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Auckland Transport

Report for Northside Drive East Notice of Requirement

Transport Assessment Report

August 2013

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Appendices

1. Introduction

1.1 Purpose of the Report

This report has been undertaken to provide comment on the expected transportation effects and design philosophy for the Northside Drive East as part of the Notice of Requirement. This report is to be read in conjunction with other technical reports that together provide the necessary justification for the proposed land take required for the construction of this road. Northside Drive East forms part of the Northern Strategic Growth Area – Transportation Infrastructure Stage 1, which includes Hobsonville Road, Northside Drive (west), Tahi Road North, Rua Road and Fred Taylor Drive in PC15.

1.2 Background

The Northern Strategic Growth Area (NorSGA) has been identified in the Auckland Regional Growth Strategy as a key growth area. Auckland Transport (AT) has identified this area as critical to accommodating future population and economic growth and in response to the Local Government (Auckland) Act notified Plan Changes 13, 14, and 15 on the 31st March 2006.

In August 2011 a new four-lane motorway link was opened to the north-west of Hobsonville Road; the new State Highway 16 to State Highway 18 Motorway Deviation Project. Included in this work was the construction of a new northbound motorway on-ramp onto SH18 from Trig Road. This on-ramp is located directly opposite the eastern extent of the existing accessway and will ultimately form a 4-leg signalised intersection with Trig Road and the new on-ramp. A plan of the future layout is included in **Appendix A**.

Other roading works being undertaken as part of the NORSGA project include:

- Hobsonville Road West (from Don Buck Road roundabout tie-in to Hobsonville Interchange);
- Rua Road (from north of Waru Road to Hobsonville Road);
- Waru Road (from Don Buck Extension to Rua Road);
- Don Buck Road Extension (from Hobsonville Road to Waru Road);
- Hobsonville Road East (from Westpark Drive to Ockelston Lane);
- Brigham Creek Road South (from SH18 extension to Hobsonville Road);
- Northside Drive (from the existing SH16 to Trig Road); and,
- Tahi Road North (from Northside Drive to NZRPG tie in point).

Northside Drive is being constructed in two sections with Northside Bridge over State Highway 16 being the separation point. This report is for the section of Northside Drive to the east of Northside Bridge. Northside Drive will be a collector road in the Auckland Transport roading hierarchy.

The western end of Northside Drive from Fred Taylor Drive to Northside Drive Bridge is located within the Auckland Metropolitan Urban Limit (MUL). The eastern end from Northside Drive Bridge to Trig Road is not part of the MUL, but it forms a key link between Plan Change 15, Fred Taylor Dr, provides northbound access to the SH18 motorway and access to Hobsonville Rd and Plan Change 14.

1.3 Description of Existing Situation

This section of Northside Drive is currently a mixture of horticultural and rural residential activities. Stormwater runoff is currently collected by way of open drains, discharging to existing watercourses and catchments at various locations along the accessway. The accessway is also unsealed, has a posted speed of 10km/hr and terminates at the eastern end of the new NZTA motorway designation.

Information relating to existing and proposed stormwater can be found in the Northside NOR Stormwater Technical report.

2. Future Considerations

2.1 Plan Changes of Massey North Area

The Massey North area has been identified as having the potential for future urban growth through a series of Plan Changes (PC13, PC14 and PC15). While Northside Drive East is located outside the above Plan Changes and even the MUL, it forms a vital link between these areas, northbound access to SH18 via the Trig Road on-ramp and improved connections between Fred Taylor Drive and Hobsonville Road. While no zoning changes are proposed to this area, this section remains an important future link to and from the road network in the Massey North Area.

2.2 Traffic Demand

This section of the report refers to traffic modelling information detailed in the PC15 Modelling Technical Report prepared by Auckland Transport. Refer to **Appendix C** for the modelling technical note.

Auckland Transport undertook traffic modelling for NorSGA PC15 area to assess how much the current infrastructure programme will support the land use projection and to identify and network shortcoming during the PC15 development period. The modelling work is similar to the exercise undertaken in 2006 as part of the Metropolitan Urban Limit (MUL) shift in PC15. Traffic demands were inputted into a micro simulation traffic model to assess the network operations in detail.

The S-Paramics[1] model identified future predicted evening peak (16:00 to 18:00) traffic flows of approximately 1000 vehicles per hour by 2051.

2.2.1 Forecast Traffic Volumes on Northside Drive in 2026

Due to the proposed plan changes and the fact that Northside Drive is a new road, an S-Paramics traffic model was developed by the former Waitakere City Council (WCC) to assess expected traffic flows on Northside Drive in the year 2026. Auckland Transport undertook traffic modelling for the NorSGA PC15 area to assess how much the current infrastructure programme will support the land use projection and to identify any network shortcoming during the PC15 development period.

Projected traffic volumes for the PC15 area has been derived using future land use and the corresponding traffic generated from such use. The 2026 year NorSGA land use projections were received from Auckland Council. This development was confirmed with Auckland Council in liaison with the developers to reflect realistic development opportunities with the next 15 years (upto 2026) in each of the five precincts in the PC15 area. The proposed PC15 land use projections are 319,500 m^2 and 411,500 m^2 of GFA for 2016 and 2026 respectively. This consists of Town Centre Retail / Hospitality, office and community facilities. The table below is a summary of plan change land use projections for 2026.

[1] S-Paramics is a microsimulation traffic modelling software that simulates the behaviour of individual vehicles and presents real time visual displays for traffic management and road network assessment.

Table 1 Land Use Projections

PC15 Massey North	2016		2026	
	Area (m^2)	Dwelling (no.)	Area (m^2)	Dwelling (no.)
Precinct A	109,500	100	117,500	127
Precinct B	60,000	-	60,000	-
Precinct C	40,000	-	50,000	120
Precinct D	-	-	10,000	340
MNSEA	110,000	-	170,000	-
Total	319,500	100	411,500	600

The PC15 daily trip prediction is 97,600 vehicles per day in 2016; it increases by 26% to 119,600 vehicles per day by 2026. Traffic flows from the Paramics model show that the proposed Northside Drive lane configuration can adequately service the forecast traffic volume.

Traffic volume forecasts for 2026 on Northside Drive are presented in Table 2.

Table 2: Forecast 2026 PM Peak Hour Traffic Flow

Route	Location	2026 Traffic Volumes per Day
Northside Drive	East of Fred Taylor Drive	7,992
	West of Tahi Road	12,258
	East of Tahi Road	16,624
	East of SH16	16,624

2.2.2 Northside Drive Level of Service

A level of service (LOS) analysis has been undertaken at the key signalised intersections in the model to assess the impact of the infrastructure. Detailed LOS analysis by approach are tabled in **Appendix C**. The Highway Capacity Manual LOS criteria for signalised intersections are shown in the table below.

Table 3 LOS Criteria for Signalised Intersections (Highway Capacity Manual)

Level of Service	Average Delay
A	0.1 to 10
B	10 to 20
C	20 to 35
D	35 to 55
E	55 to 80
F	>80

The roading infrastructure improvements currently programmed in the Long Term Plan were tested in the model. These improvements are to Fred Taylor Drive, Hobsonville Road East, Northside Drive, Westgate Drive and optimisation of signals. From the forecast traffic volumes, the proposed road network in Northside Drive would work upto 2026. These volumes provided a general indication of the number of lanes needed for each section. The LOS analysis shows that all the intersections on Northside Drive area perform at an acceptable LOS with 2026 forecast traffic volumes. The LOS results for intersections on Northside Drive are detailed in the table below.

Table 4 LOS Results with 2026 PM Peak Volumes

Intersection	Average Delay (sec / veh)	Level of Service
Northside Drive / Don Buck Ext	7	A
Northside Drive / Tahi Road	12	B
Northside Drive / Fred Taylor Drive	24	C

2.3 Pedestrian Movements

It is anticipated that there will be an increase in trips undertaken on foot (employee commuter trips as well as recreational and shopping trips). The proposed walking-supportive urban design and signalised pedestrian crossings at intersections proposed in the project seek to accommodate future demand. Given the current rural nature of this road, new footpaths will be offset and separated from the roadway by a grass swale.

2.4 Cycle Movements

Due to the proposed developments anticipated by PC15, provision for cycling lanes has been made for the full length and cycle facilities will be provided at all signalised intersections.

2.5 Urban Design Requirements

The changes in activity and development as a result of Proposed Plan Change 15 will significantly increase pedestrian and cycling activity and public transport demand in the area. The urban design requirements for the future development include:

- Provision of bus, cycle and pedestrian networks designed to promote the maximum use and safety of transport modes other than private motor vehicles;
- Increased local amenity and safety to promote walking and cycling;
- Ensuring that adverse effects on natural resources, including water quality and native vegetation are avoided, remedied or mitigated;
- Providing environments that are visually compatible with the surrounding environments;
- Providing for ecological linkages;
- Maintaining and enhancing natural landscape qualities of the riparian margins; and,
- A safe environment that promotes CPTED principles.

The urban design requirements of PC 15 have been addressed in the Project either directly i.e. they are included wherever practicable or where not included the proposal does not prevent their implementation at a later date (when development occurs).

3. Description of Proposed Works

The following form key features of the design for Northside Drive.

Road Design

- Two traffic lanes from Fred Taylor Drive (formerly SH16) to Trig Road;
- Accommodation of multiple modes, including pedestrians, cyclists, public transport, general vehicles, and freight vehicles;
- Signalisation of Northside Drive/ Tahi Road North Intersection and Northside Drive/ Trig Road;
- Construction of a new bridge (Northside Drive Bridge) over the SH16 motorway extension.

Streetscape

- Landscaping of various LID devices along the full length of Northside Drive;
- The relocation of existing bamboo fences.

Low Impact Design Stormwater Management

- Bio retention swales along both sides of Northside Drive.

Pedestrian Connectivity

- Continuous 1.8m footpath along both sides of Northside Dr;
- Pedestrian facilities at signalised intersections.

Cycle Facilities

- Continuous 1.8m wide on road cycle lane along Northside Drive;
- Provision of cycle facilities at signalised intersections.

Public Transport

- Bus shelters and associated facilities provided at all bus stops;

Utilities

- New stormwater conveyance and treatment systems, sewer, service diversions, undergrounding of overhead electrical cables and new utilities infrastructure.

Structures

- New retaining and acoustics walls;
- New wind break structures.

Enabling and Construction Activities

- Site preparation – removal of structures and vegetation and installation of erosion and sediment control measures and other environmental protection measures (stormwater management and stream protection);
- Earthworks, erosion and sediment control.

4. Assessment of Effects

4.1 Land Use

The Northside Drive Project will help facilitate the expected future growth in the Massey North area. As a result of the proposed design features of this corridor discussed in **Section 3**, land take designation is required to enable these works and to provide for the on-going management and protection of the future road asset. Where land is acquired, it will ultimately be vested as road reserve. Where land is required for temporary construction activity, the land will be returned to the owner after construction and reinstatement.

4.2 Construction Effects

During construction there will be a range of temporary activities that will generate effects as follows:

- Excavation and trucking of material off site;
- Filling and road widening activities;
- Construction of all services;
- Forming new road pavement and footpaths
- Landscaping and installation of streetlights and other street furniture;
- Consequential effects on road users such as vibration, noise and dust.

5. Construction Management Plan

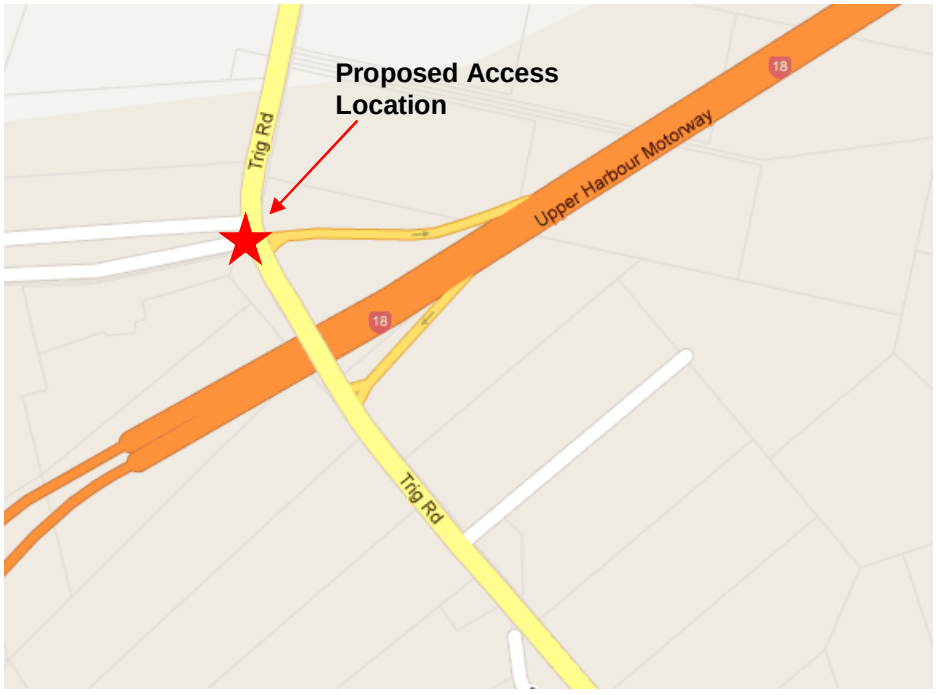
The need to properly plan for and establish safe and efficient traffic management at the Northside Drive intersection with Trig Road is recognised. Preparation of a Construction Management Plan (CMP) also provides reassurance to Auckland Council that construction can be undertaken without significant adverse effects to existing accessway users, Trig Road traffic or access to the SH18 motorway on-ramp. It is also intended to provide guidance to the Contractor as to an acceptable method of control for entering and exiting the site off Trig Road.

The particulars relating to construction timing, the contractor and construction methodology are not yet known. Notwithstanding this, it has been recognised that, as part of the detailed planning that will follow tender award, changes may be made to this construction management plan. All changes would still need to be approved and the normal procedures for applying for and obtaining an approved Traffic Management Plan from Auckland Transport apply to this work.

5.1.1 The Proposal

The upgrade of the existing access to Northside Drive off Trig Road is required to accommodate construction traffic turning manoeuvres and to mitigate any adverse effects on the operation of the SH18 on-ramp located opposite the accessway. This upgrade will allow construction traffic to access Northside Drive and to keep clear of the general flow of traffic. The location of the access is shown in **Figure 1** below.

Figure 1 Locality Plan



5.1.2 Future Plans

The upgraded access for the construction traffic will ultimately form part of the new Northside Drive / Trig Road/ SH16 on-ramp intersection.

5.1.3 Statutory Procedures

All other statutory and Local Authority procedures normally required in the course of planning and implementing traffic management must be complied with as part of these works. These include but are not limited to:

- Approval processes;
- Peer review processes; and
- Joint Party obligations, such as those that may require joint consideration by NZTA and Auckland Council or Auckland Transport.

5.1.4 External Factors

In finalising the traffic management for the site, regard shall be had for the potential implications on transport movements, as influenced by other planned works on or within the road by NZTA or by other utility operators.

5.2 Existing Environment

5.2.1 Road Layout

Trig Road at the intersection with the SH18 on-ramp is 13.5m wide. The road comprises a single lane in each direction, marked with an edge line on both sides and a 3.5m painted central median. The sealed shoulders are 1.6m wide on both sides of Trig Road. The posted speed limit is 80 km/hr, which reflects the level of roadside development and existing rural nature of this environment.

The current accessway is located on the outside of a horizontal curve next to a 5m wide service lane, which services two adjacent properties. There is a mixture of residential, horticultural and commercial properties within the vicinity of the intersection. The closest side roads are Ryans Road in the south and Speddings Road in the north.

Due to the predominantly rural nature of the site, there are no specific pedestrian or cycle facilities. There are also no existing bus stops on Trig Road. Trig Road has street lighting along this section of the road.

5.2.2 Sight Distance

Visibility to the north is restricted by the horizontal curve of Trig Road. The sight distance achieved from the proposed access is 125m to the north and 272m to the south. The required safe intersection sight distance (SISD) as identified in AUSTROADS is 181m. An approach site distance (ASD) of 114m is also required. SISD on the northern approach to the intersection cannot be achieved, although ASD requirements from both directions are met.

5.2.3 Traffic Volumes

Traffic count data identified daily movements of 4766 vehicles per day, as measured from a count station located just south of Spedding Road. These traffic counts were undertaken in 2008.

The hourly flows show a typical commuter route pattern with distinctive AM and PM peaks, consistent daily interpeak flows and low off peak flows. The hourly flows show a maximum of 505 vehicles per hour (vph) in the southbound direction during the AM peak (between 7am and 9am) and 370 vph in the northbound direction during the PM peak (between 4pm and 6pm).

5.2.4 Crash Data

A search of the NZTA Crash Database for the previous four year period (2008 – 2011) identified three non-injury crashes within a 100m radius of the new intersection. One of these crashes involved a rear end collision, while the other two crashes involved single vehicle loss of control collisions.

The recent upgrade of this section of Trig Road as part of the SH16-SH18 motorway deviation has resulted in improvements to the geometric design and road alignment through the existing horizontal curve at this location.

5.3 Access

5.3.1 Access Layout

The Trig Road and Northside Drive intersection will provide access for the construction of Northside Drive from Trig Road to Northside Bridge. The proposed layout is shown in **Appendix A**.

It is anticipated that the total traffic generation from construction of the access will be in the order of 90 vehicle movements per day. While this volume is not considered significant, improvements to the conspicuity of the intersection will improve awareness of construction traffic and in particular manoeuvres by truck and trailer units during the hours of operation for construction (7am to 7pm). Residential traffic will continue to utilise the access with no restrictions and due to the expected very low flow of truck movements, no conflicts are anticipated.

The new access would be formed and sealed for a minimum of 34m into Northside Dr, up to a maximum width of 7.0m. The exit would also be marked with a new Stop Control and centreline. Beyond this point it will form part of the construction works zone and will be formed and controlled by the Contractor as needed, to suit the requirements of residents and the construction programme. Access to and from individual properties within the construction zone would be coordinated with property owners, with excavations and construction sites cordoned off from adjacent traffic and pedestrians.

It is anticipated that construction along the accessway would take place in two distinct stages, with works to widen one side allowing residents to use the existing running surface, and temporary ramps crossing live earthworks areas to maintain individual accesses. Once the first side of the new carriageway is constructed to base course level, residents would utilise this new section for general access whilst the contractor constructs the opposite side of the new carriageway to base course level, again with temporary ramps crossing live earthworks areas to maintain individual accesses. Sealing of the final road surface is also likely to be done in stages, similar to normal road maintenance re-sealing procedures.

5.3.2 Trig Road Layout

The existing 3.5m wide flush median on Trig Road will be used to accommodate southbound construction traffic turning into and out of the new accessway. The central median is approximately 114m in the northern direction and continues to a point approximately 315m south of the access.

Large “Trucks Crossing” (TW2.7B) signs will also be erected during the hours of operation to advise motorists when the access is being used by large vehicles.

To address the limitations of sight distance in the northern direction, it is proposed to reduce the speed limit through the area to 60km/hr during the hours of construction operation and to reinforce this with appropriate signage and cones.

It is acknowledged that the use of temporary speed limits is not a cure to the problem of lack of sight distance, but it will assist in raising the conspicuity of the access by highlighting the possibility of large vehicles turning in this area.

These measures will form part of the Temporary Traffic Management Plan (TTMP) for the works and are to be in accordance with the requirements of Code of Practice for Temporary Traffic Management (COPTTM).

5.4 Traffic Effects

5.4.1 Construction Programme

Construction works are due to start in 2013 with an expected timeframe of 6 months. In order to accommodate temporary erosion and sediment control requirements, it will be necessary to start construction at the western end of the Northside Drive and work progressively up to Trig Road. As such, the upgrade and full signalisation of the Trig Road / Northside Drive and SH16 northbound on-ramp is unlikely to be achieved until the end of the construction programme. Should more managed control of access into and egress out of the site be desirable, then the full signalised upgrade of the intersection could be undertaken at the outset of the construction works. Notwithstanding this, we have worked on the basis that the upgrade and use of traffic temporary traffic management is acceptable and adequately meets the needs of residents, road users and construction traffic entering and exiting the site.

5.4.2 Construction Work Times

It is proposed that the hours of operation for the heavy vehicles will be limited to between 07:00am and 07:00pm.

5.4.3 Traffic Generation

Currently this access road provides access to seven residential properties. Based on the residential traffic generation rate of 9 vehicles per day per dwelling, the two existing accesses would be expected to generate 63 vehicle movements per day. The truck movements to the site are expected to be in the order of 90 truck and trailer units per day. Therefore the total number of movements from the access is expected to be 153 vehicle movements per day. The residential splits have been estimated to be 50% northbound and 50% southbound, while the trucks will be 80% southbound and 20% northbound.

5.4.4 Access Capacity

Traffic volumes for Trig Road show peak hourly volumes of 505 vph. The maximum peak traffic flows for the access are expected to be 16 vehicles per hour, with an expected flow of 10 vehicles to and from the south and 5 vehicles to and from the north. These flows can easily be absorbed into current traffic flows on Trig Road.

5.4.5 Sight Distance

The current sight distance to the north is 125m and to the south is 272m.

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised intersections provide the equation for calculating the required safe intersection sight distance (SISD) for an access at the appropriate grade. From this calculation the SISD for an 80km/hr speed environment is 181m.

The minimum requirements for approach sight distance (ASD) is 114m

Currently SISD can be met in one direction only, but the ASD requirement is achieved in both directions.

If the speed environment was reduced to 60km/hr, sight distance requirements would also reduce as shown in **Table 1** below.

Table 5 Sight Distance Requirements

Speed	SISD	ASD
80km/hr	181m	114m
60km/hr	123m	72m

The SISD and ASD requirements for a 60km/hr speed environment can therefore be met in both directions.

5.5 Traffic Management Plan

The planning requirements for a Traffic Management Plan are set out in the Code of Practice for Temporary Traffic Management (COPTTM).

A draft Traffic Management Plan is provided in **Appendix B**, however this will need to be reviewed and completed upon awarding of the physical works contract for the Northside Drive construction.

The features of the proposed temporary traffic management are:

- Access formed and sealed for 34.4m;
- Large “Trucks Crossing” (TW2.7B) warning signs on both approaches;
- Large “Shoulder Closed” (TW1.6B) warning signs on both approaches; and
- Temporary 60km/hr speed limit from 23 Trig Road to 84 Trig Road.

It is proposed that the temporary speed limit only apply when there will be trucks working in the area (07:00 – 19:00 Monday – Friday) and that all signage and cones are removed outside of these times.

6. Summary and Conclusions

The Northside Drive project involves the construction of a new two lane road from Fred Taylor Drive to Trig Road. The eastern section from Northside Bridge to Trig Road forms a key link, is required to address future traffic demand in this area, as well as to provide access to Trig Road, the SH18 motorway, access from the northern extents of PC15 and PC14. It also serves as an important connector between Fred Talyor Drive and Hobsonville Road.

The main objective of this project is to provide for the completion of the intended roading network in this area, by the construction of the new collector route and ultimately the comprehensive, long term management of Northside Drive:

- To ensure that the form and function of Northside Drive meet the needs of the future development of the surrounding area, including provision of access from new road intersections, driveways and to the motorway;
- To ensure that the works on Northside Drive are coordinated so that they may be be delivered in conjunction with development expected to result from Plan Change 15 and
- To provide statutory protection to Northside Drive to ensure that its construction, operation and maintenance is authorised and that the public road asset, which is an essential community resource, is protected and able to be managed on an on-going basis in the interests of the community.

Adverse effects will occur temporarily during the construction period and will also be experienced by individual site owners and occupiers as a result of loss of land. The changes in land use that result from Plan Change 15 require roading improvements in the area and better links to the adjacent road network.

Following delivery of the proposed design, land use should be designated for project related works to ensure that Northside Drive provides future levels of service to road users and pedestrians as part of the development and connections required as a result recent land use changes and amendments to the Metropolitan Urban Limit.

7. Disclaimer

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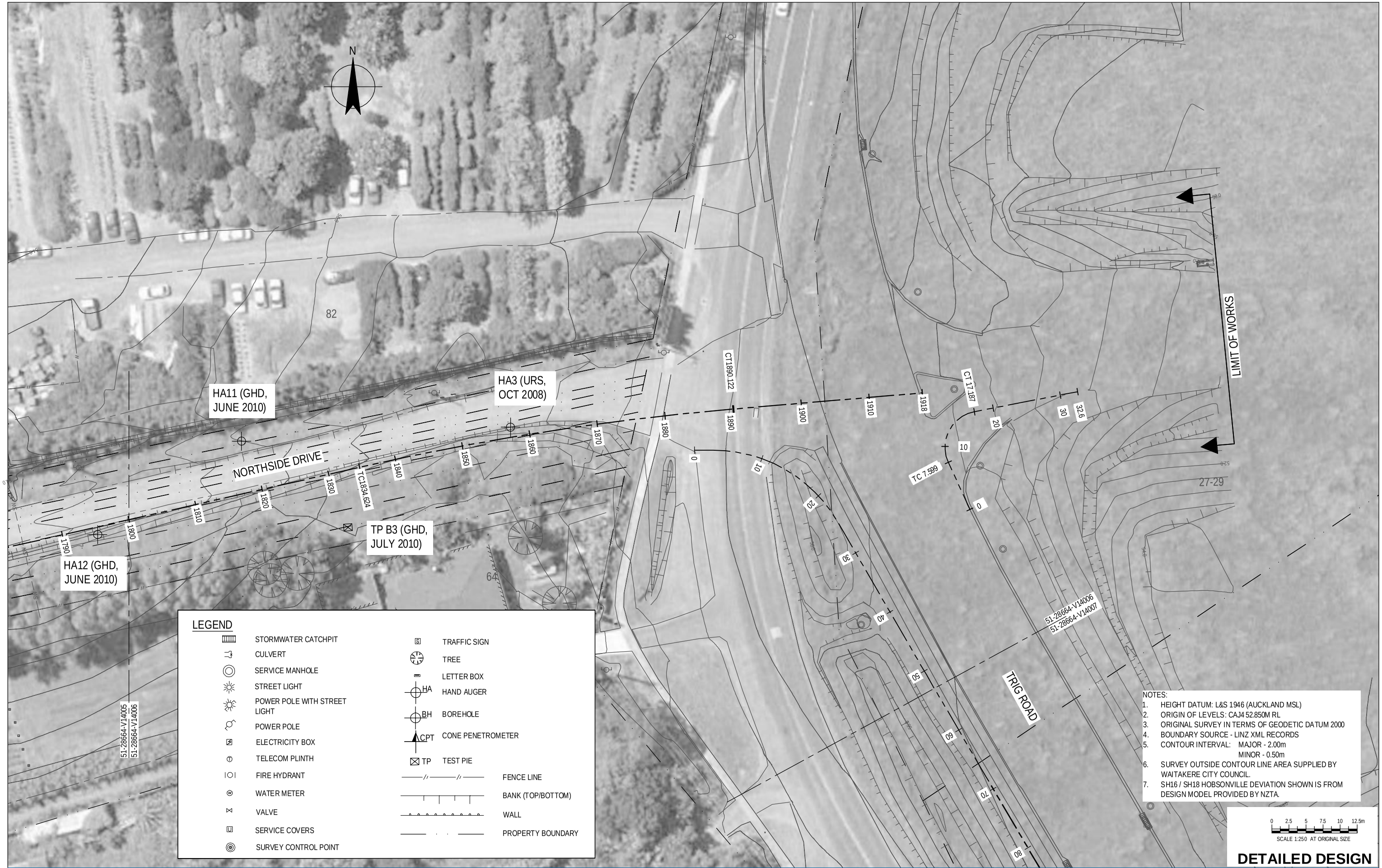
Appendix A

Intersection Layout Plan



LEGEND

- STORMWATER CATCHPIT
- CULVERT
- SERVICE MANHOLE
- STREET LIGHT
- POWER POLE WITH STREET LIGHT
- POWER POLE
- ELECTRICITY BOX
- TELECOM PLINTH
- FIRE HYDRANT
- WATER METER
- VALVE
- SERVICE COVERS
- SURVEY CONTROL POINT
- TRAFFIC SIGN
- TREE
- LETTER BOX
- HA HAND AUGER
- BH BOREHOLE
- CPT CONE PENETROMETER
- TP TEST PIE
- FENCE LINE
- BANK (TOP/BOTTOM)
- WALL
- PROPERTY BOUNDARY

NOTES:
1. HEIGHT DATUM: L&S 1946 (AUCKLAND MSL)
2. ORIGIN OF LEVELS: CAJ4 52.850M RL
3. ORIGINAL SURVEY IN TERMS OF GEODETIC DATUM 2000
4. BOUNDARY SOURCE - LINZ XML RECORDS
5. CONTOUR INTERVAL: MAJOR - 2.00m
   MINOR - 0.50m
6. SURVEY OUTSIDE CONTOUR LINE AREA SUPPLIED BY WAITAKERE CITY COUNCIL.
7. SH16 / SH18 HOBSONVILLE DEVIATION SHOWN IS FROM DESIGN MODEL PROVIDED BY NZTA.

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DETAILED DESIGN

No	Revision	Drawn	Job Manager	Project Director	Date
B	DETAILED DESIGN, ISSUED FOR ENGINEERING APPROVAL	MJ			
A	DETAILED DESIGN, ISSUED FOR REVIEW	MJ			18.08.11

Note: * indicates signatures on original issue of drawing or last revision of drawing

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DO NOT SCALE

Drawn	M.JUNG	Designer	
Drafting Check		Design Check	
Approved (Project Director)			
Date			
Scale	AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	

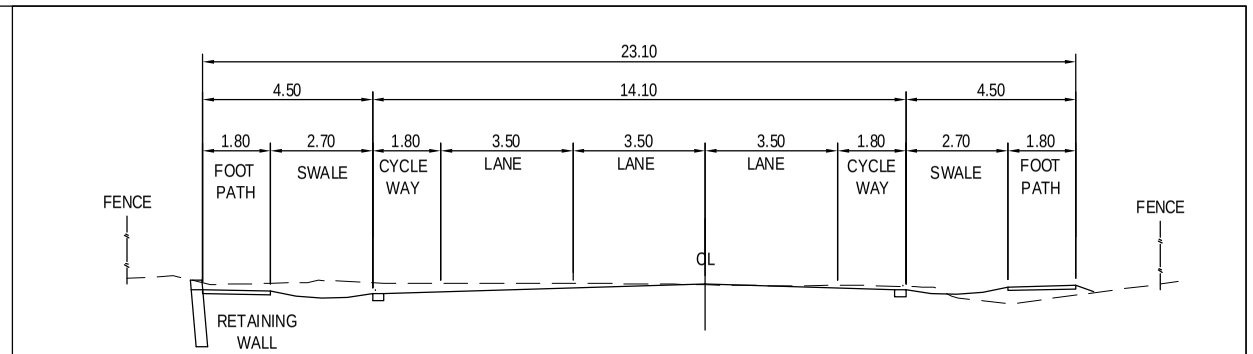
Client: AUCKLAND TRANSPORT
Project: NORSGA - NORTHSIDE DRIVE EAST
Title: NORTHSIDE DRIVE
EXISTING SURVEY PLAN - SHEET 6 OF 7

Original Size: A1
Drawing No: 51-28664-V14006
Rev: B

Plot Date: 12 December 2011 - 5:23 PM
Plotted by: Michael Jung/Auckland/GHD/AU
Cad File No: G:\51\28664\06 CADD\DWG\01 Northside - Kedgley\Stage 1\51-28664-V14001_V14007.dwg

NOTES

1. FOR LEGEND REFER TO G14006
2. FOR LIGHTING LAYOUT DETAILS, REFER TO E14001-E14007.
3. FOR STORMWATER LAYOUT DETAILS, REFER TO W14001-W14008.



G SECTION - NORTHSIDE DRIVE CH1880
SCALE 1 : 100

MATCH TO EXISTING KERBLINE
TRIG ROAD
INSTALL NEW FOOTPATH
EXISTING BAMBOO TO BE TAKEN DOWN AND REPLANTED BEHIND NEW WALL
NEW RETAINING WALL RW 15. REFER DRAWING NO 51-28664-C14210
INSTALL SAFETY FENCE ON NEW RETAINING WALL FROM CH 1700 TO CH 1840
NEW RETAINING WALL RW 16. REFER DRAWING NO 51-28664-C14211
82
NORTHSIDE DRIVE
CT1890.122
SH 18 ON RAMP
LIMIT OF WORKS
CT 17.187
MATCH TO EXISTING KERBLINE
REMOVE EXISTING TRAFFIC ISLAND AND REINSTATE PAVEMENT. REFER DRAWING NO 51-28664-C14044 FOR PAVEMENT DETAILS
EXISTING KERBLINE AND PAVEMENT TO BE REMOVED AND BUILT OUT
INSTALL NEW FOOTPATH
MATCH TO EXISTING KERBLINE
TC 7.599
TC1834.624
64
NEW RETAINING WALL RW 11. REFER DRAWING NO 51-28664-C14207
TRIG ROAD
RELOCATE BAMBOO TREES
51-28664-C14005
51-28664-C14006
N
0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DETAILED DESIGN

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
B	DETAILED DESIGN, ISSUED FOR ENGINEERING APPROVAL		MJ			
A	DETAILED DESIGN, ISSUED FOR REVIEW		MJ			18.08.11

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Drawn	M.JUNG	Designer	M.JUNG
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Approved (Project Director)			
Date			
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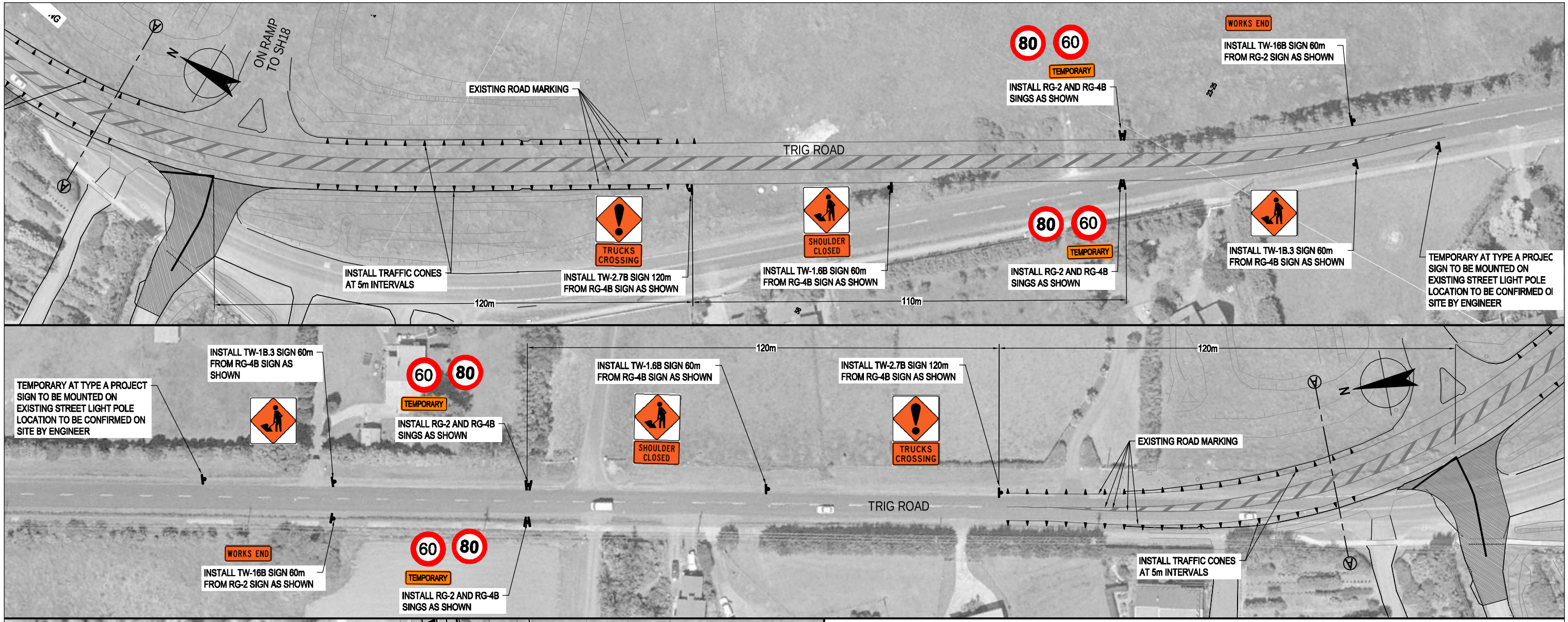
Client: AUCKLAND TRANSPORT
Project: NORSGA - NORTHSIDE DRIVE EAST
Title: NORTHSIDE DRIVE
CIVIL WORKS PLAN - SHEET 6 OF 8

Original Size A1 | Drawing No: 51-28664-C14006 | Rev: B

Plot Date: 22 February 2012 - 12:41 PM | Plotted by: Michael Jung/Auckland/GHD/AU | Cad File No: G:\51\28664\06 CADD\DWG\01 Northside - Kedgley\Stage 1\51-28664-C14001_C14008.dwg

Appendix B

Construction Management Plan



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PRELIMINARY

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Client	AUCKLAND TRANSPORT
Project	NORSGA - NORTHSIDE DRIVE EAST
Title	NORTHSIDE DRIVE / TRIG ROAD INTERSECTION CONSTRUCTION TRAFFIC MANAGEMENT PLAN
Original Size	A1
Drawing No:	51-28664-SK14111
Rev:	A

Plot Date: 15 March 2012 - 4:24 PM Plotted by: Michael Jung/Auckland/GHD/AU Cad File No: G:\51\28664\06 CADD\DWG\01 Northside - Kedgley\Stage 1\51-28664-SK14111.dwg

Appendix C

Auckland Transport - Plan Change 15 Massey North Town Centre Modelling Technical Report

Auckland Transport
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PLAN CHANGE 15 MASSEY NORTH TOWN CENTRE MODELLING

TECHINCAL REPORT

Strategy and Planning

12 March 2012

Change History and Approval

The following Change History log contains a record of changes made to this document.

PUBLISHED/REVISED DATE	VERSION #	AUTHOR (OPTIONAL)	SECTION / NATURE OF CHANGE
12/03/2012	DRAFT	Honwin Shen	

Authorisation / Distribution

APPROVER NAME	TITLE	SIGNATURE	DATE
John Davies	Transport Modelling GIS/Monitoring Leader		13/03/2012

Contents

1 Introduction

The Plan Change on the Northern Strategic Growth Area (NorSGA) instigated by Waitakere City Council (WCC) in 2006, this included a development cap in the Plan Change 15 (PC15) area. Recently, at the request of Auckland Council, Auckland Transport and New Zealand Transport Agency recently agreed to lift the development 'cap' from the PC15 area and to replace it with a suitable infrastructure programme designed to match transport infrastructure with the developers' projected land use development.

Auckland Transport undertook traffic modelling for the NorSGA PC15 area to assess how much the current infrastructure programme will support the land use projection and to identify any network shortcoming during the PC15 development period.

The modelling work is similar to the exercise undertaken in 2006 as part of the Metropolitan Urban Limit (MUL) shift in PC15. The updated land use was tested on the Waitakere Strategic Traffic Road Assignment Model (WSTRAM) based on EMME2 software. Traffic demands were then input into a micro simulation traffic model to assess the network operations in detail.

Auckland Transport and NZTA agreed to use the micro simulation model to test the impact of land use predictions on the current Long Term Plan infrastructure improvements up to 2026. The long term scenario (2041) will be modelled in NZTA's Saturn model. To ensure the WSTRAM and NZTA's Saturn models are consistent; the WSTRAM traffic demands were fed also into the Saturn models.

2 Land Use

The 2016 and 2026 year NorSGA land use projections were received from Auckland Council. This development was confirmed with Auckland Council in liaison with the developers to reflect realistic development opportunities with the next 15 years (up to 2026) in each of the five precincts in the PC15 area. The 2018 and 2021 years were interpolated based on the 2016 and 2026 projections. The 2041 forecast year is 10% total growth of the 2026 year. The table below is a summary of plan change land use projections on the forecast years. A detailed table is included in appendix A, which shows the type of activities for each of the plan changes.

Plan Change		2016		2018		2021		2026		2041	
		(m2)	Dwelling (No.)	(m2)	Dwelling (No.)	(m2)	Dwelling (No.)	(m2)	Dwelling (No.)	(m2)	Dwelling (No.)
PC15 Massey North		**319,500**	**100**	**350,166**	**267**	**380,833**	**433**	**411,500**	**600**	**452,650**	**660**
	A	109,500	100	113,500	113	117,500	127	121,500	140	133,650	154
	B	60,000	-	60,000	-	60,000	-	60,000	-	66,000	-
	C	40,000	-	43,000	40	46,667	80	50,000	120	55,000	132
	D	-	-	3,333	113	6,667	227	10,000	340	11,000	374
	MNSEA	110,000	-	130,000	-	150,000	-	170,000	-	187,000	-
PC13 Hobsonville Point		**37,200**	**1,760**	**47,167**	**2,167**	**57,133**	**2,573**	**67,100**	**2,980**	**73,810**	**3,278**
PC14 Hobsonville Corridor		**75,100**	**70**	**95,426**	**97**	**115,753**	**123**	**136,080**	**150**	**149,688**	**165**

The proposed PC15 land use projections for precinct A increase from 109,500m^2 to 121,500 m^2 of GFA between 2016 and 2026 respectively. It consists of Town Centre Retail/Hospitality, office and community facilities.

The precinct B projection is 60,000m^2 of large format retail GFA by 2016.

The precinct C projection is 40,000m^2 and 50,000m^2 of supermarket and large format general retail in 2016 and 2026 respectively.

The precinct D projection is 10,000m^2 of general retail by 2026.

The Massey North Special Employment Area projection is 110,000m^2 and 170,000m^2 of industrial and trade related business for 2016 and 2026 respectively.

3 Traffic Generation

The generation rates below were used to calculate the traffic generation for the NorSGA area. These rates were based on previous Integrated Transport Assessments, they have been agreed with NZTA.

Land Use	AM PEAK (per hour)		MD PEAK (per hour)		PM PEAK (per hour)	
	IN	OUT	IN	OUT	IN	OUT
Industrial/ Business	1.25	0.74	0.61	0.61	0.59	0.92
Trade/Yard Retail	1.02	0.77	0.89	0.89	0.84	0.95
Supermarket	1.40	1.01	3.90	3.90	5.29	5.29
Town Centre Retail/ Hospitality	0.55	0.35	1.07	1.07	1.66	1.73
General Retail LFR	0.69	0.57	1.02	1.02	1.38	1.44
Office	1.56	0.22	0.42	0.42	0.31	1.24
Community Facilities	2.24	2.24	1.84	1.84	1.96	1.96
Education	6.40	4.00	3.60	2.80	0.00	0.00
Apartments	5.00	20.00	10.00	10.00	15.00	10.00
Stand alone Dwellings	10.00	50.00	20.00	20.00	35.00	25.00

Note: the employment land use rates were based on per 100m^2 of gross floor area and the dwelling unit rates are based on per 100 units.

The trip generations for the NorSGA zones were calculated using the rates and precinct percentages above, the table below shows the calculated trips in vehicles per 2 hours.

	2016 Trip Generations (veh/2hr)				2018 Trip Generations (veh/2hr)					2021 Trip Generations (veh/2hr)					2026 Trip Generations (veh/2hr)					2041 Trip Generations (veh/2hr)				
	AM	MD	PM	Daily	AM	MD	PM	Daily	%	AM	MD	PM	Daily	%	AM	MD	PM	Daily	%	AM	MD	PM	Daily	%
WCC Zone																								
PC13	3,538	2,482	3,067	21,409	4,449	3,086	3,760	26,614	20%	5,361	3,689	4,453	31,816	33%	6,273	4,292	5,144	37,015	42%	6,900	4,718	5,663	40,706	47%
PC14	2,800	2,318	3,215	19,779	3,552	2,808	3,868	24,147	18%	4,300	3,292	4,522	28,482	31%	5,048	3,778	5,176	32,826	40%	5,555	4,156	5,695	36,114	45%
PC15	9,079	12,480	16,961	97,608	10,207	13,330	18,088	104,930	7%	11,337	14,186	19,217	112,287	13%	12,469	15,036	20,342	119,612	18%	13,713	16,542	22,380	131,586	26%
Trig & Whenuapai	1,363	1,497	1,733	11,670	1,363	1,497	1,733	11,670	0%	1,363	1,497	1,733	11,670	0%	1,363	1,497	1,733	11,670	0%	23,409	32,410	21,779	222,072	95%
Scott Point	338	108	273	1,385	338	108	273	1,385	0%	338	108	273	1,385	0%	338	108	273	1,385	0%	1,401	1,093	1,568	9,512	85%

Note that the PC15 daily trip prediction is 97,600veh/day in 2016; it increases by 26% to 131,600veh/day by 2041.

PC13 daily trip prediction is 21,400veh/day in 2016; it increases by 47% to 40,700veh/day by 2041.

PC14 daily trip prediction is 19,800veh/day in 2016; it increases by 45% to 36,100veh/day by 2041.

The modelling has assumed the Trig, Whenuapai, and Scott Point developments will not occur by 2041. The trips in the Trig and Whenuapai areas are 11,700veh/day in 2016 and 2026, but increases by 95% to 222,100veh/day in 2041. Trips generation in Scotts Point are 1,400veh/day for 2016 and 2026, but this increase by 85% to 9,500veh/day by 2041.

4 EMME Zone Traffic Generation

The forecast land uses were supplied by precinct areas for each of the plan change areas. These were split into EMME zones in order to model the forecast land uses in the WSTRAM model. In some cases, a precinct area was matched to a zone, but if a precinct covers more EMME zones, then percentages were allocated by the gross floor area take up for the zone. The table on the right shows the precinct percentage allocation to each WCC EMME zones in the NorSGA area.

WCC Zone	CDP Percentage							
CDP 13	Buckley A	Buckley B	Hudson	Sunderland	Landing	Village	Catalina	MIP
12702						100%		
12703		100%						
12704	100%							
12705							100%	
12601			100%					
12602				100%	100%			100%
CDP 14	Group A	Group B	Group D	Group E	Group F	Group V		
12503	45%							
12507				100%				
12509					35%			
12510					19%			
12511					22%			
12512					24%			
12513	26%							
12514	29%							
12515			100%					
12516		100%						
12517						100%		
CDP 15	Precinct A	Precinct B	Precinct C	Precinct D	MNSEA			
12301			55%					
12302	14%							
12303	28%							
12304	10%							
12305			35%	5%				
12306			10%	45%				
12307	22%							
12308	26%							
12309				15%	16%			
12310				35%				
12311		42%						
12312		48%						
12313					16%			
12314					18%			
12315					20%			
12316					30%			
12317		10%						

5 Infrastructure Tests

The known road infrastructure projects in this area that have been proposed to accommodate the projected land use are limited below: They were then tested at 2016, 2018, 2021, 2026 and 2041 development horizons.

The model reflects all infrastructure improvements currently programmed in the Long Term Plan to be completed by 2016, which include the following:

- Improvements along Fred Taylor Drive from Don Buck Road to the motorway (roundabout changed to signalized intersection, improvements to Rua Road Intersection).
- Improvements to Hobsonville Road East of the motorway. These include the signalization of 8 intersections along Hobsonville Road to accommodate access into the PC14 development.(Intersections to be signalized along Hobsonville Road are: West Park Drive, Marina View Drive, Hendrika Court, Suncrest Drive, Brigham Creek Road, Sinton Road, Wisely Road/Clark Road and Ockleston Landing).
- All signals were optimized within the modelling runs.
- The entire Northside Drive was included (east and west of SH16) with signals at the old SH16 intersection.
- The Westgate Drive from Royal Road to the existing Westgate Shopping Centre was opened and the signals along Royal Road were optimized within model.
- It was also assumed that SH16 would be widened to six lanes both directions between south of Royal Road interchange and Hobsonville Road.

6 Emme Modelling

The Whenuapai Stage 2 version of the WSTRAM model was used for analysis. The future years tested are 2016, 2026, and 2041, in two hour AM, midday and PM peak periods. The forecast year demands were taken from the Auckland Regional Transport (ART3) model, therefore the models are consistent with the regional growth strategy.

There are also 2018 and 2021 WSTRAM models developed for the assessment of interim years. These demands are extrapolated between 2016 and 2026.

6.1 Modelling Methodology

The following steps were used to build up the trip matrices:

- The trip generation for each NorSGA zone was calculated using the rates in section 3.
- The trips were input into the WSTRAM model and balanced to match the origin-destination (OD) trips.
- Perform assignments to assign trips into the road network.
- Analyse results.

6.2 Results

6.2.1 OD Matrices

A cordon was drawn around the Massey North Town Centre, and a select link analysis was undertaken to identify the percentage of traffic originating and ending in the town centre. The traffic was broadly allocated to north, east and south sectors:

- North is traffic from/to Kumeu area (such as Fred Taylor North)
- East is traffic from/to Hobsonville area (such as Hobsonville Rd, Northside Dr east)
- South is traffic from Massey south (such as Westgate, Fernhill Don Buck, and Northside Dr ramps)

The result shows that a consistent 60% of traffic is coming from the south, 30% is coming from the east and 10% is coming from the north, to the Massey Town Centre. And similar percentages of traffic originate at the Town Centre and travel to each sector.

		2016			2026			2041		
From	To	AM	MD	PM	AM	MD	PM	AM	MD	PM
North	Massey Town Centre	10%	9%	11%	13%	11%	10%	18%	16%	15%
East	Massey Town Centre	30%	30%	32%	36%	35%	35%	37%	41%	38%
South	Massey Town Centre	60%	61%	57%	51%	54%	55%	44%	43%	48%
Massey Town Centre	North	8%	9%	11%	10%	14%	14%	20%	21%	20%
Massey Town Centre	East	30%	23%	25%	35%	29%	32%	39%	33%	29%
Massey Town Centre	South	62%	68%	64%	55%	56%	54%	41%	47%	51%

6.2.2 Traffic Volumes

Average Daily Traffic (ADT) volumes modelled for roads are used to sieve out those parts the network requiring detailed investigation. The guideline targets below gives an indication the number of lanes required based on the traffic volume.

Traffic Lane Quantum	Guideline Target
Collector/Arterial ~ 1 lane each way and centreline	Less than 15,000 (veh/day)
Collector /Arterial ~1 lane each way and flush median	Less than 30,000 (veh/day)
Arterial ~ 2 lanes each way and flush median	Less than 45,000 (veh/day)

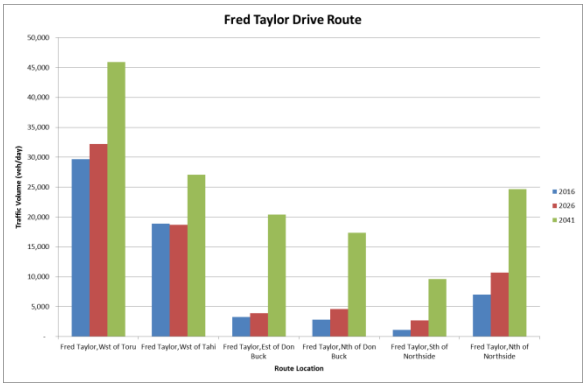
The ADT is calculated based on a formula using the three peak periods traffic flows as below:

ADT (veh/day) = 1.4 * (AM PEAK (2hrs) + 3.5*(MD PEAK (2hrs)) + PM PEAK (2hrs))

The predicted average daily traffic (ADT) for NorSGA roads are charted along the routes. The results for 2016, 2026 and 2041 are shown.

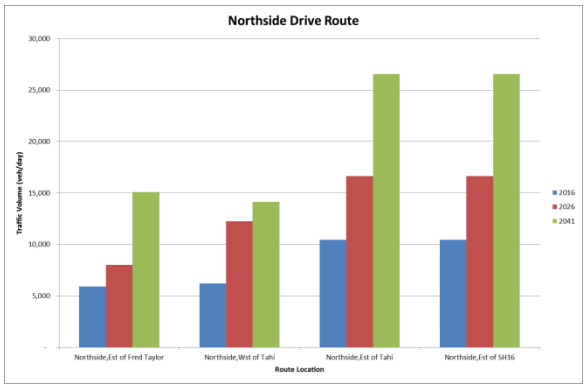
<u>Fred Taylor Drive</u>

- The greatest volume on Fred Taylor Drive is between Tahi Drive and the SH16 Motorway interchange where the ADT is about 30,000veh/day in 2016 and about 46,000veh/day in 2041.
- The volume on Fred Taylor Drive between Rua Road and Tahi Drive is about 18,000 to 28,000veh/day in 2016 and 2041 respectively.
- Along Fred Taylor Drive (old SH16), the volume in 2016 between Don Buck Road and Northside Drive is 3,000veh/day because traffic diverts to the new extension of the SH16 motorway to Brigham Creek Road. However, by 2041 the volume increases to 20,000veh/day for this section due to increase industrial development in the Whenuapai area and Massey North Special Employment Area.
- Based on the guideline target table, the section of Fred Taylor Drive between Don Buck Road and the SH16 motorway would require at least 4 lanes with widening at intersections for turning movements, the proposed road network design layout is adequate.
- Along the section north of Don Buck Road, the 2 lanes layout would be adequate to cater for the forecast traffic volume to 2041.



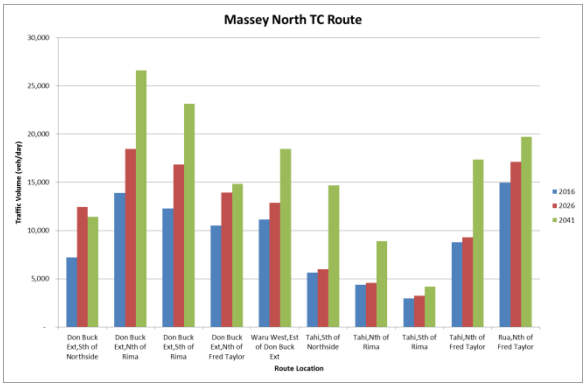
Northside Drive

- The volume on Northside Drive between Fred Taylor Drive and Tahi Drive is about 6,000 and 15,000 veh/day in 2016 and 2041 respectively.
- The volume on Northside Drive between Tahi Drive and SH16 motorway interchange is about 6,000 and 14,000veh/day from 2016 and 2041.
- The volume on Northside Drive east of the SH16 motorway is about 10,000 and 26,000 veh/day from 2016 and 2041.
- It can be seen that the traffic volume has increased significantly from 2026 to 2041 due to the increased development on Whenuapai and Trig areas.
- The proposed road network design is adequate to service the forecast traffic volume.



Massey North Town Centre Roads

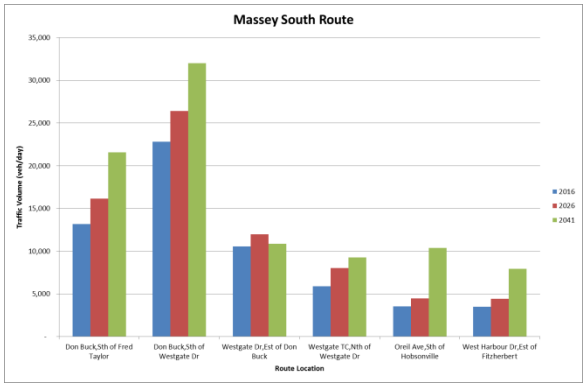
- The busiest roads inside the Massey North Town Centre are south end of Rua Road, the traffic volumes range from 14,000 to 26,000veh/day from 2016 to 2041.
- The Town Centre roads near the Fred Taylor Drive end would require 4 lanes with intersection widening to service the traffic from/to the centre. Roads inside the centre will require 2 lanes with intersection widening. The simulation test results would be able to provide detail of the correct lane layouts.



Massey South Roads

- Along Don Buck Road south of Fred Taylor Drive, the volumes increase steadily from 13,000 to 22,000 veh/day by 2041.

- Westgate Drive Extension traffic volumes increase from 3,500 to 11,000veh/day between 2026 and 2041. This road will provide an alternative access to the Massey North Special Employment Areas for Massey-east residents currently using Hobsonville Road.



Brigham Creek Road and Trig Road

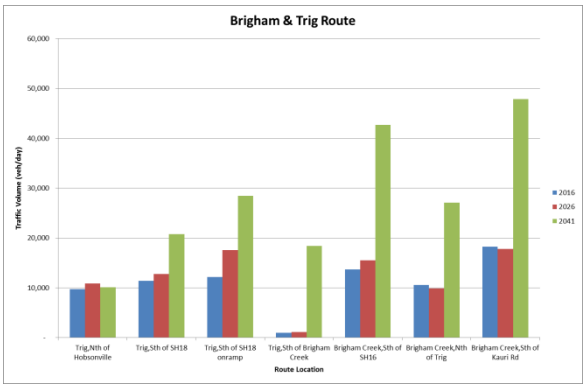
- Along Brigham Creek Road and Trig Road, there is no significant increase in ADT between 2016 and 2026.

- Brigham Creek Road, near the SH18 interchange the ADTs are generally 41,000 veh/day by 2041.

- Brigham Creek Road, north of the SH18 interchange the ADTs are generally 49,000 veh/day by 2041.

- Trig Road the ADTs are generally 29,000 veh/day by 2041, because of the increased developments in Trig area.

- There is significant increase in traffic volume by 2041 for both Brigham Creek Road and Trig Road. The proposed road network would not be able to service the forecast volume. Road improvement would be needed by 2041.

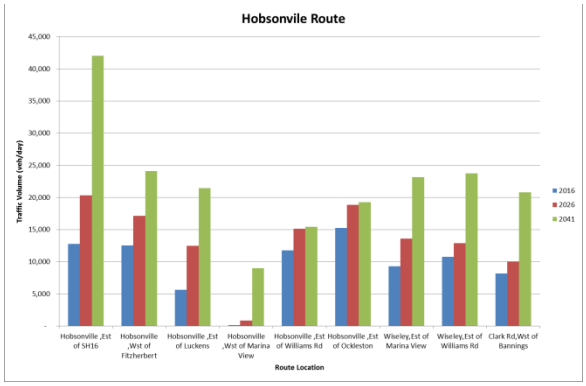


Hobsonville Road

- Hobsonville Road between the SH16 motorway and Luckens Road traffic volumes range from 10,000 to 40,000veh/day from 2016 to 2041.

- Hobsonville Road east of Luckens Road: the existing carriageway would be under-utilised in future year; the ADT is less than 10,000 veh/day in 2041. However, between Brigham Creek Road and Buckley Road, where considerable development is expected in terms of the Hobsonville Village Centre Urban Concept Plan, Hobsonville Road will be a good connection to the Hobsonville Village Centre.

- Along Hobsonville Road, near the Hobsonville Village Centre, the volumes range from 12,000 to 25,000veh/day from 2016 to 2041.

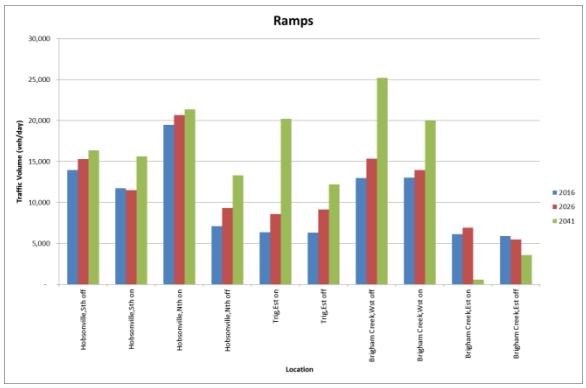


Motorway Ramps

- The ramp volumes are graphed below, the highest ramp volume is on the SH16 Hobsonville ramps.

- The Hobsonville ramps carry about 12,000 to 20,000veh/day, and are similar in 2016, 2026, and 2041.

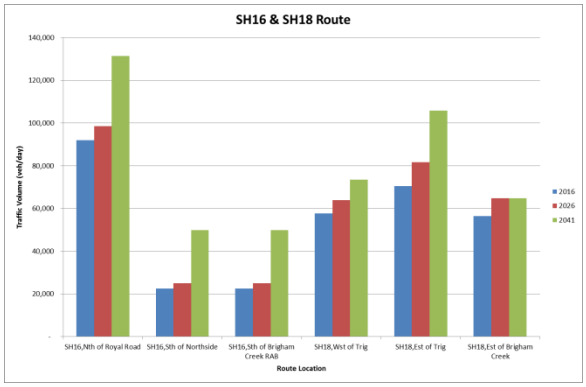
- The volumes on Trig Road are in the order of 8,000veh/day and Brigham Creek Road ramps are in the order of 15,000veh/day in 2026. However the volumes on these ramps increase significantly in 2041, it is expected these ramps would be fully utilized by 2041 because of the Trig and Whenuapai development.



SH16 and SH18

- The highest volume near the NorSGA area is SH16 south of Royal Road, the forecast volume is 90,000veh/day in 2016, increasing to 135,000veh/day in 2041.

- By 2041, there is significant increase in volumes on both SH16 and SH18 motorways due to more development in the Trig, Whenuapai and Hobsonville areas.



From the forecast traffic volumes, the proposed road network would work up to 2026, but due to increased development for Trig and Whenuapai area in 2041, more investigation is needed in Trig Road, Brigham Creek Road.

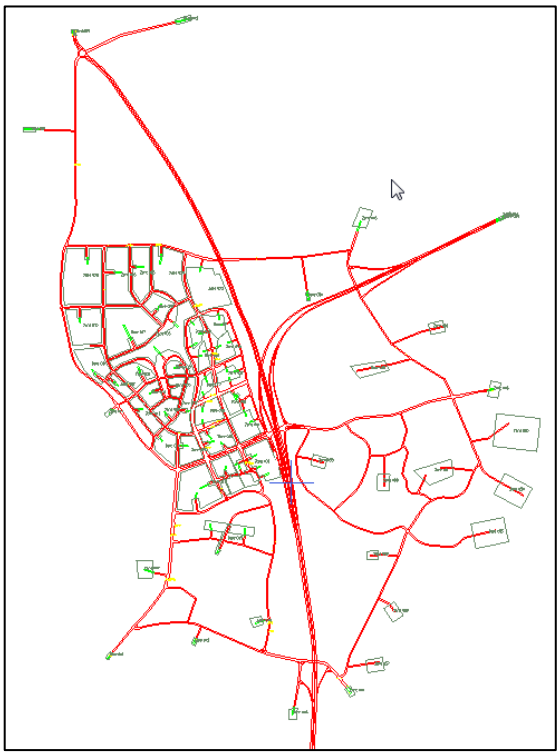
The forecast traffic volumes provided a general indication of the number of lanes needed for each section, but the exact lane layout, intersection geometry, signal phasing or any improvement to the proposed design can be tested in micro simulation.

7 Paramics Modelling

Modelling software can simulate the interactions between individual vehicles assigned to the road network. PARAMICS allows the real-time analysis of vehicle behaviour and identifies congestion spots within the road network. NZRGP developed a PARAMICS model for the NorSGA area as part of their integrated transport assessment. Auckland Transport has permission from NZRPG to use the NorSGA model. Auckland Transport and NZTA have agreed to use the micro simulation model to test the impact of land use predictions on known infrastructure options up to 2026. Trip matrices were extracted from the WSTRAM.

NZRGP's PARAMICS network only covers the road network on the west side of the SH16 Motorway. Auckland Transport extended the network to include roads east of the motorway to allow for better testing and traffic re-routing. The complete PARAMICS network can be seen below.

The extent of the network is SH16/Brigham Creek Roundabout in the north, Royal Road in the south, Don Buck Road/Fred Taylor Drive in the west and Trig Road in the east. This network was used to assess the performance of a variety of road infrastructure.



Auckland Transport has developed future year models for both the AM and PM peak periods. A base year model was not developed as the land use changes in the whole NorSGA area will be significantly different from currently exists. The existing area is greenfield with rural living and a base model would offer little useful purpose.

The simulation durations are two hours as shown below, as these are considered to represent the busiest combination of network peak traffic in the NorSGA area.

- Morning Peak Period (AM) 7-9am
- Afternoon Peak Period (PM) 4-6pm

The future year models are 2016, 2018, 2021 and 2026.

The primary model parameters such as number of zones, nodes, gaps and routeing parameters are provided in tabular form in Appendix 8.

The traffic signals' cycle times range from 70 seconds to 120 seconds. Signals along Fred Taylor Drive and Hobsonville Road are fixed at 110 seconds, and signals are optimised and co-ordinated.

7.1 Simulation Methodology

The future year traffic simulation trip tables were derived from the Waitakere Strategic Traffic Assignment Model (WSTRAM). The trip tables for WSRTAM were adjusted from subarea traversals extracted from the Auckland Regional Council's Auckland Regional Transport model (ART3).

The future year NorSGA demands were derived using the following steps:

- The 2 hour OD matrices for the NorSGA cordon area were extracted from WSTRAM for the AM and PM peak.
- The Paramics trip tables were created by matching the EMME zones to Paramics zones. In some cases, where two or more Paramics zones are within an EMME zone, the EMME zones were disaggregated to match.
- The trip demands were simulated on the network.

The simulation model based on NZRPG's Integrated Traffic Assessment model, it was extended further east to include Trig Road. The network and signal timings were modified to improve operations and the changes are listed below:

- Hobsonville Road/Rua Road: Rua Road approach was changed from left turn give way movement to signalised double left turn movement to increase the intersection capacity.

- Fred Taylor Drive/Don Buck Road: Fred Taylor Drive north approach right turn to Don Buck Road was changed from single lane to double right lane to Don Buck Road.
- Don Buck Road Extension/Waru Road: The intersection was converted from priority to signalised. Waru Road east and west approaches were widened to increase the intersection capacity.
- Signal timings were adjusted at the intersections as required to improve the network operations.

Refer to Appendix 11 for Norsga intersection layouts for the testing in micro-simulation.

7.2 Results

7.2.1 Overall Network Statistics

For both AM and PM models five model runs were undertaken for analysis. The overall network statistics are presented in the table below:

Year	PEAK	Total # Veh (veh)	Total distance (km)	Mean Speed (kph)
2016	AM	27661	104968	45.3
2016	PM	35421	122917	43.0
2018	AM	28425	107128	44.8
2018	PM	35971	124473	42.0
2021	AM	29499	110335	43.9
2021	PM	36971	127400	39.8
2026	AM	31519	114355	40.1
2026	PM	39745	132663	37.5

The global travel speed is a useful measure of the efficiency of the network. All the forecast year models show a global speed above 40kph for AM and 37.5kph for PM peak respectively. This average speed is adequate for urban area traffic. (To give indication, the average speed inside the a town centre is about 20kph)

7.2.2 Model Observations

The traffic conditions were observed during the simulation runs. Snap shots of the traffic queues for the network tested are shown in Appendix 10. These were taken at the worst time within the simulated period. Each circle identifies a traffic queue (more circles indicate the network is more congested).

Observations of the simulations are summarised as follows:

2016

- AM peak: no congestion appears in the network, traffic at signals is clearing every cycle.
- PM peak: no congestion appears in the network, traffic at signals is clearing every cycle. Queues at Whau Road/Rima Road intersection occur temporarily.

2018

- AM peak: queues temporarily build up at the Don Buck south approach of Fred Taylor Drive/Don Buck intersection.
- PM peak: congestion at Fred Taylor Drive between Don Buck Road and SH16 motorway after 5pm on both directions. Short queues develop at Don Buck south approach at Don Buck Road / Fred Taylor Drive intersection.

2021

- AM peak: short queues build up on the Don Buck Road approach at Don Buck Road/ Fred Taylor Drive intersection after 8:45.
- PM peak: congestion at Fred Taylor Drive between Don Buck Road and SH16 motorway after 5pm on both directions. Short queues develop at Don Buck south approach at Don Buck / Fred Taylor intersection

2026

- AM peak: short queues build up on the Don Buck Road approach at Don Buck Road / Fred Taylor Drive intersection after 8:45. Short queues build up on Hobsonville Road east approach and Luckens Road south approach of the Hobsonville Road / Trig Road intersection.

- PM peak; queues temporarily build up at Whau Road / Rua Road intersection. Queues build up on the Don Buck Road approach at Don Buck Road / Fred Taylor Drive intersection. When congestion occurs at Rua Road, vehicles are switching between Rua Road and Don Buck Extension to exit the Massey North Town Centre.

The simulation observations shows the proposed road networks were performing satisfactory up to 2026. However, widening maybe required at the following locations after 2026 to increase the intersection capacity:

- Don Buck Road south approach of the Don Buck Road / Fred Taylor Drive intersection

- Hobsonville Road / Trig Road intersection

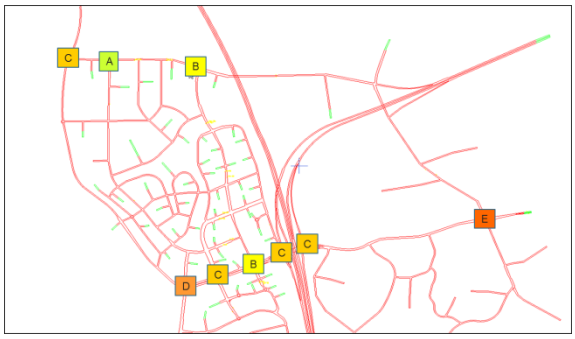
7.2.3 Level of Service

A level of service (LOS) analysis has been undertaken at the key signalised intersections in the model to assess the impact of the infrastructure.

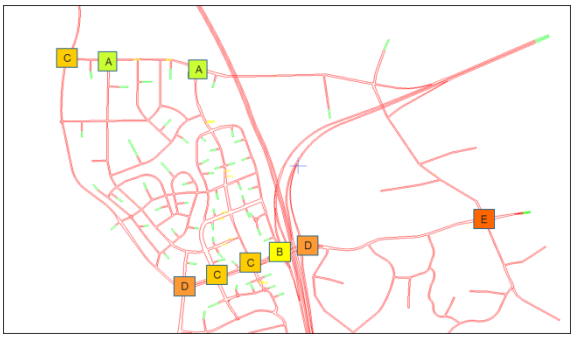
The results of the overall intersection average LOS analysis are shown in shown diagrammatically in the figures below for the forecast years. Detailed LOS analyses by approach are tabled in Appendix 9. The Highway Capacity Manual LOS criteria for signalised are shown in table below:

Level of Service	Average Delay
A	0.1 to 10
B	10 to 20
C	20 to 35
D	35 to 55
E	55 to 80
F	>80

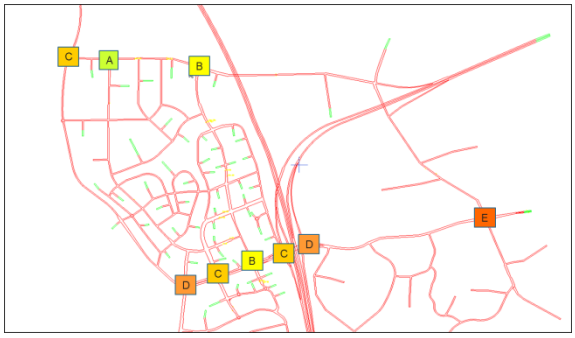
2016 AM peak



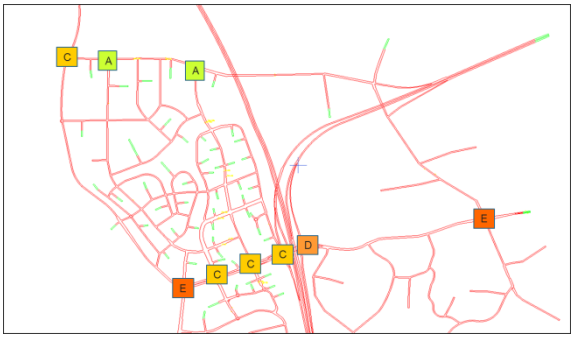
2016 PM peak



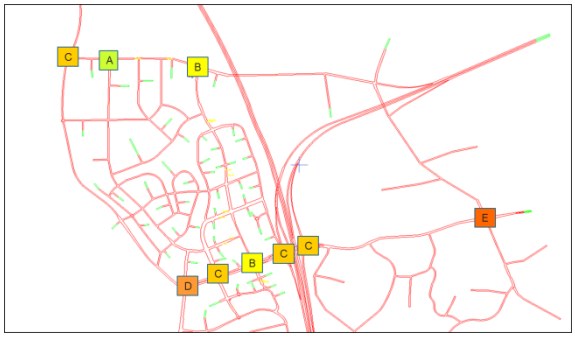
2018 AM peak



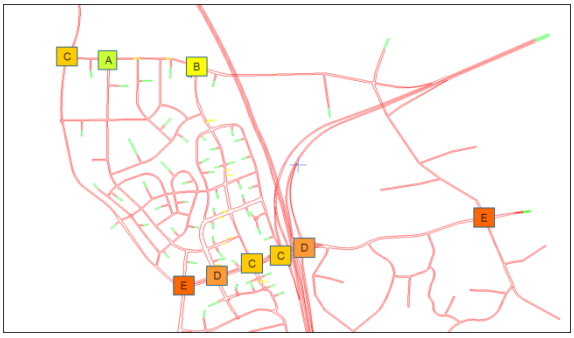
2018 PM peak



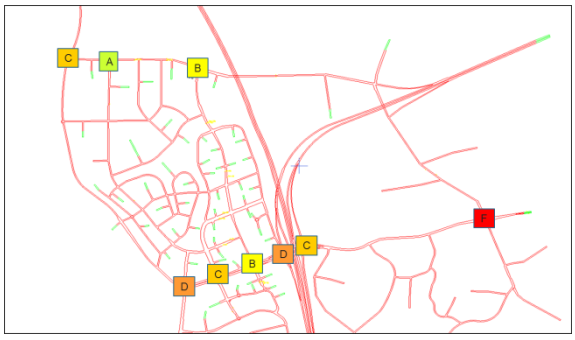
2021 AM peak



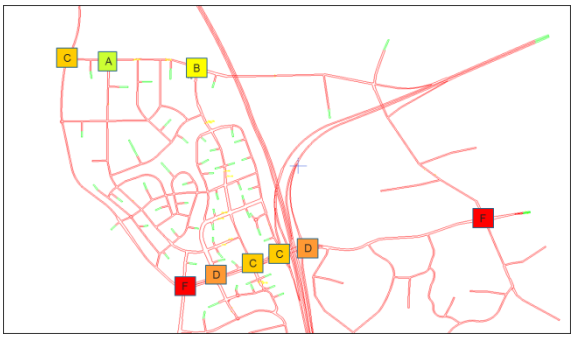
2021 PM peak



2026 AM peak



2026 PM peak



The LOS analysis shows that all the intersections in the PC15 area perform at an acceptable LOS D or above up to 2021. The LOS at Hobsonville/Trig intersection is E, caused by the heavy congestion at the Don Buck Road south approach. This intersection will need to be investigated at a later stage when the Trig Road and Whenuapai areas are developed.

For 2026 morning peak, the intersection operations in the PC15 are still acceptable, with LOS D or better. The afternoon peak Fred Taylor / Don Buck intersection operates at LOS F. The LOS at Hobsonville/Trig intersection has worsened to F. Both intersections will need to investigate to increase the capacity.

8 Summary

The Plan Change on the Northern Strategic Growth Area (NorSGA) instigated by Waitakere City Council (WCC) in 2006, this included a development cap in the Plan Change 15 (PC15) area. Recently, at the request of Auckland Council, Auckland Transport and New Zealand Transport Agency recently agreed to lift the development 'cap' from the PC15 area and to replace it with a suitable infrastructure programme designed to match transport infrastructure with the developers' projected land use development.

Auckland Transport undertook traffic modelling for the NorSGA PC15 area to assess how much the current infrastructure programme will support the land use projection and to identify any network shortcoming during the PC15 development period.

NorSGA land use projections were received from Auckland Council, these projections were a result of consultation with Auckland Council and the developer as reflection of the realistic development opportunities with the next 15 years.

The proposed PC15 land use projections is 319,500m^2 and 411,500m^2 of GFA for 2016 and 2026 respectively, and consists of Town Centre Retail/Hospitality, office and community facilities.

The PC15 daily trip prediction is 97,600 vehicles per day in 2016; it increases by 26% to 131,600 vehicles per day by 2041.

The roading infrastructure improvements currently programmed in the Long Term Plan were tested in the model. These improvements are to Fred Taylor Drive, Hobsonville Road east, Northside Drive, Westgate Drive and optimization of signals.

The wider area modeling work was done on the WSTRAM model. The result shows that a consistent 60% of traffic is coming from the south, 30% is coming from the east and 10% is coming from the north to the Town Centre. Similar percentages of traffic originate from the Town Centre.

From the forecast traffic volumes, the proposed road network would work up to 2026, but due to increased development for Trig and Whenuapai areas in 2041, more investigation is needed in Trig Road, Brigham Creek Road.

The forecast traffic volumes provided a general indication of the number of lanes needed for each section, but the exact lane layout, intersection geometry, signal phasing or any improvement to the proposed design can be tested in micro simulation.

A Paramics micro-simulation model was used to test the impact of land use predictions on known infrastructure up to 2026. The future years of 2016, 2018, 2021 and 2026 morning and afternoon peak were tested. The simulation observations shows the proposed road networks were performing satisfactory up to

2026. However, widening will required at the following locations after 2026 to increase the intersection capacity:

- Don Buck Road south approach of the Don Buck Road / Fred Taylor Drive intersection
- Hobsonville Road / Trig Road intersection

9 Next Steps

So far, based on the land use projections provided by Auckland Council and the developers, the simulation modelling exercise only analysed the medium term forecast year up to 2026. For 2041 forecast year, the current extent of the simulation network may not be big enough to cover the traffic effects in Trig Road, Whenuapai and Scotts point areas.

NZTA will undertake medium – long term modelling using the Saturn model to assess effects from wider regional development further along SH16 and SH18.

Appendix 1 – Land Use

2016 Development Projection for NorSGA

Development Zone	Industrial/ Business	Trade/Yard Retail	Large Format Retail	Town Centre Retail/ Hospitality	General Retail	Office	Community Facilities	Education	Apartments	Stand alone Dwellings
	M2	M2	M2	M2	M2	M2	M2	M2	Units	Units
PC 13 Hobsonville Point										
Buckley A					1000			2500	110	550
Buckley B										
Hudson				200					100	300
Sunderland				1500	2000	4500	1000		200	500
Landing				1000	1000	3500	2000			
Village										
Catalina										
MIP	17000									
PC13 Total	**17000**	**0**	**0**	**2700**	**4000**	**8000**	**3000**	**2500**	**410**	**1350**
PC 14 Hobsonville Corridor										
Group A	15000					8000				
Group B			1500			300				
Group D				300		300			50	10
Group E	4000					1500				
Group F	26000					12000				
Group V			4000	800	600	800			10	
PC14 Total	45000	0	5500	1100	600	22900	0	0	60	10
PC15 Massey North										
Precinct A				90000		14000	5500		100	
Precinct B			60000							
Precinct C			30000		10000					
Precinct D										
MNSEA	50000	60000								
PC15 Total	50000	60000	90000	90000	10000	14000	5500	0	100	0

2018 Estimated Development Projection for NorSGA

Development Zone	Industrial/ Business	Trade/Yard Retail	Supermarket	Town Centre Retail/ Hospitality	General Retail LFR	Office	Community Facilities	Education	Apartments	Stand alone Dwellings
	M2	M2	M2	M2	M2	M2	M2	M2	Units	Units
PC 13 Hobsonville Point										
Buckley A	0	0	0	0	1000	0	0	2500	110	550
Buckley B	0	0	0	0	67	0	0	833	27	113
Hudson	0	0	0	200	0	0	0	0	100	300
Sunderland	0	0	0	1500	2000	4500	1000	0	200	500
Landing	0	0	0	1000	1000	3500	2000	0	0	0
Village	0	0	0	167	333	167	0	0	33	100
Catalina	0	0	0	67	0	0	0	0	17	117
MIP	25333	0	0	0	0	0	0	0	0	0
PC13 Total	**25333**	**0**	**0**	**2933**	**4400**	**8167**	**3000**	**3333**	**487**	**1680**
PC 14 Hobsonville Corridor										
Group A	20000	0	0	0	0	9333	0	0	0	0
Group B	0	0	1680	0	0	380	0	0	0	0
Group D	0	0	0	567	0	567	0	0	77	10
Group E	4333	0	0	0	0	1700	0	0	0	0
Group F	35333	0	0	0	0	14000	0	0	0	0
Group V	0	0	4000	800	1200	1533	0	0	10	0
PC14 Total	**59667**	**0**	**5680**	**1367**	**1200**	**27513**	**0**	**0**	**87**	**10**
PC15 Massey North	0	0	0	0	0	0	0	0	0	0
Precinct A	0	0	0	90000	0	18000	5500	0	113	0
Precinct B	0	0	4500	0	55500	0	0	0	0	0
Precinct C	0	0	5500	0	37833	0	0	0	40	0
Precinct D	0	0	0	0	3333	0	0	0	113	0
MNSEA	70000	60000	0	0	0	0	0	0	0	0
PC15 Total	**70000**	**60000**	**10000**	**90000**	**96667**	**18000**	**5500**	**0**	**267**	**0**

2021 Estimated Development Projection for NorSGA

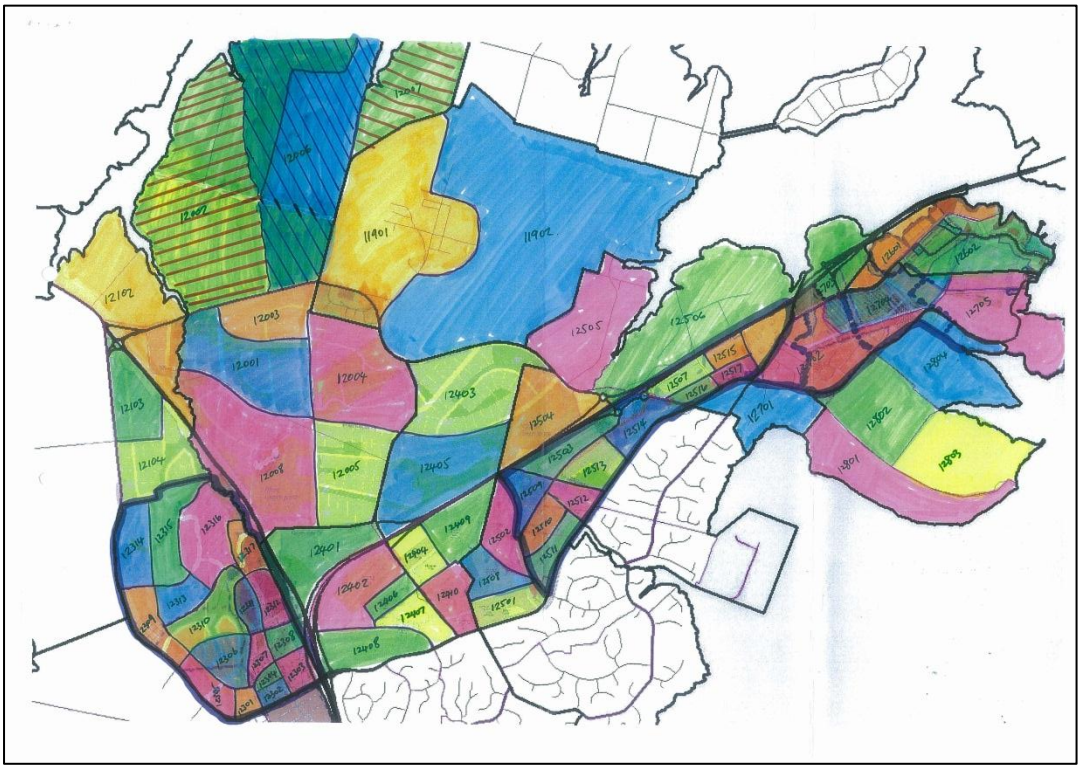
Development Zone	Industrial/ Business	Trade/Yard Retail	Supermarket	Town Centre Retail/ Hospitality	General Retail LFR	Office	Community Facilities	Education	Apartments	Stand alone Dwellings
			M2	M2						Units
		M2			M2		M2			
	M2					M2		M2	Units	
PC 13 Hobsonville Point										
Buckley A	0	0	0	0	1000	0	0	2500	110	550
Buckley B	0	0	0	0	133	0	0	1667	53	227
Hudson	0	0	0	200	0	0	0	0	100	300
Sunderland	0	0	0	1500	2000	4500	1000	0	200	500
Landing	0	0	0	1000	1000	3500	2000	0	0	0
Village	0	0	0	333	667	333	0	0	67	200
Catalina	0	0	0	133	0	0	0	0	33	233
MIP	33667	0	0	0	0	0	0	0	0	0
PC13 Total	**33667**	**0**	**0**	**3167**	**4800**	**8333**	**3000**	**4167**	**563**	**2010**
PC 14 Hobsonville Corridor										
Group A	25000	0	0	0	0	10667	0	0	0	0
Group B	0	0	1860	0	0	460	0	0	0	0
Group D	0	0	0	833	0	833	0	0	103	10
Group E	4667	0	0	0	0	1900	0	0	0	0
Group F	44667	0	0	0	0	16000	0	0	0	0
Group V	0	0	4000	800	1800	2267	0	0	10	0
PC14 Total	**74333**	**0**	**5860**	**1633**	**1800**	**32127**	**0**	**0**	**113**	**10**
PC15 Massey North	0	0	0	0	0	0	0	0	0	0
Precinct A	0	0	0	90000	0	22000	5500	0	127	0
Precinct B	0	0	4500	0	55500	0	0	0	0	0
Precinct C	0	0	5500	0	41167	0	0	0	80	0
Precinct D	0	0	0	0	6667	0	0	0	227	0
MNSEA	90000	60000	0	0	0	0	0	0	0	0
PC15 Total	**90000**	**60000**	**10000**	**90000**	**103333**	**22000**	**5500**	**0**	**433**	**0**

2026 Development Projection for NorSGA

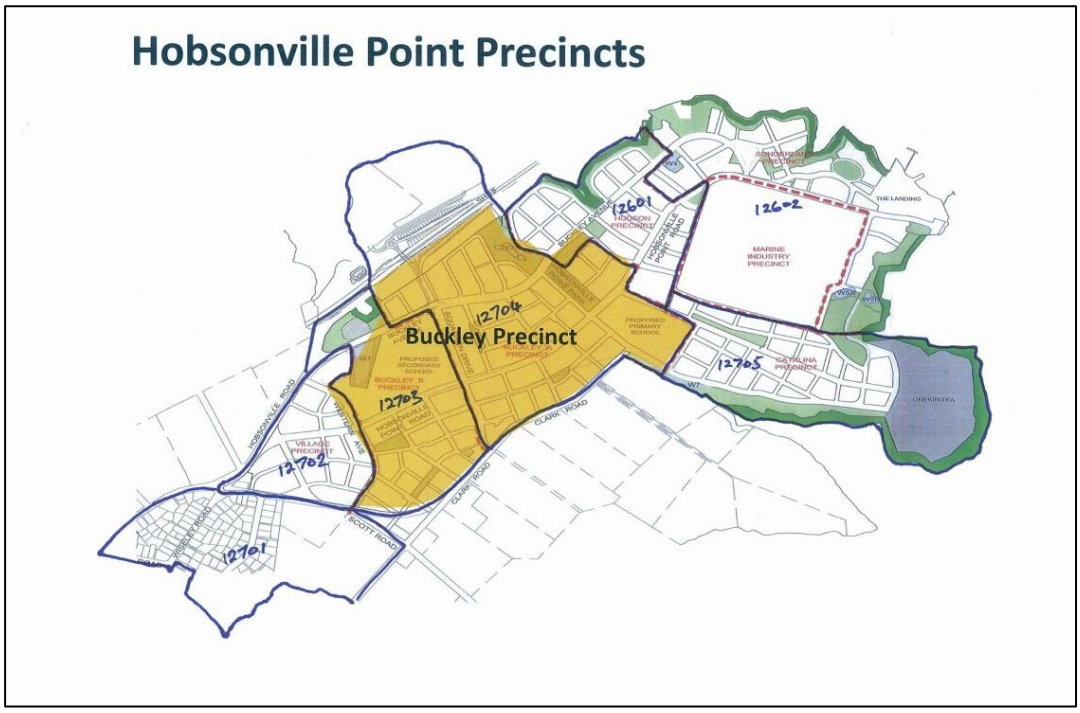
Development Zone	Industrial/ Business	Trade/Yard Retail	Super market	Town Centre Retail/	General Retail LFR	Office	Community Facilities	Education	Apartments	Stand alone Dwellings
	M2	M2	M2	M2	M2	M2	M2	M2	Units	Units
PC 13 Hobsonville Point										
Buckley A					1000			2500	110	550
Buckley B					200			2500	80	340
Hudson				200					100	300
Sunderland				1500	2000	4500	1000		200	500
Landing				1000	1000	3500	2000			
Village				500	1000	500			100	300
Catalina				200					50	350
MIP	42000									
PC13 Total	**42000**	**0**	**0**	**3400**	**5200**	**8500**	**3000**	**5000**	**640**	**2340**
PC 14 Hobsonville Corridor										
Group A	30000					12000				
Group B			2040			540				
Group D				1100		1100			130	10
Group E	5000					2100				
Group F	54000					18000				
Group V			4000	800	2400	3000			10	
PC14 Total	89000	0	6040	1900	2400	36740	0	0	140	10
PC15 Massey North										
Precinct A				90000		26000	5500		140	
Precinct B			4500		55500					
Precinct C			5500		44500				120	
Precinct D					10000				340	
MNSEA	110000	60000								
PC15 Total	110000	60000	10000	90000	110000	26000	5500	0	600	0

Appendix 2 – NORSGA EMME Zones

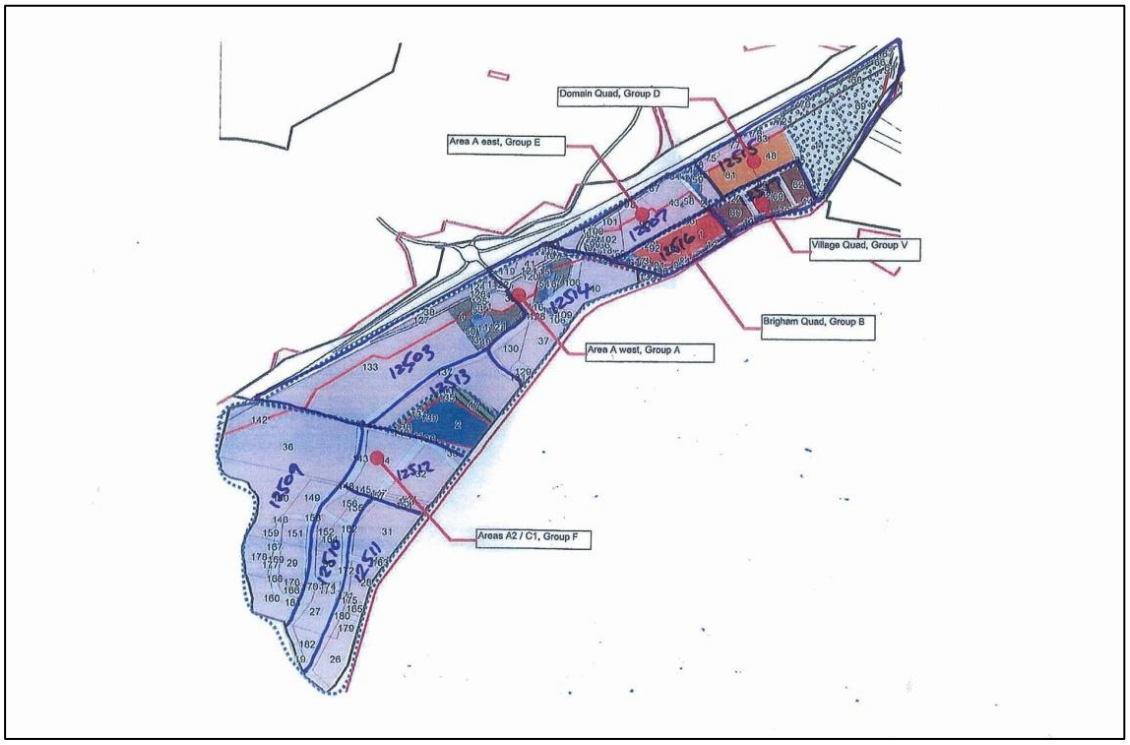
NorSGA Zones



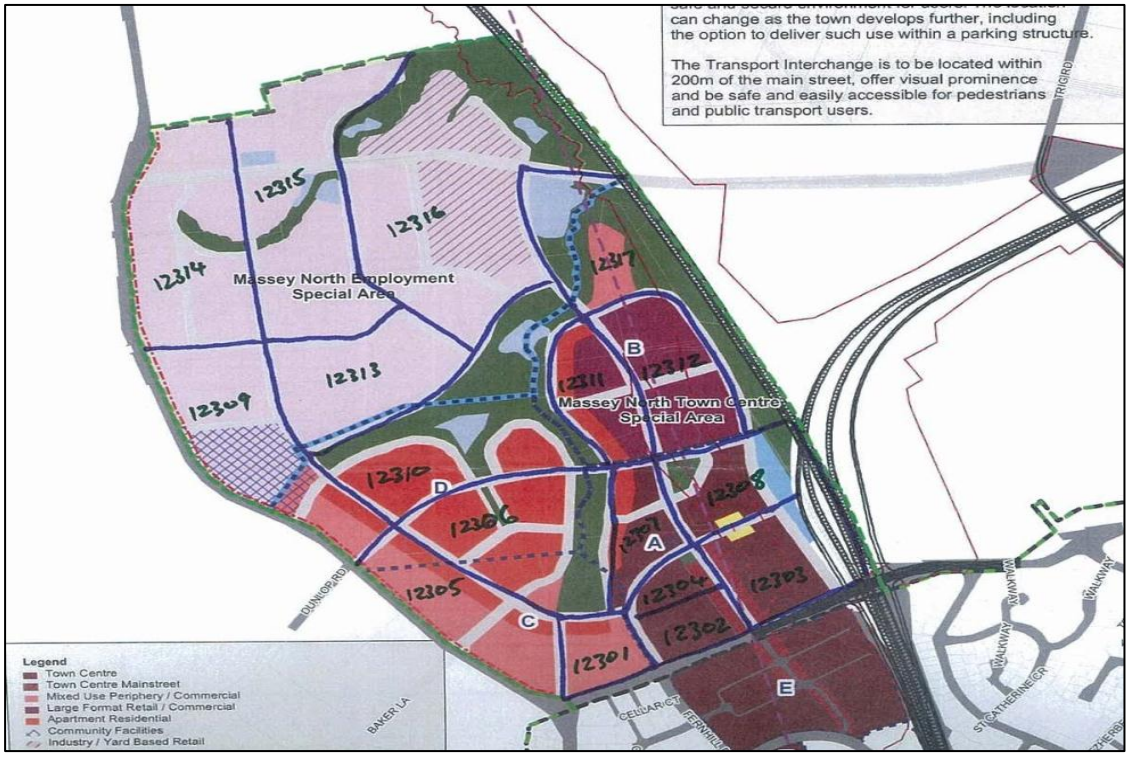
Plan Change 13



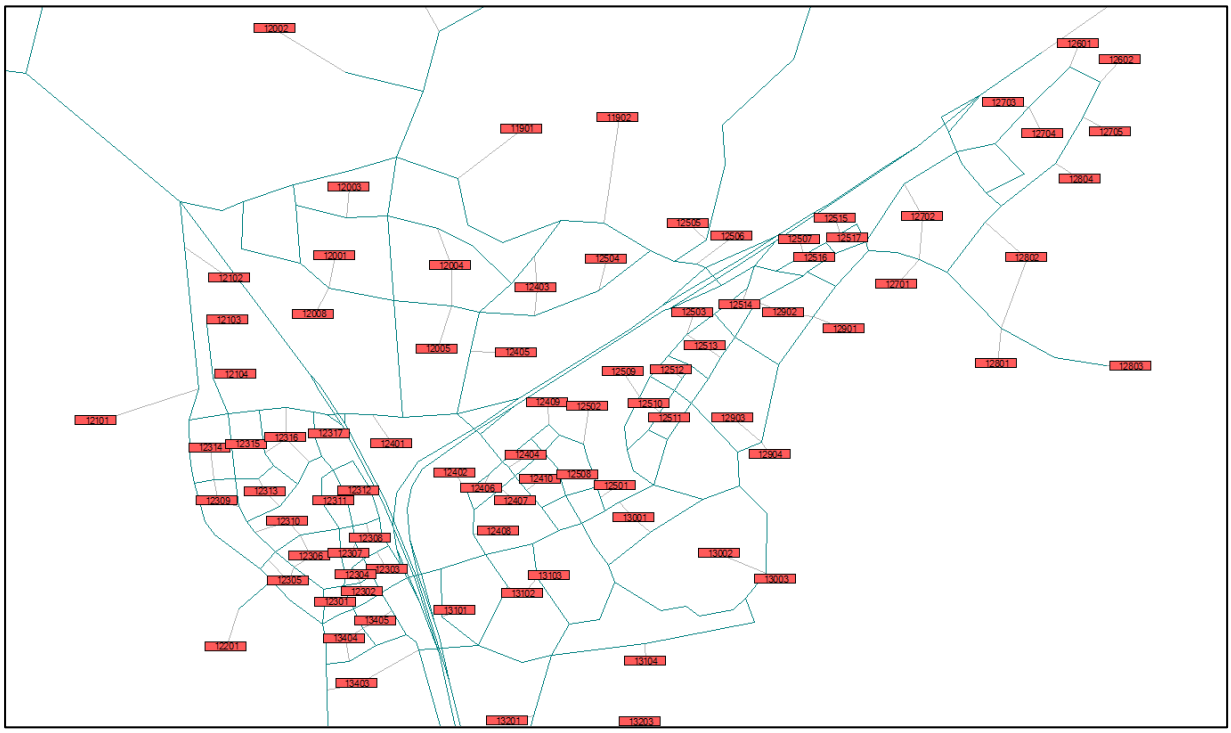
Plan Change 14



Plan Change 15



Appendix 3 –EMME Zones and Network

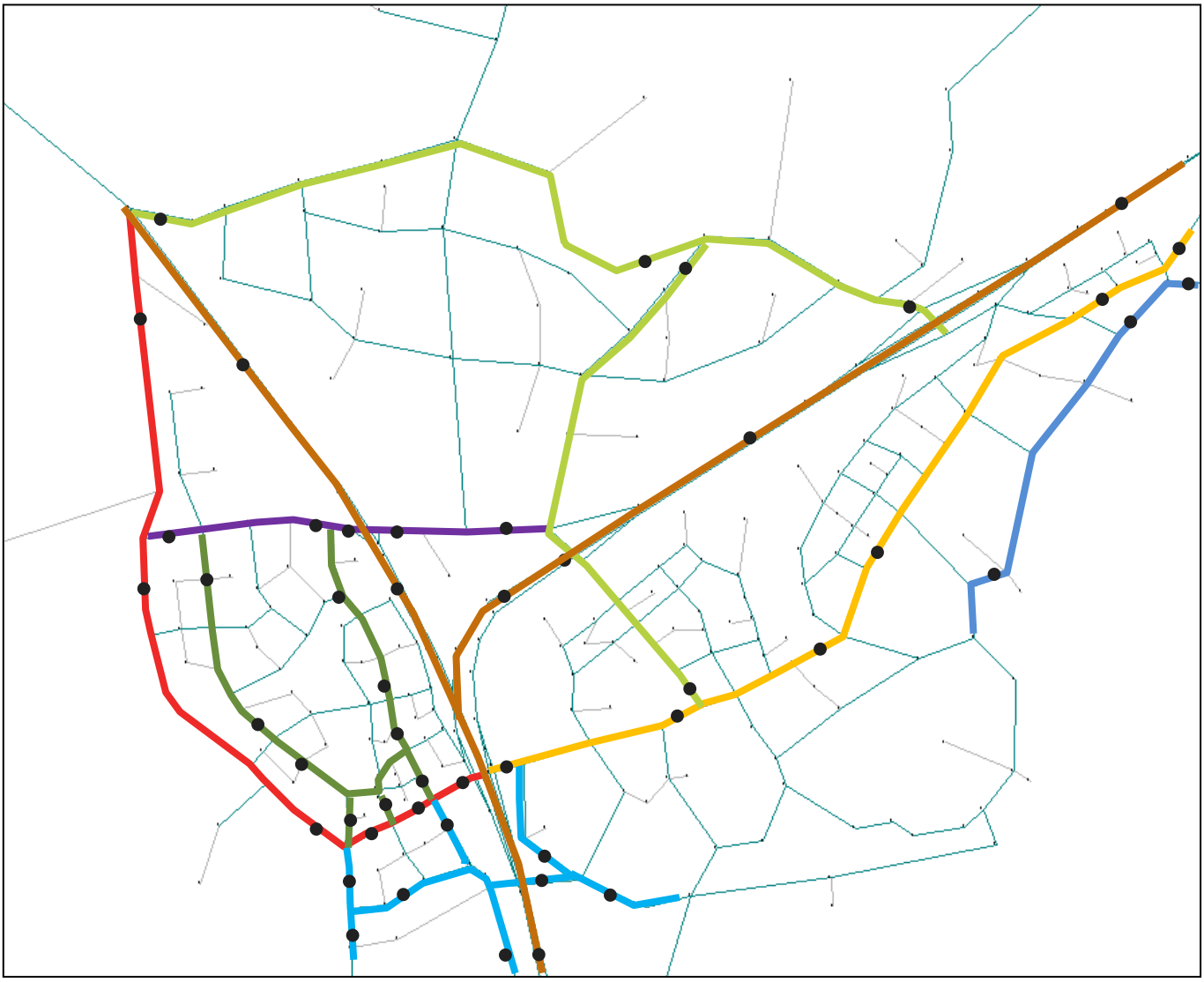


Appendix 4 – Trip Generations

	2016 Total Trip Generations (veh/2 hour)						2018 Total Trip Generations (veh/2 hour)						2021 Total Trip Generations (veh/2 hour)						2026 Total Trip Generations (veh/2 hour)						2041 Total Trip Generations (veh/2 hour)					
	AM PEAK		MD PEAK		PM PEAK		AM PEAK		MD PEAK		PM PEAK		AM PEAK		MD PEAK		PM PEAK		AM PEAK		MD PEAK		PM PEAK		AM PEAK		MD PEAK		PM PEAK	
WCC Zone	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
12702	0	0	0	0	0	0	33	113	56	56	91	72	66	226	111	111	182	145	100	339	167	167	273	217	110	373	183	183	300	239
12703	0	0	0	0	0	0	126	182	106	94	85	61	253	364	213	188	169	121	379	546	319	281	254	182	417	600	351	309	280	200
12704	432	765	420	382	423	309	432	765	420	382	423	309	432	765	420	382	423	309	432	765	420	382	423	309	475	842	462	420	466	340
12705	0	0	0	0	0	0	24	118	49	49	84	61	49	235	98	98	169	122	73	353	147	147	253	182	81	388	161	161	279	201
12601	69	324	137	137	234	168	69	324	137	137	234	168	69	324	137	137	234	168	69	324	137	137	234	168	75	357	151	151	258	185
12602	948	1000	703	703	896	1037	1147	1116	800	800	989	1183	1345	1233	897	897	1082	1329	1544	1349	994	994	1175	1474	1698	1484	1093	1093	1293	1622
PC13 Total	**1449**	**2089**	**1260**	**1222**	**1553**	**1514**	**1831**	**2618**	**1568**	**1518**	**1906**	**1854**	**2214**	**3147**	**1876**	**1813**	**2259**	**2194**	**2597**	**3676**	**2184**	**2108**	**2612**	**2532**	**2856**	**4044**	**2401**	**2317**	**2876**	**2787**
12503	267	110	107	107	97	203	339	144	138	138	125	256	410	178	169	169	154	310	481	212	200	200	183	363	529	233	220	220	201	400
12507	140	62	58	58	54	105	153	68	64	64	58	116	167	73	69	69	63	126	181	79	75	75	68	137	199	87	82	82	75	151
12509	341	145	139	139	127	258	439	194	183	183	167	332	538	242	226	226	208	405	636	291	270	270	248	479	700	320	297	297	273	527
12510	185	79	75	75	69	140	239	105	99	99	91	180	292	132	123	123	113	220	345	158	146	146	135	260	380	174	161	161	148	286
12511	214	91	87	87	80	162	276	122	115	115	105	209	338	152	142	142	131	255	400	183	169	169	156	301	440	201	186	186	172	331
12512	234	99	95	95	87	177	301	133	125	125	115	228	369	166	155	155	142	278	436	199	185	185	170	329	480	219	203	203	187	361
12513	154	63	62	62	56	117	196	83	80	80	72	148	237	103	98	98	89	179	278	122	115	115	106	210	306	134	127	127	116	231
12514	172	71	69	69	62	131	218	93	89	89	81	165	264	114	109	109	99	200	310	136	129	129	118	234	341	150	142	142	130	258
12515	19	32	22	22	32	31	32	45	34	34	50	51	45	58	47	47	67	71	58	71	60	60	85	91	64	78	66	66	93	101
12516	49	30	113	113	153	158	56	34	127	127	171	178	63	38	141	141	190	198	70	41	155	155	208	218	77	46	171	171	229	240
12517	147	96	332	332	451	465	177	105	350	350	471	499	206	115	367	367	491	533	236	125	385	385	511	566	260	137	423	423	562	623
PC14 Total	**1922**	**878**	**1159**	**1159**	**1268**	**1947**	**2426**	**1126**	**1404**	**1404**	**1506**	**2362**	**2929**	**1371**	**1646**	**1646**	**1747**	**2775**	**3431**	**1617**	**1889**	**1889**	**1988**	**3188**	**3776**	**1779**	**2078**	**2078**	**2186**	**3509**
12301	328	264	591	591	802	823	354	292	631	631	857	877	380	320	671	671	911	931	406	349	711	711	965	985	447	383	782	782	1062	1084
12302	225	131	302	302	441	491	241	134	307	307	445	504	258	137	312	312	449	518	275	140	316	316	453	531	302	154	348	348	498	585
12303	449	262	604	604	882	982	483	268	613	613	890	1009	516	275	623	623	898	1036	550	281	633	633	905	1063	605	309	696	696	996	1169
12304	160	94	216	216	315	351	172	96	219	219	318	360	184	98	223	223	321	370	196	100	226	226	323	380	216	110	249	249	356	418
12305	209	168	376	376	510	523	228	190	406	406	551	564	247	212	436	436	592	604	266	234	465	465	632	644	293	257	512	512	696	708
12306	60	48	108	108	146	150	89	89	153	153	210	210	118	130	199	199	273	271	180	218	297	297	409	399	198	240	327	327	450	439
12307	353	206	474	474	693	771	379	211	482	482	699	793	406	216	490	490	705	814	432	221	497	497	711	835	475	243	547	547	783	919
12308	417	243	561	561	819	911	448	249	570	570	826	937	479	255	579	579	834	962	510	261	587	587	841	987	561	287	646	646	925	1086
12309	377	252	256	256	243	313	461	309	306	306	296	385	545	366	356	356	350	458	630	422	407	407	404	531	692	464	447	447	444	584
12310	0	0	0	0	0	0	19	28	30	30	42	39	38	55	60	60	84	79	24	36	39	39	54	51	27	39	43	43	59	56
12311	354	289	591	591	802	827	354	289	591	591	802	827	354	289	591	591	802	827	354	289	591	591	802	827	390	318	651	651	882	910
12312	405	330	676	676	917	945	405	330	676	676	917	945	405	330	676	676	917	945	405	330	676	676	917	945	445	363	743	743	1008	1040
12313	377	252	256	256	243	313	453	297	293	293	278	369	529	342	331	331	314	424	605	387	368	368	350	480	666	425	405	405	385	528
12314	424	284	288	288	273	352	509	334	330	330	313	415	595	384	372	372	353	478	681	435	414	414	394	541	749	478	455	455	433	595
12315	471	315	320	320	303	391	566	371	367	367	348	461	661	427	413	413	393	531	756	483	460	460	437	601	832	531	506	506	481	661
12316	706	473	480	480	455	586	849	557	550	550	522	691	992	641	620	620	589	796	1135	725	690	690	656	901	1248	797	759	759	722	991
12317	84	69	141	141	191	197	84	69	141	141	191	197	84	69	141	141	191	197	84	69	141	141	191	197	93	76	155	155	210	217
PC15 Total	**5399**	**3680**	**6240**	**6240**	**8035**	**8926**	**6094**	**4113**	**6665**	**6665**	**8505**	**9583**	**6791**	**4546**	**7093**	**7093**	**8976**	**10241**	**7489**	**4980**	**7518**	**7518**	**9444**	**10898**	**8239**	**5474**	**8271**	**8271**	**10390**	**11990**
11901	139	176	149	140	183	166	139	176	149	140	183	166	139	176	149	140	183	166	139	176	149	140	183	166	626	570	844	804	516	679
11902	303	108	225	206	140	373	303	108	225	206	140	373	303	108	225	206	140	373	303	108	225	206	140	373	768	503	935	886	488	846
12001	56	15	59	59	33	81	56	15	59	59	33	81	56	15	59	59	33	81	56	15	59	59	33	81	1212	909	1535	1479	743	1085
12002	0	5	1	0	2	1	0	5	1	0	2	1	0	5	1	0	2	1	0	5	1	0	2	1	973	732	1237	1191	599	871
12003	40	17	45	44	31	61	40	17	45	44	31	61	40	17	45	44	31	61	40	17	45	44	31	61	621	486	795	766	400	560
12004	0	5	2	1	4	2	0	5	2	1	4	2	0	5	2	1	4	2	0	5	2	1	4	2	897	687	1140	1100	564	806
12005	1	7	4	2	6	4	1	7	4	2	6	4	1	7	4	2	6	4	1	7	4	2	6	4	960	736	1223	1179	605	866
12006	2	13	2	1	5	6	2	13	2	1	5	6	2	13	2	1	5	6	2	13	2	1	5	6	887	687	1129	1083	557	798
12007	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	1111	840	1403	1354	687	996
12008	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	436	347	555	536	284	390
12101	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	331	194	330	318	170	328
12102	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65	42	65	63	37	64
12103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	225	134	225	217	117	223
12104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	208	124	208	200	108	206
12401	0	0	1	1	1	1	0	0	1	1	1	1	0	0	1	1	1	1	0	0	1	1	1	1	445	280	462	440	252	453
12402	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	81	172	187	190	146	76
12403	0	0	1	1	1	1	0	0	1	1	1	1	0	0	1	1	1	1	0	0	1	1	1	1	1070	668	1105	1052	600	1090
12404	26	0	8	3	4	8	26	0	8	3	4	8	26	0	8	3	4	8	26	0	8	3	4	8	97	112	144	138	109	86
12405	0	0	2	1	1	1	0	0	2	1	1	1	0	0	2	1	1	1	0	0	2	1	1	1	627	393	650	618	354	638
12406	1	2	6	2	10	3	1	2	6	2	10	3	1	2	6	2	10	3	1	2	6	2	10	3	33	70	84	81	69	33
12407	1	3	10	3	18	5	1	3	10	3	18	5	1	3	10	3	18	5	1	3	10	3	18	5	11	26	37	30	38	15
12408	1	2	5	2	8	2	1	2	5	2	8	2	1	2	5	2	8	2	1	2	5	2	8	2	29	61	73	71	60	29
12409	1	1	4	2	6	3	1	1	4	2	6	3	1	1	4	2	6	3	1	1	4	2	6	3	44	118	128	130	106	42
12410	2	2	14	1	28	3	2	2	14	1	28	3	2	2	14	1	28	3	2	2	14	1	28	3	40	100	133	110	119	33
12501	1	2	11	1	7	3	1	2	11	1	7	3	1	2	11	1	7	3	1	2	11	1	7	3	92	104	164	137	106	103
12502	54	17	55	39	29	64	54	17	55	39	29	64	54	17	55	39	29	64	54	17	55	39	29	64	296	230	382	352	229	334
12508	1	2	6	0	7	4	1	2	6	0	7	4	1	2	6	0	7	4	1	2	6	0	7	4	48	116	145	129	115	61
12504	1	3	8	3	14	4	1	3	8	3	14	4	1	3	8	3	14	4	1	3	8	3	14	4	105	58	119	108	73	124
12505	64	102	83	77	97	84	64	102	83	77	97	84	64	102	83	77	97	84	64	102	83	77	97	84	322	373	517	511	372	374
12506	115	67	112	93	76	140	115	67	112	93	76	140	115	67	112	93	76	140	115	67	112	93	76	140	523	354	611	572	354	593
Trig & Whenuapai Total	**809**	**554**	**814**	**683**	**712**	**1021**	**809**	**554**	**814**	**683**	**712**	**1021**	**809**	**554**	**814**	**683**	**712**	**1021**	**809**	**554**	**814**	**683**	**712**	**1021**	**13183**	**10226**	**16565**	**15845**	**8977**	**12802**
12801	13	81	10	16	51	19	13	81	10	16	51	19	13	81	10	16	51	19	13	81	10	16	51	19	91	267	130	147	264	129
12802	34	71	11	23	49	42	34	71	11	23	49	42	34	71	11	23	49	42	34	71	11	23	49	42	111	258	123	146	263	151
12803	11	26	8	10	21	14	11	26	8	10	21	14	11	26	8	10	21	14	11	26	8	10	21	14	90	217	130	141	236	124
12804	25	77	9	21	48	29	25	77	9	21	48	29	25	77	9	21	48	29	25	77	9	21	48	29	102	265	125	151	262	139
Scotts Point Total	**83**	**255**	**38**	**70**	**169**	**104**	**83**	**255**	**38**	**70**	**169**	**104**	**83**	**255**	**38**	**70**	**169**	**104**	**83**	**255**	**38**	**70**	**169**	**104**	**394**	**1007**	**508**	**585**	**1025**	**543**

Appendix 5 – Traffic Volumes

Routes and Location



Traffic Volumes

Route	Road	Location	2016 Daily (veh/day)	2026 Daily (veh/day)	2041 Daily (veh/day)
Fred Taylor Route	Fred Taylor	Fred Taylor,Wst of Toru	29,678	32,187	45,928
	Fred Taylor	Fred Taylor,Wst of Tahi	18,905	18,694	27,101
	Fred Taylor	Fred Taylor,Est of Don Buck	3,308	3,906	20,443
	Fred Taylor	Fred Taylor,Nth of Don Buck	2,852	4,627	17,357
	Fred Taylor	Fred Taylor,Sth of Northside	1,116	2,722	9,650
	Fred Taylor	Fred Taylor,Nth of Northside	7,025	10,714	24,686
Massey North TC	Don Buck Ext	Don Buck Ext,Sth of Northside	7,228	12,439	11,403
	Don Buck Ext	Don Buck Ext,Nth of Rima	13,905	18,475	26,602
	Don Buck Ext	Don Buck Ext,Sth of Rima	12,271	16,866	23,146
	Don Buck Ext	Don Buck Ext,Nth of Fred Taylor	10,531	13,938	14,838
	Waru West	Waru West,Est of Don Buck Ext	11,154	12,861	18,461
	Tahi	Tahi,Sth of Northside	5,635	5,985	14,694
	Tahi	Tahi,Nth of Rima	4,388	4,560	8,901
	Tahi	Tahi,Sth of Rima	2,973	3,251	4,199
	Tahi	Tahi,Nth of Fred Taylor	8,795	9,306	17,357
	Rua	Rua,Nth of Fred Taylor	14,955	17,133	19,724
Northside Drive	Northside	Northside,Est of Fred Taylor	5,905	7,992	15,095
	Northside	Northside,Wst of Tahi	6,216	12,258	14,145
	Northside	Northside,Est of Tahi	10,427	16,624	26,542
	Northside	Northside,Est of SH16	10,427	16,624	26,542
Massey South Route	Don Buck	Don Buck,Sth of Fred Taylor	13,182	16,132	21,567
	Don Buck	Don Buck,Sth of Westgate Dr	22,798	26,418	32,027
	Westgate Dr	Westgate Dr,Est of Don Buck	10,578	11,969	10,856
	Westgate TC	Westgate TC,Nth of Westgate Dr	5,882	8,005	9,274
	Oreil Ave	Oreil Ave,Sth of Hobsonville	3,536	4,471	10,378
	West Harbour Dr	West Harbour Dr,Est of Fitzherbert	3,494	4,423	7,935
Hobsonville Route	Hobsonville	Hobsonville ,Est of SH16	12,772	20,313	42,050
	Hobsonville	Hobsonville ,Wst of Fitzherbert	12,547	17,118	24,095
	Hobsonville	Hobsonville ,Est of Luckens	5,609	12,467	21,433
	Hobsonville	Hobsonville ,Wst of Marina View	164	845	9,001
	Hobsonville	Hobsonville ,Est of Williams Rd	11,771	15,128	15,417
	Hobsonville	Hobsonville ,Est of Ockleston	15,248	18,855	19,265
	Wiseley	Wiseley,Est of Marina View	9,304	13,565	23,120
	Wiseley	Wiseley,Est of Williams Rd	10,768	12,891	23,762
	Clark Rd	Clark Rd,Wst of Bannings	8,176	10,015	20,770
Brigham & Trig	Trig	Trig,Nth of Hobsonville	9,701	10,889	10,105
	Trig	Trig,Sth of SH18	11,419	12,738	20,801
	Trig	Trig,Sth of SH18 onramp	12,167	17,536	28,426
	Trig	Trig,Sth of Brigham Creek	963	1,119	18,367
	Brigham Creek	Brigham Creek,Sth of SH16	13,679	15,502	42,662
	Brigham Creek	Brigham Creek,Nth of Trig	10,558	9,871	27,108
	Brigham Creek	Brigham Creek,Sth of Kauri Rd	18,276	17,823	47,834
SH16 & SH18	SH16	SH16,Sth of Oreil Bridge	91,965	98,496	131,427
	SH16	SH16,Sth of Northside	22,499	25,017	49,805
	SH16	SH16,Sth of Brigham Creek RAB	22,499	25,017	49,805
	SH18	SH18,Wst of Trig	57,695	63,939	73,445
	SH18	SH18,Est of Trig	70,392	81,648	105,811
	SH18	SH18,Est of Brigham Creek	56,396	64,772	64,807
Ramps	Hobsonville	Hobsonville,Sth off	13,940	15,285	16,375
	Hobsonville	Hobsonville,Sth on	11,718	11,522	15,631
	Hobsonville	Hobsonville,Nth on	19,452	20,657	21,373
	Hobsonville	Hobsonville,Nth off	7,092	9,328	13,320
	Trig	Trig,Est on	6,364	8,575	20,192
	Trig	Trig,Est off	6,333	9,135	12,176
	Brigham Creek	Brigham Creek,Wst off	13,004	15,366	25,207
	Brigham Creek	Brigham Creek,Wst on	13,035	13,945	19,956
	Brigham Creek	Brigham Creek,Est on	6,149	6,934	582
	Brigham Creek	Brigham Creek,Est off	5,900	5,495	3,569

Appendix 6 – Micro-Simulation Cordon

Appendix 7 – PC15 Road Names

Appendix 8 – Paramics Model Parameters

Parameter	Value
Nodes	608
Links	1372
Zones	62
Seed	0
Start time	AM Peak 07:00:00; PM Peak 16:00:00
Simulation time	02:00:00
Demand weight	100.0
Time step detail	2
Cost coefficient	1.000, 0.400, 0.000
Feedback	00:01:00
Feedback coefficient	0.500
Perturbation	Enabled
Algorithm	Enabled
Signal movement start delay	1.0 seconds
Signal red to green time	0.0 seconds lights red plus amber
Signal movement stop delay	2.0 seconds
Signals green to red time	4.0 seconds lights amber
Mean headway	0.8
Mean reaction time	1.00
Network minimum gap	2.00
Overtake level	20
NZ left turn	enabled

Appendix 9 – Level of Service Tables

2016 Morning Peak

Intersection	Approach	Mvt	Morning Peak Hour (0745-0845)								
			Movement			Approach			Intersection		
			Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS
Don Buck / Hobsonville	Don Buck Ext N	Left	43	34	C	179	42	D	1676	40	D
		Thru	128	44	D						
		Right	8	42	D						
	Hobsonville E	Left	139	12	B	272	29	C			
		Thru	79	40	D						
		Right	54	56	E						
	Don Buck S	Left	273	42	D	1066	43	D			
		Thru	390	50	D						
		Right	403	37	D						
	SH16 W	Left	1	0	A	160	42	D			
		Thru	39	47	D						
		Right	119	40	D						
Hobsonville / Rua	Rua N	Left	602	11	B	646	14	B	1733	28	C
		Thru	24	51	D						
		Right	20	49	D						
	Hobsonville Road E	Left	27	9	A	465	21	C			
		Thru	231	8	A						
		Right	208	37	D						
	Fernhill S	Left	9	31	C	150	45	D			
		Thru	53	44	D						
		Right	88	47	D						
	Hobsonville Road W	Left	44	44	D	472	49	D			
		Thru	415	51	D						
		Right	13	25	C						
Tahi / Hobsonville	Tahi N	Left	6	22	C	7	21	C	1628	18	B
		Thru	2	15	B						
	Hobsonville E	Left	133	2	A	552	13	B			
		Thru	418	17	B						
		Right	1	0	A						
	Westgate S	Left	55	27	C	58	27	C			
		Thru	2	29	C						
	Hobsonville W	Left	0	0	A	1011	20	C			
		Thru	1011	20	B						
SH16 E Interchange	SH16 E	Thru	312	3	A	602	4	A	2376	32	C
		Right	290	6	A						
	SH16 off S	Thru	349	35	C	736	27	C			
		Right	147	30	C						
		Left	240	13	B						
	SH16 W	Thru	542	64	E	1037	51	D			
		Left	496	37	D						
SH16 W Interchange	SH16 off N	Left	23	3	A	325	26	C	1568	25	C
		Right	301	28	C						
	SH16 E	Left	257	54	D	554	55	E			
		Thru	297	56	E						
	SH16 W	Thru	269	1	A	689	1	A			
		Right	420	2	A						
Fred Taylor / Northside	Fred Taylor N	Left	151	17	B	218	17	B	378	22	C
		Thru	67	16	B						
	Northside E	Left	1	19	B	45	40	D			
		Right	44	40	D						
	Fred Taylor S	Thru	82	9	A	114	25	C			
		Right	32	64	E						
Northside / Don Buck Ext	Northside E	Left	60	5	A	165	6	A	445	5	A
		Thru	105	6	A						
	Don Buck Ext S	Left	83	5	A	148	6	A			
		Right	66	7	A						
	Northside W	Thru	81	5	A	132	5	A			
		Right	51	4	A						
Northside / Tahi	Northside E	Left	124	1	A	281	9	A	800	10	B
		Thru	157	15	B						
	Northside W	Thru	139	15	B	228	15	B			
		Right	89	15	B						
	Tahi S	Left	100	9	A	290	8	A			
		Right	190	8	A						
Hobsonville / Trig	Trig N	Left	64	23	C	211	33	C	1236	58	E
		Thru	106	40	D						
		Right	41	33	C						
	Hobsonville E	Left	32	16	B	322	34	C			
		Thru	175	35	D						
		Right	115	36	D						
	Luckens S	Left	49	112	F	288	117	F			
		Thru	190	123	F						
		Right	48	99	F						
	Hobsonville W	Left	216	44	D	416	48	D			
		Thru	179	55	D						
		Right	21	34	C						

2016 Afternoon Peak

Intersection	Approach	Mvt	Afternoon Peak Hour (1645-1745)								
			Movement			Approach			Intersection		
			Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS
Don Buck / Hobsonville	Don Buck Ext N	Left	61	36	D	723	41	D	2627	50	D
		Thru	660	42	D						
		Right	2	14	B						
	Hobsonville E	Left	439	43	D	741	55	E			
		Thru	139	58	E						
		Right	163	85	F						
	Don Buck S	Left	224	51	D	722	58	E			
		Thru	287	69	E						
		Right	212	50	D						
	SH16 W	Left	19	31	C	440	45	D			
		Thru	60	48	D						
		Right	362	45	D						
Hobsonville / Rua	Rua N	Left	1021	14	B	1170	21	C	2785	30	C
		Thru	77	64	E						
		Right	71	73	E						
	Hobsonville Road E	Left	36	14	B	1024	34	C			
		Thru	617	15	B						
		Right	370	67	E						
	Fernhill S	Left	13	38	D	251	44	D			
		Thru	124	47	D						
		Right	114	42	D						
	Hobsonville Road W	Left	42	39	D	341	41	D			
		Thru	283	41	D						
		Right	15	48	D						
Tahi / Hobsonville	Tahi N	Left	11	35	D	17	30	C	2512	21	C
		Thru	6	20	C						
	Hobsonville E	Left	169	2	A	1031	15	B			
		Thru	860	17	B						
		Right	2	51	D						
	Westgate S	Left	162	29	C	165	29	C			
		Thru	3	19	B						
	Hobsonville W	Left	3	25	C	1299	24	C			
		Thru	1296	24	C						
SH16 E Interchange	SH16 E	Thru	731	7	A	1055	10	B	3540	46	D
		Right	324	18	B						
	SH16 off S	Thru	478	53	D	1179	45	D			
		Right	416	52	D						
		Left	284	19	B						
	SH16 W	Thru	981	83	F	1305	75	E			
		Left	324	51	D						
SH16 W Interchange	SH16 off N	Left	102	17	B	896	33	C	2707	19	B
		Right	794	35	C						
	SH16 E	Left	129	51	D	396	52	D			
		Thru	267	53	D						
	SH16 W	Thru	756	1	A	1416	2	A			
		Right	660	3	A						
Fred Taylor / Northside	Fred Taylor N	Left	135	16	B	230	16	B	465	24	C
		Thru	94	16	B						
	Northside E	Left	2	48	D	116	45	D			
		Right	114	45	D						
	Fred Taylor S	Thru	95	6	A	120	17	B			
		Right	25	61	E						
Northside / Don Buck Ext	Northside E	Left	52	6	A	193	5	A	439	5	A
		Thru	141	5	A						
	Don Buck Ext S	Left	64	4	A	121	7	A			
		Right	58	9	A						
	Northside W	Thru	65	4	A	124	4	A			
		Right	59	4	A						
Northside / Tahi	Northside E	Left	208	1	A	326	6	A	1079	9	A
		Thru	117	13	B						
	Northside W	Thru	153	14	B	241	14	B			
		Right	88	14	B						
	Tahi S	Left	125	10	A	512	9	A			
		Right	387	9	A						
Hobsonville / Trig	Trig N	Left	88	113	F	477	105	F	1455	58	E
		Thru	255	123	F						
		Right	135	67	E						
	Hobsonville E	Left	86	18	B	320	30	C			
		Thru	161	34	C						
		Right	72	32	C						
	Luckens S	Left	73	35	C	212	47	D			
		Thru	124	54	D						
		Right	15	45	D						
	Hobsonville W	Left	111	25	C	447	32	C			
		Thru	243	33	C						
		Right	94	39	D						

2018 Morning Peak

Intersection	Approach	Mvt	Morning Peak Hour (0745-0845)								
			Movement			Approach			Intersection		
			Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS
Don Buck / Hobsonville	Don Buck Ext N	Left	48	31	C	193	41	D	1726	42	D
		Thru	134	44	D						
		Right	11	38	D						
	Hobsonville E	Left	130	12	B	276	32	C			
		Thru	88	43	D						
		Right	59	58	E						
	Don Buck S	Left	316	42	D	1075	45	D			
		Thru	411	53	D						
		Right	348	40	D						
	SH16 W	Left	1	5	A	182	41	D			
		Thru	45	47	D						
		Right	136	40	D						
Hobsonville / Rua	Rua N	Left	632	12	B	673	14	B	1783	28	C
		Thru	25	50	D						
		Right	15	58	E						
	Hobsonville Road E	Left	28	11	B	501	22	C			
		Thru	239	7	A						
		Right	233	39	D						
	Fernhill S	Left	10	33	C	180	47	D			
		Thru	62	45	D						
		Right	108	49	D						
	Hobsonville Road W	Left	42	43	D	430	49	D			
		Thru	375	50	D						
		Right	13	31	C						
Tahi / Hobsonville	Tahi N	Left	5	22	C	7	25	C	1672	18	B
		Thru	2	33	C						
	Hobsonville E	Left	129	2	A	578	13	B			
		Thru	448	16	B						
		Right	0	0	A						
	Westgate S	Left	61	29	C	65	30	C			
		Thru	3	41	D						
	Hobsonville W	Left	2	16	B	1023	20	C			
		Thru	1021	20	C						
SH16 E Interchange	SH16 E	Thru	314	3	A	604	5	A	2463	35	D
		Right	290	7	A						
	SH16 off S	Thru	382	36	D	812	28	C			
		Right	165	31	C						
		Left	265	15	B						
	SH16 W	Thru	571	64	E	1047	57	E			
		Left	476	49	D						
SH16 W Interchange	SH16 off N	Left	22	4	A	320	25	C	1611	27	C
		Right	298	27	C						
	SH16 E	Left	252	55	E	555	62	E			
		Thru	303	67	E						
	SH16 W	Thru	291	1	A	736	2	A			
		Right	445	3	A						
Fred Taylor / Northside	Fred Taylor N	Left	164	19	B	241	18	B	411	23	C
		Thru	78	16	B						
	Northside E	Left	1	35	C	46	41	D			
		Right	45	41	D						
	Fred Taylor S	Thru	88	9	A	124	25	C			
		Right	36	64	E						
Northside / Don Buck Ext	Northside E	Left	73	5	A	192	6	A	510	6	A
		Thru	119	6	A						
	Don Buck Ext S	Left	97	4	A	176	6	A			
		Right	79	8	A						
	Northside W	Thru	90	5	A	141	4	A			
		Right	51	3	A						
Northside / Tahi	Northside E	Left	139	1	A	328	8	A	915	10	B
		Thru	189	14	B						
	Northside W	Thru	169	14	B	261	15	B			
		Right	92	17	B						
	Tahi S	Left	117	9	A	326	8	A			
		Right	210	8	A						
Hobsonville / Trig	Trig N	Left	85	26	C	235	34	C	1315	67	E
		Thru	113	42	D						
		Right	38	32	C						
	Hobsonville E	Left	39	17	B	346	32	C			
		Thru	183	34	C						
		Right	124	34	C						
	Luckens S	Left	53	124	F	305	129	F			
		Thru	198	134	F						
		Right	54	113	F						
	Hobsonville W	Left	206	63	E	428	68	E			
		Thru	205	74	E						
		Right	17	37	D						

2018 Afternoon Peak

Intersection	Approach	Mvt	Afternoon Peak Hour (1645-1745)								
			Movement			Approach			Intersection		
			Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS
Don Buck / Hobsonville	Don Buck Ext N	Left	72	36	D	757	44	D	2730	58	E
		Thru	683	45	D						
		Right	2	10	A						
	Hobsonville E	Left	424	45	D	744	64	E			
		Thru	141	74	E						
		Right	179	103	F						
	Don Buck S	Left	236	68	E	709	75	E			
		Thru	281	91	F						
		Right	193	60	E						
	SH16 W	Left	24	35	D	520	49	D			
		Thru	78	50	D						
		Right	418	49	D						
Hobsonville / Rua	Rua N	Left	1019	16	B	1178	23	C	2843	34	C
		Thru	84	68	E						
		Right	76	74	E						
	Hobsonville Road E	Left	35	15	B	1046	41	D			
		Thru	615	22	C						
		Right	396	74	E						
	Fernhill S	Left	13	48	D	271	42	D			
		Thru	131	45	D						
		Right	128	39	D						
	Hobsonville Road W	Left	51	36	D	348	39	D			
		Thru	278	40	D						
		Right	19	44	D						
Tahi / Hobsonville	Tahi N	Left	14	56	E	18	49	D	2580	26	C
		Thru	5	25	C						
	Hobsonville E	Left	205	3	A	1097	15	B			
		Thru	890	18	B						
		Right	3	80	F						
	Westgate S	Left	160	30	C	164	30	C			
		Thru	3	22	C						
	Hobsonville W	Left	3	13	B	1301	35	D			
		Thru	1298	35	C						
SH16 E Interchange	SH16 E	Thru	771	8	A	1097	12	B	3611	47	D
		Right	326	19	B						
	SH16 off S	Thru	483	55	D	1208	45	D			
		Right	413	53	D						
		Left	313	20	C						
	SH16 W	Thru	980	87	F	1306	78	E			
		Left	326	51	D						
SH16 W Interchange	SH16 off N	Left	97	16	B	919	32	C	2762	20	C
		Right	822	34	C						
	SH16 E	Left	153	53	D	432	54	D			
		Thru	280	55	E						
	SH16 W	Thru	726	1	A	1411	2	A			
		Right	685	3	A						
Fred Taylor / Northside	Fred Taylor N	Left	133	19	B	240	17	B	490	25	C
		Thru	107	16	B						
	Northside E	Left	3	43	D	123	47	D			
		Right	120	48	D						
	Fred Taylor S	Thru	102	6	A	128	17	B			
		Right	25	61	E						
Northside / Don Buck Ext	Northside E	Left	64	5	A	214	5	A	480	5	A
		Thru	150	5	A						
	Don Buck Ext S	Left	75	5	A	147	6	A			
		Right	73	8	A						
	Northside W	Thru	65	4	A	118	4	A			
		Right	54	4	A						
Northside / Tahi	Northside E	Left	223	2	A	361	6	A	1180	9	A
		Thru	138	13	B						
	Northside W	Thru	182	14	B	278	14	B			
		Right	95	14	B						
	Tahi S	Left	133	10	A	541	9	A			
		Right	409	9	A						
Hobsonville / Trig	Trig N	Left	82	108	F	480	104	F	1543	55	E
		Thru	256	122	F						
		Right	142	70	E						
	Hobsonville E	Left	110	19	B	396	30	C			
		Thru	201	35	D						
		Right	85	31	C						
	Luckens S	Left	72	36	D	219	47	D			
		Thru	122	53	D						
		Right	25	43	D						
	Hobsonville W	Left	119	22	C	448	30	C			
		Thru	246	32	C						
		Right	84	38	D						

2021 Morning Peak

Intersection	Approach	Mvt	Morning Peak Hour (0745-0845)								
			Movement			Approach			Intersection		
			Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS
Don Buck / Hobsonville	Don Buck Ext N	Left	53	35	C	209	42	D	1800	48	D
		Thru	145	45	D						
		Right	11	31	C						
	Hobsonville E	Left	141	14	B	312	34	C			
		Thru	99	44	D						
		Right	72	58	E						
	Don Buck S	Left	364	53	D	1073	54	D			
		Thru	420	63	E						
		Right	289	42	D						
	SH16 W	Left	1	0	A	206	41	D			
		Thru	55	47	D						
		Right	150	39	D						
Hobsonville / Rua	Rua N	Left	642	12	B	687	14	B	1831	28	C
		Thru	29	43	D						
		Right	16	52	D						
	Hobsonville Road E	Left	28	9	A	537	24	C			
		Thru	273	8	A						
		Right	235	44	D						
	Fernhill S	Left	11	39	D	218	48	D			
		Thru	87	47	D						
		Right	120	50	D						
	Hobsonville Road W	Left	49	41	D	388	47	D			
		Thru	327	48	D						
		Right	13	36	D						
Tahi / Hobsonville	Tahi N	Left	6	25	C	9	22	C	1679	18	B
		Thru	3	15	B						
	Hobsonville E	Left	130	2	A	627	13	B			
		Thru	496	16	B						
		Right	1	93	F						
	Westgate S	Left	52	29	C	54	28	C			
		Thru	2	12	B						
	Hobsonville W	Left	1	21	C	990	20	C			
		Thru	989	20	B						
SH16 E Interchange	SH16 E	Thru	335	3	A	639	4	A	2534	34	C
		Right	304	6	A						
	SH16 off S	Thru	410	43	D	877	32	C			
		Right	172	34	C						
		Left	294	15	B						
	SH16 W	Thru	598	65	E	1018	54	D			
		Left	420	38	D						
SH16 W Interchange	SH16 off N	Left	20	4	A	322	27	C	1702	30	C
		Right	302	28	C						
	SH16 E	Left	277	62	E	609	67	E			
		Thru	332	71	E						
	SH16 W	Thru	298	1	A	770	2	A			
		Right	473	2	A						
Fred Taylor / Northside	Fred Taylor N	Left	186	20	B	264	18	B	448	24	C
		Thru	78	16	B						
	Northside E	Left	1	33	C	50	42	D			
		Right	49	42	D						
	Fred Taylor S	Thru	97	9	A	134	27	C			
		Right	38	73	E						
Northside / Don Buck Ext	Northside E	Left	84	7	A	224	7	A	592	7	A
		Thru	140	7	A						
	Don Buck Ext S	Left	116	5	A	208	7	A			
		Right	92	10	B						
	Northside W	Thru	93	4	A	160	4	A			
		Right	67	4	A						
Northside / Tahi	Northside E	Left	167	1	A	386	8	A	1077	11	B
		Thru	219	14	B						
	Northside W	Thru	201	15	B	304	17	B			
		Right	103	19	B						
	Tahi S	Left	143	9	A	387	8	A			
		Right	244	8	A						
Hobsonville / Trig	Trig N	Left	101	24	C	247	33	C	1417	76	E
		Thru	108	41	D						
		Right	39	33	C						
	Hobsonville E	Left	32	18	B	394	33	C			
		Thru	220	35	C						
		Right	142	35	C						
	Luckens S	Left	51	143	F	341	139	F			
		Thru	209	143	F						
		Right	81	126	F						
	Hobsonville W	Left	181	87	F	434	90	F			
		Thru	229	98	F						
		Right	23	41	D						

2021 Afternoon Peak

Intersection	Approach	Mvt	Afternoon Peak Hour (1645-1745)								
			Movement			Approach			Intersection		
			Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS
Don Buck / Hobsonville	Don Buck Ext N	Left	70	42	D	842	48	D	2810	77	E
		Thru	770	49	D						
		Right	2	10	B						
	Hobsonville E	Left	375	57	E	716	83	F			
		Thru	139	91	F						
		Right	202	127	F						
	Don Buck S	Left	220	97	F	703	102	F			
		Thru	311	123	F						
		Right	172	72	E						
	SH16 W	Left	39	58	E	550	80	F			
		Thru	102	84	F						
		Right	409	81	F						
Hobsonville / Rua	Rua N	Left	994	16	B	1183	26	C	2875	43	D
		Thru	107	77	E						
		Right	82	88	F						
	Hobsonville Road E	Left	47	19	B	1026	59	E			
		Thru	580	34	C						
		Right	400	100	F						
	Fernhill S	Left	17	78	E	314	59	E			
		Thru	162	66	E						
		Right	135	47	D						
	Hobsonville Road W	Left	47	35	D	351	37	D			
		Thru	285	36	D						
		Right	19	48	D						
Tahi / Hobsonville	Tahi N	Left	10	54	D	15	44	D	2558	30	C
		Thru	4	21	C						
	Hobsonville E	Left	224	3	A	1089	16	B			
		Thru	860	19	B						
		Right	4	56	E						
	Westgate S	Left	161	31	C	167	31	C			
		Thru	6	23	C						
	Hobsonville W	Left	2	20	B	1287	41	D			
		Thru	1285	41	D						
SH16 E Interchange	SH16 E	Thru	758	7	A	1105	11	B	3626	52	D
		Right	346	19	B						
	SH16 off S	Thru	487	59	E	1224	50	D			
		Right	424	59	E						
		Left	313	22	C						
	SH16 W	Thru	987	99	F	1297	88	F			
		Left	310	53	D						
SH16 W Interchange	SH16 off N	Left	110	15	B	915	32	C	2852	21	C
		Right	805	34	C						
	SH16 E	Left	203	54	D	506	56	E			
		Thru	303	57	E						
	SH16 W	Thru	753	1	A	1431	2	A			
		Right	678	3	A						
Fred Taylor / Northside	Fred Taylor N	Left	153	17	B	257	16	B	537	27	C
		Thru	104	16	B						
	Northside E	Left	3	69	E	133	59	E			
		Right	129	59	E						
	Fred Taylor S	Thru	117	6	A	148	19	B			
		Right	31	68	E						
Northside / Don Buck Ext	Northside E	Left	76	7	A	237	6	A	536	6	A
		Thru	161	6	A						
	Don Buck Ext S	Left	80	5	A	166	7	A			
		Right	86	9	A						
	Northside W	Thru	68	4	A	134	4	A			
		Right	65	4	A						
Northside / Tahi	Northside E	Left	230	2	A	391	7	A	1294	10	B
		Thru	161	15	B						
	Northside W	Thru	215	15	B	317	16	B			
		Right	102	17	B						
	Tahi S	Left	140	10	B	586	9	A			
		Right	446	9	A						
Hobsonville / Trig	Trig N	Left	88	123	F	489	118	F	1685	59	E
		Thru	260	135	F						
		Right	141	82	F						
	Hobsonville E	Left	126	20	B	488	31	C			
		Thru	263	36	D						
		Right	99	34	C						
	Luckens S	Left	77	33	C	230	44	D			
		Thru	124	52	D						
		Right	29	40	D						
	Hobsonville W	Left	111	25	C	477	33	C			
		Thru	270	36	D						
		Right	96	37	D						

2026 Morning Peak

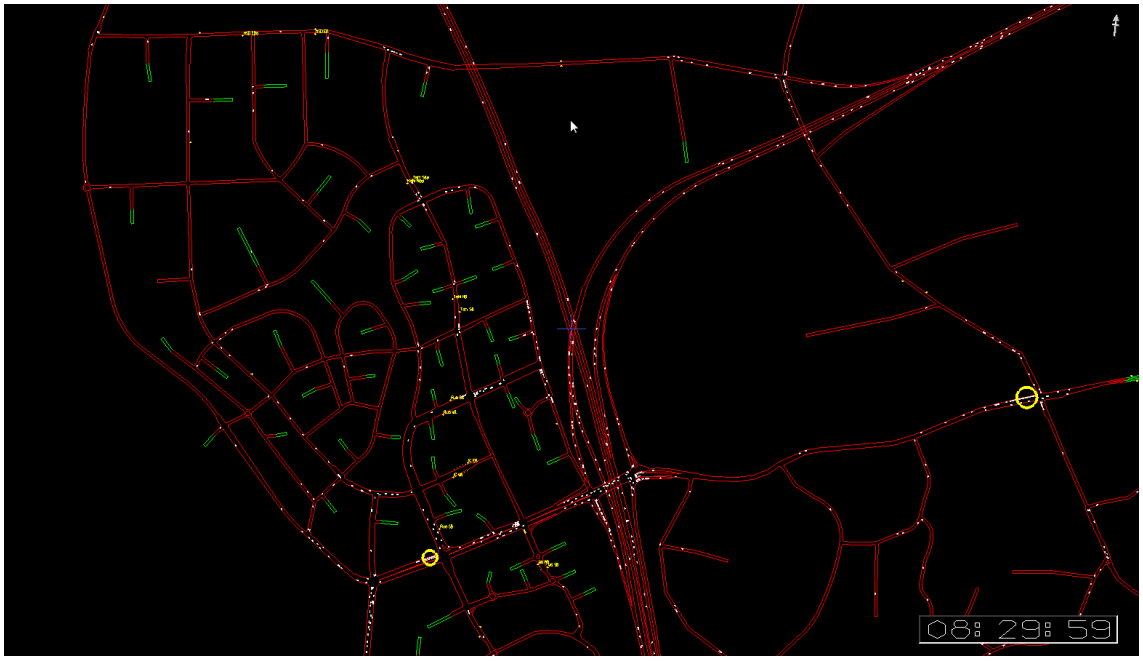
Intersection	Approach	Mvt	Morning Peak Hour (0745-0845)								
			Movement			Approach			Intersection		
			Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS
Don Buck / Hobsonville	Don Buck Ext N	Left	49	34	C	187	42	D	1865	45	D
		Thru	131	46	D						
		Right	8	32	C						
	Hobsonville E	Left	216	17	B	401	34	C			
		Thru	105	48	D						
		Right	80	61	E						
	Don Buck S	Left	397	49	D	1060	50	D			
		Thru	375	59	E						
		Right	288	42	D						
	SH16 W	Left	7	33	C	217	42	D			
		Thru	53	48	D						
		Right	157	40	D						
Hobsonville / Rua	Rua N	Left	655	12	B	705	14	B	1997	27	C
		Thru	28	50	D						
		Right	22	52	D						
	Hobsonville Road E	Left	43	11	B	666	23	C			
		Thru	347	6	A						
		Right	276	46	D						
	Fernhill S	Left	17	32	C	244	44	D			
		Thru	88	46	D						
		Right	139	44	D						
	Hobsonville Road W	Left	49	42	D	383	47	D			
		Thru	317	48	D						
		Right	17	37	D						
Tahi / Hobsonville	Tahi N	Left	5	28	C	8	27	C	1868	18	B
		Thru	3	25	C						
	Hobsonville E	Left	208	3	A	801	14	B			
		Thru	592	19	B						
		Right	2	2	A						
	Westgate S	Left	84	29	C	88	28	C			
		Thru	4	17	B						
	Hobsonville W	Left	2	6	A	971	20	C			
		Thru	969	20	C						
SH16 E Interchange	SH16 E	Thru	532	3	A	871	5	A	2732	30	C
		Right	339	8	A						
	SH16 off S	Thru	395	38	D	867	30	C			
		Right	202	33	C						
		Left	270	15	B						
	SH16 W	Thru	574	64	E	994	53	D			
		Left	420	39	D						
SH16 W Interchange	SH16 off N	Left	26	5	A	463	27	C	2074	39	D
		Right	437	28	C						
	SH16 E	Left	408	72	E	834	80	F			
		Thru	426	88	F						
	SH16 W	Thru	331	1	A	777	2	A			
		Right	446	3	A						
Fred Taylor / Northside	Fred Taylor N	Left	222	19	B	317	18	B	515	24	C
		Thru	95	17	B						
	Northside E	Left	2	53	D	50	46	D			
		Right	48	46	D						
	Fred Taylor S	Thru	102	10	A	148	28	C			
		Right	46	70	E						
Northside / Don Buck Ext	Northside E	Left	118	8	A	275	9	A	693	7	A
		Thru	157	9	A						
	Don Buck Ext S	Left	119	5	A	228	8	A			
		Right	109	11	B						
	Northside W	Thru	106	5	A	190	4	A			
		Right	84	4	A						
Northside / Tahi	Northside E	Left	222	1	A	527	9	A	1297	12	B
		Thru	304	15	B						
	Northside W	Thru	240	15	B	342	19	B			
		Right	102	28	C						
	Tahi S	Left	137	10	A	428	9	A			
		Right	290	9	A						
Hobsonville / Trig	Trig N	Left	151	29	C	336	36	D	1750	83	F
		Thru	116	47	D						
		Right	69	36	D						
	Hobsonville E	Left	49	35	D	623	54	D			
		Thru	391	56	E						
		Right	183	53	D						
	Luckens S	Left	64	142	F	352	142	F			
		Thru	189	140	F						
		Right	100	146	F						
	Hobsonville W	Left	166	110	F	438	113	F			
		Thru	248	122	F						
		Right	24	40	D						

2026 Afternoon Peak

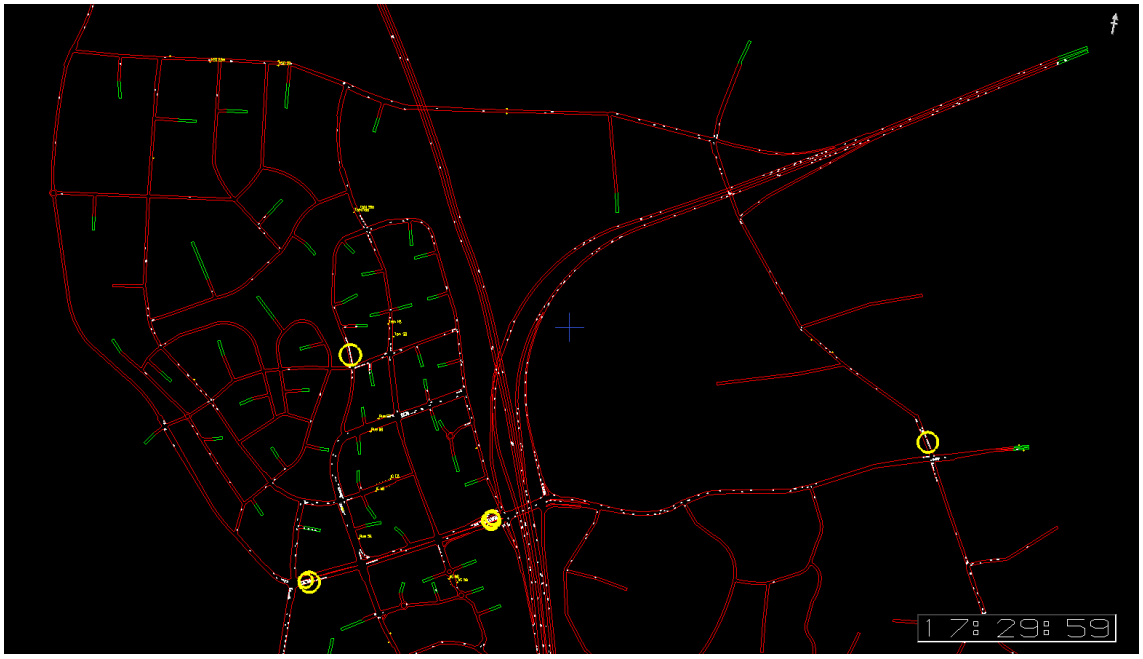
Intersection	Approach	Mvt	Afternoon Peak Hour (1645-1745)								
			Movement			Approach			Intersection		
			Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS	Volume	Average Delay (s/veh)	LOS
Don Buck / Hobsonville	Don Buck Ext N	Left	136	39	D	730	42	D	2820	86	F
		Thru	573	44	D						
		Right	21	29	C						
	Hobsonville E	Left	422	46	D	768	74	E			
		Thru	148	90	F						
		Right	198	121	F						
	Don Buck S	Left	219	124	F	729	121	F			
		Thru	313	145	F						
		Right	197	78	E						
	SH16 W	Left	33	128	F	592	115	F			
		Thru	139	132	F						
		Right	420	108	F						
Hobsonville / Rua	Rua N	Left	1016	19	B	1224	29	C	3221	45	D
		Thru	97	72	E						
		Right	111	85	F						
	Hobsonville Road E	Left	42	14	B	1051	59	E			
		Thru	593	33	C						
		Right	415	101	F						
	Fernhill S	Left	23	105	F	466	61	E			
		Thru	197	79	E						
		Right	246	42	D						
	Hobsonville Road W	Left	51	39	D	481	39	D			
		Thru	409	39	D						
		Right	21	36	D						
Tahi / Hobsonville	Tahi N	Left	18	47	D	27	38	D	2852	30	C
		Thru	9	18	B						
	Hobsonville E	Left	268	4	A	1081	18	B			
		Thru	810	23	C						
		Right	3	62	E						
	Westgate S	Left	244	41	D	256	39	D			
		Thru	12	18	B						
	Hobsonville W	Left	3	23	C	1488	37	D			
		Thru	1485	37	D						
SH16 E Interchange	SH16 E	Thru	797	7	A	1168	11	B	3857	51	D
		Right	370	20	B						
	SH16 off S	Thru	444	66	E	1185	57	E			
		Right	473	67	E						
		Left	267	24	C						
	SH16 W	Thru	1042	86	F	1505	77	E			
		Left	462	55	E						
SH16 W Interchange	SH16 off N	Left	135	21	C	935	34	C	3134	23	C
		Right	800	36	D						
	SH16 E	Left	291	52	D	665	55	E			
		Thru	373	58	E						
	SH16 W	Thru	935	1	A	1534	2	A			
		Right	599	2	A						
Fred Taylor / Northside	Fred Taylor N	Left	155	21	C	241	19	B	580	30	C
		Thru	86	16	B						
	Northside E	Left	2	59	E	138	67	E			
		Right	136	68	E						
	Fred Taylor S	Thru	164	6	A	201	17	B			
		Right	37	66	E						
Northside / Don Buck Ext	Northside E	Left	100	8	A	262	7	A	590	7	A
		Thru	162	7	A						
	Don Buck Ext S	Left	87	6	A	201	9	A			
		Right	114	11	B						
	Northside W	Thru	71	5	A	128	5	A			
		Right	56	4	A						
Northside / Tahi	Northside E	Left	255	2	A	455	7	A	1579	11	B
		Thru	201	14	B						
	Northside W	Thru	288	15	B	392	16	B			
		Right	104	17	B						
	Tahi S	Left	130	11	B	731	10	B			
		Right	601	10	B						
Hobsonville / Trig	Trig N	Left	157	228	F	499	206	F	2033	100	F
		Thru	205	232	F						
		Right	136	143	F						
	Hobsonville E	Left	124	26	C	654	40	D			
		Thru	379	43	D						
		Right	151	41	D						
	Luckens S	Left	74	59	E	290	71	E			
		Thru	165	76	E						
		Right	51	72	E						
	Hobsonville W	Left	126	95	F	590	91	F			
		Thru	349	105	F						
		Right	115	43	D						

Appendix 10 – Simulation Snapshots

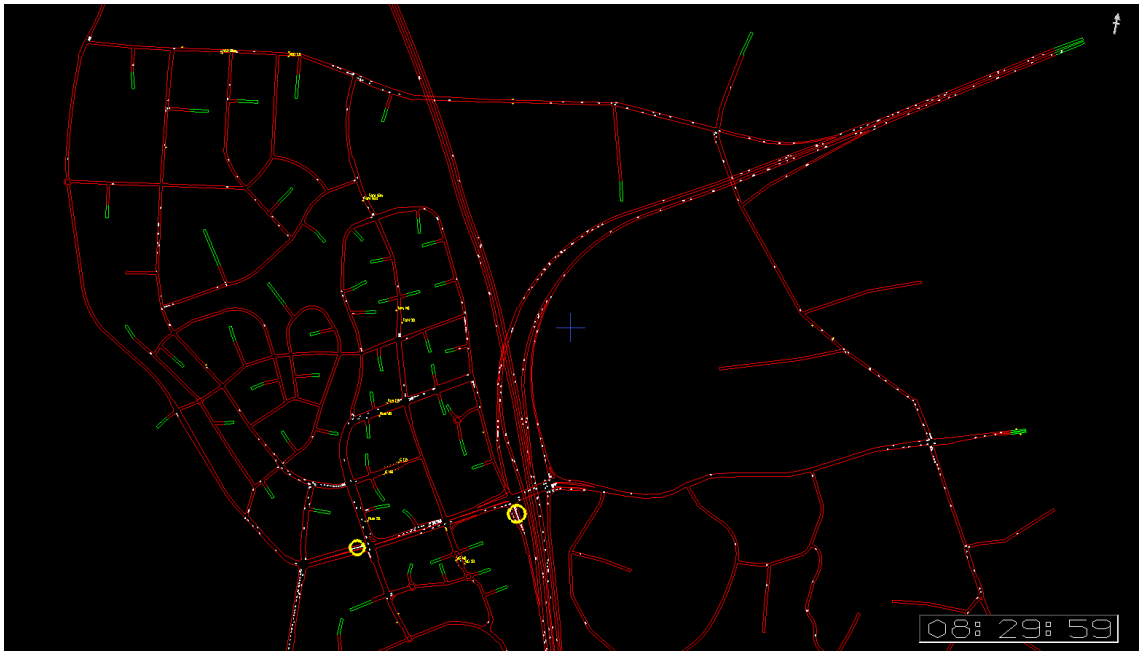
2016 AM PEAK



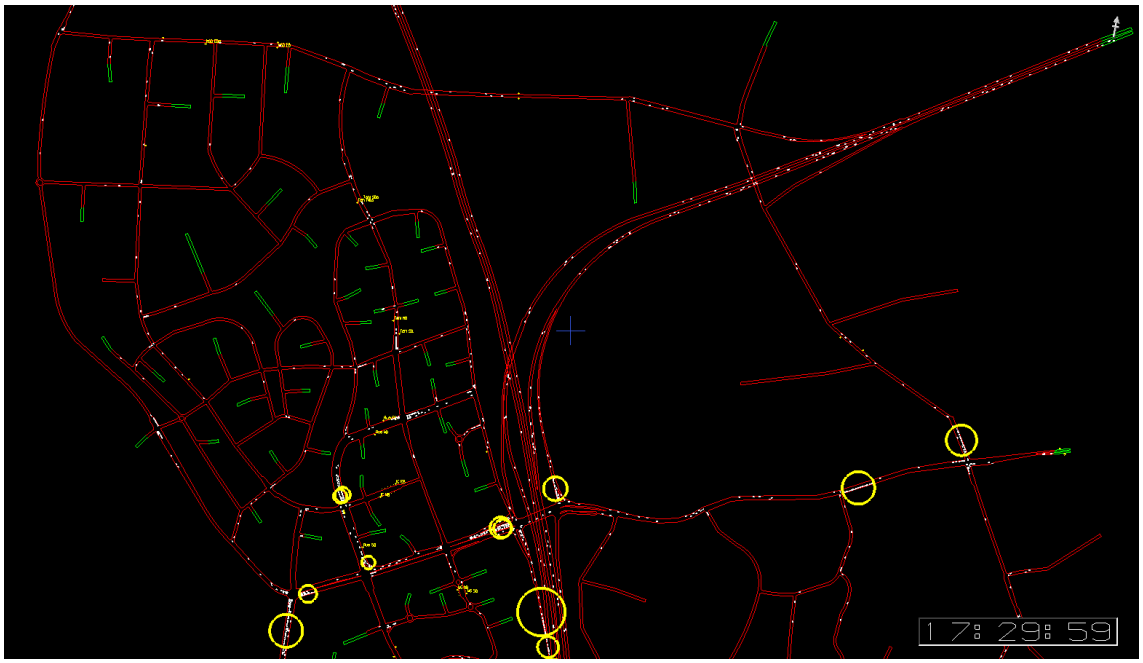
2016 MD PEAK



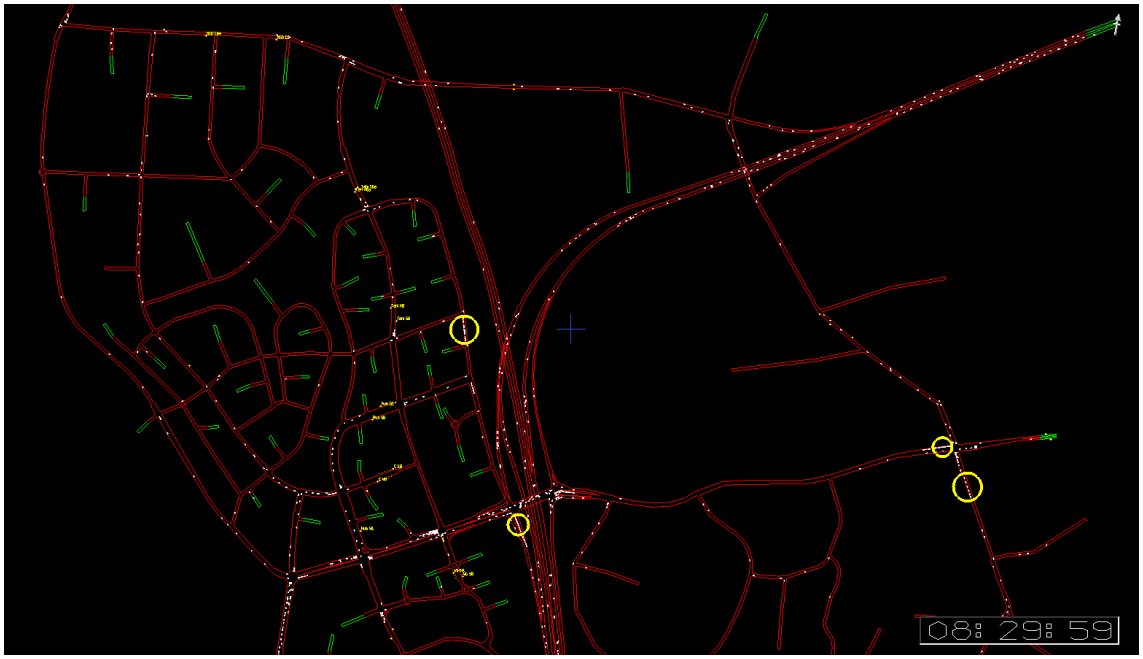
2018 AM PEAK



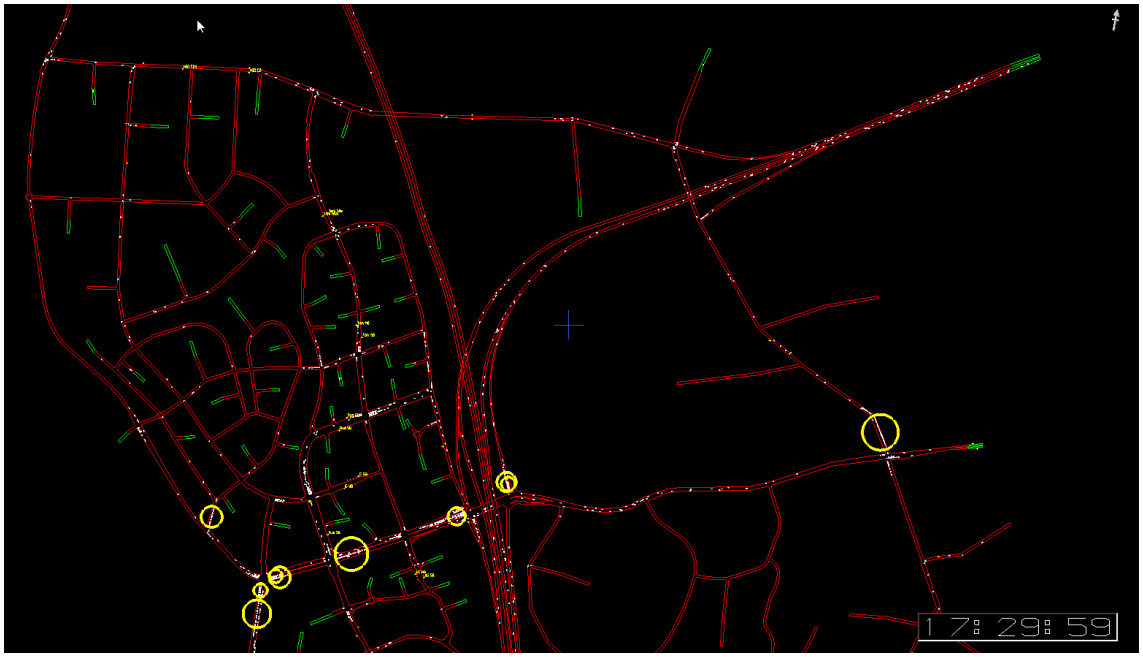
2018 PM PEAK



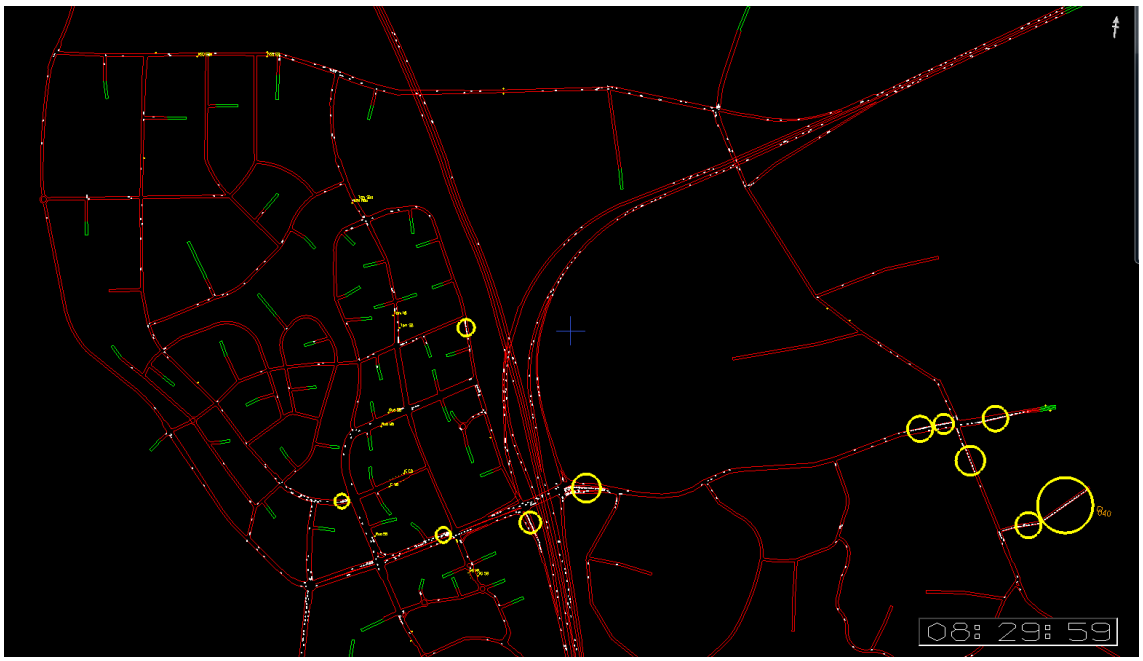
2021 AM PEAK



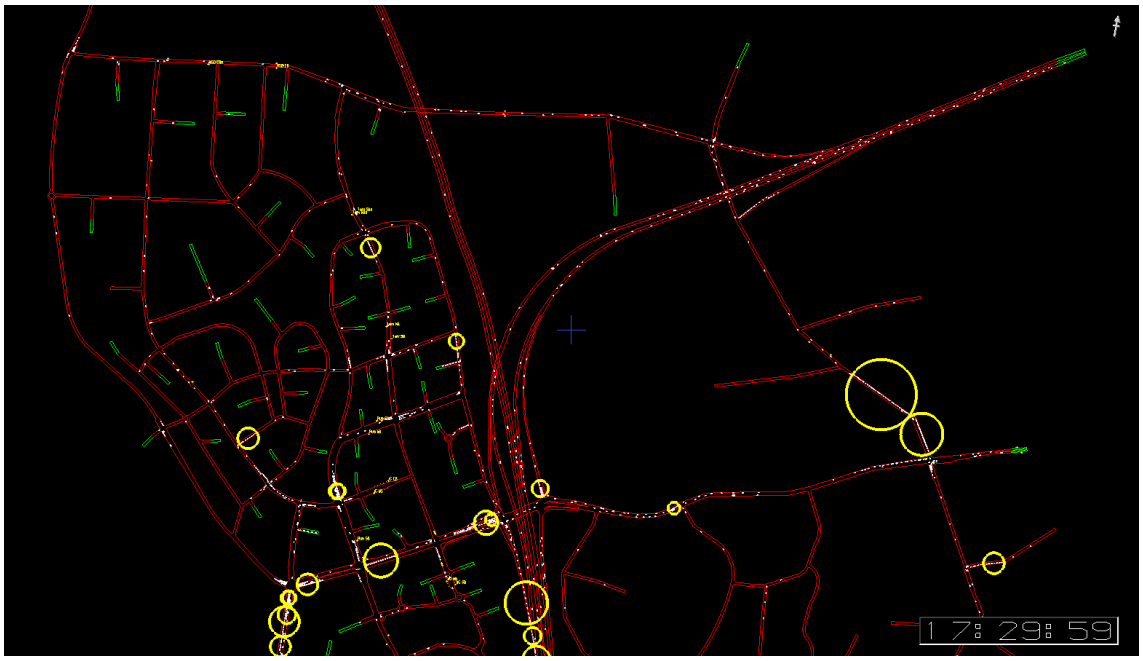
2021 PM PEAK



2026 AM PEAK

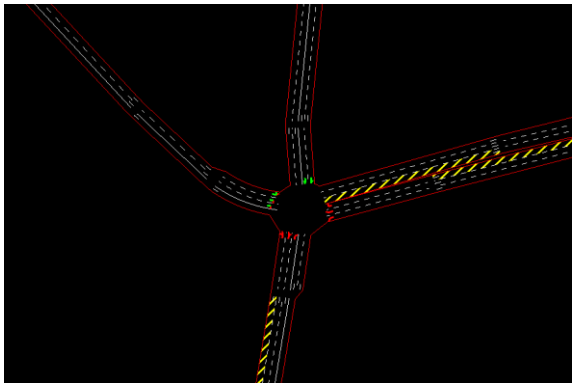


2026 PM PEAK

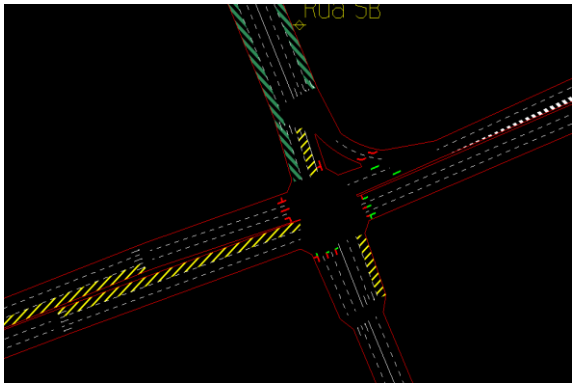


Appendix 11 – Intersection Layouts

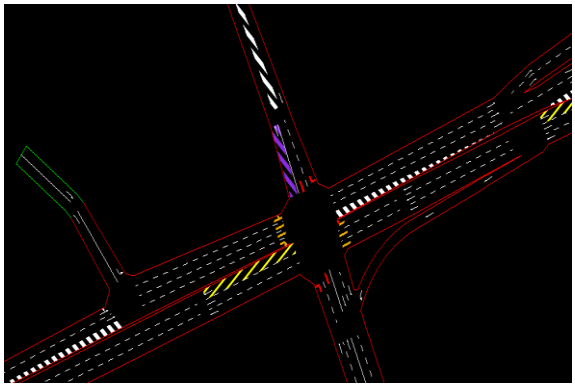
Fred Taylor Drive/Don Buck Road



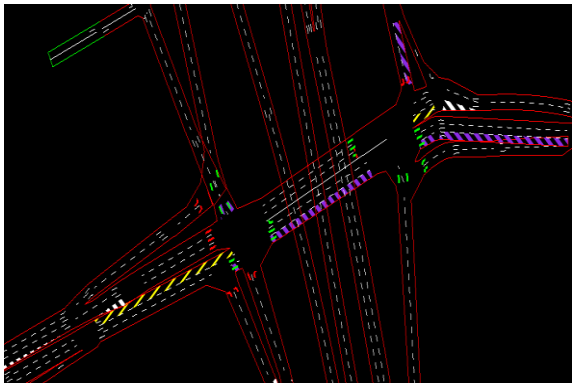
Fred Taylor Drive/Rua Road



Fred Taylor Drive/Tahi Road

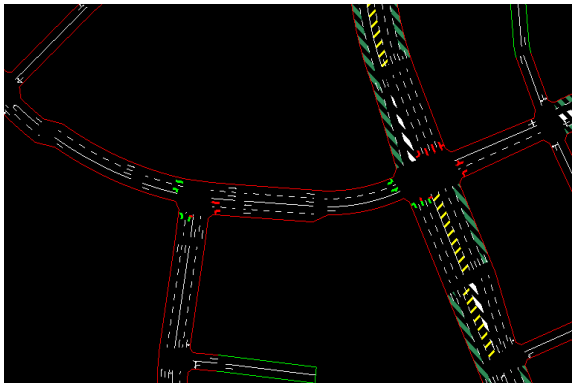


Fred Taylor Drive/Toru & Hobsonville Interchange



Don Buck Extension/Waru & Rua/Waru

Rua/Tahi



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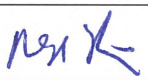
Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	Janette Underwood/ Samin Huq	Ray Johnston	On file	David Matthews	On file	20/3/2102
1	Janette Underwood/ Samin Huq	Ray Johnston		David Matthews		15/08/2013