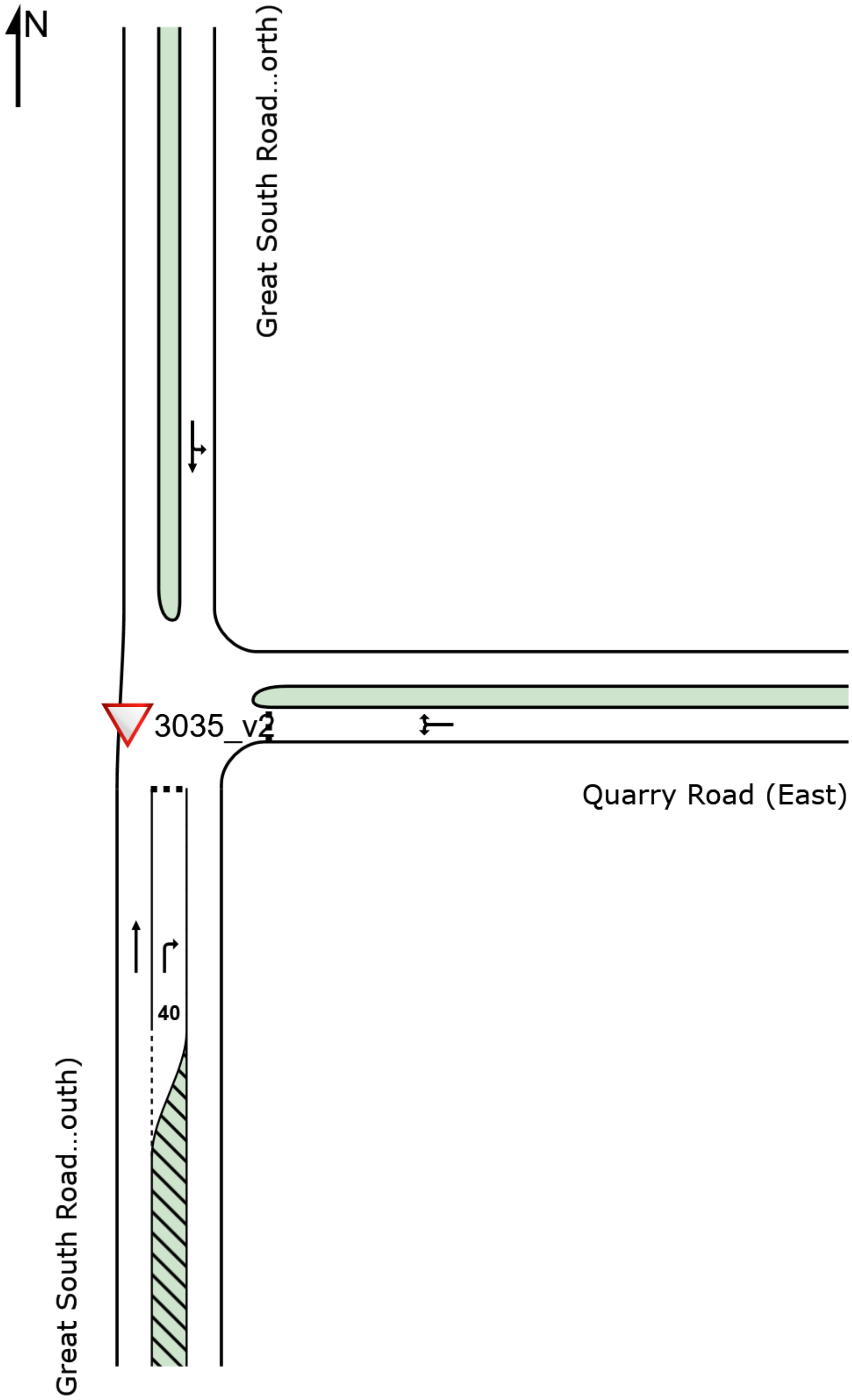
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

▽ Site: 3035_v2 [Scenario62n : AM 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62n : AM 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

▽ Site: 3035_v2 [Scenario62n : AM 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62n : AM 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Road (South)														
5	T1	130	21	137	16.2	0.078	3.3	LOS A	0.0	0.0	0.00	0.46	0.00	45.0
6	R2	33	3	35	9.1	0.043	6.4	LOS A	0.1	0.4	0.39	0.63	0.39	41.4
Approach		163	24	172	14.7	0.078	3.9	LOS A	0.1	0.4	0.08	0.50	0.08	44.2
East: Quarry Road (East)														
7	L2	21	1	22	4.8	0.295	5.0	LOS A	0.5	4.0	0.40	0.69	0.42	41.5
9	R2	197	42	207	21.3	0.295	7.6	LOS A	0.5	4.0	0.40	0.69	0.42	41.0
Approach		218	43	229	19.7	0.295	7.4	LOS A	0.5	4.0	0.40	0.69	0.42	41.0
North: Great South Road (North)														
10	L2	258	17	272	6.6	0.192	4.6	LOS A	0.0	0.0	0.00	0.42	0.00	45.1
11	T1	69	6	73	8.7	0.192	0.0	LOS A	0.0	0.0	0.00	0.42	0.00	45.5
Approach		327	23	344	7.0	0.192	3.7	NA	0.0	0.0	0.00	0.42	0.00	45.2
All Vehicles		708	90	745	12.7	0.295	4.9	NA	0.5	4.0	0.14	0.52	0.15	43.6

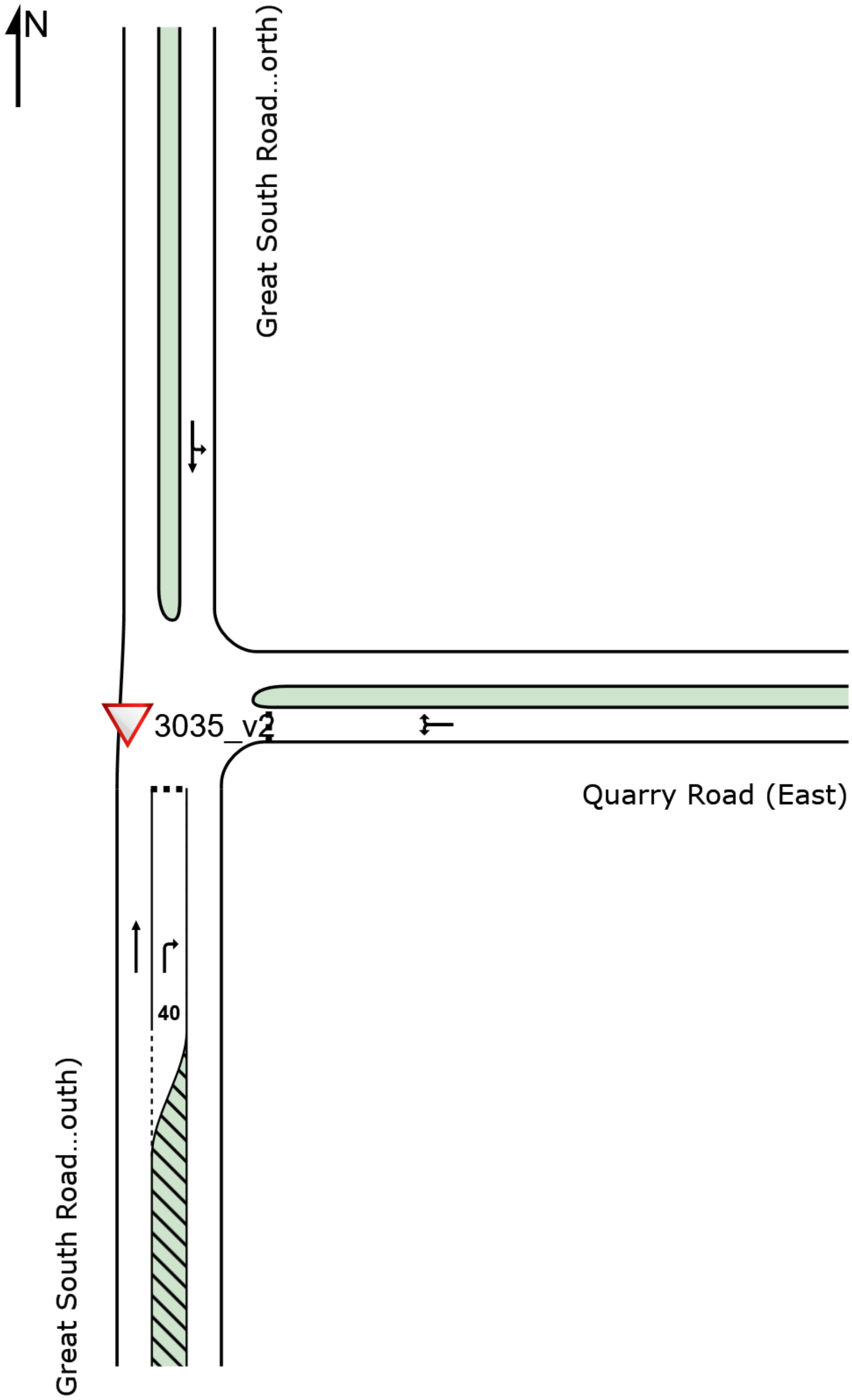
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

▽ Site: 3035_v2 [Scenario62n : IP 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62n : IP 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

▽ Site: 3035_v2 [Scenario62n : IP 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62n : IP 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Road (South)														
5	T1	81	9	85	11.1	0.047	3.3	LOS A	0.0	0.0	0.00	0.46	0.00	45.1
6	R2	22	2	23	9.1	0.026	6.0	LOS A	0.0	0.3	0.34	0.59	0.34	41.9
Approach		103	11	108	10.7	0.047	3.8	LOS A	0.0	0.3	0.07	0.49	0.07	44.3
East: Quarry Road (East)														
7	L2	23	3	24	13.0	0.331	5.1	LOS A	0.6	4.7	0.39	0.66	0.40	41.9
9	R2	249	50	262	20.1	0.331	6.8	LOS A	0.6	4.7	0.39	0.66	0.40	41.5
Approach		272	53	286	19.5	0.331	6.7	LOS A	0.6	4.7	0.39	0.66	0.40	41.6
North: Great South Road (North)														
10	L2	174	20	183	11.5	0.152	4.7	LOS A	0.0	0.0	0.00	0.37	0.00	45.5
11	T1	79	7	83	8.9	0.152	0.0	LOS A	0.0	0.0	0.00	0.37	0.00	46.1
Approach		253	27	266	10.7	0.152	3.2	NA	0.0	0.0	0.00	0.37	0.00	45.7
All Vehicles		628	91	661	14.5	0.331	4.8	NA	0.6	4.7	0.18	0.51	0.19	43.5

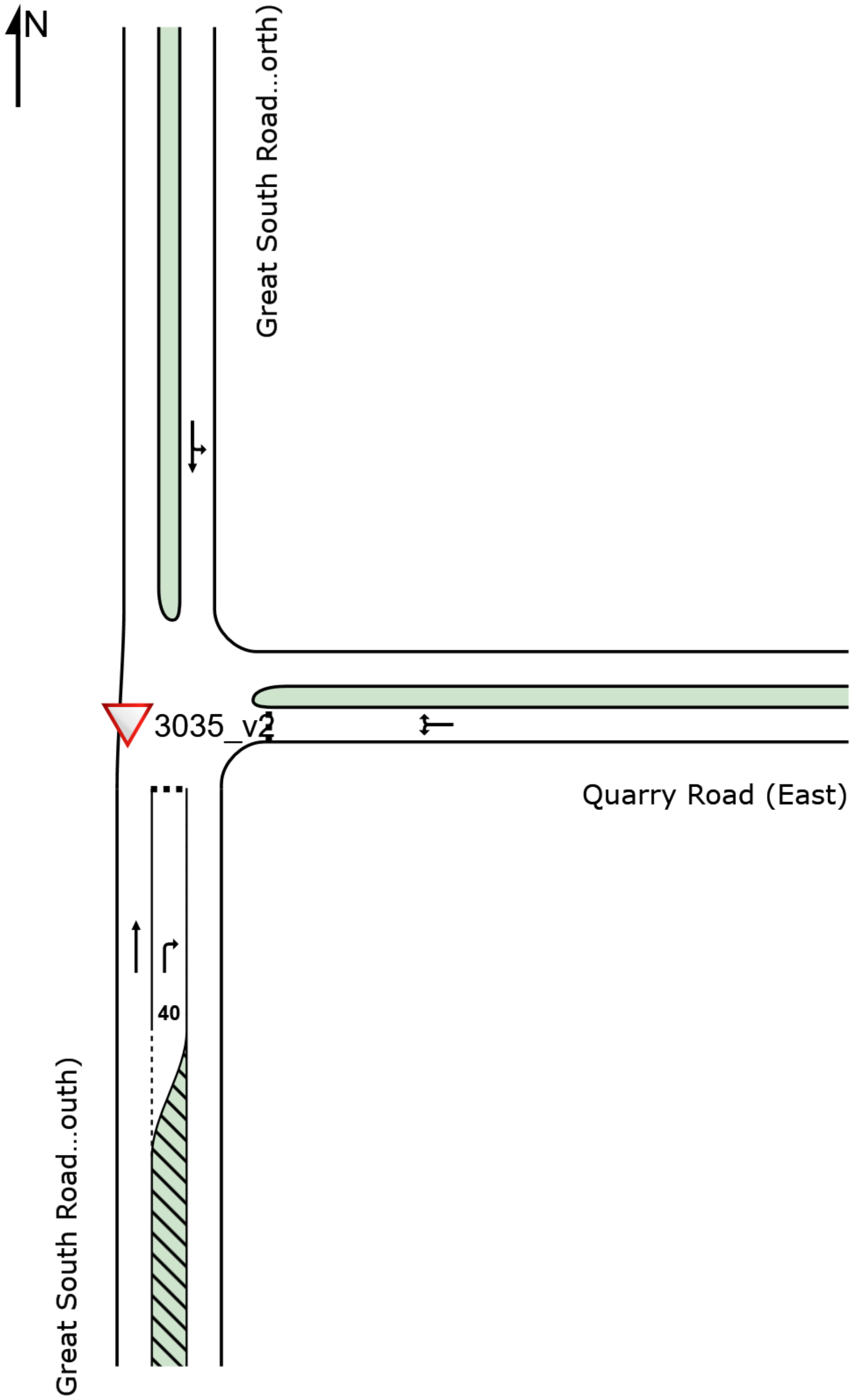
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

▽ Site: 3035_v2 [Scenario62n : PM 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62n : PM 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

▽ Site: 3035_v2 [Scenario62n : PM 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62n : PM 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Road (South)														
5	T1	98	6	103	6.1	0.055	3.2	LOS A	0.0	0.0	0.00	0.46	0.00	45.2
6	R2	22	1	23	4.5	0.026	6.0	LOS A	0.0	0.2	0.35	0.60	0.35	41.9
Approach		120	7	126	5.8	0.055	3.7	LOS A	0.0	0.2	0.06	0.49	0.06	44.5
East: Quarry Road (East)														
7	L2	61	1	64	1.6	0.564	6.6	LOS A	1.7	12.9	0.53	0.83	0.76	40.6
9	R2	420	32	442	7.6	0.564	8.6	LOS A	1.7	12.9	0.53	0.83	0.76	40.4
Approach		481	33	506	6.9	0.564	8.4	LOS A	1.7	12.9	0.53	0.83	0.76	40.4
North: Great South Road (North)														
10	L2	120	18	126	15.0	0.154	4.7	LOS A	0.0	0.0	0.00	0.25	0.00	46.5
11	T1	140	9	147	6.4	0.154	0.0	LOS A	0.0	0.0	0.00	0.25	0.00	47.4
Approach		260	27	274	10.4	0.154	2.2	NA	0.0	0.0	0.00	0.25	0.00	47.0
All Vehicles		861	67	906	7.8	0.564	5.9	NA	1.7	12.9	0.30	0.60	0.43	42.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

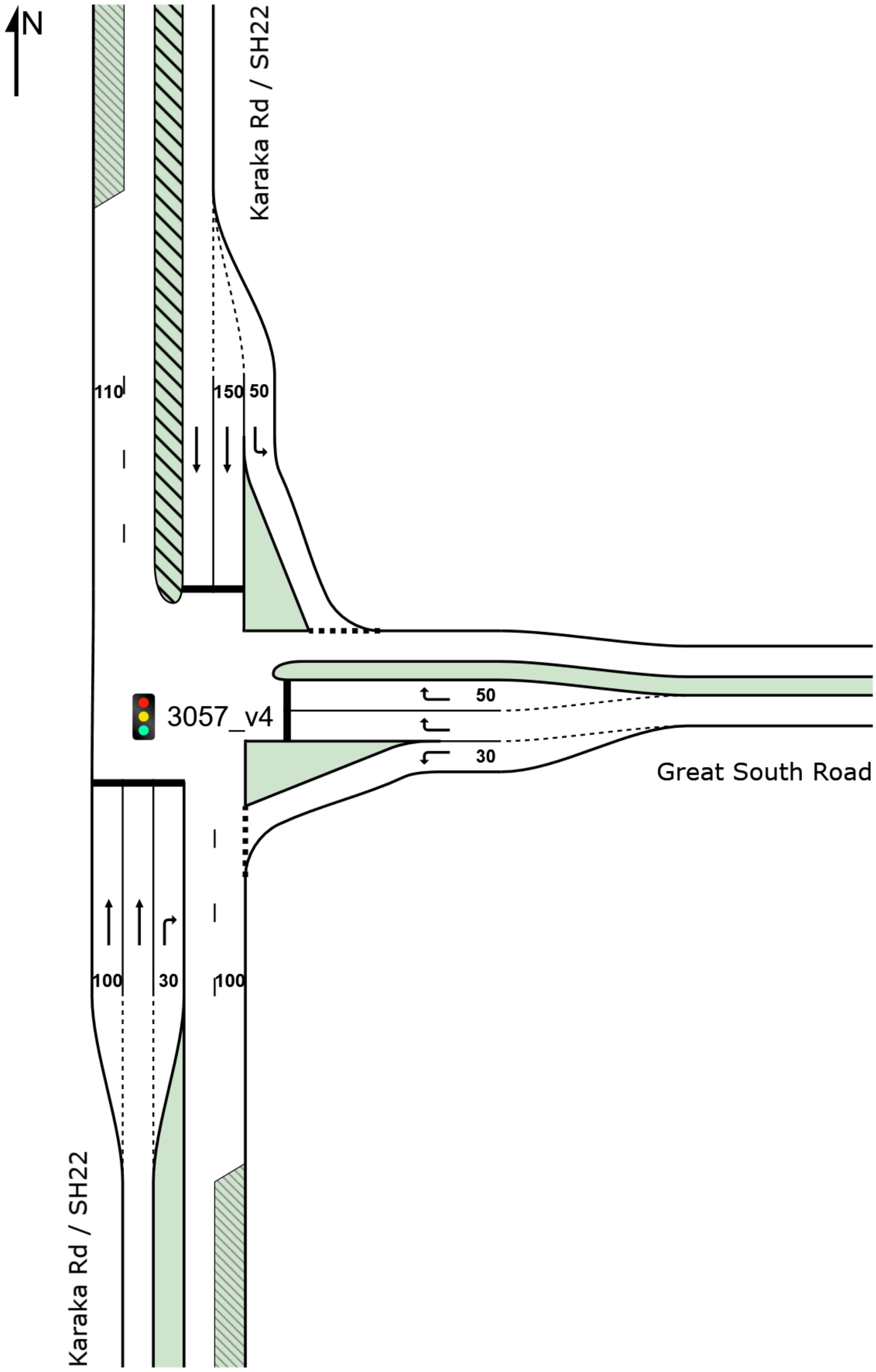
Appendix C Test 3 SIDRA Results

SITE LAYOUT

Site: 3057_v4 [Scenario62o : PM 2028 - SH22/GSR - Signalised (extra 50m RT lane) (Site Folder: 3057 SH22/GSR)]

Scenario62o : PM 2028 - SH22/GSR - Signalised (extra 50m RT lane)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 3057_v4 [Scenario62o : PM 2028 - SH22/GSR - Signalised (extra 50m RT lane) (Site Folder: 3057 SH22/GSR)]

Scenario62o : PM 2028 - SH22/GSR - Signalised (extra 50m RT lane)
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Karaka Rd / SH22														
5	T1	681	69	717	10.1	0.402	6.1	LOS A	4.4	33.2	0.42	0.36	0.42	44.6
6	R2	105	6	111	5.7	* 0.796	55.1	LOS E	3.3	24.2	1.00	0.93	1.32	20.8
Approach		786	75	827	9.5	0.796	12.6	LOS B	4.4	33.2	0.50	0.44	0.54	39.5
East: Great South Road														
7	L2	142	3	149	2.1	0.236	20.4	LOS C	2.4	17.0	0.68	0.72	0.68	33.8
9	R2	410	39	432	9.5	* 0.870	49.6	LOS D	8.3	63.0	0.98	0.93	1.20	28.2
Approach		552	42	581	7.6	0.870	42.1	LOS D	8.3	63.0	0.91	0.87	1.07	29.0
North: Karaka Rd / SH22														
10	L2	187	14	197	7.5	0.142	5.6	LOS A	0.8	5.6	0.23	0.57	0.23	46.0
11	T1	1341	65	1412	4.8	* 0.895	25.9	LOS C	27.1	197.9	0.86	0.87	0.97	32.8
Approach		1528	79	1608	5.2	0.895	23.5	LOS C	27.1	197.9	0.78	0.83	0.88	34.4
All Vehicles		2866	196	3017	6.8	0.895	24.1	LOS C	27.1	197.9	0.73	0.73	0.82	34.1

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

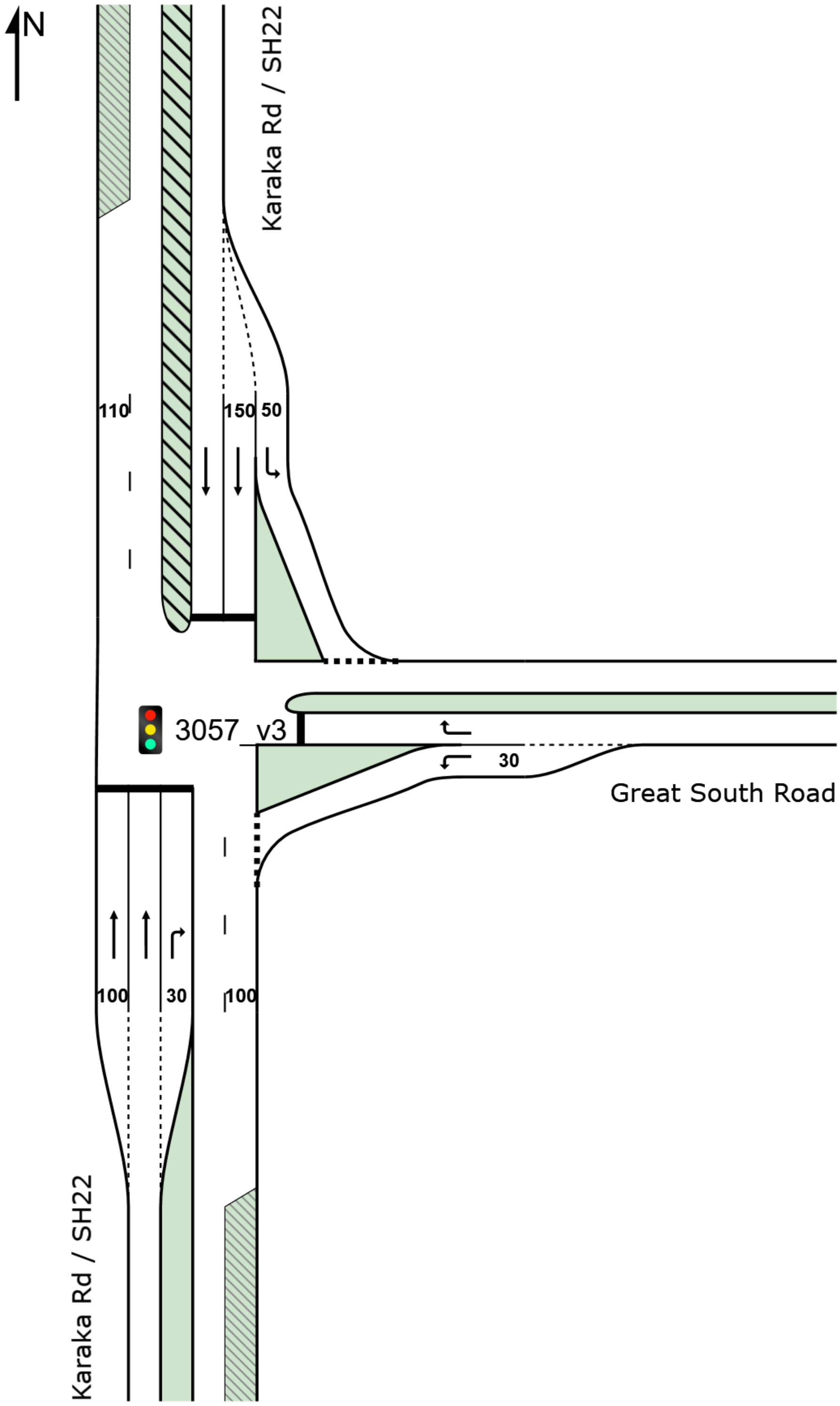
* Critical Movement (Signal Timing)

SITE LAYOUT

Site: 3057_v3 [Scenario62o : PM 2028 - SH22/GSR - Signalised_v3 (Site Folder: 3057 SH22/GSR)]

Scenario62o : PM 2028 - SH22/GSR - Signalised_v3
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 3057_v3 [Scenario62o : PM 2028 - SH22/GSR - Signalised_v3 (Site Folder: 3057 SH22/GSR)]

Scenario62o : PM 2028 - SH22/GSR - Signalised_v3
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total	HV]	DEMAND FLOWS [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh.	Dist]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		veh/h	veh/h	veh/h	%	v/c	sec		veh	m				km/h
South: Karaka Rd / SH22															
5	T1	681	69	717	10.1	0.465	9.9	LOS A	5.7	43.7	0.54	0.47	0.54	41.6
6	R2	105	6	111	5.7	* 0.929	65.7	LOS E	3.7	27.1	1.00	1.10	1.74	18.6
Approach		786	75	827	9.5	0.929	17.4	LOS B	5.7	43.7	0.60	0.55	0.70	36.5
East: Great South Road															
7	L2	142	3	149	2.1	0.203	21.4	LOS C	2.4	17.4	0.69	0.71	0.69	33.0
9	R2	410	39	432	9.5	* 1.109	164.2	LOS F	26.5	200.8	1.00	1.58	2.48	13.9
Approach		552	42	581	7.6	1.109	127.5	LOS F	26.5	200.8	0.92	1.35	2.02	15.4
North: Karaka Rd / SH22															
10	L2	187	14	197	7.5	0.145	5.6	LOS A	0.7	5.6	0.23	0.57	0.23	46.0
11	T1	1341	65	1412	4.8	* 1.088	97.2	LOS F	55.4	404.1	0.92	1.46	1.71	16.4
Approach		1528	79	1608	5.2	1.088	86.0	LOS F	55.4	404.1	0.84	1.35	1.53	18.3
All Vehicles		2866	196	3017	6.8	1.109	75.2	LOS E	55.4	404.1	0.79	1.13	1.40	20.0

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

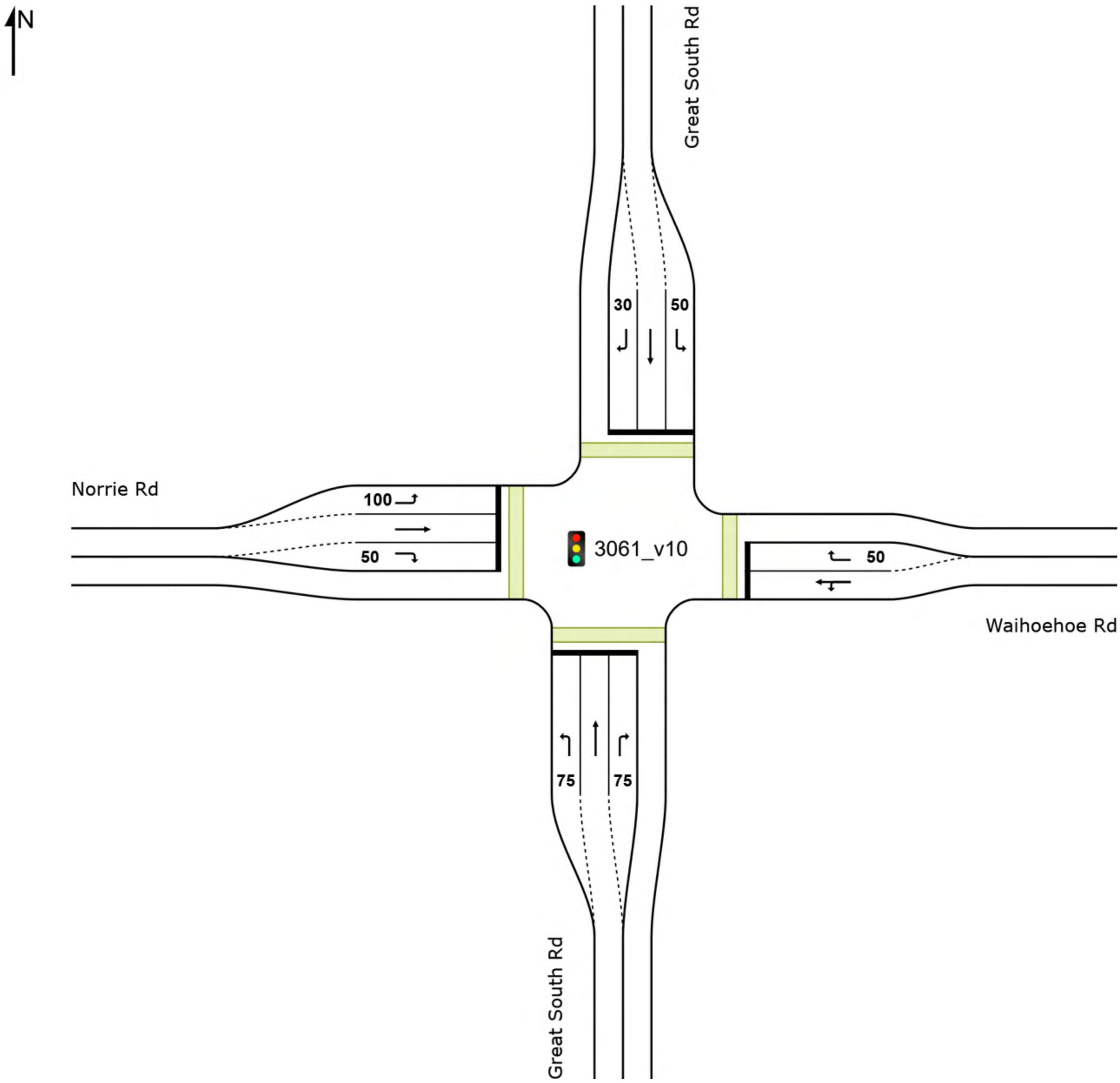
* Critical Movement (Signal Timing)

SITE LAYOUT

Site: 3061_v10 [Scenario62o : PM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62o : PM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 3061_v10 [Scenario62o : AM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62o : AM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 68 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Rd														
1	L2	20	0	20	0.0	0.042	25.5	LOS C	0.3	2.2	0.78	0.67	0.78	34.6
2	T1	277	30	277	10.8	0.861	37.9	LOS D	6.6	50.3	1.00	1.07	1.40	33.0
3	R2	122	12	122	9.8	0.397	32.6	LOS C	2.3	17.5	0.93	0.78	0.93	30.8
Approach		419	42	419	10.0	0.861	35.8	LOS D	6.6	50.3	0.97	0.97	1.24	32.5
East: Waihoehoe Rd														
4	L2	241	13	241	5.4	* 0.673	18.7	LOS B	3.8	28.0	0.94	0.84	0.98	37.3
5	T1	92	5	92	5.4	* 0.673	14.1	LOS B	3.8	28.0	0.94	0.84	0.98	34.7
6	R2	350	25	350	7.1	0.832	38.0	LOS D	7.9	59.0	1.00	0.99	1.28	29.3
Approach		683	43	683	6.3	0.832	28.0	LOS C	7.9	59.0	0.97	0.92	1.13	32.3
North: Great South Rd														
7	L2	305	12	305	3.9	* 0.535	16.0	LOS B	3.1	22.2	0.87	0.79	0.87	38.1
8	T1	148	24	148	16.2	0.526	29.7	LOS C	2.9	23.2	0.96	0.77	0.96	35.6
9	R2	223	13	223	5.8	0.761	38.0	LOS D	4.8	35.6	1.00	0.93	1.21	30.3
Approach		676	49	676	7.2	0.761	26.3	LOS C	4.8	35.6	0.94	0.83	1.00	34.6
West: Norrie Rd														
10	L2	453	18	453	4.0	0.878	40.3	LOS D	11.0	79.5	1.00	1.03	1.35	29.4
11	T1	106	3	106	2.8	0.408	30.7	LOS C	2.1	14.9	0.96	0.75	0.96	28.1
12	R2	20	0	20	0.0	* 0.118	37.1	LOS D	0.4	2.8	0.95	0.69	0.95	30.6
Approach		579	21	579	3.6	0.878	38.4	LOS D	11.0	79.5	0.99	0.97	1.27	29.3
All Vehicles		2357	155	2357	6.6	0.878	31.4	LOS C	11.0	79.5	0.97	0.91	1.15	32.2

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Great South Rd												
P1	Full	50	53	27.4	LOS C	0.1	0.1	0.90	0.90	56.7	38.0	0.67
East: Waihoehoe Rd												

P2 Full	50	53	28.3	LOS C	0.1	0.1	0.91	0.91	54.5	34.0	0.62
North: Great South Rd											
P3 Full	50	53	28.3	LOS C	0.1	0.1	0.91	0.91	57.6	38.0	0.66
West: Norrie Rd											
P4 Full	50	53	28.3	LOS C	0.1	0.1	0.91	0.91	57.6	38.0	0.66
All Pedestrians	0	211	28.1	LOS C	0.1	0.1	0.91	0.91	56.6	37.0	0.65

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

MOVEMENT SUMMARY

Site: 3061_v10 [Scenario62o : IP 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62o : IP 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 68 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Rd														
1	L2	20	0	20	0.0	0.059	30.2	LOS C	0.3	2.4	0.86	0.68	0.86	32.8
2	T1	88	26	88	29.5	0.548	34.2	LOS C	1.9	16.3	0.99	0.79	1.03	34.1
3	R2	82	12	82	14.6	0.479	38.2	LOS D	1.7	13.4	0.98	0.77	0.98	28.9
Approach		190	38	190	20.0	0.548	35.5	LOS D	1.9	16.3	0.98	0.77	0.99	31.9
East: Waihoehoe Rd														
4	L2	234	40	234	17.1	* 0.572	17.6	LOS B	3.2	25.2	0.88	0.81	0.88	37.8
5	T1	75	7	75	9.3	* 0.572	12.8	LOS B	3.2	25.2	0.88	0.81	0.88	35.4
6	R2	366	46	366	12.6	0.699	28.6	LOS C	7.0	54.0	0.94	0.87	0.99	32.5
Approach		675	93	675	13.8	0.699	23.0	LOS C	7.0	54.0	0.91	0.84	0.94	34.5
North: Great South Rd														
7	L2	269	36	269	13.4	* 0.403	13.5	LOS B	2.6	20.0	0.76	0.76	0.76	39.4
8	T1	160	40	160	25.0	0.561	29.1	LOS C	3.1	26.7	0.96	0.78	0.96	35.8
9	R2	224	17	224	7.6	0.713	36.0	LOS D	4.7	34.9	0.99	0.89	1.13	31.0
Approach		653	93	653	14.2	0.713	25.0	LOS C	4.7	34.9	0.89	0.81	0.93	35.1
West: Norrie Rd														
10	L2	234	16	234	6.8	0.467	27.1	LOS C	4.1	30.0	0.88	0.80	0.88	33.9
11	T1	66	8	66	12.1	0.311	31.4	LOS C	1.3	10.1	0.95	0.72	0.95	27.9
12	R2	20	0	20	0.0	* 0.118	37.1	LOS D	0.4	2.8	0.95	0.69	0.95	30.6
Approach		320	24	320	7.5	0.467	28.6	LOS C	4.1	30.0	0.90	0.77	0.90	32.6
All Vehicles		1838	248	1838	13.5	0.713	26.0	LOS C	7.0	54.0	0.91	0.81	0.94	34.1

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Great South Rd												
P1	Full	50	53	23.9	LOS C	0.1	0.1	0.84	0.84	53.2	38.0	0.71
East: Waihoehoe Rd												

P2 Full	50	53	28.3	LOS C	0.1	0.1	0.91	0.91	54.5	34.0	0.62
North: Great South Rd											
P3 Full	50	53	28.3	LOS C	0.1	0.1	0.91	0.91	57.6	38.0	0.66
West: Norrie Rd											
P4 Full	50	53	28.3	LOS C	0.1	0.1	0.91	0.91	57.6	38.0	0.66
All Pedestrians	0	211	27.2	LOS C	0.1	0.1	0.90	0.90	55.7	37.0	0.66

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

MOVEMENT SUMMARY

Site: 3061_v10 [Scenario62o : PM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing (Site Folder: 3061 - GSR / Waihoehoe)]

Scenario62o : PM 2028 - GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Rd														
1	L2	21	1	21	4.8	0.071	35.8	LOS D	0.4	3.2	0.88	0.69	0.88	30.8
2	T1	172	28	172	16.3	0.990	73.5	LOS E	6.1	49.1	1.00	1.32	2.03	25.0
3	R2	87	8	87	9.2	0.497	43.9	LOS D	2.1	15.9	0.99	0.77	0.99	27.3
Approach		280	37	280	13.2	0.990	61.4	LOS E	6.1	49.1	0.99	1.10	1.62	25.9
East: Waihoehoe Rd														
4	L2	441	25	441	5.7	* 0.788	26.5	LOS C	10.4	76.1	0.94	0.96	1.02	33.6
5	T1	126	4	126	3.2	0.788	21.9	LOS C	10.4	76.1	0.94	0.96	1.02	30.4
6	R2	511	27	511	5.3	* 1.031	103.6	LOS F	24.0	175.3	1.00	1.42	2.06	17.0
Approach		1078	56	1078	5.2	1.031	62.5	LOS E	24.0	175.3	0.97	1.18	1.52	22.6
North: Great South Rd														
7	L2	462	25	462	5.4	* 0.521	12.8	LOS B	4.6	34.0	0.73	0.77	0.73	39.9
8	T1	329	31	329	9.4	1.068	121.4	LOS F	16.2	122.3	1.00	1.71	2.39	18.6
9	R2	237	11	237	4.6	0.952	64.3	LOS E	7.6	55.7	1.00	1.21	1.77	23.9
Approach		1028	67	1028	6.5	1.068	59.4	LOS E	16.2	122.3	0.88	1.17	1.50	25.1
West: Norrie Rd														
10	L2	366	14	366	3.8	0.792	39.2	LOS D	9.1	65.5	0.99	0.93	1.15	29.8
11	T1	76	3	76	3.9	* 0.447	39.8	LOS D	1.8	13.3	0.99	0.75	0.99	24.9
12	R2	20	0	20	0.0	0.139	44.0	LOS D	0.5	3.3	0.96	0.69	0.96	28.6
Approach		462	17	462	3.7	0.792	39.5	LOS D	9.1	65.5	0.99	0.89	1.11	29.0
All Vehicles		2848	177	2848	6.2	1.068	57.5	LOS E	24.0	175.3	0.94	1.12	1.46	24.8

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Great South Rd												
P1	Full	50	53	22.5	LOS C	0.1	0.1	0.75	0.75	51.8	38.0	0.73
East: Waihoehoe Rd												

P2	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	60.5	34.0	0.56
North: Great South Rd												
P3	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	63.5	38.0	0.60
West: Norrie Rd												
P4	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	63.5	38.0	0.60
All Pedestrians		0	211	31.4	LOS D	0.1	0.1	0.88	0.88	59.8	37.0	0.62

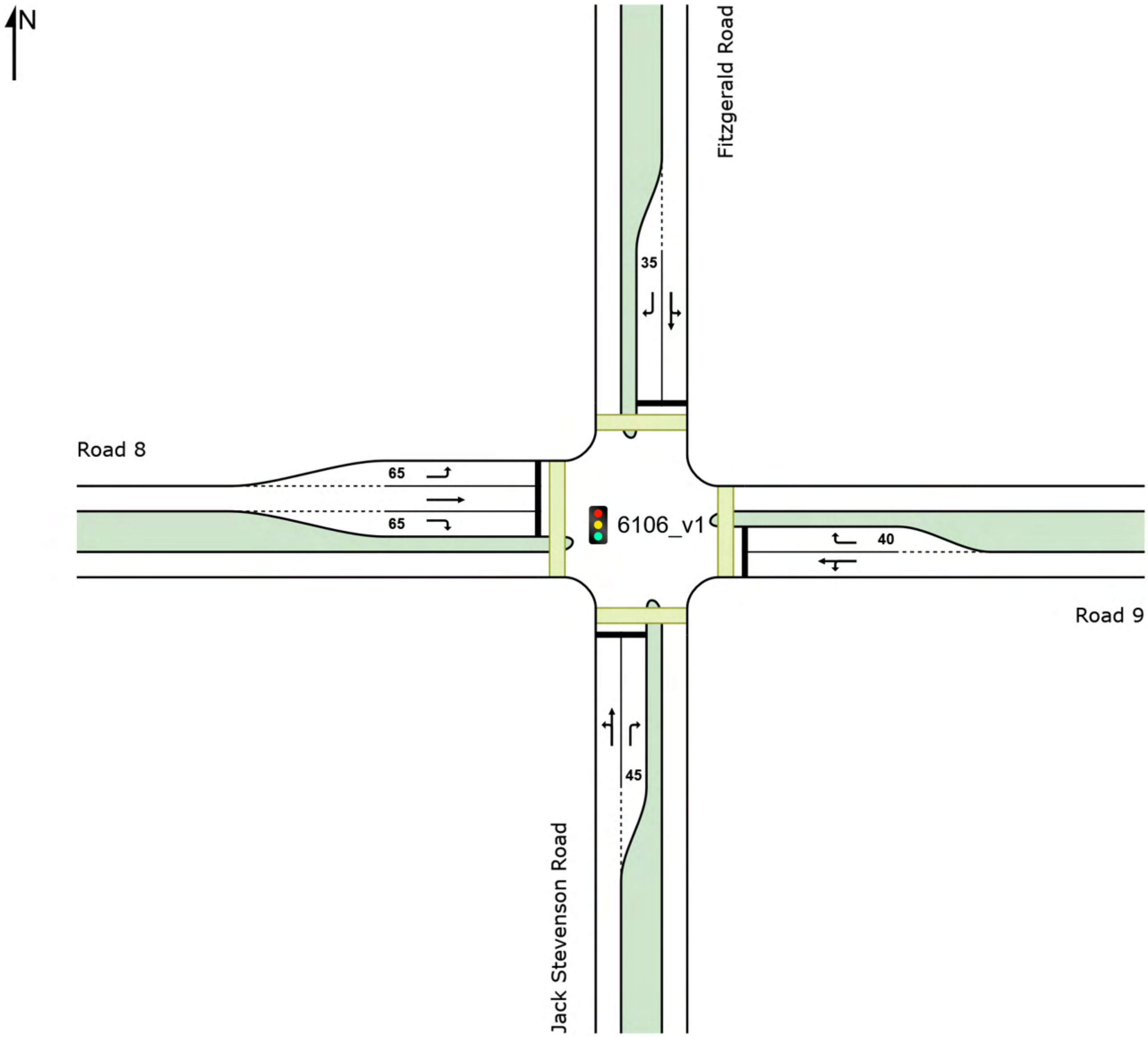
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 6106_v1 [Scenario62o : PM 2028 - Fitzgerald / Jack Stevenson / Rd 8 / Rd 9 (Site Folder: General)]

Scenario62o : PM 2028 - Fitzgerald / Jack Stevenson / Rd 8 / Rd 9
Site Category: -
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 6106_v1 [Scenario62o : PM 2028 - Fitzgerald / Jack Stevenson / Rd 8 / Rd 9 (Site Folder: General)]

Scenario62o : PM 2028 - Fitzgerald / Jack Stevenson / Rd 8 / Rd 9
Site Category: -
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 70 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Jack Stevenson Road														
1	L2	39	7.7	41	7.7	* 0.452	23.3	LOS C	2.3	17.5	0.96	0.76	0.96	30.5
2	T1	56	12.5	59	12.5	0.452	18.7	LOS B	2.3	17.5	0.96	0.76	0.96	28.0
3	R2	20	0.0	21	0.0	0.132	38.5	LOS D	0.7	5.0	0.95	0.70	0.95	24.2
Approach		115	8.7	121	8.7	0.452	23.7	LOS C	2.3	17.5	0.96	0.74	0.96	27.9
East: Road 9														
4	L2	20	0.0	21	0.0	* 0.361	27.1	LOS C	1.1	8.1	0.99	0.72	0.99	29.6
5	T1	21	4.8	22	4.8	* 0.361	22.5	LOS C	1.1	8.1	0.99	0.72	0.99	32.9
6	R2	21	4.8	22	4.8	0.123	37.3	LOS D	0.7	5.3	0.94	0.70	0.94	25.7
Approach		62	3.2	65	3.2	0.361	29.0	LOS C	1.1	8.1	0.97	0.71	0.97	29.3
North: Fitzgerald Road														
7	L2	21	4.8	22	4.8	0.651	23.0	LOS C	10.0	75.0	0.83	0.72	0.84	33.8
8	T1	328	8.8	345	8.8	* 0.651	18.4	LOS B	10.0	75.0	0.83	0.72	0.84	29.3
9	R2	277	5.8	292	5.8	0.545	27.2	LOS C	8.5	62.8	0.89	0.81	0.89	28.5
Approach		626	7.3	659	7.3	0.651	22.5	LOS C	10.0	75.0	0.86	0.76	0.86	29.0
West: Road 8														
10	L2	165	7.3	174	7.3	0.246	19.8	LOS B	4.0	29.6	0.70	0.74	0.70	32.1
11	T1	20	0.0	21	0.0	0.108	32.4	LOS C	0.7	4.8	0.94	0.66	0.94	29.8
12	R2	24	4.2	25	4.2	0.140	37.4	LOS D	0.8	6.0	0.94	0.70	0.94	23.1
Approach		209	6.2	220	6.2	0.246	23.0	LOS C	4.0	29.6	0.75	0.73	0.75	30.6
All Vehicles		1012	7.0	1065	7.0	0.651	23.1	LOS C	10.0	75.0	0.85	0.75	0.86	29.3

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Jack Stevenson Road												
P1	Full	50	53	29.3	LOS C	0.1	0.1	0.92	0.92	193.9	213.9	1.10
East: Road 9												
P2	Full	50	53	29.3	LOS C	0.1	0.1	0.92	0.92	193.9	213.9	1.10

North: Fitzgerald Road											
P3 Full	50	53	29.3	LOS C	0.1	0.1	0.92	0.92	193.9	213.9	1.10
West: Road 8											
P4 Full	50	53	29.3	LOS C	0.1	0.1	0.92	0.92	196.4	217.2	1.11
All Pedestrians	200	211	29.3	LOS C	0.1	0.1	0.92	0.92	194.5	214.7	1.10

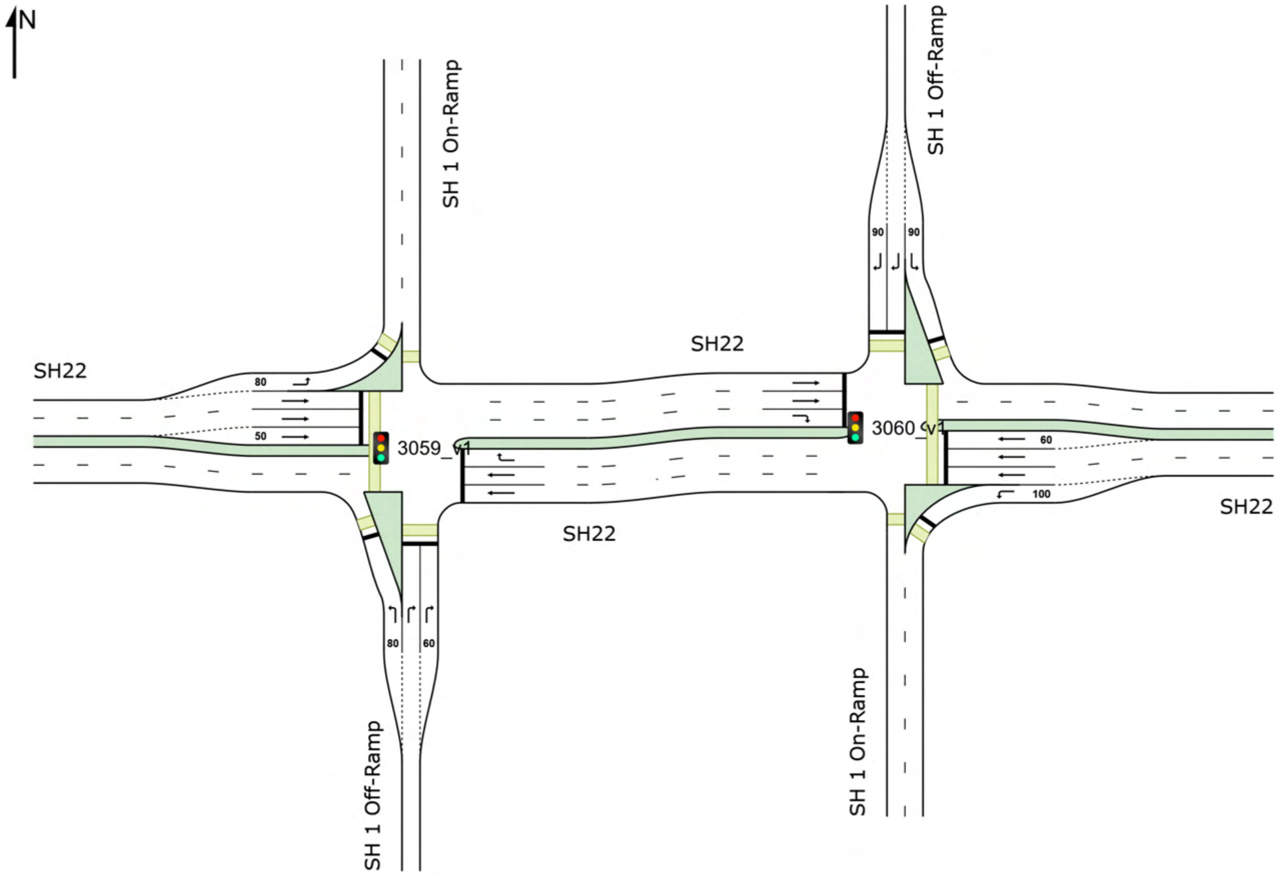
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

NETWORK LAYOUT

Network: N101 [Network1 - MH (Network Folder: General)]

New Network
Network Category: (None)
EQUISAT (Fixed-Time/SCATS) Isolated
Common Control Group: CCG1 [CCGName]

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
3059_v1	CCG1	Scenario62o : AM 2028 - 3059_SH1_SH22_Interchange_West
3060_v1	CCG1	Scenario62o : AM 2028 - 3060_SH1_SH22_Interchange_East

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [CCGName]

Network: N101 [Network1 - MH (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 118 seconds (CCG Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance (CCG)

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
Site: 3059_v1 [Scenario62o : AM 2028 - 3059_SH1_SH22_Interchange_West]														
South: SH 1 Off-Ramp														
7	L2	61	1.6	61	1.6	0.392	62.1	LOS E	3.5	24.7	0.99	0.75	0.99	18.5
9	R2	94	10.6	94	10.6	0.321	61.9	LOS E	2.7	20.4	0.98	0.74	0.98	14.9
Approach		155	7.1	155	7.1	0.392	62.0	LOS E	3.5	24.7	0.98	0.75	0.98	16.4
East: SH22														
11	T1	676	8.3	676	8.3	0.225	0.3	LOS A	0.5	3.6	0.03	0.02	0.03	49.2
9	R2	163	4.3	163	4.3	0.159	5.2	LOS A	0.2	1.6	0.03	0.54	0.03	43.2
Approach		839	7.5	839	7.5	0.225	1.3	LOS A	0.5	3.6	0.03	0.12	0.03	47.0
West: SH22														
1	L2	1202	13.0	1202	13.0	* 0.930	29.4	LOS C	57.9	450.6	0.67	0.86	0.80	29.3
5	T1	312	10.9	312	10.9	0.391	44.8	LOS D	7.0	54.0	0.91	0.73	0.91	9.4
Approach		1514	12.5	1514	12.5	0.930	32.6	LOS C	57.9	450.6	0.72	0.84	0.82	25.9
All Vehicles		2508	10.5	2508	10.5	0.930	23.9	LOS C	57.9	450.6	0.50	0.59	0.57	28.1
Site: 3060_v1 [Scenario62o : AM 2028 - 3060_SH1_SH22_Interchange_East]														
East: SH22														
1	L2	90	12.2	90	12.2	0.065	6.7	LOS A	1.0	7.7	0.21	0.53	0.21	44.5
5	T1	353	9.9	353	9.9	* 0.972	72.8	LOS E	10.1	77.0	1.00	1.01	1.42	5.8
Approach		443	10.4	443	10.4	0.972	59.4	LOS E	10.1	77.0	0.84	0.91	1.17	11.2
North: SH 1 Off-Ramp														
7	L2	300	7.3	300	7.3	0.386	28.3	LOS C	11.5	85.8	0.72	0.76	0.72	28.5
9	R2	486	5.8	486	5.8	0.309	27.4	LOS C	9.0	65.8	0.69	0.75	0.69	25.5
Approach		786	6.4	786	6.4	0.386	27.7	LOS C	11.5	85.8	0.70	0.75	0.70	26.8
West: SH22														
11	T1	382	11.3	382	11.3	0.230	0.8	LOS A	0.3	2.1	0.03	0.02	0.03	48.0
9	R2	23	0.0	23	0.0	0.037	5.4	LOS A	0.0	0.2	0.02	0.54	0.02	44.0
Approach		405	10.6	405	10.6	0.230	1.0	LOS A	0.3	2.1	0.03	0.05	0.03	47.4
All Vehicles		1634	8.5	1634	8.5	0.972	29.7	LOS C	11.5	85.8	0.57	0.62	0.66	22.8

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance (CCG)

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
Site: 3059_v1 [Scenario62o : AM 2028 - 3059_SH1_SH22_Interchange_West]											

South: SH 1 Off-Ramp										
P3	Full	5	53.2	LOS E	0.0	0.0	0.95	0.95	213.6	208.6	0.98
P3B	Slip/ Bypass	5	53.2	LOS E	0.0	0.0	0.95	0.95	210.3	204.3	0.97
North: SH 1 On-Ramp											
P4	Full	53	53.3	LOS E	0.2	0.2	0.95	0.95	213.7	208.6	0.98
West: SH22											
P2	Full	5	53.2	LOS E	0.0	0.0	0.95	0.95	222.8	220.5	0.99
P2B	Slip/ Bypass	5	53.2	LOS E	0.0	0.0	0.95	0.95	210.3	204.3	0.97
All Pedestrians		74	53.2	LOS E	0.2	0.2	0.95	0.95	213.9	208.8	0.98
Site: 3060_v1 [Scenario62o : AM 2028 - 3060_SH1_SH22_Interchange_East]											
South: SH 1 On-Ramp											
P4	Full	53	53.3	LOS E	0.2	0.2	0.95	0.95	213.7	208.6	0.98
East: SH22											
P2	Full	5	53.2	LOS E	0.0	0.0	0.95	0.95	222.8	220.5	0.99
P2B	Slip/ Bypass	5	53.2	LOS E	0.0	0.0	0.95	0.95	210.3	204.3	0.97
North: SH 1 Off-Ramp											
P3	Full	5	53.2	LOS E	0.0	0.0	0.95	0.95	213.6	208.6	0.98
P3B	Slip/ Bypass	5	53.2	LOS E	0.0	0.0	0.95	0.95	210.3	204.3	0.97
All Pedestrians		74	53.2	LOS E	0.2	0.2	0.95	0.95	213.9	208.8	0.98

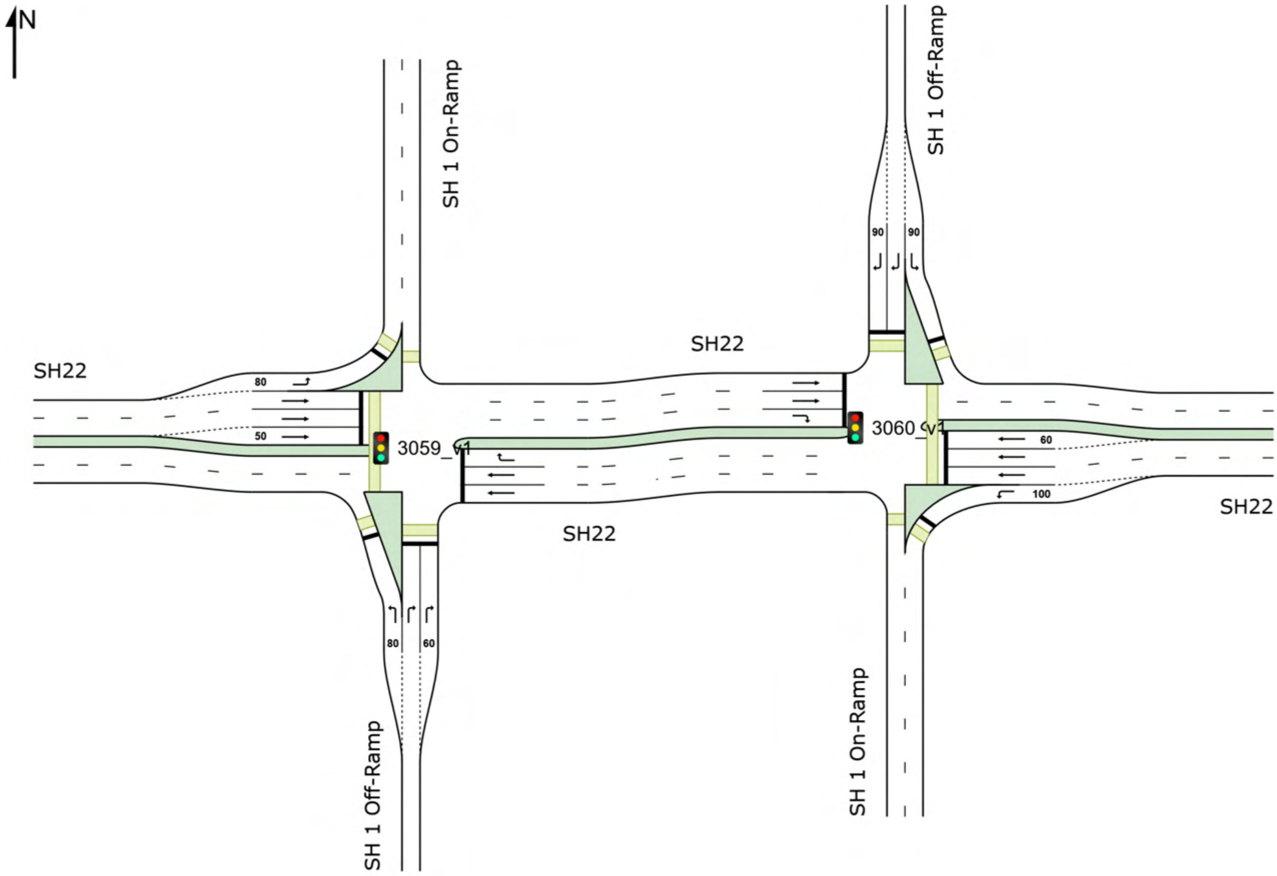
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

NETWORK LAYOUT

Network: N101 [Network1 - MH (Network Folder: General)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
3059_v1	CCG1	Scenario62o : PM 2028 - 3059_SH1_SH22_Interchange_West
3060_v1	CCG1	Scenario62o : PM 2028 - 3060_SH1_SH22_Interchange_East

CCG MOVEMENT SUMMARY

Common Control Group: CCG1 [CCGName]

Network: N101 [Network1 - MH (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 86 seconds (CCG Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance (CCG)

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
Site: 3059_v1 [Scenario62o : PM 2028 - 3059_SH1_SH22_Interchange_West]														
South: SH 1 Off-Ramp														
7	L2	83	3.6	83	3.6	0.657	50.9	LOS D	3.7	27.0	1.00	0.83	1.14	20.8
9	R2	64	25.0	64	25.0	0.291	49.1	LOS D	1.4	11.8	0.98	0.72	0.98	17.5
Approach		147	12.9	147	12.9	0.657	50.1	LOS D	3.7	27.0	0.99	0.78	1.07	19.5
East: SH22														
11	T1	1489	5.2	1489	5.2	0.499	0.4	LOS A	1.2	8.8	0.04	0.04	0.04	49.1
9	R2	324	8.0	324	8.0	0.283	5.0	LOS A	0.4	2.8	0.03	0.54	0.03	43.3
Approach		1813	5.7	1813	5.7	0.499	1.2	LOS A	1.2	8.8	0.04	0.13	0.04	47.1
West: SH22														
1	L2	938	9.5	938	9.5	* 0.841	20.1	LOS C	31.8	240.5	0.77	0.86	0.84	33.9
5	T1	190	12.6	190	12.6	0.672	46.2	LOS D	3.8	29.6	1.00	0.82	1.14	9.1
Approach		1128	10.0	1128	10.0	0.841	24.5	LOS C	31.8	240.5	0.81	0.85	0.89	29.9
All Vehicles		3088	7.6	3088	7.6	0.841	12.0	LOS B	31.8	240.5	0.37	0.42	0.40	35.0
Site: 3060_v1 [Scenario62o : PM 2028 - 3060_SH1_SH22_Interchange_East]														
East: SH22														
1	L2	182	8.2	182	8.2	0.131	6.7	LOS A	1.7	13.1	0.25	0.56	0.25	44.6
5	T1	714	6.7	714	6.7	* 0.856	39.5	LOS D	14.0	104.0	0.98	0.90	1.11	9.8
Approach		896	7.0	896	7.0	0.856	32.8	LOS C	14.0	104.0	0.83	0.83	0.93	17.2
North: SH 1 Off-Ramp														
7	L2	375	6.1	375	6.1	0.533	26.1	LOS C	12.1	89.4	0.82	0.80	0.82	29.5
9	R2	1098	4.9	1098	4.9	0.774	31.4	LOS C	21.3	155.5	0.94	0.89	0.99	23.8
Approach		1473	5.2	1473	5.2	0.774	30.0	LOS C	21.3	155.5	0.91	0.87	0.95	25.3
West: SH22														
11	T1	253	15.4	253	15.4	0.153	0.8	LOS A	0.2	1.6	0.04	0.03	0.04	47.8
9	R2	20	0.0	20	0.0	0.051	12.4	LOS B	0.2	1.3	0.23	0.57	0.23	38.8
Approach		273	14.3	273	14.3	0.153	1.7	LOS A	0.2	1.6	0.05	0.07	0.05	46.1
All Vehicles		2642	6.8	2642	6.8	0.856	28.1	LOS C	21.3	155.5	0.79	0.77	0.85	23.6

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance (CCG)

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
Site: 3059_v1 [Scenario62o : PM 2028 - 3059_SH1_SH22_Interchange_West]											

South: SH 1 Off-Ramp										
P3	Full	5	37.2	LOS D	0.0	0.0	0.93	0.93	197.7	208.6	1.06
P3B	Slip/ Bypass	5	37.2	LOS D	0.0	0.0	0.93	0.93	194.4	204.3	1.05
North: SH 1 On-Ramp										
P4	Full	53	37.3	LOS D	0.1	0.1	0.93	0.93	197.8	208.6	1.05
West: SH22										
P2	Full	5	37.2	LOS D	0.0	0.0	0.93	0.93	206.8	220.5	1.07
P2B	Slip/ Bypass	5	37.2	LOS D	0.0	0.0	0.93	0.93	194.4	204.3	1.05
All Pedestrians		74	37.3	LOS D	0.1	0.1	0.93	0.93	197.9	208.8	1.06
Site: 3060_v1 [Scenario62o : PM 2028 - 3060_SH1_SH22_Interchange_East]										
South: SH 1 On-Ramp										
P4	Full	53	37.3	LOS D	0.1	0.1	0.93	0.93	197.8	208.6	1.05
East: SH22										
P2	Full	5	37.2	LOS D	0.0	0.0	0.93	0.93	206.8	220.5	1.07
P2B	Slip/ Bypass	5	37.2	LOS D	0.0	0.0	0.93	0.93	194.4	204.3	1.05
North: SH 1 Off-Ramp										
P3	Full	5	37.2	LOS D	0.0	0.0	0.93	0.93	197.7	208.6	1.06
P3B	Slip/ Bypass	5	37.2	LOS D	0.0	0.0	0.93	0.93	194.4	204.3	1.05
All Pedestrians		74	37.3	LOS D	0.1	0.1	0.93	0.93	197.9	208.8	1.06

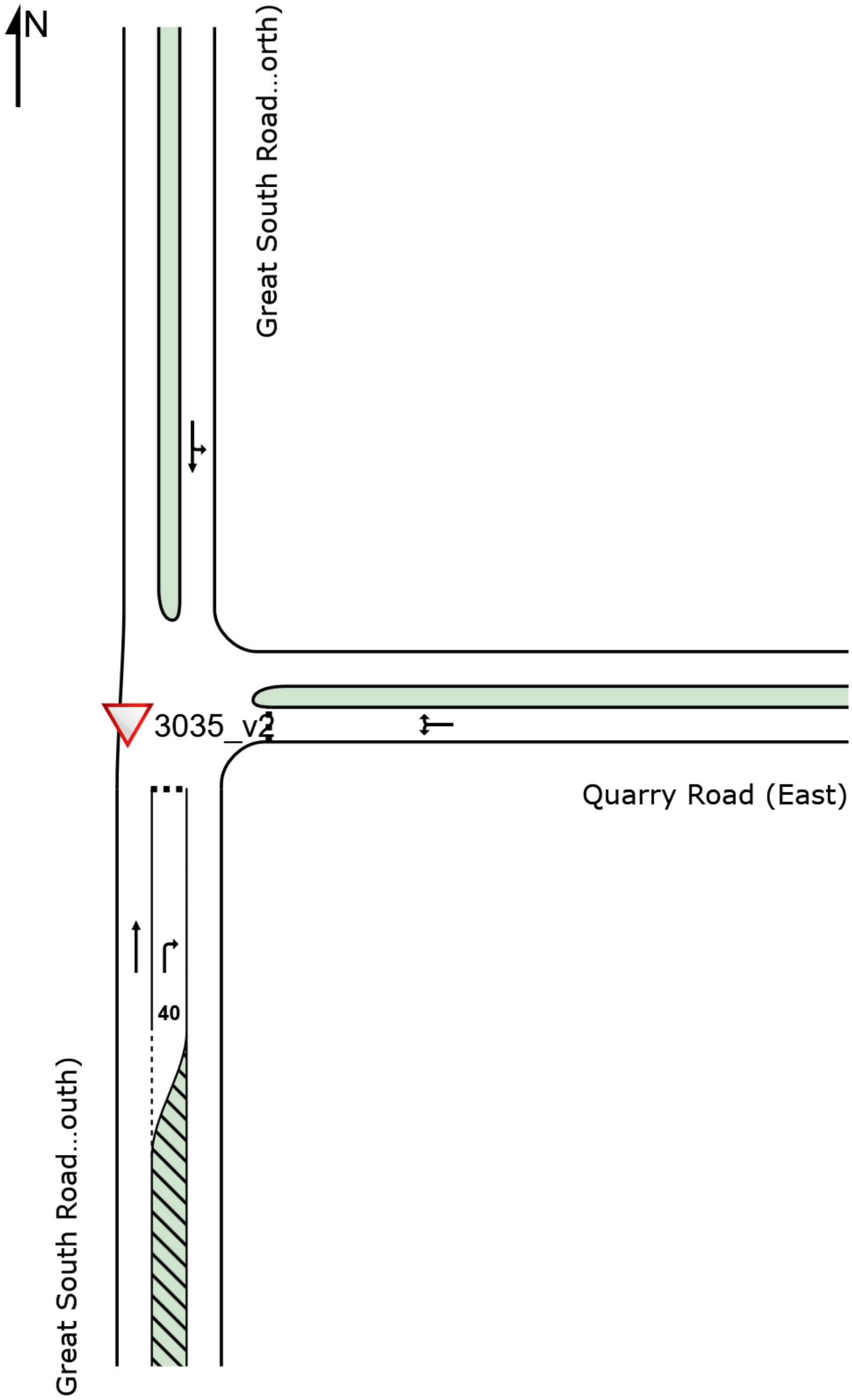
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

▽ Site: 3035_v2 [Scenario62o : AM 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62o : AM 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

▽ Site: 3035_v2 [Scenario62o : AM 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62o : AM 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Road (South)														
5	T1	131	24	138	18.3	0.079	3.3	LOS A	0.0	0.0	0.00	0.46	0.00	44.9
6	R2	31	3	33	9.7	0.038	6.1	LOS A	0.0	0.4	0.36	0.61	0.36	41.7
Approach		162	27	171	16.7	0.079	3.9	LOS A	0.0	0.4	0.07	0.49	0.07	44.2
East: Quarry Road (East)														
7	L2	21	1	22	4.8	0.273	4.9	LOS A	0.4	3.5	0.38	0.67	0.38	41.8
9	R2	185	41	195	22.2	0.273	7.3	LOS A	0.4	3.5	0.38	0.67	0.38	41.2
Approach		206	42	217	20.4	0.273	7.1	LOS A	0.4	3.5	0.38	0.67	0.38	41.3
North: Great South Road (North)														
10	L2	215	13	226	6.0	0.166	4.6	LOS A	0.0	0.0	0.00	0.40	0.00	45.3
11	T1	69	6	73	8.7	0.166	0.0	LOS A	0.0	0.0	0.00	0.40	0.00	45.7
Approach		284	19	299	6.7	0.166	3.5	NA	0.0	0.0	0.00	0.40	0.00	45.4
All Vehicles		652	88	686	13.5	0.273	4.7	NA	0.4	3.5	0.14	0.51	0.14	43.7

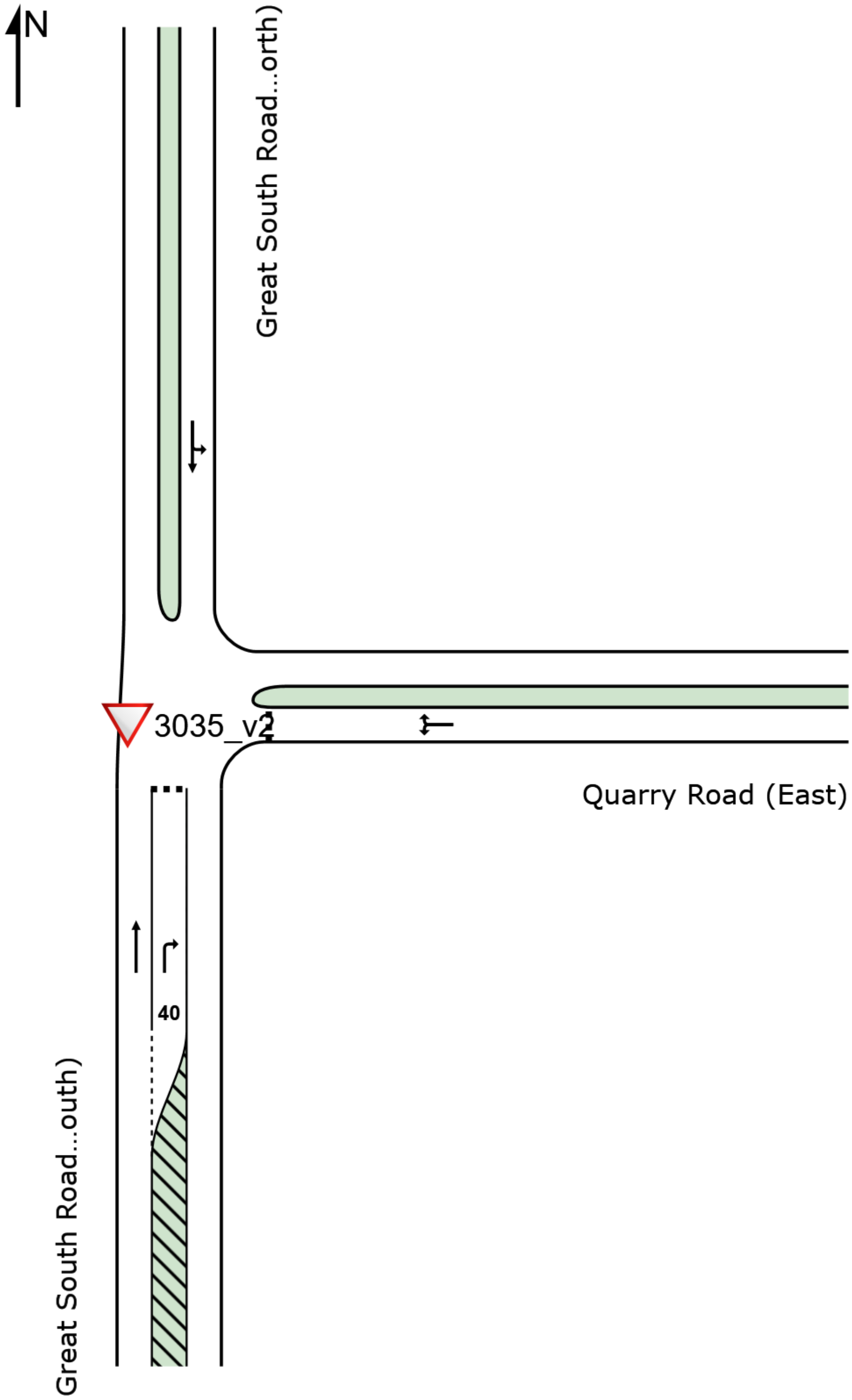
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

▽ Site: 3035_v2 [Scenario62o : IP 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62o : IP 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

▽ Site: 3035_v2 [Scenario62o : IP 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62o : IP 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Road (South)														
5	T1	82	9	86	11.0	0.047	3.3	LOS A	0.0	0.0	0.00	0.46	0.00	45.1
6	R2	22	2	23	9.1	0.026	5.9	LOS A	0.0	0.2	0.33	0.58	0.33	41.9
Approach		104	11	109	10.6	0.047	3.8	LOS A	0.0	0.2	0.07	0.49	0.07	44.3
East: Quarry Road (East)														
7	L2	23	3	24	13.0	0.328	5.2	LOS A	0.6	4.6	0.41	0.67	0.42	41.8
9	R2	245	49	258	20.0	0.328	6.9	LOS A	0.6	4.6	0.41	0.67	0.42	41.5
Approach		268	52	282	19.4	0.328	6.7	LOS A	0.6	4.6	0.41	0.67	0.42	41.5
North: Great South Road (North)														
10	L2	143	13	151	9.1	0.143	4.7	LOS A	0.0	0.0	0.00	0.31	0.00	46.0
11	T1	100	7	105	7.0	0.143	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	46.6
Approach		243	20	256	8.2	0.143	2.8	NA	0.0	0.0	0.00	0.31	0.00	46.2
All Vehicles		615	83	647	13.5	0.328	4.7	NA	0.6	4.6	0.19	0.50	0.19	43.7

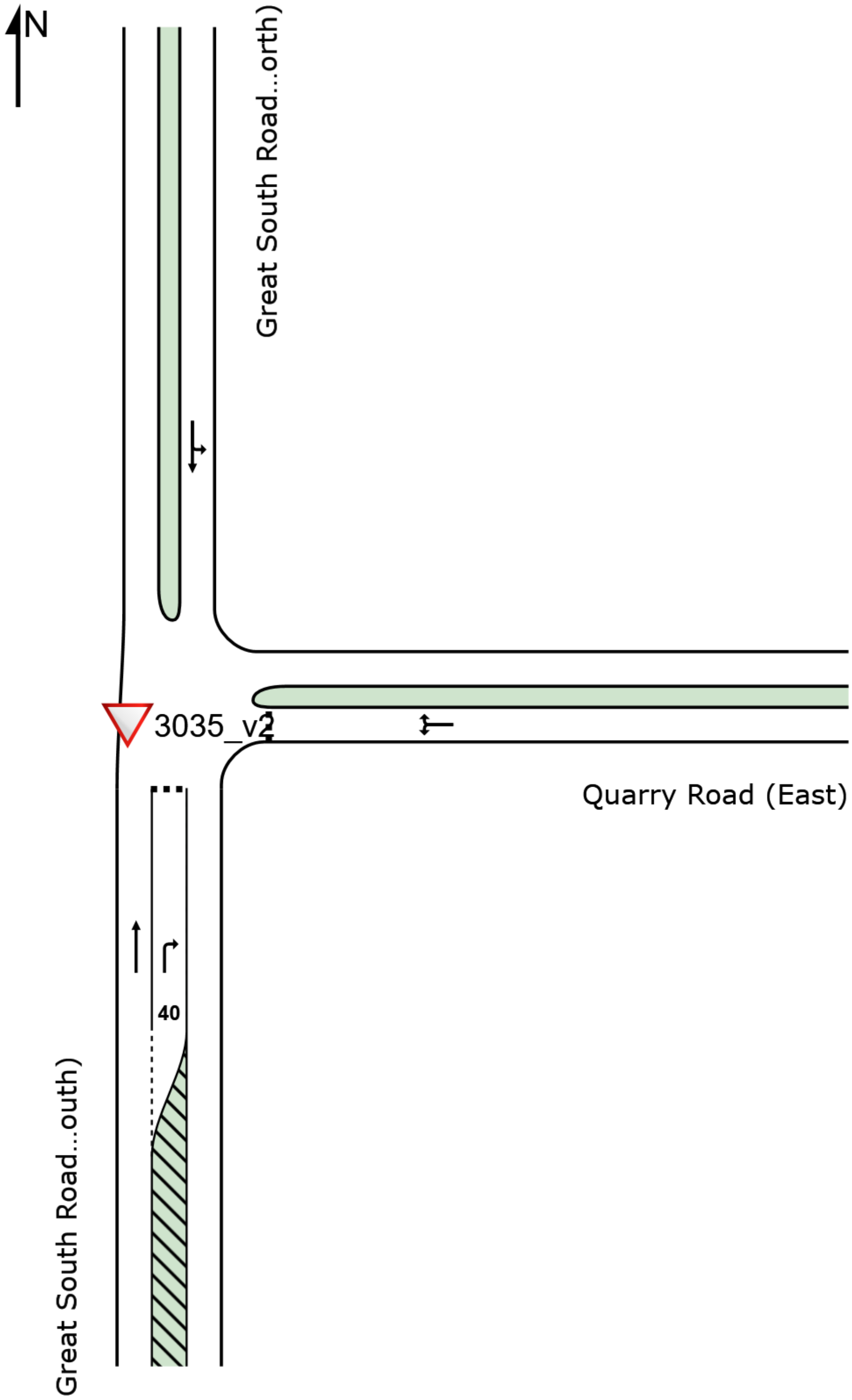
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

▽ Site: 3035_v2 [Scenario62o : PM 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62o : PM 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 3035_v2 [Scenario62o : PM 2028 - Great South Rd / Quarry Rd - Give-Way (Site Folder: 3035 Great South Rd / Quarry Rd)]

Scenario62o : PM 2028 - Great South Rd / Quarry Rd - Give-Way
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Great South Road (South)														
5	T1	94	6	99	6.4	0.053	3.2	LOS A	0.0	0.0	0.00	0.46	0.00	45.2
6	R2	21	1	22	4.8	0.025	6.0	LOS A	0.0	0.2	0.35	0.59	0.35	41.9
Approach		115	7	121	6.1	0.053	3.7	LOS A	0.0	0.2	0.06	0.49	0.06	44.5
East: Quarry Road (East)														
7	L2	62	1	65	1.6	0.590	6.8	LOS A	1.9	14.4	0.55	0.85	0.82	40.3
9	R2	438	36	461	8.2	0.590	8.9	LOS A	1.9	14.4	0.55	0.85	0.82	40.2
Approach		500	37	526	7.4	0.590	8.7	LOS A	1.9	14.4	0.55	0.85	0.82	40.2
North: Great South Road (North)														
10	L2	112	11	118	9.8	0.152	4.7	LOS A	0.0	0.0	0.00	0.23	0.00	46.8
11	T1	150	9	158	6.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.23	0.00	47.5
Approach		262	20	276	7.6	0.152	2.0	NA	0.0	0.0	0.00	0.23	0.00	47.2
All Vehicles		877	64	923	7.3	0.590	6.0	NA	1.9	14.4	0.32	0.62	0.47	42.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

CREATING COMMUNITIES

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of belonging. That's why at Stantec, we always **design with community in mind**.

We care about the communities we serve—because they're our communities too. We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

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Appendix C FAST TRACK MODELLING RESULTS

SIDRA Intersection Performance Summary

Scenario 152y – Fast Track without SH1 Direct Connection

AM – Scenario 152y	LOS					Worst Delay				Worst Queue				DoS				
Extracted Site name	Intersection	North	West	South	East	North	West	South	East	North	West	South	East	Intersection	North	West	South	East
Oyster / Waihoehoe - LILO_Give Way	NA	A	NA		NA	6.5	4.6	0.0	0.0	0.2	0.0	0.0	0.0	0.4	0.0	0.3		0.4
Fitzgerald / Waihoehoe - Signalised	C	C	C	C	C	37.9	35.3	31.7	35.7	20.3	43.1	67.7	28.6	0.8	0.7	0.8	0.8	0.7
Brookfield / Fitzgerald - Signalised	B	B	C	B		21.3	27.4	14.9	0.0	10.5	3.5	20.5	0.0	0.5	0.3	0.2	0.5	
GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing	C	C	C	D	C	39.7	38.3	39.7	32.7	36.5	53.4	36.7	55.8	0.8	0.8	0.7	0.8	0.7
Fitzgerald / Pitt - Signalised	B	B	C	B		27.0	27.0	18.8	0.0	9.7	2.1	19.8	0.0	0.3	0.2	0.1	0.3	
P&R / Waihoehoe - Roundabout	A	A	A	A	A	11.8	7.7	12.3	9.1	1.5	13.3	1.9	23.3	0.7	0.1	0.5	0.1	0.7
Fulton Access / Fitzgerald - Signalised	B	B		B	C	24.2	0.0	21.3	27.4	10.5	0.0	20.5	4.4	0.5	0.3		0.5	0.2
Firth / GSR - Signalised	C	D	C	C	B	41.6	35.4	39.4	46.4	19.8	66.4	6.7	18.5	0.7	0.4	0.7	0.1	0.2
Great South Rd / Quarry Rd - Roundabout	A	A		A	A	3.0	0.0	8.5	8.1	4.6	0.0	2.2	2.8	0.2	0.2		0.1	0.1
SH22/GSR - Signalised (extra 50m RT lane)	B	B		A	C	13.5	0.0	39.3	41.6	38.5	0.0	58.6	24.5	0.6	0.4		0.6	0.6
Fitzgerald / Jack Stevenson / Rd 8 / Rd 9	C	C	C	C	B	31.3	27.4	35.0	27.1	31.0	26.9	41.7	4.5	0.9	0.7	0.4	0.9	0.2
Maketu / Rd 8	C	C	C	C	C	40.6	33.2	36.2	36.5	21.0	10.3	40.8	32.9	0.6	0.5	0.2	0.5	0.6
Waihoehoe / Fielding Sig	C	C	C	C	C	28.1	29.4	27.5	28.0	7.4	15.5	4.5	21.9	0.6	0.3	0.6	0.2	0.6

Scenario 152y – Fast Track without SH1 Direct Connection

IP – Scenario 152y	LOS					Worst Delay				Worst Queue				DoS				
Extracted Site name	Intersection	North	West	South	East	North	West	South	East	North	West	South	East	Intersection	North	West	South	East
Oyster / Waihoehoe - LILO_Give Way	NA	A	NA		NA	8.3	4.6	0.0	0.0	0.3	0.0	0.0	0.0	0.4	0.0	0.4		0.4
Fitzgerald / Waihoehoe - Signalised	C	D	D	C	D	43.8	40.8	42.0	44.2	13.4	116.0	83.7	18.3	0.9	0.4	0.9	0.7	0.6
Brookfield / Fitzgerald - Signalised	B	B	C	B		21.3	27.4	16.1	0.0	10.6	9.4	11.0	0.0	0.4	0.4	0.3	0.4	
GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing	C	C	C	D	C	46.5	42.9	42.3	37.1	41.8	34.0	50.4	66.9	0.8	0.8	0.5	0.8	0.8
Fitzgerald / Pitt - Signalised	B	B	B	B		19.0	19.2	24.7	0.0	8.3	2.5	9.6	0.0	0.4	0.3	0.1	0.4	
P&R / Waihoehoe - Roundabout	A	B	A	B	A	13.4	7.8	13.7	7.8	1.9	19.2	1.9	20.2	0.6	0.1	0.6	0.1	0.6
Fulton Access / Fitzgerald - Signalised	B	B		B	C	27.9	0.0	21.3	27.4	9.9	0.0	13.5	2.0	0.4	0.3		0.4	0.2
Firth / GSR - Signalised	C	C	C	C	B	35.3	36.7	32.8	37.2	19.7	58.0	5.4	22.5	0.7	0.5	0.7	0.1	0.3
Great South Rd / Quarry Rd - Roundabout	A	A		A	A	3.0	0.0	9.3	8.2	4.0	0.0	2.0	5.0	0.2	0.2		0.1	0.2
SH22/GSR - Signalised (extra 50m RT lane)	B	B		B	C	16.4	0.0	43.4	33.2	45.4	0.0	40.5	29.6	0.4	0.4		0.4	0.4
Fitzgerald / Jack Stevenson / Rd 8 / Rd 9	C	C	C	C	C	33.3	29.1	28.6	30.0	35.7	29.0	32.8	5.4	0.7	0.7	0.4	0.7	0.3
Maketu / Rd 8	C	C	C	D	C	37.8	32.3	41.6	35.1	21.0	11.0	29.4	29.4	0.5	0.4	0.2	0.5	0.4
Waihoehoe / Fielding Sig	C	C	C	C	C	28.1	27.6	27.5	27.3	7.4	12.7	4.5	11.4	0.4	0.3	0.4	0.2	0.4

Scenario 158w - Fast Track without SH1 Direct Connection with revised phasing for PM Peak only

PM – Scenario 158w	LOS					Worst Delay				Worst Queue				DoS				
Extracted Site name	Intersection	North	West	South	East	North	West	South	East	North	West	South	East	Intersection	North	West	South	East
Oyster / Waihoehoe - LILO_Give Way	NA	A	NA		NA	8.0	4.6	0.0	0.1	0.3	0.0	0.0	0.0	0.5	0.0	0.4		0.5
Fitzgerald / Waihoehoe - Signalised	C	D	C	C	D	53.5	36.8	42.4	55.9	20.9	99.9	149.3	27.5	0.8	0.5	0.8	0.8	0.8
Brookfield / Fitzgerald - Signalised	C	C	C	B		23.6	21.7	19.5	0.0	17.9	39.5	8.4	0.0	0.7	0.7	0.7	0.2	
GSR / Waihoehoe_Sig_Fast_Track_Optm_Phasing	D	D	D	D	E	79.4	44.0	50.3	102.2	86.8	59.5	35.9	178.2	1.0	1.0	0.8	0.9	1.0
Fitzgerald / Pitt - Signalised	B	B	B	B		19.0	19.0	24.9	0.0	13.8	29.4	2.3	0.0	0.7	0.6	0.7	0.1	
P&R / Waihoehoe - Roundabout	A	B	A	C	A	13.0	8.3	28.3	8.0	1.9	17.8	16.1	33.3	0.7	0.1	0.6	0.6	0.7
Fulton Access / Fitzgerald - Signalised	B	B		B	C	21.7	0.0	23.6	29.9	12.9	0.0	36.2	2.8	0.7	0.3		0.7	0.2
Firth / GSR - Signalised	C	D	C	C	B	45.8	36.7	40.5	50.6	37.5	74.1	6.9	43.5	0.7	0.7	0.7	0.1	0.5
Great South Rd / Quarry Rd - Roundabout	A	A		A	A	3.0	0.0	10.4	8.8	4.0	0.0	2.9	9.3	0.4	0.2		0.2	0.4
SH22/GSR - Signalised (extra 50m RT lane)	B	B		B	D	18.6	0.0	48.2	42.6	131.6	0.0	32.5	48.9	0.8	0.8		0.7	0.8
Fitzgerald / Jack Stevenson / Rd 8 / Rd 9	C	C	C	B	C	28.2	33.0	32.7	32.9	74.4	27.5	15.6	6.2	0.7	0.7	0.3	0.4	0.3
Maketu / Rd 8	C	C	C	C	C	38.7	33.1	35.8	35.6	17.5	9.4	26.5	23.5	0.4	0.4	0.2	0.4	0.4
Waihoehoe / Fielding Sig	C	C	C	C	C	28.0	26.6	27.5	28.7	7.1	14.9	4.5	12.7	0.5	0.3	0.5	0.2	0.5

Appendix D CONSTRUCTION TRAFFIC MANAGEMENT PLAN

Drury Centre Precinct
Construction Traffc Management Plan

PREPARED FOR KIWI PROPETY HOLDINGS NO.2 LIMITED | NOVEMBER 2021

We design with community in mind

Stantec

Revision schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)			
			Prepared by	**Checked by**	**Reviewed by**	**Approved by**
1	16/4/21	Work in Progress (WIP)	Casey Guan	Martin Huang	Alasdair McGeachie	Daryl Hughes
2	18/11/21	Final	Casey Guan	Martin Huang	Alasdair McGeachie	Daryl Hughes

Quality statement

Project manager	Project technical lead
Daryl Hughes	Hilary Papps

PREPARED BY

Martin Huang 15/10/2021

CHECKED BY

Martin Huang 17/11/2021

REVIEWED BY

Alasdair McGeachie 17/11/2021

APPROVED FOR ISSUE BY

Daryl Hughes 18/11/2021

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STATUS Final | Project No 310203562

Executive summary

This Construction Traffic Management Plan (**CTMP**) report assesses the temporary traffic management measures that may be proposed during construction by Kiwi Property related to the development of a contiguous landholding bounded by Fitzgerald and Brookfield Road in Drury which includes 139, 155, 173 and 189 Fitzgerald Road, 61 Brookfield Road, 108, 116, 120, 124 and 132 Flanagan Road, Drury. The development proposes to provide a new "Drury Centre" including large format retail (**LFR**) and super lots enabling later residential development. This project is proposed under the Covid-19 recovery (Fast-track Consenting) Act 2020 (the "**Act**") to utilise the fast-track consenting process via an expert consenting panel.

The main access to the development will be via Fitzgerald Road where the new roads which are proposed as part of the development will intersect with the existing road network.

Fitzgerald Road is a primary collector road that currently links the wider road network via Waihoehoe Road and State Highway 22 (**SH22**) with the Drury area to the north or south to the interchange with State Highway 1 (**SH1**). The site thus has good direct connections to the wider public road network to allow for efficient movement of deliveries and staff.

The primary construction works are site preparation and earthworks to form the super lots and building construction works for the LFR centre. Physical construction works for the development considered by this CTMP scope are thus expected to be primarily confined on-site.

Although a new internal road network and associated intersections have been scheduled to be constructed, the project team consider using the current access of No.133 Fitzgerald Road would be suitable during initial construction stages as it would allow heavy vehicles to utilise an existing facility, that is suitably sited in terms of spacing to other nearby accesses and intersection, enjoys good sightlines and would be familiar to road users in the vicinity. While some temporary works will be required to modify the vehicle crossing for regular heavy vehicle usage, utilising an existing facility will minimise the works in the road corridor. At the end of the works, the removal of the then redundant vehicle crossing will require some short-term temporary traffic management (**TTM**) in the road corridor.

Estimated construction truck movements peak at approximately 50-60 movements (inbound plus outbound) per day, which in terms of an hourly volume is 5-6 truck movements.

The expected temporary traffic effects during construction are primarily associated with traffic generation associated with transport of materials and staff to / from the site. The anticipated programme of construction works is around four years.

In order to minimise any impact on the proposed construction operations, it is intended to employ several mitigations. These measures are discussed and assessed in the course of this report and are summarised here for clarity:

- Construction access is to be at 133 Fitzgerald Road;
- Apart from any specific short-term arrangements, the existing traffic lanes will be maintained;
- A clearly delineated vehicular paths and associated turning areas will be identified for heavy vehicle manoeuvres during the construction so that pedestrians and cyclists can temporarily stop and wait for safe movements;
- Apart from any specific arrangements, loading will occur on-site;
- Truck arrivals will be co-ordinated to prevent on-street waiting, and
- Ride-sharing/ reduction by construction staff to be encouraged.

Based on the analyses undertaken within this report it is considered that any impact arising during construction will be managed with minimal impact on the operation of the local / wider road network subject to the implementation of the mitigation / management measures set out in this report.

The proposed temporary traffic management measures in this report are in general accordance with the Waka Kotahi (NZTA) Code of Practise for Temporary Traffic Management (**CoPTTM**).

This report has been prepared based on information available at the time of writing (prior to the start of works). If the construction or temporary traffic management methodology need to change during the course of the construction works, then the CTMP or TMP should be modified and reapproved as necessary.

Contents

List of tables

List of figures

Abbreviations

Enter Abbreviation	Enter Full Name
AADT	Annual Average Daily Traffic
COPTTM	Code of Practise Temporary Traffic Management
TC	Traffic Controller
TMP	Traffic Management Plan
TTM	Temporary Traffic Management

1 Introduction

This Construction Traffic Management Plan (**CTMP**) report assesses the temporary traffic management measures that are proposed during construction by Kiwi Property Holdings No.2 Limited related to new town centre precinct development including large format retail and residential super lots on a contiguous landholding at 139, 155, 173 and 189 Fitzgerald Road, 61 Brookfield Road, 108, 116, 120, 124 and 132 Flanagan Road, Drury.

The CTMP examines the potential impact of the proposed development on the existing local / wider network whilst construction works are ongoing including:

- The traffic environment in which the works will occur;
- assessing the anticipated construction traffic volumes and any impact of these on the adjacent road network; and
- providing an overview of the proposed pedestrian / traffic control measures during construction.

Physical construction works at the development under this CTMP scope will be primarily confined on-site. To enable the safe and efficient movement of heavy vehicles to and from the site it is proposed to utilise the existing vehicle access of No.133 Fitzgerald Road to the north of the Fitzgerald Road / Brookfield Road intersection during the initial stages of construction. Some works in the road corridor will be required to modify this vehicle crossing for heavy vehicle usage, and again at the end of the works to removal then then redundant crossing.

The works required for the development considered in this CTMP will include site preparation, earthworks, internal road construction and the new residential houses and retail construction.

The expected temporary traffic effects during construction are related to traffic generation associated with transport of materials and staff to / from the site. The anticipated programme of construction works is around four years.

Based on the analyses undertaken within this report it is considered that any impact arising during construction will be managed with minimal impact on the operation of the local / wider road network.

This report has been prepared based on information available at the time of writing (prior to the start of works). If the construction or temporary traffic management methodology need to change during the course of the construction works, then the CTMP or TMP should be modified and reapproved as necessary. Likewise, there are some as yet not confirmed details for certain aspects of the construction methodology that will be confirmed closer to the construction date, and in an updated version of this CTMP. These mostly relate to those works either on the existing street network, or where a contractor methodology has not yet been established.

2 Site Environment

2.1 Site Location

The development site is a contiguous landholding at 133 Fitzgerald Road and 61 Brookfield Road. In the Auckland Unitary Plan Operative in Part (“**AUP**”), it is zoned as Future Urban. This landholding forms part of a larger land area within Drury East that is currently subject to a private plan change process – Drury Centre Precinct (“**PC48**”) to rezone it to Business: Metropolitan Centre zone, Business: Mixed Use Zone and Open Space Informal Recreation zone under the AUP.

The site is located approximately 30km southeast of Auckland’s central business district,14km southeast of Manukau, 6km south of Papakura, and within 1km of the existing Drury Town Centre. The site is bound by Fitzgerald Road to the east, Brookfield Road to the south and SH1 to the west. Fitzgerald Road and Brookfield Road are currently rural roads with no separate walking or cycling facilities. The North Island Main Trunk (railway) runs north-south to the northwest of the site. The site is located near the confluence of several major roads such as SH1, SH22 and Great South Road. The site thus has good connections to the arterial and strategic road network.

Figure 1 shows the site location within the context of the surrounding environment while **Figure 2** shows the wider road network.

Figure 1:Subject Site in Context with the Local Road Network (Source: Ignite)

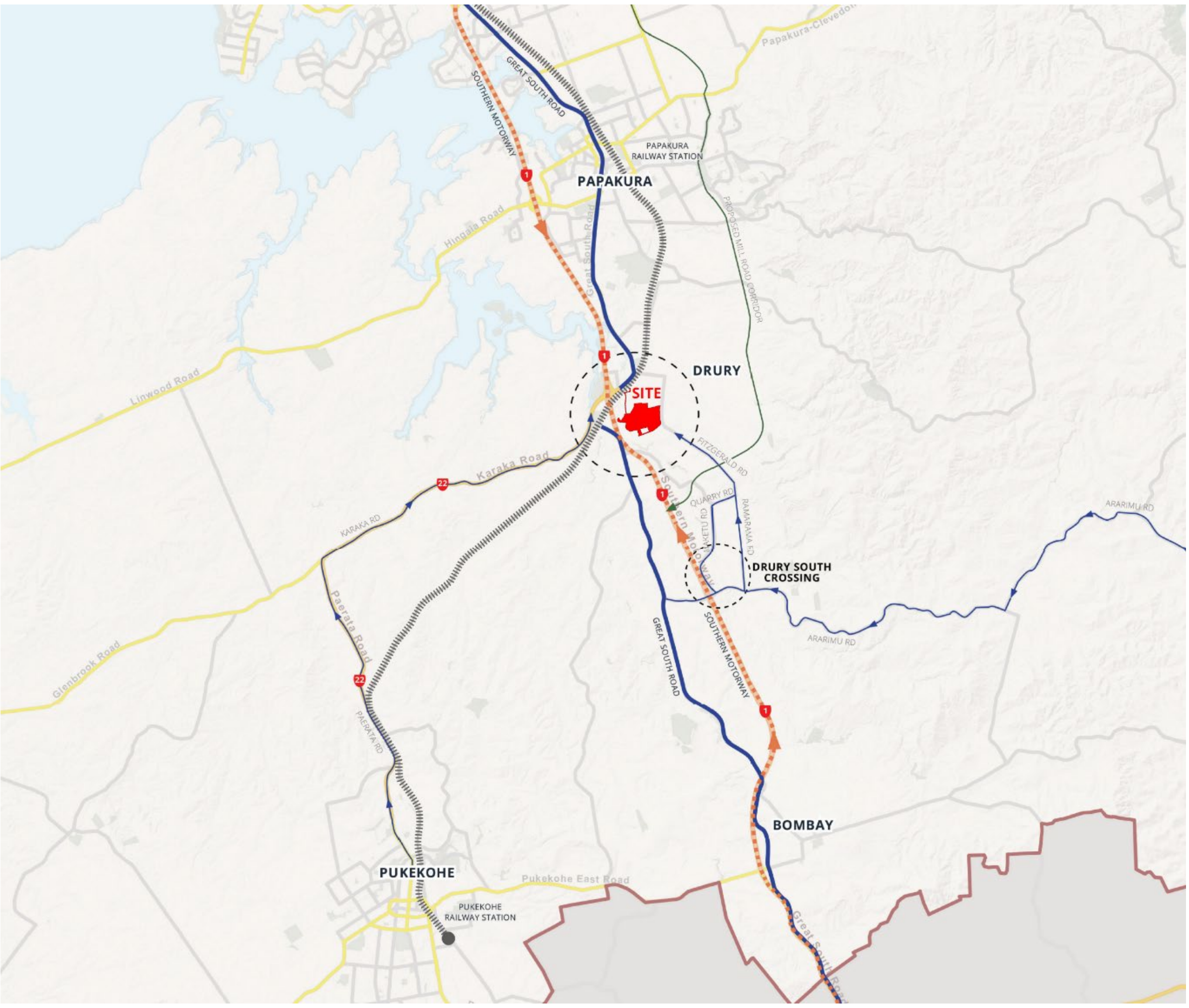

Figure 2: The site in context with the wider road network (Source: Ignite)

2.2 Proposed Development Works

The site will be divided into three areas connected by a new internal road (Pitt Road) running east-west across the site. Access to the proposed developments will be mainly through this new internal road which adjoins Fitzgerald Road and is located close to the northern boundary of the proposed developments. The western portion of the site will consist of six super lots for large format retail with surrounding ancillary car parking areas for this retail space. An open space in the form of Hingaia Reserve is proposed directly adjacent to the Hingaia Stream at the western boundary of the site. The eastern portion of the site will include 12 super lots for residential development.

Construction works will include site preparation, bulk earthworks, civil construction including construction of several new internal roads running east-west and north-south through the site, building construction of large format retail lots, and residential super lots.

During the initial construction works, construction traffic will access the site via the existing driveway at 133 Fitzgerald Road whilst the internal roads and other connecting intersections with the public roads are built. This is discussed in Section 4.

It is noted that for the purpose of this CTMP, only the construction traffic effects related to the movements in and out of the site are considered to be within the scope of assessment. The potential external effects of works along the public road corridor (e.g., during the new intersection construction) will be assessed in a subsequent CTMP as required.

2.3 Traffic Environment

Access to the site will be from Fitzgerald Road. The existing driveway at 133 Fitzgerald Road is approximately 260m north of the Brookfield Road/ Fitzgerald Road intersection.

Fitzgerald Road forms a key north-south road in the Drury area to the east of the proposed development. It currently has a predominantly collector road function in connecting the low-density residential housing and lifestyle blocks in Drury East to Great South Road and the Drury Interchange. The cross section of Fitzgerald Road comprises of one lane in each direction separated by solid double yellow lines with the exception of a right turning bay into Brookfield Road. Fitzgerald Road currently has a posted speed limit of 80km/h.

Fitzgerald Road continues northward to connect with Waihoehoe Road, which provides access to Great South Road and the existing Drury Town Centre. To the south, Fitzgerald Road connects with Ramarama Road and Quarry Road where the Stevenson Drury Quarry is located.

The Waihoehoe Road/ Fitzgerald Road intersection is a priority controlled "T" intersection located approximately 720m north of the driveway to 133 Fitzgerald Road. Waihoehoe Road forms the head of the T and movements on this road have priority over those on Fitzgerald Road (Give-Way controlled). Waihoehoe Road continues westward to connect with Great South Road and the existing Drury Town Centre.

The Brookfield Road/ Fitzgerald Road intersection located south of driveway to 133 Fitzgerald Road is a "T" intersection with give-controlled priority to Fitzgerald Road. Brookfield Road runs along the southern frontage of the site and is currently classified as an access road.

No existing footpaths are provided on either side of the road on Fitzgerald Road. A narrowly sealed shoulder with wide grass berms is provided on both sides of the road within the vicinity of the driveway at 133 Fitzgerald Road.

2.4 Traffic Volumes

Traffic Count data provided by Mobile Road online database for the immediate section of Fitzgerald Road along the site frontage indicated a two-way 5-day average daily traffic flow of 1,508 vehicles per day with 26% of heavy vehicles (2020 estimate).

The volumes indicate that Fitzgerald Road is a classified as a level 1- low to moderate volume roads (AADT 500 to 10,000 vpd) under the CoPTTM road hierarchy.

2.5 Road Safety

The Waka Kotahi New Zealand Transport Agency (Waka Kotahi) Crash Analysis System (CAS) database has been examined to ascertain the five-year road safety record during the period 2016 to 2020, plus all available data for 2021. The search area included:

- A 50m radius of Waihoehoe Road/ Fitzgerald Road
- A 50m radius of Brookfield Road / Fitzgerald Road
- Fitzgerald Road between Waihoehoe Road and Brookfield Road
- Brookfield Road

A total of six crashes were reported within the study area.

No recorded crashes at the Waihoehoe Road/ Fitzgerald Road intersection between 2016 and 2021.

A total of two crashes have been recorded at the Brookfield Road / Fitzgerald Road intersection, one of the crashes resulted in injuries. A summary of the crashes that have occurred are provided as follows:

- One crash occurred on Fitzgerald Road involving an eastbound vehicle losing control while avoiding a stray cat and hitting the grass embankment and power pole which brought the lines down across the road. This crash resulted in serious injuries.
- One crash occurred on Fitzgerald Road involving a westbound vehicle losing control while turning right and hitting the property fence. This crash resulted in no injuries and occurred during wet weather conditions.

A total of four crashes have been recorded on Fitzgerald Road between Waihoehoe Road and Brookfield Road, one of the crashes resulted in injuries. A summary of the crashes that have occurred are provided as follows:

- One crash occurred on Fitzgerald Road involving a crossing pedestrian being hit by a truck. This crash, resulting in a minor injury to the pedestrian occurred 60m west of the Waihoehoe Road/ Kath Henry Lane intersection.
- One crash occurred on Fitzgerald Road involving a southbound vehicle losing control and hitting a few property fences and paddocks before coming to a stop. This crash resulted in no injuries.
- Two crash occurred on Fitzgerald Road involving a northbound vehicle losing control and hitting the power pole on the opposite side of the road. One of the crashes was due to wet weather conditions and intoxication. The other crash involved a driver with no licence. This crash resulted in no injuries.

No recorded crashes Brookfield Road between 2016 and 2021.

The recorded crash history indicated that a loss of vehicle control is a common factor in the study area, potentially due to road conditions or alignment in a high-speed environment. Although there are no specific crashes related to traffic movements in and out of the current site access, it is considered appropriate to implement speed control mechanism as part of CTMP for this project.

2.6 Occupation of the Road Corridor

Predominantly the development works covered by this CTMP will be within the development site, with only minor works in the road corridor required to upgrade the existing driveway at 133 Fitzgerald Road to allow its utilisation for heavy vehicles and machineries as the initial construction access and connection of the new internal roads to Fitzgerald Road.

If subsequent works are expected have effects in the road corridor beyond the scope of this CTMP, Auckland Transport will be advised proceed to commencement and an appropriate TMP prepared.

3 Construction Operations

3.1 Staging of Works and Construction Timeframe

The overall duration of the construction programme from the start of the site preparation works through to completion of the first stage is estimated at approximately 4 years.

The existing site is largely vacant, so only minor demolition is required to remove the existing houses. House removal/ demolition is expected to be part of the initial site preparation and earthworks to level the site. To protect against unauthorised or inadvertent entry the site should be securely fenced.

Designated area(s) within the site will need to be provided for the construction staff parking, site offices / facilities and a staging area. These areas should be established at the start of the works programme.

Table 1 below sets out a high-level construction programme. An approximate programme is set out below.

Table 1: Construction Staging and Estimated Traffic Volumes

Construction Stage	Construction Operations	Estimated Duration*	Estimated Average Daily Truck Movements**	Traffic Management Scenario
Site Establishment /Season 1 Earthworks	Demolition, site clearance, fencing, establishment of offices/ facilities, earthworks.	Q3 2021 to Q1 2021	20-30	A
Season 2 Earthworks	Excavation, stockpiling stormwater drainage management,	Q3 2022 to Q1 2023	20-30	A
Civil construction	Includes construction of internal roading network and residential super lots.	Q2 2022 to Q3 2023	To be Confirmed	To Be Confirmed
LFR construction	Retail construction elements	Q3 2023 to Q3 2025	To be confirmed	A (until building works finished and ready for driveway removal)

*It is expected there will be some overlap between construction stages e.g., fitout works will likely commence before the end of building construction, so the initial programme duration may be less than the total length of the individual stages.

**This is inbound plus outbound traffic (i.e. one delivery will generate two movements. Some construction elements e.g. concrete pours will not occur continuously across the construction period. The average daily volume is only a high-level estimate to indicative the possible traffic volume pattern.

Heavy vehicle movements associated with construction are expected to be relatively consistent throughout the construction programme, but there will be some day-to-day variable depending on the particular activities in progress (e.g., there may be higher traffic volumes on days with concrete pours). Construction traffic effects are discussed in Section 6.

3.2 Hours of Operation

It is proposed that the construction works will be limited to 6am to 6pm Monday to Friday and only half days for weekends. The delivery of specific construction items and machinery may need to occur outside of these hours for the purposes of efficient traffic control. Applications for such out of hours works would be made as, and if required.

4 Construction Access

Access to the subject site will be via the existing driveway to 133 Fitzgerald Road for the construction until the new Pitt Road/ Fitzgerald Road intersection is formed.

Once this intersection has been constructed, the main access route may be relocated to use this intersection. Another access route to the development is also proposed in the north-south direction connecting with Brookfield Road.

However, for the purpose of this CTMP, it is considered that only the 133 Fitzgerald Road access will be operative and only the effects and associated mitigations of utilising this existing access have been assessed. A separate assessment may be required if the construction access has changed to suit the subsequent construction programme.

Currently the driveway at 133 Fitzgerald Road is approximately 6m in width at the site boundary, which is readily available to allow two-way heavy vehicle movements. At the access, sight distance is sufficient to both left and right due to the straight road alignment.

5 Traffic Management

5.1 Overview

From a construction traffic management perspective for the purpose of this current CTMP assessment, it will focus on works on-site using an internal loading bay for the site traffic management.

5.2 Scenario A - Works on-site with internal loading bay

This scenario constitutes the significant majority of the works programme under the current CTMP scope. The site will be securely fenced off to prevent inadvertent or unauthorised pedestrian access and outside of working hours the site gates will be closed.

Appropriate road signage and markings of the site access will be installed to direct site traffic to the designated vehicle access, and additionally to advise other road users including pedestrians to the potential of heavy vehicles manoeuvring in the vicinity of the site access. Advance warning signage will also be installed on Fitzgerald Road.

All heavy vehicle movements will be in a forward gear / direction and there will be a dedicated turning area on-site to support this recommendation.

Given the rural nature of Fitzgerald Road, it is anticipated that pedestrian and cyclist will be low/ infrequent.

It is proposed that all vehicle movements are in a forward direction, thus ensuring that drivers have the best line of sight to a crossing pedestrian or cyclist. During the project induction, drivers should be reminded or the need to give way to pedestrians and to be alert for cyclists. The vehicle crossing is of sufficient dimensions that trucks will note need to track outside of the seal area to enter or exit the site (therefore pedestrians on the grass berm will be out of the path of turning vehicles.) All heavy vehicles should have an all-round flashing orange beacon(s) which are operated when entering or leaving the site to make their movements more visible. It is considered that if these mitigations are in place, the effect on the public road network will be minimal.

Figure 3: shows the proposed traffic controls during this phase of the works.

When the works involve the movement of site vehicles across the exposed ground, a wheel wash or other truck cleaning facility will be installed to wash trucks prior to their exit onto the road network.

Sufficient loading and truck waiting areas should be provided on-site so that trucks do not need to queue onto Fitzgerald Road. Similarly, any gate or access control should be located so that trucks do not need queue into Fitzgerald Road, or opened prior to the start of the workday.

The traffic effects of this scenario are discussed in Sections 6.1.4 and 6.1.5.

5.3 Works in the Road Corridor

Works in the road corridor will be required to construct four new intersections to the proposed development and to widen the existing access at 133 Fitzgerald Road for construction traffic if required. One of these intersections will be with Fitzgerald Road and the other three with Brookfield Road.

The anticipated construction period for this stage is approximately between second quarter of 2022 until the third quarter of 2023. It is expected a separate CTMP will be completed prior to this construction programme when more detailed information can be confirmed.

5.4 Other Works

Additional short-term traffic management scenarios and traffic management plans may be required to accommodate specific short-term operations at the site to suit special construction needs. These plans will be prepared as and when required by the contractor.

6 Traffic Effects of Construction

6.1 Road Network Effects

6.1.1 Overview

The works associated with the proposed construction programme under this CTMP scope are primarily confined within the site.

Whilst some works in the berm area will occur these are expected to occur very short periods over the course of whole construction period.

Accordingly, the primary traffic effects are anticipated to be trucks and construction staff vehicles to / from the site for the purpose of this CTMP.

6.1.2 At the site access

The detailed construction information is still yet to be confirmed at the moment apart from the preliminary indication for the anticipated stages. It is considered that the effects of the Fitzgerald Road corridor are confined to the immediate site access and adjacent road reserve areas. In this regard, the key traffic effect to manage is pedestrian/ cyclist movement across the site access. As discussed in the earlier section, it is proposed to identify heavy vehicle turning paths and associated manoeuvring areas then pedestrians and / or cyclists can expect where to temporarily stop and wait in the vicinity of the vehicle crossing so that safe movements for these road users along the site frontage can be maintained.

6.1.3 Off-Peak Period Traffic Effects

As set out in Table 1 heavy vehicle traffic volumes will be relatively consistent throughout the various stages of construction, with a typical maximum being 50-60 movements (in plus out) per day.

Given the 9-10 hour working day and allowing for some concentration of the movement pattern in the network off-peak hours to minimise truck movements (and hence potential delivery delays) during road network peak periods, there would typically be 6-8 trucks movements (in plus out) during an hour, which is equivalent to approximately one movement every 6-8 minutes. Consequently, it is not considered that there will be discernible delays associated with the movements of heavy vehicles to or from the site.

Nonetheless to prevent queuing on-street and to manage truck manoeuvring efficiently within the site, it is recommended that a site traffic co-ordinator is appointed to liaise with the material delivery points to ensure trucks arrive in at the site in a co-ordinated manner. In event of an equipment breakdown or other issue on site which may affect unloading operations the traffic co-ordinator should contact the necessary dispatch points to advise them of the delay.

6.1.4 Peak Period Traffic Effects

The proposed site working hours are expected to be 6am to 6pm on weekdays with construction staff on-site between these hours. Stantec have been advised that there would be approximately 40 staff on-site during the earthworks' phases with higher staffing numbers during the building construction phases. It is likely there will be limited staff traffic movements during the commuter / network peak hour periods. Some staff arrivals are likely to occur after 7am hence partially overlapping with the early part of the morning peak period and similarly some staff departures may occur before 6pm coinciding with the latter part of the afternoon peak period, however such effects would be minor.

Whilst a few deliveries may arrive on-site between 7-9am or 4-6pm, it is proposed to limit these to minimise any impact on the wider road network during these periods.

Assuming a truck generation rate of half that of the off-peak periods (i.e., 3-4 movements per hour) or one heavy vehicle movement every 15 to 20 minutes it is considered any impact of heavy vehicle movements during these periods will be minimal.

Accordingly, it is considered that there will be limited impact from site traffic on the operation of the adjacent road network during peak periods.

6.1.5 Interaction with Other Works

At time of preparing this report, no other works have been confirmed in the vicinity of the subject site. However, if new works in the nearby area have become aware to the project team, liaison with the respective project teams will be required to ensure that any work conflicts are mitigated and avoided.

6.1.6 Truck Waiting

Due to the site location in relation to the surrounding public road network, it is considered the majority of heavy vehicles will come from the west via the state highway network. In this regard, no impacts to the general traffic flow are anticipated for exit movements given they will be left turn movements and trucks will be waiting within the development therefore general traffic will not be impeded.

In terms of trucks arriving on site to make right turn ingress movements, they will be required to wait within the existing carriageway on Fitzgerald Road for a suitable gap to turn right into the development. This may result in a minor delay to general traffic as the cars wait and/or negotiate to manoeuvre around the waiting truck. However, as assessed earlier, the expected truck movements of 6-8 per hour into the development from both directions during off-peak hours and 3-4 movements per hour during peak hours, it is considered any impacts or delays to the general traffic flow will be minimal.

If a large number of trucks is expected to arrive on site at the same time, a site traffic co-ordinator should be appointed to manage truck arrivals and general traffic flow. This is likely to require the establishment of a communication protocol between the site and the truck operators s and / or the trucks themselves.

6.2 Parking

It is considered that there is sufficient space within the site to create staff parking areas. Given the scale of the development there are at peak construction times (particularly during the house building phases) there may be a reasonable parking demand for construction staff on-site, and to more efficiently manage parking provisions and traffic flows, consideration should be given to providing staff shuttles/ mini-buses to encourage higher vehicle occupancy. To support this the staff facilities on-site should include secure lockers for personal tool and equipment storage.

Given the rural environment of the road and narrow shoulders, it is unlikely drivers are currently parking on Fitzgerald Road, therefore it is considered any impacts on on-street parking will be minimal.

7 Liaison

7.1 Project Manager

TBC

7.2 Site Traffic Management Supervisor (STMS)

TBC

7.3 Affected Parties

The primary affected parties under the current CTMP scope will be the tenants and properties owners surrounding the development site and along Fitzgerald Road and Brookfield Road. Consultation with these groups will be undertaken before and regularly updated during construction.

7.4 Consultation with adjoining works

Potential clashes and overlaps with other adjacent works will be discussed and resolved with those parties as such situations arose.

8 Mitigation Summary

In order to minimise any impact on the proposed construction operations, it is intended to employ the following mitigations. These measures have been discussed and assessed in the course of the previous sections of this report but are summarised here for clarity:

- Construction access is to be from the existing vehicle crossing at 133 Fitzgerald Road;
- Apart from specific arrangements, the existing traffic lanes will be maintained;
- A clearly delineated vehicular paths and associated turning areas will be identified for heavy vehicle manoeuvres during the construction so that pedestrians and cyclists can temporarily stop and wait for safe movements;
- Apart from specific arrangements, loading will occur on-site;
- Truck arrivals will be co-ordinated to prevent on-street waiting, and
- Ride-sharing/reduction by construction staff to be encouraged.

9 Conclusion

This CTMP examines the potential impact of the proposed construction works to be undertaken by Kiwi Property at the 133 Fitzgerald Road and 61 Brookfield Road, Drury site.

Physical construction works at the development under this CTMP scope will be primarily confined on-site. However, to enable the safe and efficient movement of heavy vehicles to and from the site it is proposed to utilise the existing driveway and vehicle crossing (which may be removed at the latter part of the construction programme). The installation and later removal of this vehicle crossing may require some short term works in the road corridor but will be assessed in a subsequent CTMP as appropriate.

Estimated construction truck movements peak at approximately 50-60 movements (inbound plus outbound) per day, which in terms of an hourly volume is 5-6 truck movements per hour.

The expected temporary traffic effects during construction are associated with:

- Traffic generation associated with transport of materials and staff to / from the site; and
- Temporary provision on Fitzgerald Road to maintain pedestrian and cyclist safety.

The anticipated programme of construction works is around four years.

Based on the analyses undertaken within this report it is considered that any impact arising during construction will be managed with minimal impact on the operation of the local / wider road network subject to the implementation of the mitigation / management measures set out in this report.

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