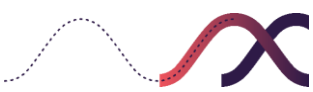
Fonterra Limited

Private Plan Change 17 - Te Rapa North

Integrated Transport Assessment

December 2024



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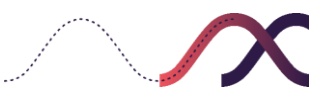

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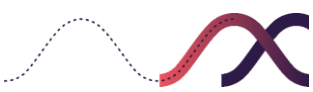


1. Executive Summary

Bloxam Burnett & Olliver ("BBO") has been commissioned by Fonterra Limited ("Fonterra"), the Applicant, to prepare an Integrated Transport Assessment ("ITA") to support its Private Plan Change Request, Plan Change 17 ("PC17"), of the Hamilton City Operative District Plan ("District Plan"). The purpose of PC17 is to rezone approximately 91 hectares (ha) of land ("Plan Change Area") to Te Rapa North Industrial Zone land and remove the "Deferred Industrial Zone" overlay that currently applies over the Plan Change Area.

Of this, it is estimated only 79 ha is suitable to be developed for industrial purposes. The balance area is identified as riparian and flood prone area.

When complete, PC17 is expected to generate approximately 1,030 trips per peak hour spread across four access points of which three are on Te Rapa Road and one on Ruffell Road.

Two new signalised intersections are proposed for access from Te Rapa Road to the Plan Change Area, one approximately 330 m south of the Te Rapa Road / Hutchinson Road roundabout, and the other is located south of the Fonterra Dairy Manufacturing factory and will eventually form the intersection with the future Northern River Crossing ("NRC").

The transportation effects study area was informed by the modelled distribution of traffic from PC17 on the wider network. The area extends from Horotiu Interchange at the north end to Te Rapa Road / The Base Parade intersection at the south end.

Overall, this assessment finds that the transportation effects on the adjoining road network enabled by PC17 can be managed and mitigated to acceptable levels provided the recommended infrastructure upgrades (illustrated in Figure 1) and associated timing of each (outlined below) are adopted.

Recommended Transport Infrastructure Provision

Refer to Figure 1 for locality illustration of the following:

1. *Access 1: Te Rapa Road / East - West Road Intersection*
    - Construction of a new signalised T-intersection on Te Rapa Road connecting to a new public road (East - West Road) through the Plan Change Area, in general accordance with the location and form illustrated in Appendix B of this ITA.
    - Provision of a pair of bus stops on Te Rapa Road north of East - West Road.
    - Provision of walking and cycling shared paths on both sides of Te Rapa Road connecting East - West Road to the proposed new bus stops on Te Rapa Road.
    - Four lanes to be provided on Te Rapa Road between East - West Road and McKee Street.
2. *East - West Road*
    - -East - West Road between Te Rapa Road and Structure Plan spine road is designed in accordance with the typical cross-section in Figure 19 and in consultation with HCC so that it is able to be upgraded to form part of the NRC if and when that project is progressed by HCC.
    - Construction of new East - West Road / Structure Plan spine road intersection in general accordance with the location presented in the proposed Structure Plan.
3. *Access 2: Te Rapa Road Access – South of Hutchinson Road*

- Construction of a new signalised crossroads intersection on Te Rapa Road connecting to new public roads through the Plan Change Area, in general accordance with the location and form illustrated in Appendix B of this ITA.
- Four laning of Te Rapa Road between the Hutchinson Road roundabout and the signalised intersection.
- Removal of existing right turn bay and relocation of vehicle crossings to 1426 Te Rapa Road to eastern arm of signalised intersection.
- Provision of a walking and cycling shared path on the eastern side of Te Rapa Road connecting Access 2 intersection to the existing walking and cycling shared path on Hutchinson Road.

4. *Te Rapa Road / McKee Street Intersection*
    - The existing Te Rapa Road / McKee Street priority-controlled intersection should be upgraded to a signalised T-intersection with four lanes provided between McKee Street and Ruffell Road before any land use activity in PC17 generates operational traffic, and if the intersection has not been upgraded as part of Te Awa Lakes development[1].

5. *Te Rapa Road / Ruffell Road Intersection*
    - The capacity of the existing Te Rapa Road / Ruffell Road signalised intersection should be upgraded to add a second northbound through movement auxiliary lane and a second southbound auxiliary exit lane on Te Rapa Road before any land use activity in PC17 generates operational traffic.

6. *Te Rapa Road / Kapuni Street Intersection*
    - The existing Te Rapa Road / Kapuni Street priority-controlled intersection should be upgraded to a signalised T-intersection before any land use activity in PC17 generates operational traffic.

7. *Te Rapa Road / Te Kowhai Road / Church Road Roundabout*
    - The capacity of the existing Te Rapa Road / Te Kowhai Road / Church Road Roundabout should be increased by modifying the lane configuration on Te Kowhai Road from shared through and left turning lane to left turn only lane before any land use activity in PC17 generates operational traffic.

8. *Structure Plan Spine Road*
    - Construction of a new public road in general accordance with the collector road typical cross-section in Figure 20 connecting Access 2 to the north and Old Ruffell Road to the south.

Enabling of Public Transport

In addition to the inclusion of bus stop infrastructure, part of the solution to reduce future car-dependency and congestion on strategic roads in Hamilton involves growth areas supporting and enabling the development of the future Bus Rapid Transit (BRT) network identified in the Waikato-Hamilton Metro Spatial Plan.

For PC17, Fonterra supports the BRT through engaging and agreeing with HCC an appropriate building setback along the Te Rapa Road site frontage that will enable future retrofitting of the BRT infrastructure. However, the set-back distance is not yet quantifiable without further work by Hamilton City Council to determine the minimum corridor width to accommodate a suitable number of traffic and BRT lanes and stops, including at intersections.

[1] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006

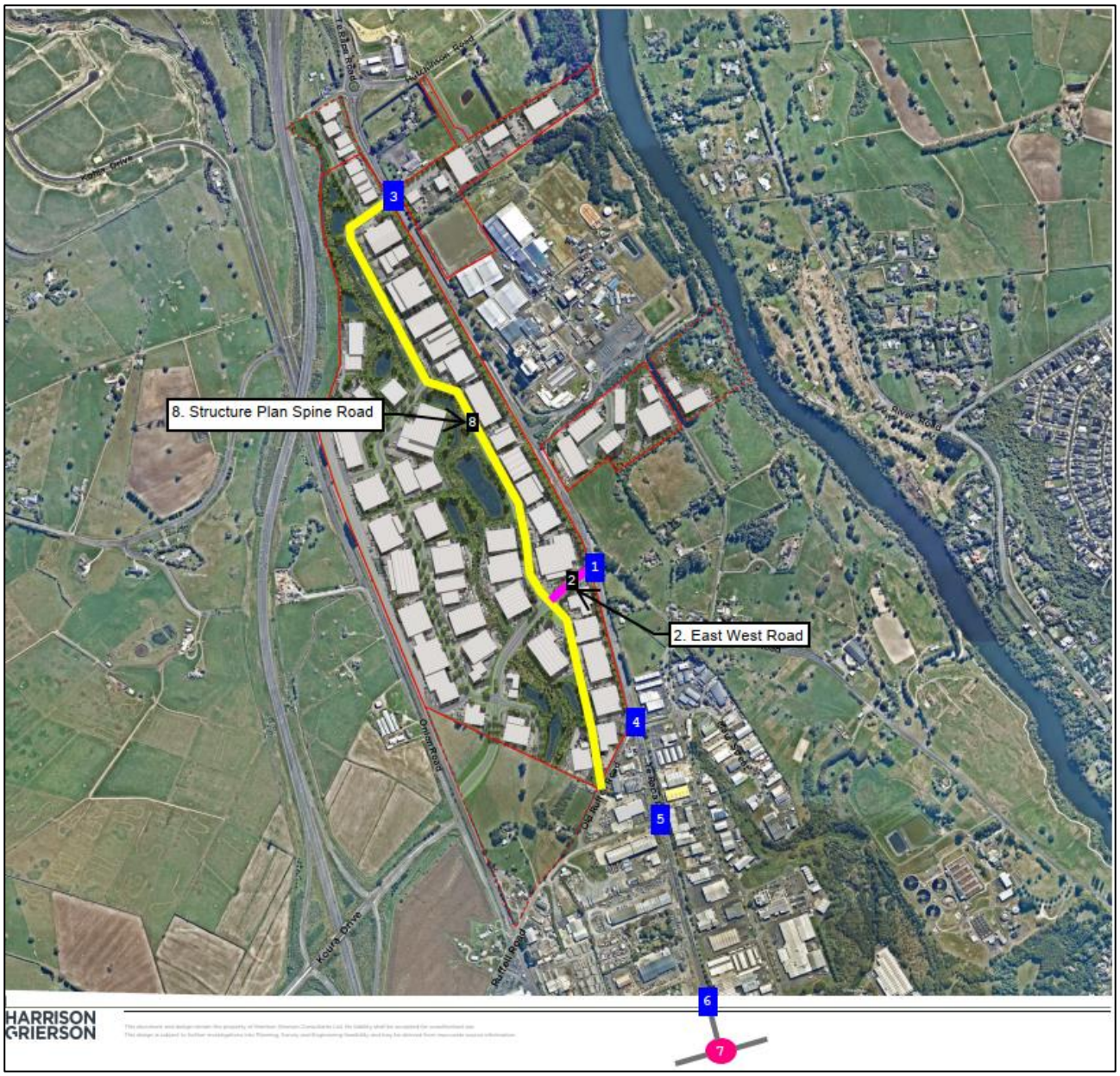


Figure 1: Recommended Transport Infrastructure Upgrades

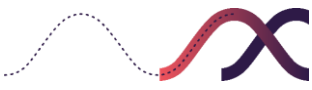
The following summarises the recommended transportation infrastructure upgrades and related timing and responsibilities for delivery, in relation to this rezoning submission.

Table No: 1

Staging of Transportation Infrastructure Improvements			
No.	**Infrastructure Requirement**	**Trigger**	**Delivered By**
1	A new signalised T-intersection on Te Rapa Road providing access to the Plan Change Area (Access 1), including: • new northbound and southbound bus stops located on the north arm of the intersection	Prior to: • Any section 224c certificate for subdivision under the Resource Management Act 1991 ("RMA") being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant

	• shared walking and cycling paths on both sides of Te Rapa Road connecting East - West Road paths to the new bus stops. • four continuous traffic lanes on Te Rapa Road between East - West Road and McKee Street intersections.		
2	A new public road (East - West Road) between Te Rapa Road and the Structure Plan spine road to be designed and constructed in general accordance with the East - West Road typical cross-section in Figure 19, including the intersection of East - West Road with the Structure Plan spine road.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and Hamilton City Council
3	A new signalised cross-roads intersection on Te Rapa Road providing northern access to the Plan Change Area (Access 2). Includes: • closure of two existing vehicle crossings to #1426 Te Rapa Road and provision of one new commercial vehicle crossing to the same property from the new eastern road of the signalised intersection • provision of four continuous traffic lanes on Te Rapa Road between the Hutchinson Road roundabout and the new signalised intersection • provision of a shared walking and cycling path on the eastern side of Te Rapa Road connecting to the existing shared path from Hutchinson Road. •	To be completed prior to: • Any section 224c certificate being issued under the RMA for any subdivision in PC17 that takes the cumulative developed area with sole access to Te Rapa Rd / East - West Rd intersection over 33 ha (net developable); or • When the cumulative total consented land area in PC17 with sole access to Te Rapa Rd / East - West Rd intersection, exceeds 33 ha (net developable).	The Applicant
4	Upgrading of Te Rapa Road / McKee Street intersection to a signalised T-intersection and upgrading Te Rapa Road to four continuous lanes between McKee Street and Ruffell Road intersections.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and/ or Te Awa Lakes Developers[2]

[2] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006



5	Capacity increase at Te Rapa Road / Ruffell Road signalised intersection to add a second northbound through movement auxiliary lane and a second southbound auxiliary exit lane on Te Rapa Road.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and/or Te Awa Lakes Developers[3]
6	Upgrading Te Rapa Road / Kapuni Street intersection to a signalised T-intersection, providing sufficient capacity to accommodate PC17 traffic.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and / or Te Awa Lakes Developers[4]
7	Lane marking changes on Te Kowhai Road at Te Rapa Road / Te Kowhai Road / Church Road roundabout, from shared through and left to left turn only from the kerbside lane.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant
8	Extension of the Structure Plan spine road south in general accordance with the collector road typical cross-section in Figure 20 including connection to Old Ruffell Road, (Access 3) and north with connection to Access 2 Road.	To be completed prior to: • Any 224c being issued under the RMA for any subdivision in PC17 that takes the cumulative developed area with sole access to Te Rapa Rd / East - West Rd intersection over 33 ha (net developable); or • When the cumulative total consented land area in PC17 with sole access to Te Rapa Rd / East - West Rd intersection, exceeds 33 ha (net developable).	The Applicant

[3] Rule 3.8.5.3.2(b) in the Hamilton City Operative District Plan

[4] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006

2. Introduction

Fonterra Limited ("Fonterra"), the Applicant, is lodging an application to Hamilton City Council ("HCC") for a private plan change ("PC17") to rezone approximately 91 hectares (ha) of land ("Plan Change Area") surrounding the Te Rapa Dairy Manufacturing Site in Te Rapa, Hamilton. The Plan Change Area is currently zoned "Te Rapa North Industrial Zone" but is overlaid with the "Deferred Industrial Zone" Area. Fonterra seeks to remove the deferral and amend the zone provisions to enable industrial development, manufacturing, and ancillary activities that support industrial uses. PC17 does not seek to change any of the land within the Te Rapa Dairy Manufacturing Site ("Dairy Manufacturing Site") or planning provisions relating to the Dairy Manufacturing Site.

The objectives of PC17 are to:

1. Live-zone all Fonterra-owned land to Te Rapa North Industrial zone
2. Protect the Dairy Manufacturing Site from incompatible surrounding land use and reverse sensitivity risk.
3. Future proof rail access on the North Island Main Trunk Line ("NIMT").

The extent of the Plan Change Area is shown in Figure 2.

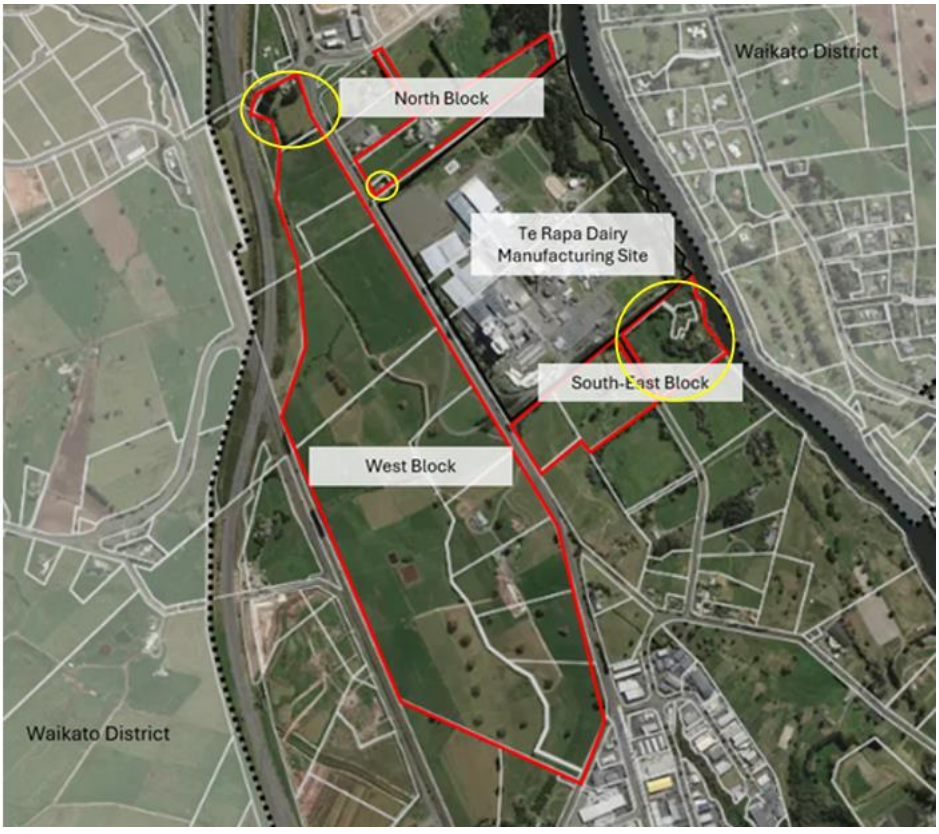


Figure 2: Plan Change Area (Red Outlines)

2.1 Master Planning Process

Over the past 18 months Bloxam Burnett & Olliver ("BBO"), along with a wider team of urban design and planning experts, have been commissioned by Fonterra to undertake a master planning process to explore options consistent with the overall vision to form an enhancement to Hamilton City's northern industrial sector whilst supporting the viability and regional significance of the Dairy Manufacturing Site. The goal was

to protect the Dairy Manufacturing site by enabling the surrounding land to be developed for industrial use consistent with best practice urban development and sustainable management.

Through the master planning process, our team developed and tested various development options and subsequently selected the preferred development masterplan that most closely aligned with Fonterra's objectives. This informed development of the proposed structure plan and PC17.

2.2 Report Purpose

This Integrated Transport Assessment ("ITA") is in general accordance with Rule 25.14.4.3 of the Hamilton City Operative District Plan ("District Plan"). The ITA provides an assessment of the traffic and transportation aspects of PC17, which includes:

- The local transport environment surrounding the Plan Change Area;
- An estimation of the predicted trip generation when the Plan Change Area is rezoned and developed;
- Anticipated effects on the supporting road infrastructure, including the following intersections:
    - Te Rapa Road / SH1C Horotiu Interchange
    - Te Rapa Road / Hutchinson Road roundabout;
    - The future Te Rapa Road / Northern River Crossing Arterial intersection;
    - Te Rapa Road / McKee Street signalised intersection;
    - Te Rapa Road / Ruffell Road signalised intersection;
    - Te Rapa Road / Kapuni Street intersection;
    - Te Rapa Road / Te Kowhai Road / Church Road roundabout; and
    - Te Rapa Road / The Base Parade / Eagle Way signalised intersection;
- Proposed upgrades and solutions to mitigate effects on the adjoining road network having regard to the long-term function and configuration of the road network and consideration for existing zoned and consented development;
- The provision for alternate modes of transport including public transport, micro-mobility and pedestrian and cycle linkages within the Plan Change Area; and
- PC17's alignment with local and national transport strategies and policies.

3. Existing Transportation Environment

3.1 Plan Change Area Location

The locality of the Plan Change Area is shown in Figure 3. The Plan Change Area is in the northern extent of Te Rapa, 8 km north of Central Hamilton. It is made up of three distinct areas, the North, West and South-East Blocks, all of which are encompassed by the Waikato River to the east, State Highway 1C (Mangaharakeke Drive) and the NIMT rail line to the west, Hutchinson Road and Bern Road to the north and Ruffell Road and Old Ruffell Road to the south. All three areas have frontage to Te Rapa Road which runs north to south through the centre of the Plan Change Area. The three areas are described as follows:

- West Block: Section 3 SO 456626, Section 1 SO 456626, Lot 1 – 6 DPS 11087, Part Lot 2 DPS 10804, Lot 1 DPS 34481, and Part Lot 1 DPS 10804.
- North Block: Lot 1 DP 551065 and Lot 1 DPS 8230.
- South-East Block: Lot 5 DPS 18043, Lot 1 DPS 85687, and Lot 1-3 DPS 61136.

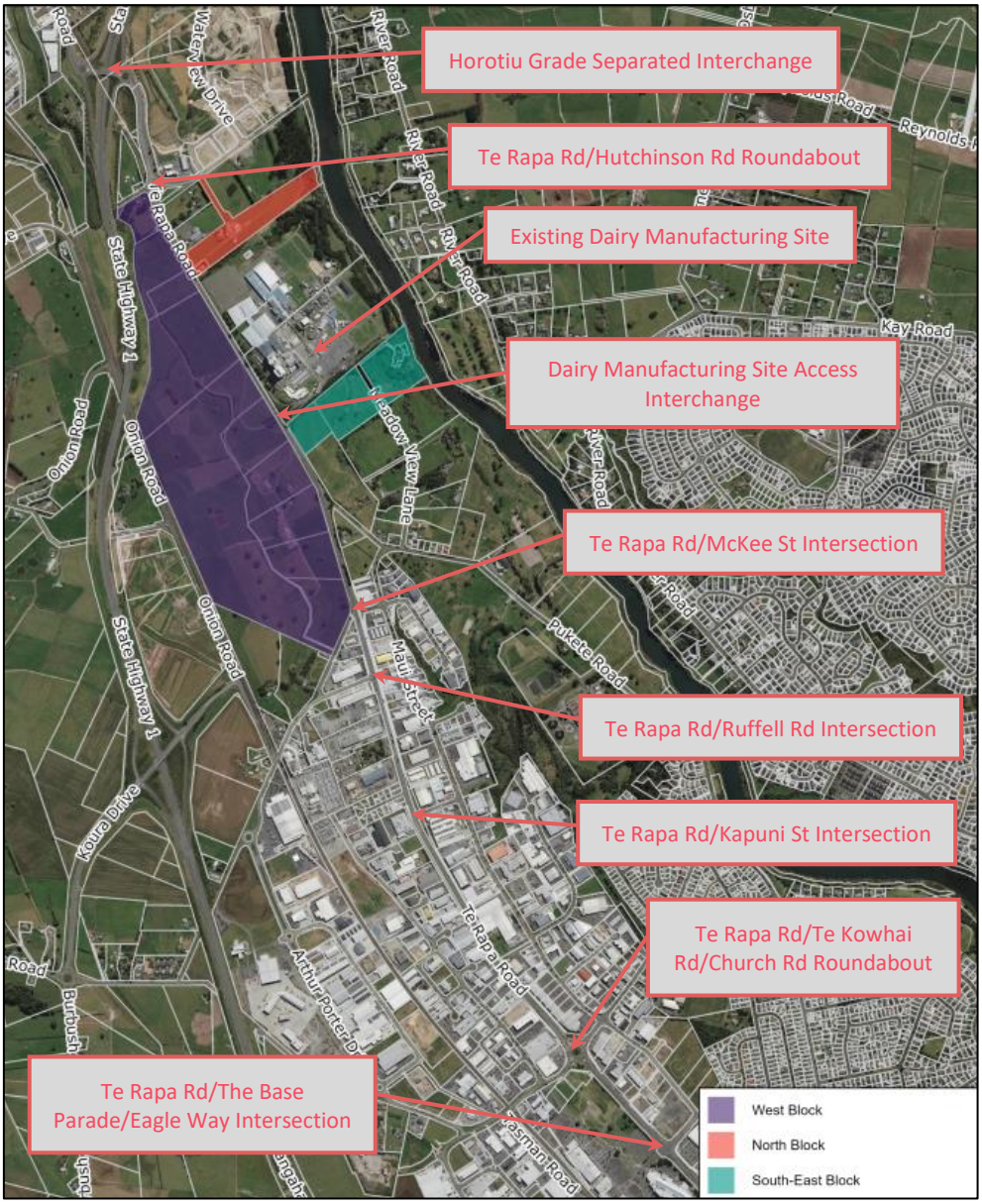


Figure 3: Plan Change Area Locality

The Plan Change Area is currently utilised for rural and residential uses and the Te Rapa Stream runs north to south through the centre of the West block.

The Plan Change Area is zoned Te Rapa North Industrial Zone - Deferred Industrial and Open Space Zone - Natural Open Space Zone in the District Plan.

Stage 1A of the Te Rapa North Industrial Zone staging applies to most of the West Block as shown in Figure 4. The District Plan indicates that permitting unanticipated industrial development, either within or outside Stage 1A, other than on the Dairy Manufacturing Site, would mean the inefficient provision of infrastructure.

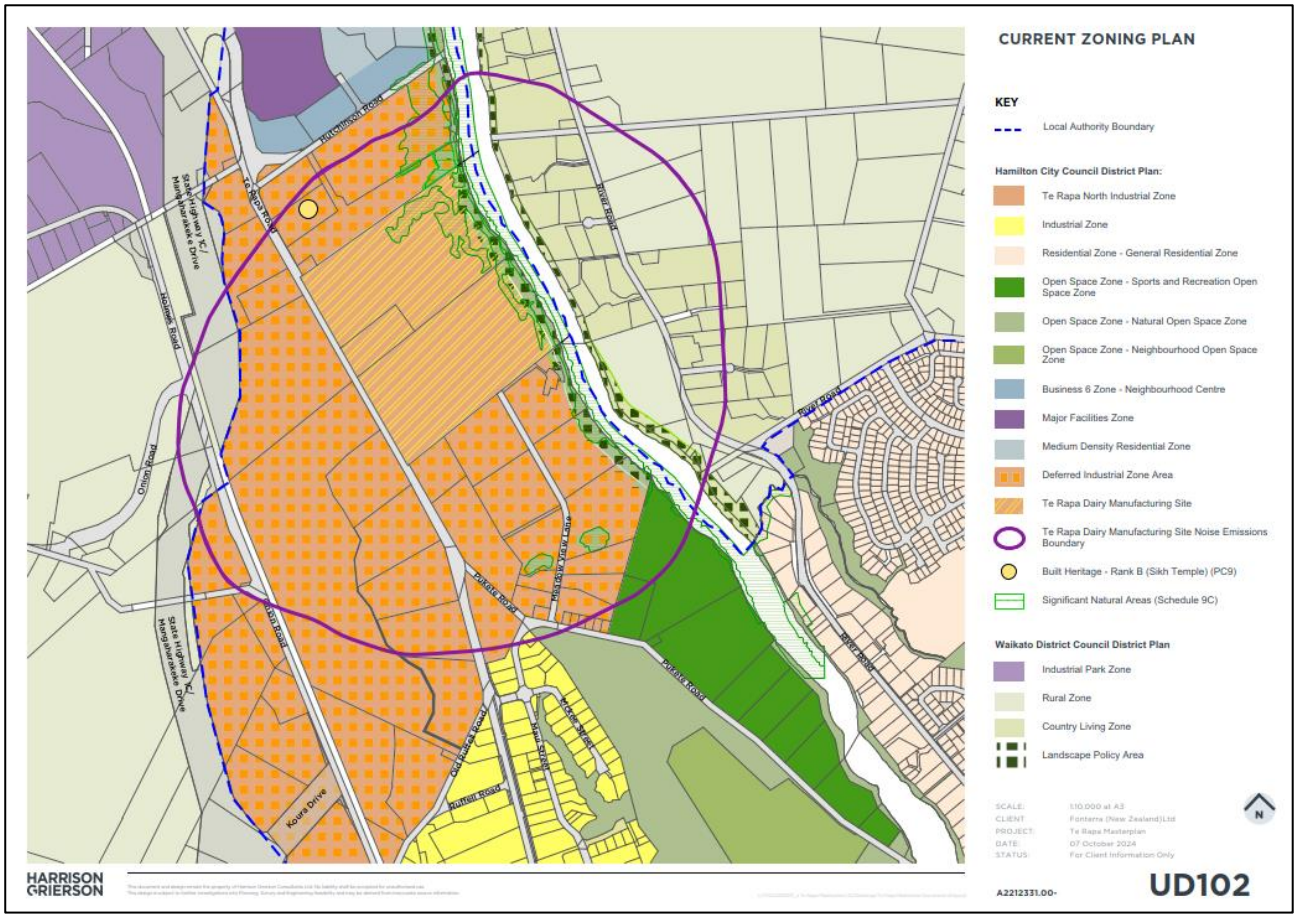


Figure 4: Te Rapa North Industrial Zone Staging

3.2 Existing Road Network

The existing network of public roads surrounding the Plan Change Area that could potentially be affected by PC17 are described in this section.

3.2.1 Te Rapa Road

Te Rapa Road is considered a strategically important road corridor through the area. It is identified as part of HCC's Strategic and Sensitive Transport Network and is classified as a Major Arterial transport corridor in the District Plan Transport Corridor Hierarchy. It is categorised as a transit corridor in One Network Framework ("ONF") which provides fast and efficient movement of people and goods within urban areas.

The Average Daily Traffic ("ADT") volume along the section of Te Rapa Road between Hutchinson Road and McKee Street, adjacent to the Plan Change Area is 14,600 vehicles per day ("vpd")[5]. This section of Te Rapa Road has a posted speed limit of 80 km/h with a mean operating speed of 75 km/h and a safe and appropriate speed ("SAAS") of 80 km/h[6].

Figure 5 illustrates the existing partial grade-separated interchange access to the Dairy Manufacturing Site on Te Rapa Road. The northbound and southbound on and off ramps at the interchange provide exclusive access to the Dairy Manufacturing Site. The southbound on and off ramps are at grade while the northbound ramps pass under Te Rapa Road (referred to as Te Rapa Access Road). The volume of traffic which can use these ramps is governed by Rule 12.4.7 (d) of the District Plan.

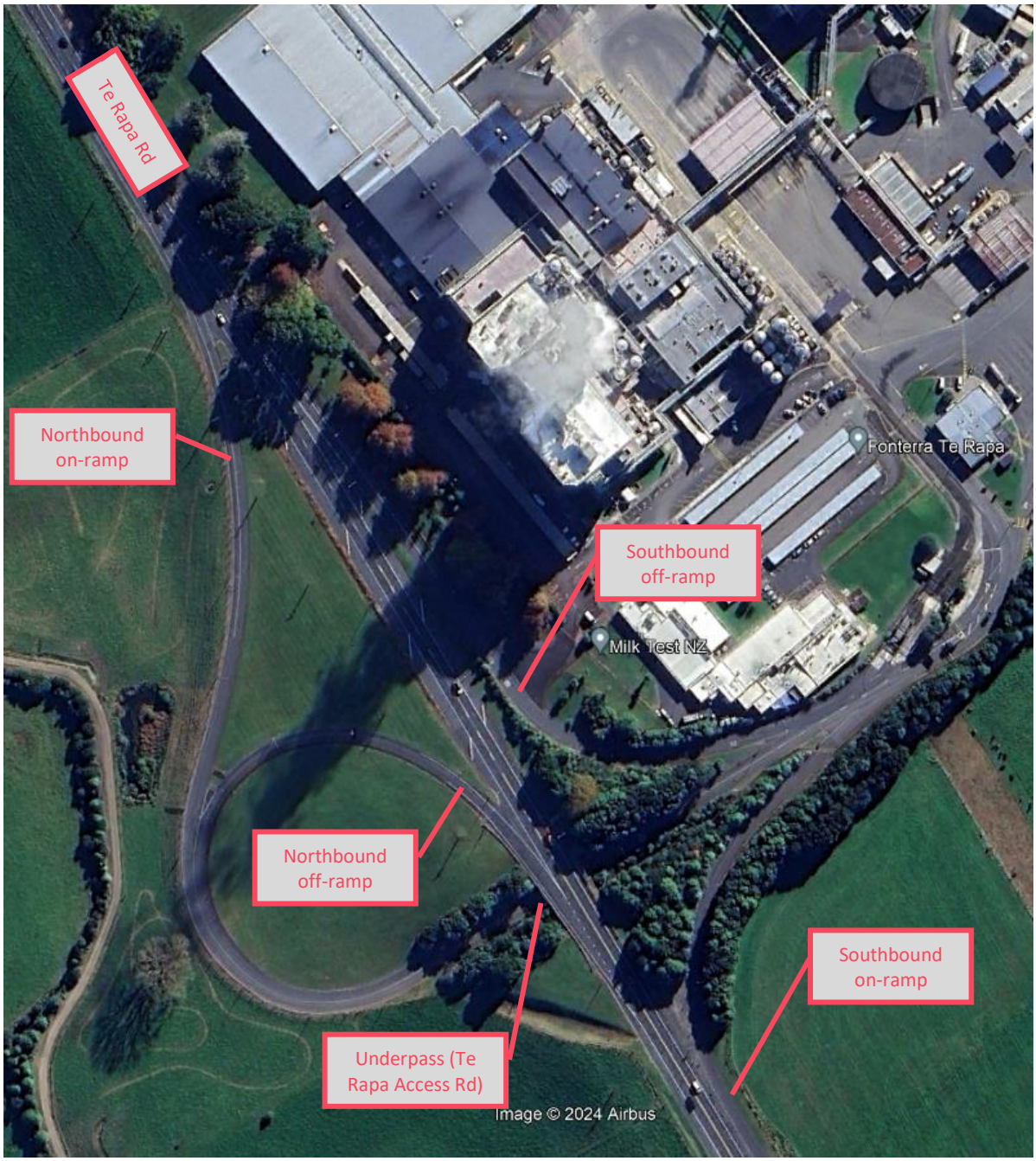


Figure 5: Partial Grade Separated Interchange Access to the Dairy Manufacturing Site

[5] CoLab Waikato Data Portal
[6] MegaMaps

3.2.2 Hutchinson Road

Hutchinson Road is classified as a local road in the District Plan Transport Corridor Hierarchy. It was previously a 480 m long, no exit road but is presently undergoing reconstruction work to provide access to the Te Awa Lakes development that is under construction. Current (but likely to become outdated) characteristics are:

- A 9 m wide two-lane sealed but unmarked carriageway.
- An estimated ADT volume of 1,587 vpd[7].
- A posted speed limit of 80 km/h.
- A mean operating speed of 37 km/h[8].
- A SAAS of 80 km/h[9].

Hutchinson Road is to be upgraded to a minor arterial / collector standard in accordance with the District Plan Transport Corridor Hierarchy, including pedestrian and cycle facilities, prior to any section 223 certificate for subdivision of the Te Awa Lakes development being issued in the Medium Density Residential or Business 6 Zones, or prior to any building being occupied or open for use in the Major Facilities zone that can generate more than 500 vehicle movements in the peak hour measured cumulatively across all zones[10].

At its western end, Hutchinson Road connects to the roundabout intersection with Te Rapa Road and Bern Road. The roundabout has two circulating traffic lanes and Hutchinson Road and both Te Rapa Road approaches all provide dual entry and exit lanes. Bern Road has a single entry and exit lane only and is a short (138 m) no exit road.

3.2.3 McKee Street

The section of McKee Street between Te Rapa Road and Maui Street is identified as a collector transport corridor in the District Plan Transport Corridor Hierarchy and as an urban connector in the ONF primarily providing safe, reliable, and efficient movement of people and goods between different parts of urban areas. The balance of McKee Street is classified as a local transport corridor in the District Plan. McKee Street has a sealed carriageway of approximately 10.4 m with an estimated ADT of 1,330 vpd based on Mobile Road website. It has a posted speed limit of 50 km/h with a mean operating speed of 32 - 34 km/h and a SAAS of 40 km/h (between Te Rapa Road and Maui Street) according to MegaMaps.

McKee Street currently intersects Te Rapa Road in the form of a give-way controlled T-intersection. The intersection has a 135 m long left turn slip lane from Te Rapa Road onto McKee Street. There is also a 40 m right turn lane provided on Te Rapa Road.

3.2.4 Ruffell Road

Ruffell Road is currently classified as a proposed collector transport corridor in the District Plan Transport Corridor Hierarchy and as an urban connector in the ONF. It has an ADT of 1,300 vpd based on CoLab Waikato Data Portal. Ruffell Road has a posted speed limit of 80 km/h with a mean operating speed of 48 km/h and a SAAS of 40 km/h as per MegaMaps.

[7] https://www.mobileroad.org/
[8] MegaMaps
[9] MegaMaps
[10] Rule 3.8.5.3.1(b) in the Hamilton City Operative District Plan and Condition 1 (Advice Note) in resource consent number 010.2021.00011468.006.

3.3 Existing Transport Modes

3.3.1 Public Transport

Te Rapa Road is the current public transport route for services connecting Hamilton to Horotiu, Ngāruawāhia and Huntly. Bus stops for both directions of travel are shown in Figure 6.

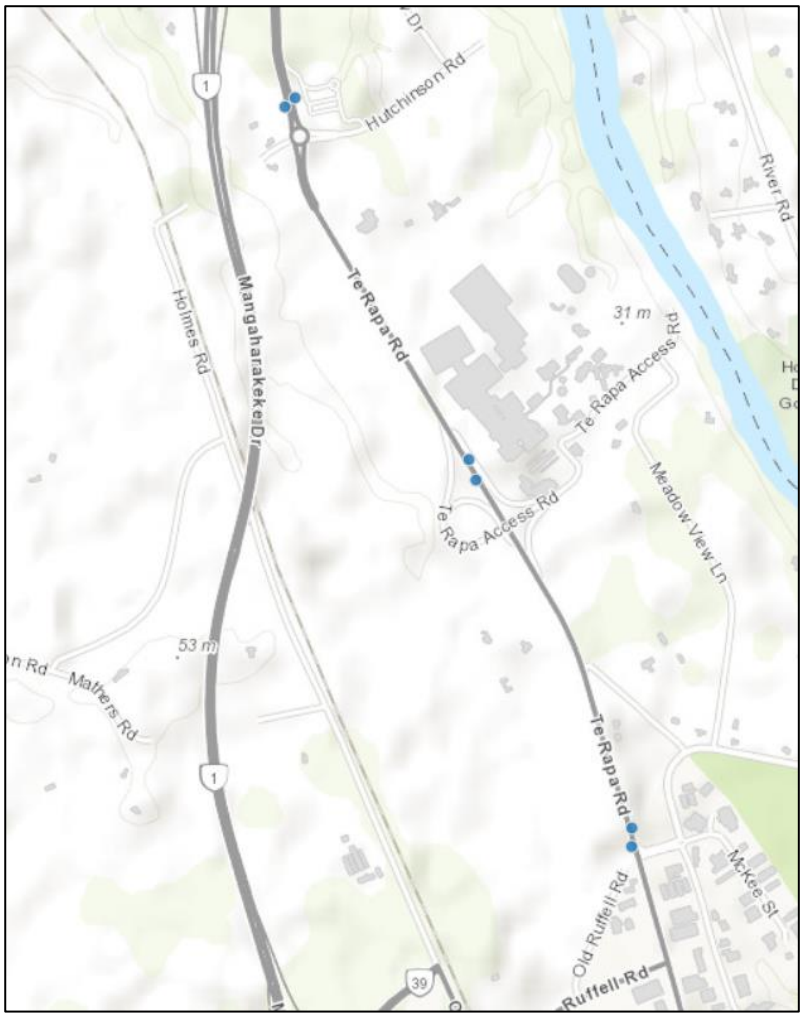


Figure 6: Public Transport Bus Stop Locations (blue dots)

These bus stops on Te Rapa Road are currently served by the bus route '21 Northern Connector'. The 21 Northern Connector is a regional service that provides service from the Hamilton Transport Centre to Huntly, Te Kauwhata and Pukekohe via The Base. The weekday services are provided every 35 minutes outside of the two-weekday commuter peak periods. More frequent services are provided during the weekday commuter peak periods.

3.3.2 Walking and Cycling

There are no existing pedestrian or cycling facilities on Te Rapa Road. This is attributed to it being a transit corridor, as its separation from residential land use and low-density surrounding land use mean there is little demand for walking or cycling on these roads.

On and off cycle ramps are provided at the Te Rapa Road / Hutchinson Road roundabout allowing cyclist to connect to an off-road walking and cycling shared path with crossing points provided within the roundabout splitter islands. A 3 m wide walking and cycling shared path exists on the northern side of Hutchinson Road.

A 1.2 m wide footpath currently exists on the southern side of McKee Street with no cycling facilities present on McKee Street and at the intersection with Te Rapa Road.

There are 1.5 m wide footpaths on both sides of the urbanised section of Ruffell Road between Te Rapa Road and Old Ruffell Road. No cycle facilities are present on Ruffell Road; however, advanced stop boxes are provided at the Te Rapa Road / Ruffell Road signalised intersection.
Like the Hutchinson Road roundabout, on and off cycle ramps are provided at the Te Rapa Road / Te Kowhai East Road / Church Road roundabout allowing cyclist to connect to an off-road walking and cycling shared path with crossing points provided within the roundabout splitter islands.

3.3.3 Railway Siding

The NIMT passes the western boundary of the Plan Change Area. This provides a significant opportunity for a rail siding to support the future development resulting from PC17.

3.4 Crash History

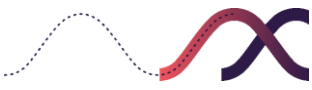
Crash records for a ten-year period 2014 – 2023 were sourced from the NZ Transport Agency Waka Kotahi ("NZTA") Crash Analysis System ("CAS"). Additionally, we have also included all available data for 2024. The study area includes all crashes within a 100 m radius of the proposed accesses to the Plan Change Area and key intersections in the vicinity of the Plan Change Area as well as the section of Te Rapa Road between Hutchinson Road and McKee Street.

Table 1 summarises the crash and injury history together with relevant commentary.

Table No: 2

Crash History 2014 - 2024						
Location	**Total # Crashes**	**Crash Severity**				**Comments**
		Death	**Serious Injury**	**Minor Injury**	**Non-injury**	
Intersections						
Horotiu Grade Separated Interchange	33	1	2	10	20	The fatality involved a vehicle exiting the southbound off-ramp failing to give way to a motorcyclist travelling eastbound towards Te Rapa Rd. One serious injury crash involved a motorcyclist losing control due to speed while travelling westbound on Te Rapa Rd approaching the eastern roundabout, while another serious injury crash involved a motorcyclist exiting the western roundabout towards Horotiu and colliding head-on with another southbound vehicle that had crossed to the opposing lane due to distraction. Most of the minor and non-injury crashes relate to loss of control crashes while negotiating the roundabouts.
Te Rapa Rd / Hutchinson Rd Roundabout	15	0	0	1	14	Trends noted were rear-end collisions and changing / cutting lanes when on circulating lanes. Minor injury involved a vehicle travelling northbound on Te Rapa Rd failing to give way to right turning

						vehicle from Hutchinson Rd when entering the roundabout.
Dairy Manufacturing Site Interchange	0	0	0	0	0	-
Te Rapa Rd / McKee St Intersection	3	0	1	1	1	Serious injury involved a motorcyclist falling off his motorcycle while doing a wheelie. Minor injury involved a northbound vehicle on Te Rapa Rd hitting the rear end of another vehicle.
Te Rapa Rd / Ruffell Rd Intersection	19	0	1	1	17	Rear-end collisions were the most common crash type, which is common at signalised intersections. Both serious and minor injury crashes were rear end collisions.
Te Rapa Rd / Ann Michele St Intersection	4	0	1	2	1	Serious injury crash involved a head-on collision where the driver of one of the vehicles had fallen asleep. One of the minor injury crashes involved a head-on collision where the driver was dizzy and had crossed the centreline. Another minor injury crash involved a motorcyclist travelling northbound on Te Rapa Rd being hit by a right turning vehicle into Ann Michele St.
Te Rapa Rd / Kapuni St Intersection	1	0	0	0	1	-
Te Rapa Rd / Te Kowhai Rd / Church Rd Roundabout	39	0	0	9	30	Trends noted were failing to give way (including three of the minor injury crashes) when entering the roundabout and rear-end collisions. Two of the minor injury crashes involved a northbound vehicle on Te Rapa Rd failing to notice a cyclist from the right and hitting the cyclist. Two of the minor injury crashes involved a police pursuit with the driver losing control and vehicle going off-road. One of the minor injury crashes involved a driver losing control of the vehicle while racing with another vehicle. Another minor injury crash involved a 90-degree crash.
Road Sections						
Te Rapa Rd – between Hutchinson Rd and Dairy Manufacturing Site	5	0	1	1	3	Serious injury involved a vehicle travelling northbound on Te Rapa Rd losing control and colliding head-on with a southbound vehicle. Minor injury crash involved a vehicle undertaking a U-turn on Te Rapa Rd colliding with another vehicle in the same direction of travel.
Te Rapa Rd – between Dairy Manufacturing Site and McKee St	11	1	1	2	7	Fatal crash involved a northbound vehicle overtaking another vehicle at 5:30am in a 30 km/h temporary speed limit area and clipping the vehicle being overtaken. The overtaking vehicle rolled and collided with an oncoming car. Driver doing the overtaking was on learner licence.

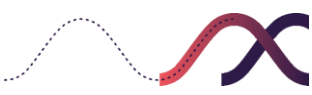


						Serious injury crash involved a vehicle found off-road and driver out of the car. Minor injury crashes include overtaking on the opposing lane, losing control and going off-road.
Te Rapa Rd – between McKee St and Ruffell Rd	1	0	0	0	1	-
Te Rapa Rd – between Ruffell Rd and Kapuni St	8	0	0	4	4	Three of the minor injury crashes involved rear end collision between a northbound vehicle and a vehicle that has stopped or slowed due to the signals at Ruffell Rd intersection.
Te Rapa Rd – between Kapuni St and Church Rd	7	0	1	3	3	The serious injury crash and one of the minor injury crashes involved vehicles crossing the centreline and colliding with another vehicle in the opposite direction. Another minor injury crash was a run-off road crash

The above tabulated data reveals there were two fatality crashes within the study area over the last 10+ year period.

One of the fatal crashes occurred in 2015 involving a motorcyclist being hit by a car entering the Horotiu Interchange east roundabout from the southbound off-ramp.

The other fatality occurred within the last 5-year period (2021), caused by a driver on a learner licence overtaking a car travelling slowly in a construction zone with a 30 km/h temporary speed limit, clipping that car and rolling into an oncoming car.



4. Future Planned Transport Infrastructure

This section provides a brief description on key roading projects that are within the vicinity of the Plan Change Area.

4.1 Future Northern River Crossing Arterial

HCC has long-term aspirations to provide a northern crossing of the Waikato River from Koura Drive at the State Highway 1C interchange through to Resolution Drive in Rototuna North. HCC envisages the Northern River Crossing ("NRC") to be a major east / west orientated arterial transport corridor like Wairere Drive.

While the corridor alignment is not confirmed and no designation has been set, the Transport Corridor Hierarchy in the District Plan and the HCC 2021 – 2051 Infrastructure Strategy ("HCC Infrastructure Strategy") show that the section of NRC between Koura Drive and Te Rapa Road will pass through the southern end of the Plan Change Area, before intersecting with Te Rapa Road and continuing east across the Waikato River somewhere south of the existing Dairy Manufacturing Site as illustrated by Figure 7.

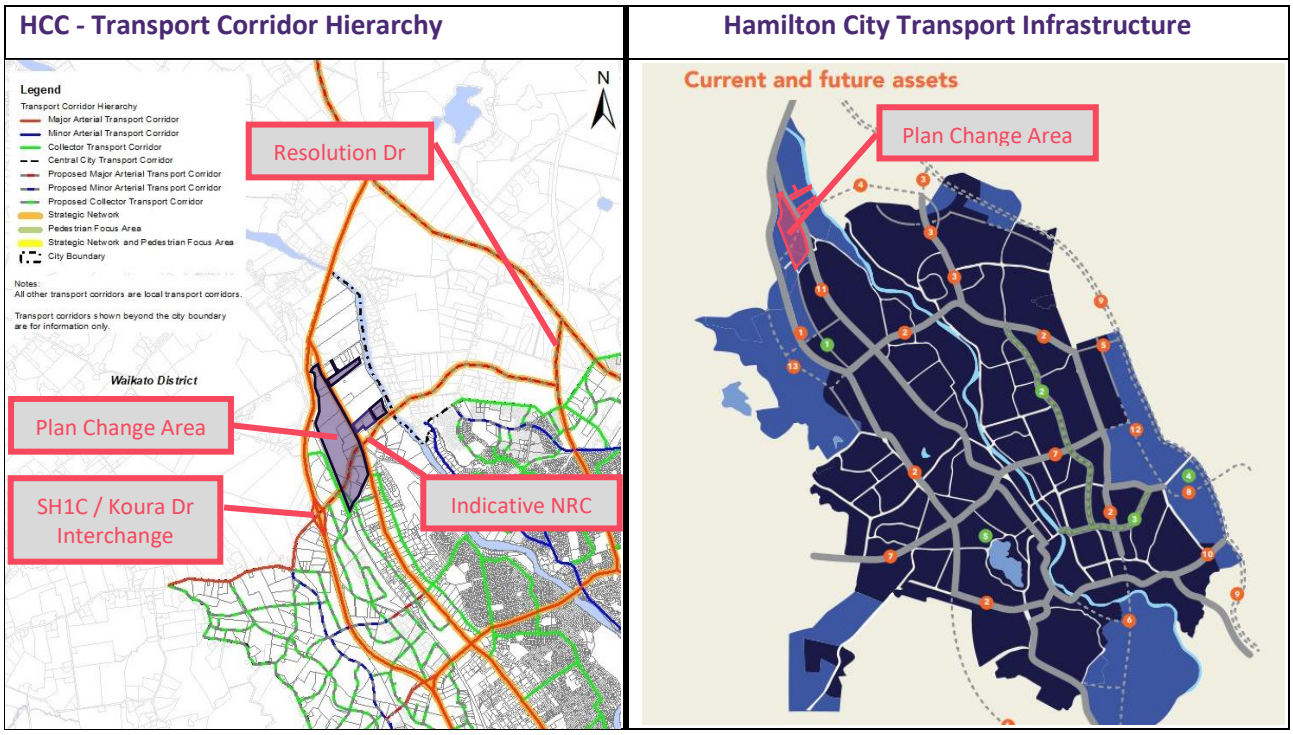


Figure 7: Indicative NRC Location within the District Plan (left) and the HCC Infrastructure Strategy (right)

The indicative position of the river crossing coincides with where the river narrows, allowing for the shortest bridge length. Following further engagement, HCC has advised that no geotechnical, archaeological or ecological investigations have been completed, so the preferred bridge location is not yet determined.

The HCC Infrastructure Strategy shows an anticipated timeline for construction of the NRC being 2030 and beyond. The NRC is also listed as a future main arterial transport corridor in the HCC Infrastructure Strategy, and the alignment in the HCC Infrastructure Strategy is consistent with the alignment shown in the District Plan. The Plan Change Area and the Te Awa Lakes development (north of Hutchinson Road) are identified as Growth Areas, shaded in blue in Figure 7 above.

At the time of writing this ITA, the NRC remains a long-term plan with no level of design or route designation having been completed, nor construction timeframe or funding confirmed.

4.1.1 NRC High-Level Alignment Options Analysis

As an input to the drafting of the PC17 Structure Plan, BBO undertook a high-level analysis of the potential NRC corridor options to identify a route that minimises the loss of developable land in PC17 Plan Change Area and identifies a suitable intersection location with Te Rapa Road that provides both some certainty for PC17 whilst affording Council sufficient flexibility in determining the corridor alignment east of Te Rapa Road and the crossing point over the Waikato River.

The following demonstrates that the proposed alignment of East - West Road through the Plan Change Area (west of Te Rapa Road) does not preclude the ability for HCC to deliver the NRC arterial when funding for the investigation and route protection process for the NRC is secured. We have demonstrated that there is a range of alignment options to the east of Te Rapa Road and across the river for the NRC.

The high-level analysis included the understanding that the NRC will be a major arterial road and is likely to be part of HCC's Strategic Road Network.

Pre-application meetings with Council's strategic planning and infrastructure staff confirmed that it is reasonable to assume for concept optioneering purposes that the posted speed limit on the section of NRC between Koura Drive and Te Rapa Road will be 60 km/h while the section east of Te Rapa Road crossing the Waikato River would be 80 km/h to reflect its core movement function. A major arterial typically has a high standard of geometry with large radii curves, sufficient sight distances for the respective design speeds, grade separated walking and cycling crossing points (unless provided at signalised intersections or mid-block) and no direct property access. Each of these characteristics have been accommodated in the alignment optioneering by BBO.

In addition to the above, the NRC transport corridor is expected to cross the NIMT and Onion Road via an overbridge. The extension of Koura Drive over the railway line will likely require permanent closure of the Koura Drive / Onion Road intersection, with Onion Road continuing at grade alongside the railway lines beneath the Koura Drive overbridge. This would be a similar bridge configuration to the Gateway Drive rail overbridge in Northgate Business Park at Horotiu. The eastern approach to the overbridge is likely to be positioned through Fonterra and third-party land holdings and is anticipated to require a large earth embankment to raise the road to provide sufficient clearance height for the bridge over Onion Road and the railway lines.

It is also considered good design practice that the eventual NRC corridor intersection with Te Rapa Road is orientated at or near a right-angle to facilitate good sightlines on all approaches, and efficient turning movements for heavy vehicles with the smallest footprint for the intersection.

All these factors, along with the necessity for appropriate horizontal geometry (curve radii) to match the anticipated design speed (eliminating sharp alignment changes between the NIMT and Te Rapa Road), limit the alignment options to those within the enveloped area shown in Figure 8.

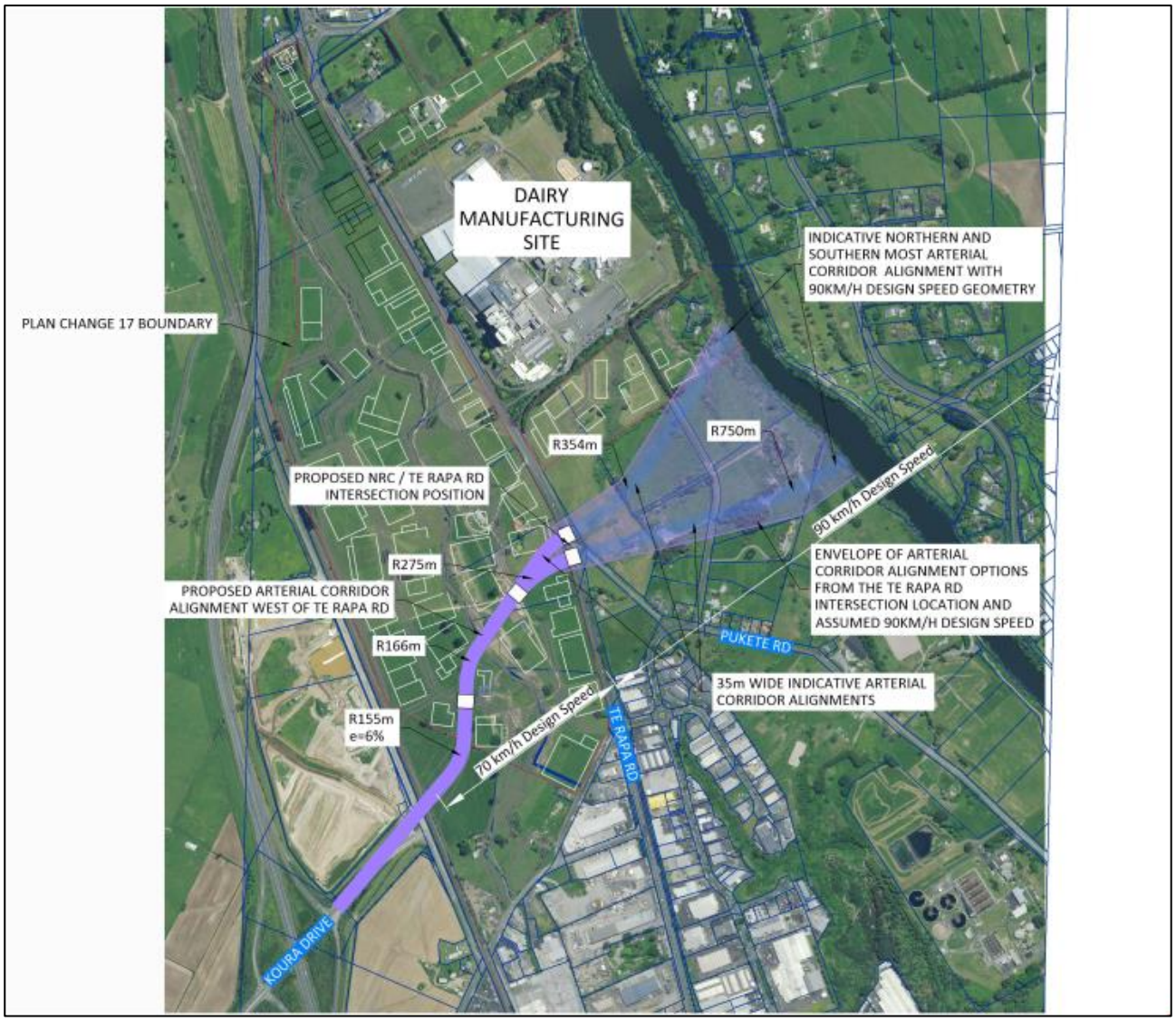


Figure 8: Indicative NRC Corridor Envelope east of Te Rapa Road

4.1.2 East - West Road and the Future NRC Alignment West of Te Rapa Road

The proposed East - West Road and the future NRC alignment through PC17 land west of Te Rapa Road, as shown in Figure 8:

- Maximises the developable industrial land within the Plan Change Area.
- Avoids the widest part of the proposed storm water and riparian basin at the southern end of the Plan Change Area.
- Meets the geometric standards for a 70 km/h design speed.
- Seeks to minimise the impact on 3rd party land holdings (e.g Empire Corporation land).
- Enables an intersection with Te Rapa Road that is at or near a right-angle.
- Supports the anticipated alignment of the future overbridge connection to Koura Drive.

4.1.3 Future NRC Alignment East of Te Rapa Road

Figure 8 also demonstrates an envelope (with example alignment options) providing significant flexibility for HCC to designate a suitable NRC alignment and river crossing location in the future. The envelope is constrained to alignments that:

- Achieve the geometric standards of a 90 km/h design speed.
- Connect to PC17's identified location for the NRC intersection with Te Rapa Road.
- Support a river bridge location somewhere between Kay Road and the southern boundary of the Dairy Manufacturing Site, consistent with the high-level plans shown in Figure 7.

Accordingly, BBO considers that the proposed alignment of East - West Road through the Plan Change Area (as shown on the proposed Structure Plan) does not preclude HCC's ability to designate the NRC east of Te Rapa Road in a location that achieves the river crossing connection and location anticipated by the high-level plans currently available.

4.2 Te Awa Lakes Development

North of the Plan Change Area, beyond Hutchinson Road, is the Te Awa Lakes development, which will provide 90 ha of industrial, commercial, and residential land. Te Awa Lakes development is a staged development encompassing the area that is identified as Stage 1B of Te Rapa North Industrial (refer to Figure 4).

Stage 1 of the Te Awa Lakes development is east of the Great South Road and Te Rapa Road interchange, predominantly residential and is currently under development. Stage 2 is to the north of State Highway 1C. Stage 3 abuts the northern portion of the North Block and is envisioned as a recreational, commercial, and accommodation area.

The following is a list of transportation infrastructure upgrades that are required as part of the Te Awa Lakes development in accordance with the rules in the District Plan.

4.2.1 Rule 3.8.5.3.1 (a)

Prior to any section 223 certificate for subdivision under the Resource Management Act being issued in the Medium Density Residential zone or the Business 6 zone, or prior to any building being occupied or open for use in the Major Facilities zone, the following improvements are to be completed:

i. The Te Rapa Road / McKee Street intersection is to be signalised, including any additional works to address adverse transferred effects associated with the signalisation, at the Te Rapa Road / Kapuni Street intersection;

ii. A pedestrian crossing facility is to be constructed at the existing bus stops on Te Rapa Road adjacent to the Structure Plan area and a bus shelter is to be constructed at the western bus stop location;

iii. The Te Awa River Ride path from and within the Structure Plan area to Pukete Road is to be upgraded in accordance with CPTED principles. In addition, as much existing cycle route that is within the road corridor as practicable is to be replaced with riverside cycle path from the Structure Plan area to Pukete Road; and

iv. Te Rapa Road on-road cycle safety improvements including targeted road markings, signage and road surfacing work between Hutchinson Road and Church Road.

4.2.2 Rule 3.8.5.3.1 (b)

Prior to any section 223 certificate for subdivision under the Resource Management Act being issued in the Medium Density Residential zone or the Business 6 zone or prior to any building being occupied or open for use in the Major Facilities zone, that will generate more than 500 vehicle movements in the peak hour measured cumulatively across all zones, Hutchinson Road is to be upgraded to a minor arterial / collector standard, including pedestrian and cycle facilities.

4.2.3 Rule 3.8.5.3.2

All Land Development Plan consent applications, and resource consent applications in the Te Awa Lakes Adventure Park Major Facilities Zone (except for Land Development Consents for Land Development Plan Areas B, I and J) shall include a Broad ITA. Resource consents in the Business 6 zone shall include a Broad ITA. All ITAs shall identify and evaluate the effects of all cumulative development in the Structure Plan area on the infrastructure identified for improvements in Section 3.8.3. Where consented development will result in more than 500 vehicle movements in the peak hour, measured cumulatively across all zones, the ITA shall evaluate the effects and where necessary propose mitigation for cumulative effects on the following:

a. *Te Rapa Road between the Fonterra Interchange and Hutchinson Road to determine whether an additional northbound lane is required;*
b. *Te Rapa Road between the Fonterra Interchange and Ruffell Road to determine whether an additional southbound lane is required;*
c. *the Te Rapa Road/Hutchinson Road intersection to determine if upgrading is required; and*
d. *the Horotiu Interchange to determine if upgrading is required.*

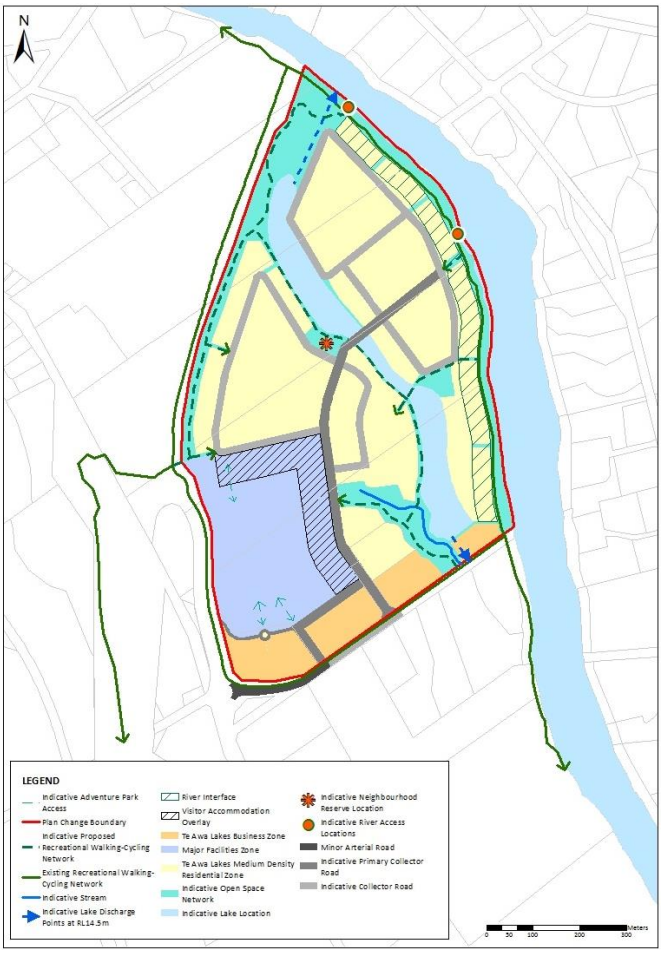


Figure 9: Te Awa Lakes Framework Plan (Source: District Plan Appendix 2)

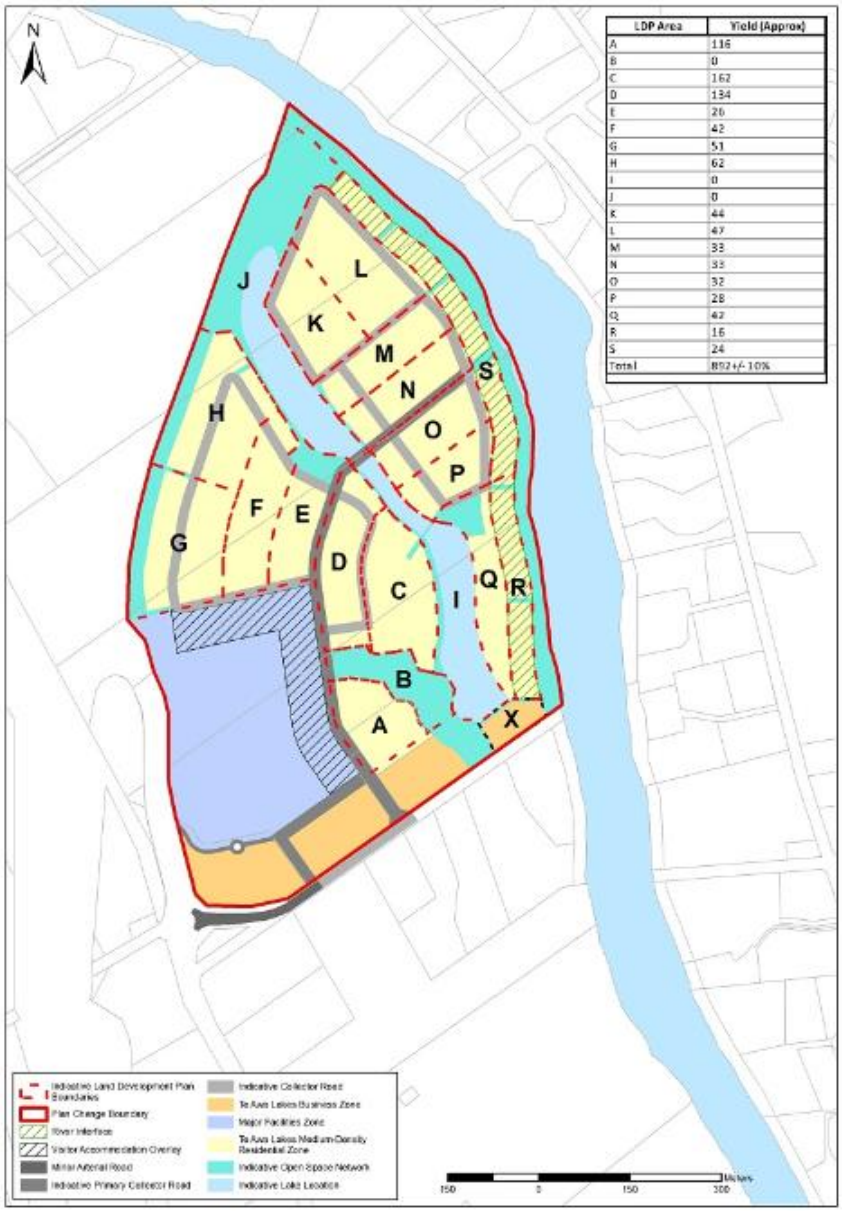


Figure 10: Te Awa Lakes Land Development Plan Areas (Source: District Plan Appendix 2)

4.2.4 Te Rapa Road / McKee Street Signalised Intersection

Stantec prepared an ITA in 2019 in support of the Te Awa Lakes Plan Change 2 application. This ITA identified that the existing Te Rapa Road / McKee Street intersection (a give-way controlled T-intersection), will need to be signalised. The example illustrated in Figure 11 is a minimum configuration to accommodate the modelled future traffic demands including Te Awa Lakes development, without PC17 traffic.

Accordingly, Rule 3.8.5.3.1 (a) of the District Plan requires the Te Rapa Road / McKee Street intersection to be signalised and include any additional works to address adverse transferred effects associated with the signalisation, at the Te Rapa Road / Kapuni Street intersection. These upgrades are required prior to any section 223 certificate for subdivision under the Resource Management Act 1991 ("RMA") being issued in the Medium Density Residential and Business 6 Zones, or prior to any building being occupied or open for use in the Major Facilities Zone. This upgrade therefore was included in the baseline for the Transport Modelling (refer to Section 7.2.2).

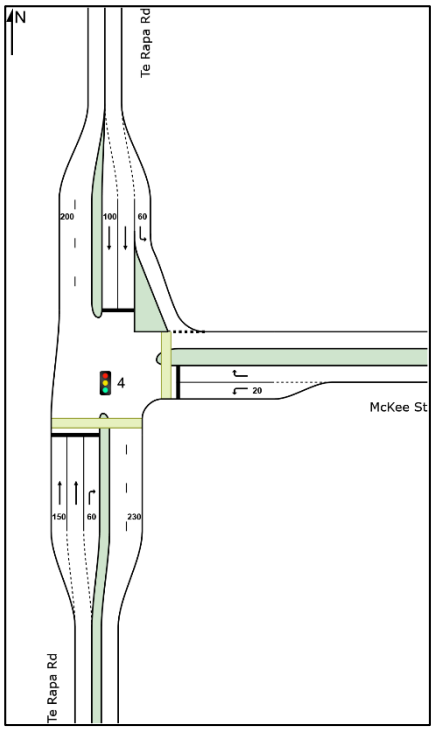


Figure 11: Recommended Te Rapa Rd / McKee St Intersection Layout Post 2031 by Stantec

PC17 will not undermine or exceed the capacity of the Te Rapa Road / McKee Street intersection upgrade recommended as part of Te Awa Lakes development[11]. However, the recommended upgrade is likely to require coordination with Te Awa Lakes developers and HCC to ensure the upgrade solution is sufficiently future proofed for both growth areas.

4.3 Hamilton – Waikato Metro Spatial Plan Transport Programme Business Case

A Transport Programme Business Case was prepared by Aurecon to establish potential network transport interventions to promote the compact urban form aspirations set in the Hamilton-Waikato Metro Spatial Plan ("MSP Business Case"). This MSP Business Case identifies "Short list Option C" as the recommended programme to "support a radical transport shift and support the transformative move to a Rapid Transit Network future" in Hamilton.

The MSP Business Case illustrates the Rapid Transit Network[12] ("RT") components of this programme as follows:

[11] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006

[12] Waikato Metro Spatial Plan Executive Summary report. Revision C, Figure 1-8

Figure 12: Proposed Rapid Transit Corridors (Source: MSP Business Case Executive Summary)

RT1 is a dedicated Bus Rapid Transit ("BRT") corridor servicing the north-south and east rapid transit corridors connecting Te Awa Lakes development, Hamilton Airport and Ruakura. RT1 will include an 'evolution' from bus service provision only, to bus services that include bus lanes and bus priority at intersections before finally delivering full bus rapid transit outcomes. This would be based upon the demand trigger as noted as 2,000 passengers per hour per direction at peak times.

The MSP Business Case states[13]:

"From a demand and accessibility perspective RT1 and RT2 routes deliver the best outcomes irrespective of the land use scenario chosen.

[13] Waikato Metro Spatial Plan Programme Business Case report. Revision D, Section 6.2.2

The delivery of both of these corridors is key to creating the long-term demand and formation of LUS2A[14] density outcomes. It will be the 'vision' to commit to the early delivery of the routes through action focussed staging and sequencing, to aid the transit outcomes to help change shift and land use outcome.

The critical linchpin in the network will be the RT1 north and east routes – as these existing brownfield corridors can facilitate the intensification of the existing land use areas as well as provide for the expansion and intensification of the greenfield areas (e.g. Rotokauri) and access to the employment and residential area of Ruakura and to the university.".

The MSP Business Case also identifies a recommended timeframe to implement the programme as shown below[15]. This indicates RT1 coming online from Year 10 onwards (year 1 is 2025).

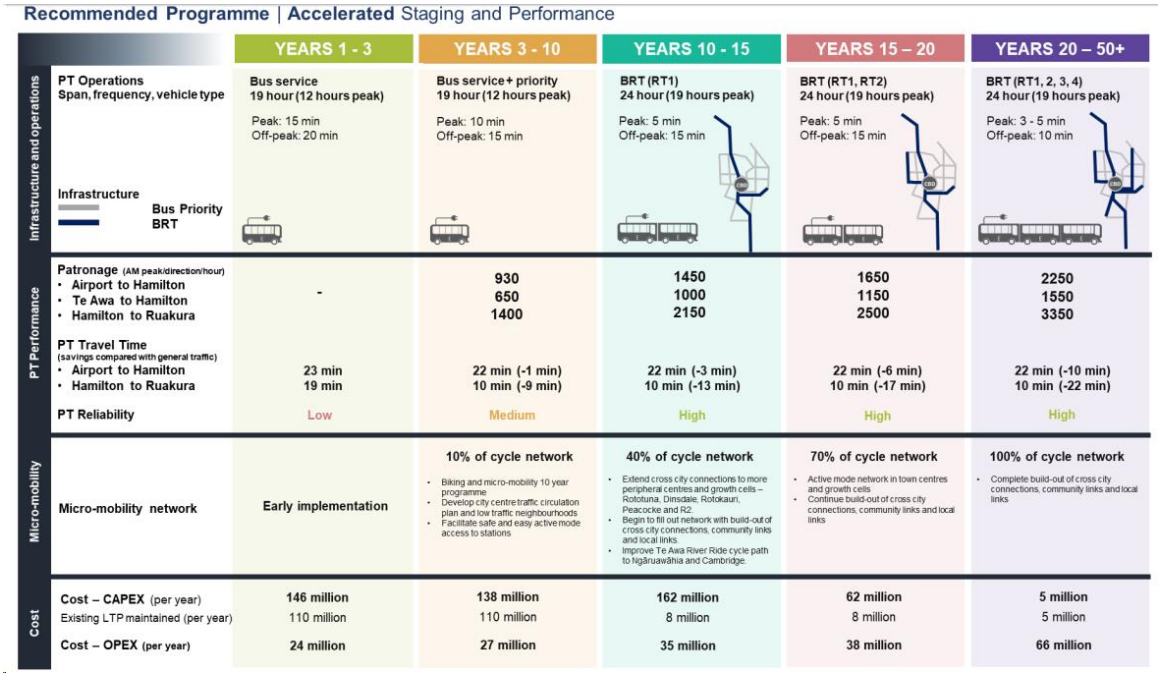


Figure 13: Staging Approach (Source: MSP Business Case Executive Summary)

PC17 is consistent with the MSP Business Case as it will introduce significant employment adjacent to the future RT1 route, along with two new signalised intersections on Te Rapa Road for accessibility. It will also enable the inclusion of traffic signal priority pre-emption for public transport vehicles, which is a core requirement for efficient RT networks. PC17 also recommends new public transport stops on Te Rapa Road which also supports RT1 identified in the MSP Business Case.

[14] Land use scenario 2A: Future Proof Strategy regional splits, Future Proof intensification (64%), slower greenfield completion. The Future Proof Strategy capacity test that achieves 10% shift to brownfield with balance maintained for greenfield growth cells (MSP Business Case Section 2.3.1.3)

[15] Waikato Metro Spatial Plan Programme Business Case report. Revision D, Figure 6-9

5. Plan Change 17

5.1 PC17 Overview

The proposed Structure Plan for PC17 provides part of the evidential basis for the rezoning request. The proposed Structure Plan, as shown in Figure 14, is proposed to be inserted to the District Plan which demonstrates at high level, the key elements that will guide the development of the Plan Change Area; the principal transport network, access intersections and stormwater reserve.

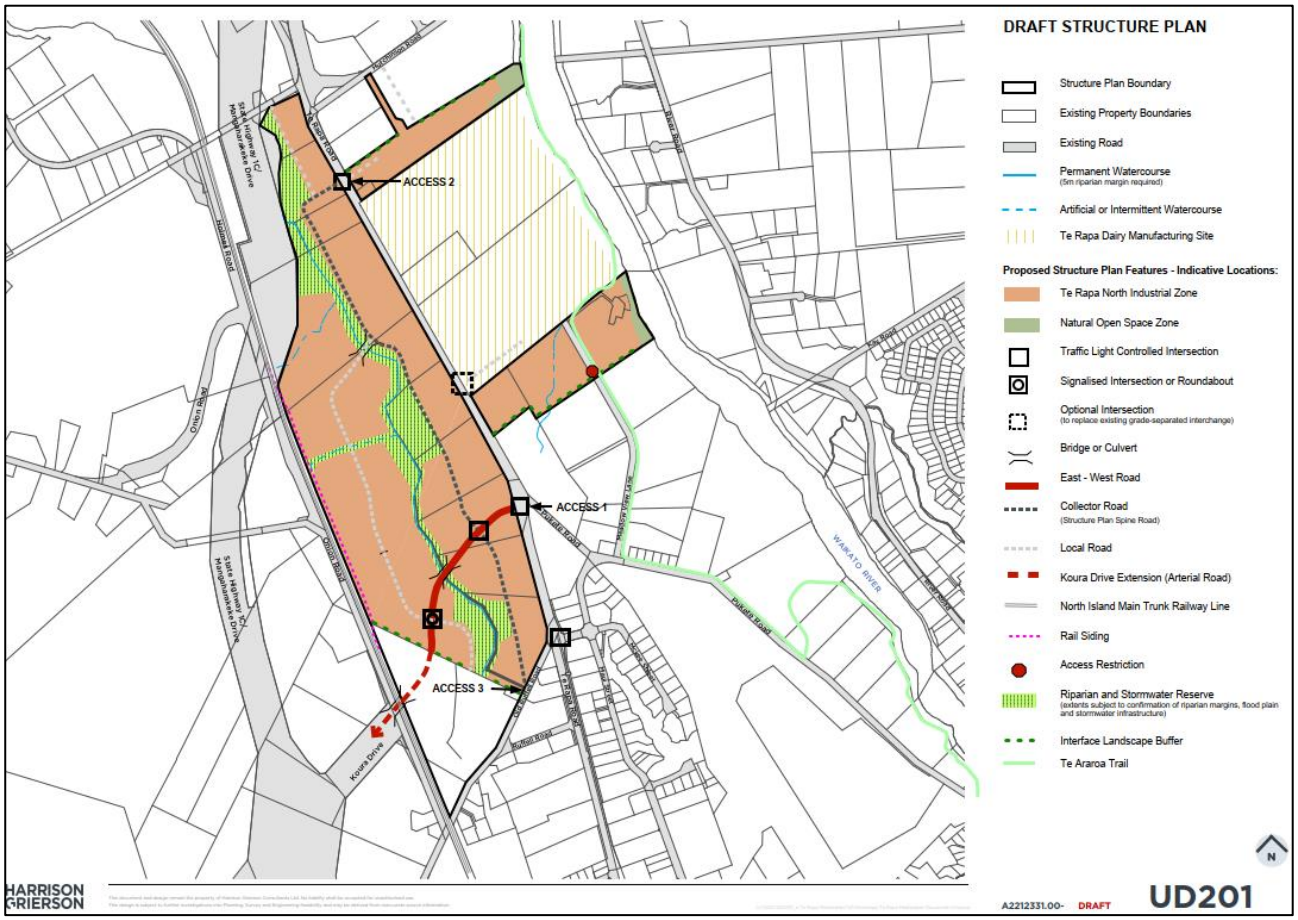


Figure 14: PC17 Proposed Structure Plan

The Masterplan, illustrated in Figure 15, shows one potential development outcome that is possible if development proceeds in accordance with the proposed Structure Plan. As with all masterplans, it will continue to evolve to respond to opportunities and constraints as they are identified through the rezoning and subsequent resource consent processes.

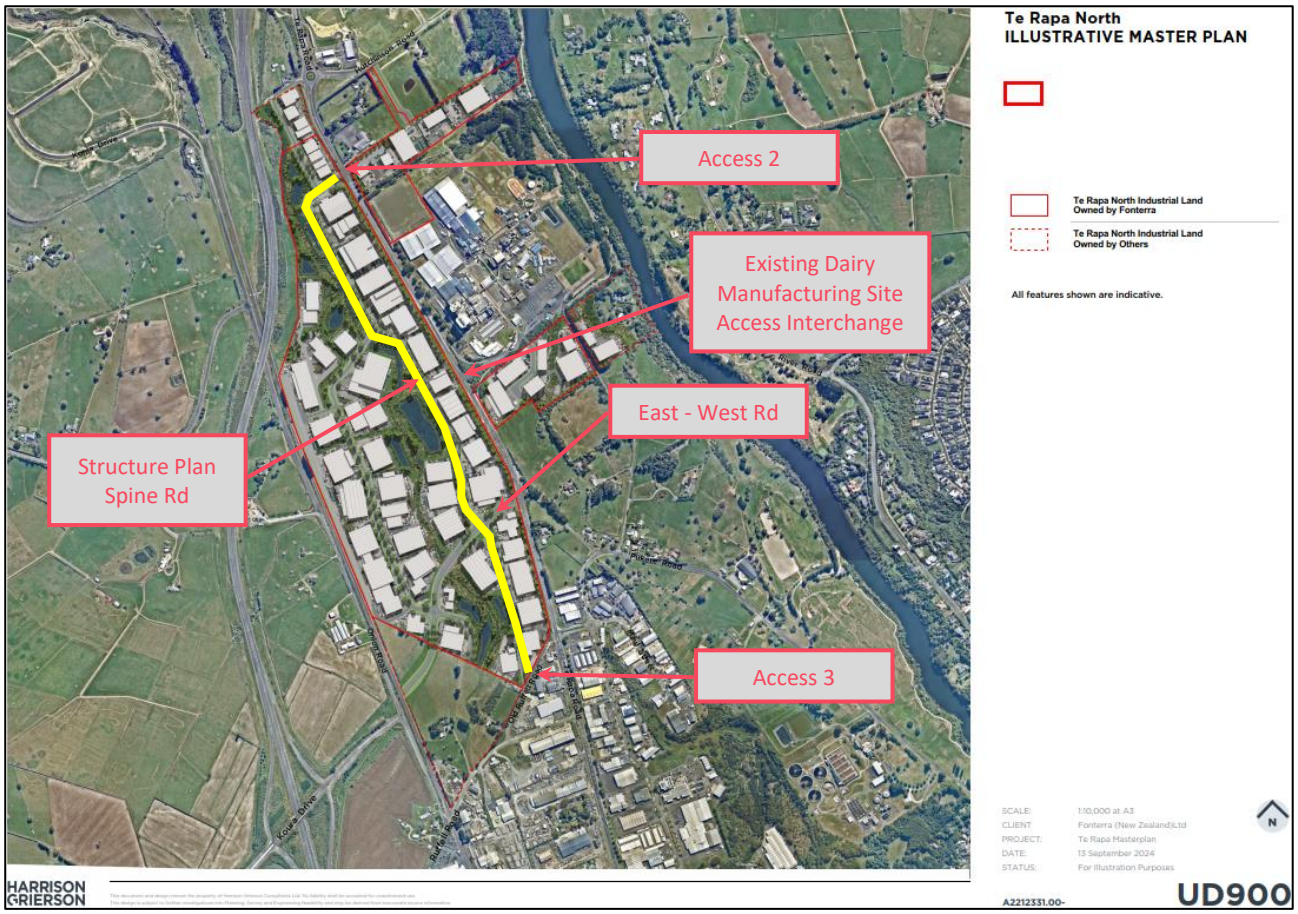


Figure 15: PC17 Illustrative Masterplan

Approximately 91 ha of land is proposed to be rezoned to enable industrial activities. Of that, only about 79 ha is capable of being developed for industrial purposes. The balance area is identified as riparian and flood prone area.

The following transport infrastructure is proposed to support the development of PC17 land area for industrial purposes:

- Provision of a north / south orientated collector road through the Plan Change Area (the Structure Plan spine road).
- Two new signalised intersections on Te Rapa Road providing access to the Structure Plan spine road.
- Connecting Old Ruffell Road to the southern end of the Structure Plan spine road.
- Provision of a safe and efficient load road network within the Plan Change Area that supports the types of vehicles and movements associated with industrial activities and freight haulage.
- Provision of a safe and convenient walking and cycling network throughout the Plan Change Area connecting to new and existing infrastructure on the wider road network.
- Future proof access to the NIMT rail for efficient freight movement.

The transport effects of PC17 are considered and discussed in the following sections of this report.

5.2 Access Strategy

5.2.1 Hamilton City Operative District Plan Framework

The existing District Plan rules around vehicle access to Te Rapa North Industrial Zone Stage 1A (refer to Figure 4) are as follows:

a. All vehicular access is provided via the existing grade separated interchange to Te Rapa Road (Rule 12.4.7 (a)(i)).

b. Access, vehicle entrance crossing, parking, loading, queuing, and manoeuvring space are provided in accordance with Rule 25.14.4 (Rule 12.4.7 (a)(i)).

BBO understands from the planning experts within the PC17 project team, that the existing District Plan rule framework that is based on a Concept Development Consent approach and sequencing is proposed to be deleted by PC17.

5.2.2 Proposed Access Strategy

The master planning process that informed PC17 and its resulting Structure Plan (refer to Figure 14) illustrates a development and access strategy for the Plan Change Area that contrasts with the above-mentioned rules in the District Plan. As such, the existing rules are proposed to be updated or deleted as part of PC17.

The proposed Structure Plan shows three primary access points directly to Te Rapa Road, including the existing Dairy Manufacturing Site interchange.

In the period before the ultimate NRC is constructed, all transport access into the Plan Change Area will be through four connections: the existing Dairy Manufacturing Site interchange, two new connections onto Te Rapa Road (Access 1 and Access 2) and one via Old Ruffell Road (Access 3). These access points will be internally connected via a Structure Plan spine road as illustrated in the proposed Structure Plan (refer to Figure 14).

Having considered the Hamilton - Waikato Metropolitan Spatial Plan, in which it is indicated that Te Rapa Road and the NRC will form part of the rapid transit corridor and frequent transit corridor respectively, it is proposed that the new PC17 accesses to Te Rapa Road are signalised.

The following are the key benefits of the proposed access strategy with and without the NRC:

- Improved access legibility over the current Te Rapa North Industrial Zone - Deferred Industrial Zone road network, which presently requires access to be provided via the existing grade separated interchange to Te Rapa Road as per Rule 12.4.7 of the District Plan.
- Greater accessibility and options for efficient future rapid and frequent transit servicing Te Rapa.
- Releases more land within Te Rapa North to be developed for economic growth.
- Future Proofing network connection to NRC.

Table No: 3 provides a summary of the concept design configurations for each new access intersection (refer also to Drawings in Appendix B).

It is recognised that these are high-level concepts, and the final design configuration is subject to preliminary and detailed design processes, safety audits and the Road Controlling Authority's ("RCA") standard approval

processes, so they will be amended and confirmed as part of resource consent or subdivision consent applications to develop the Plan Change Area once rezoned.

For the purposes of assessing effects and demonstrating that access to the rezoned land is feasible, each concept design has been produced in accordance with the existing District Plan provisions, the Waikato Regional Infrastructure Technical Specifications ("RITS"), Austroads Guide to Road Design Part 3: Geometric Design ("AGRD Part 3") and Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections ("AGRD Part 4A"). The concept layouts have been modelled to demonstrate that the expected performance and capacity of the intersections is sufficient for the transport demands of the Plan Change Area once developed.

Table No: 3

Preliminary Access Configurations – New Intersections			
Proposed Access	**Access Type**	**Proposed Configuration**	**Appendix Reference**
Access 1 (Te Rapa Rd/ East - West Rd)	Intersection	Signalised T-intersection	Appendix B Drawings 148020-00-0101 and 148020-00-0102
Access 2 (Te Rapa Rd – South of Hutchinson Rd)	Intersection	Signalised Crossroads Intersection	Appendix B Drawing 148020-00-0103

5.2.3 Proposed Access 1 – Te Rapa Road / East - West Road Intersection

Access 1 has been designed at a concept level in accordance with the best practice guidance in AGRD Part 4A.

The key design considerations in developing the concept signalised intersection layout and location were:

a. The preferred location of the intersection (from Plan Change 17 perspective) ensures Council has flexibility in determining the most appropriate alignment option for the future NRC section east of Te Rapa Road. The proposed location and demonstration of the alignment options envelope to extend the NRC over Waikato River is provided in Appendix B, drawing 148020-00-0004-B.

b. The intersection design and location enable staged upgrading to a four arm cross roads signalised intersection when the section of NRC east of Te Rapa Road is constructed.

5.2.4 Proposed Access 2 – Te Rapa Road Intersection (South of Hutchinson Road)

Access 2 on Te Rapa Road has been designed at a concept level in accordance with the best practice guidance in AGRD Part 4A.

Access to #1426 Te Rapa Road is currently located abutting the northern boundary of the South-East Block of the Plan Change Area. It is proposed that all accesses on Te Rapa Road to this property be closed and existing right turn bay be removed as part of the construction of Access 2. Access to 1426 Te Rapa Road is proposed to be provided from the eastern leg of the new signalised intersection. This provides a safer access arrangement for 1426 Te Rapa Road considering that vehicles currently must find safe gaps on an 80 km/h posted speed limit road to either join Te Rapa Road or turn right into the access.

5.3 Sight Distance

AGRD Part 4A requires the minimum Safe intersection sight distance (SISD) to be approximately 214 m for a design speed of 90 km/h and reaction time of 2 seconds. All access intersections will comply with the minimum SISD in all directions.

5.4 Separation Distance

The RITS (Section 3.3.9.7) requires a minimum intersection spacing of 90 m (on the same side of the road) or 45 m (on the opposite side of the road) for arterial roads, whereas it requires a minimum intersection spacing of 200 m (on the same side of the road) or 100 m (on the opposite side of the road) for industrial roads. Although Te Rapa Road is identified as a major arterial transport corridor, this assessment has considered the minimum intersection spacing for industrial roads more applicable considering the industrial land use surrounding Te Rapa Road if PC17 is approved. Figure 16 illustrates that the proposed locations of all new access intersections (i.e. Accesses 1 and 2) meet the minimum intersection spacing requirements.

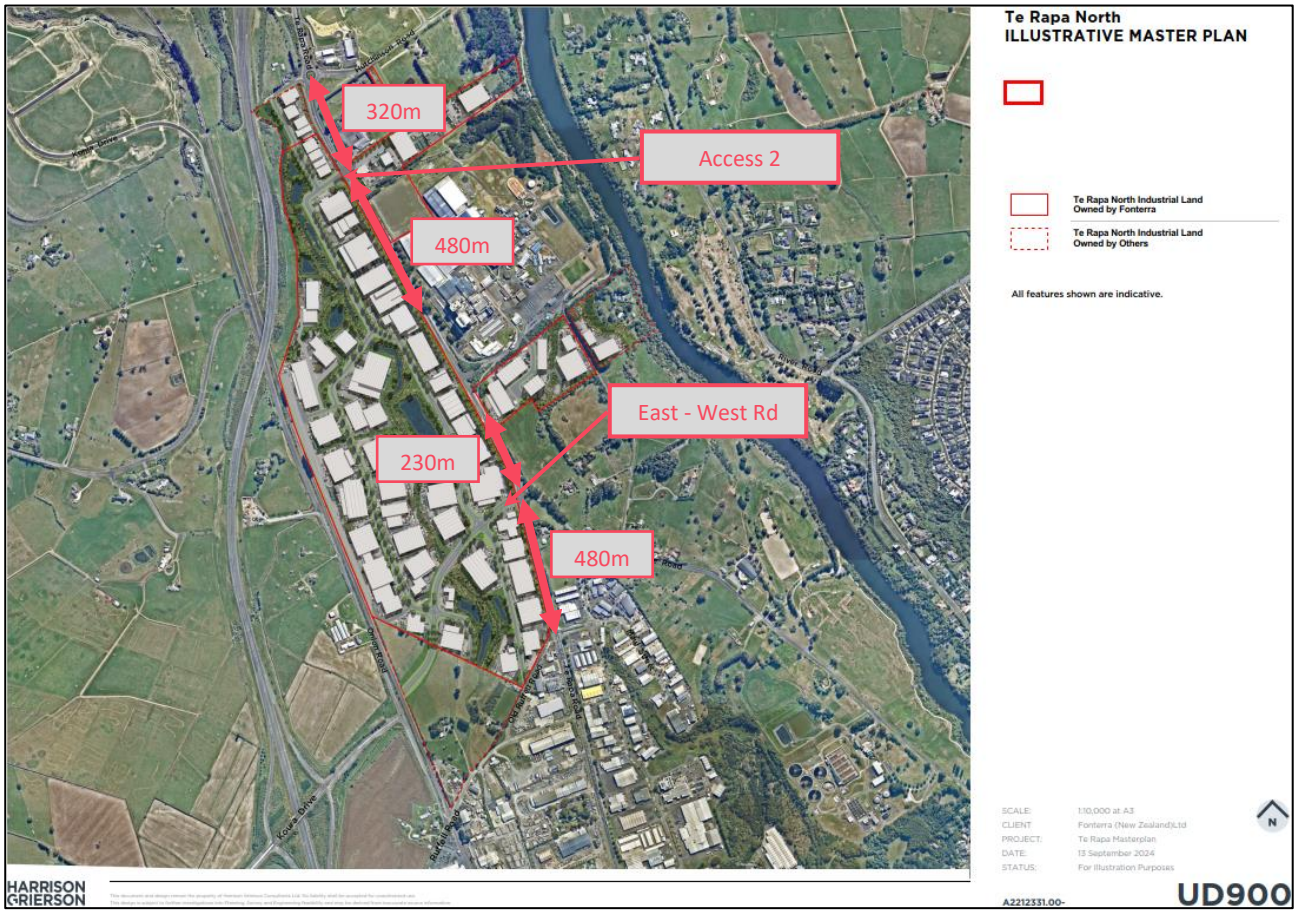


Figure 16: Intersection Spacing of New Access Intersections

5.5 Proposed Internal Road Network

An indicative integrated network of internal roads to service the Plan Change Area has been designed as shown in Figure 17. The road corridor typologies and layout proposed within the proposed Structure Plan are designed to industrial road standards of the District Plan to appropriately cater for heavy vehicle traffic that is typically anticipated, along with safe provision for walking and cycling and public transport.

PC17's internal road network will consist of three industrial road typologies described in the subsequent sub-sections. The proposed cross-sections were assessed against Table 15-6a)ii of the District Plan which provides the minimum geometric standards for each road classification. The assessment indicated that the proposed cross-sections fulfil all minimum requirements for an industrial road.

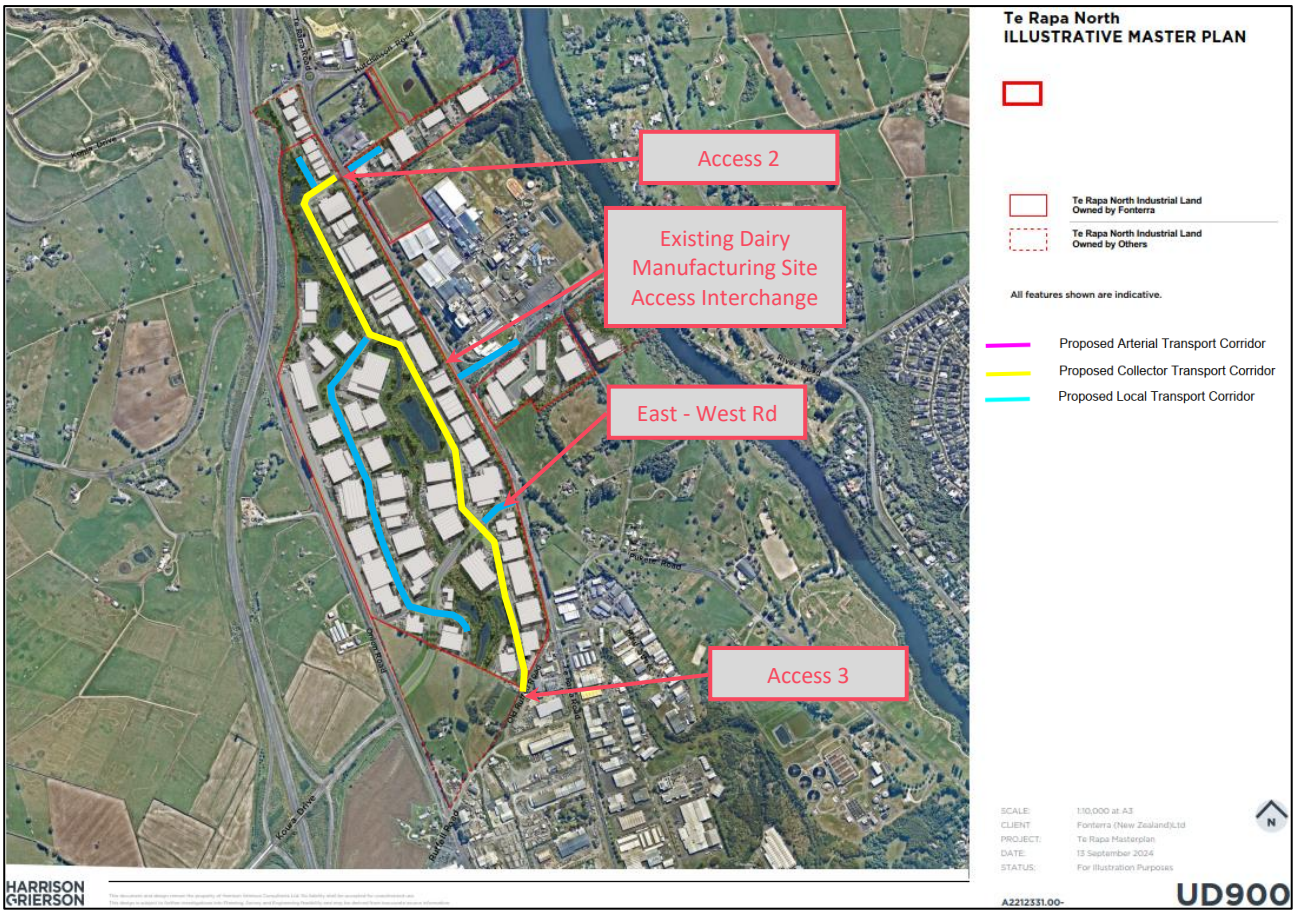


Figure 17: PC17 Road Hierarchy

5.5.1 Arterial Road

The District Plan requires major arterial roads within an industrial land use environment to be a four-lane transport corridor with a 3 m solid median. All bus stops along a major arterial corridor are expected to be recessed and a 3 m wide off-road shared walking and cycling path is to be provided on one side of the carriageway.

Given that NRC is expected to be a frequent transit corridor based on the Hamilton – Waikato Metro Spatial Plan, it is expected that one lane in each direction will be allocated to public transport. BBO has produced a concept typical cross-section illustrating what the NRC will look like ultimately, as shown in Figure 18.

However, to support the development of PC17 site in the interim period, the East - West Road will be constructed initially as a local road between Te Rapa Road and the Structure Plan spine road to service the PC17 site, but with a corridor width protected so HCC can form the NRC as a major arterial road in future. this assessment proposes the East - West Road typical cross-section presented in Figure 19 as an interim

outcome that future-proofs the width required for the ultimate cross-section.

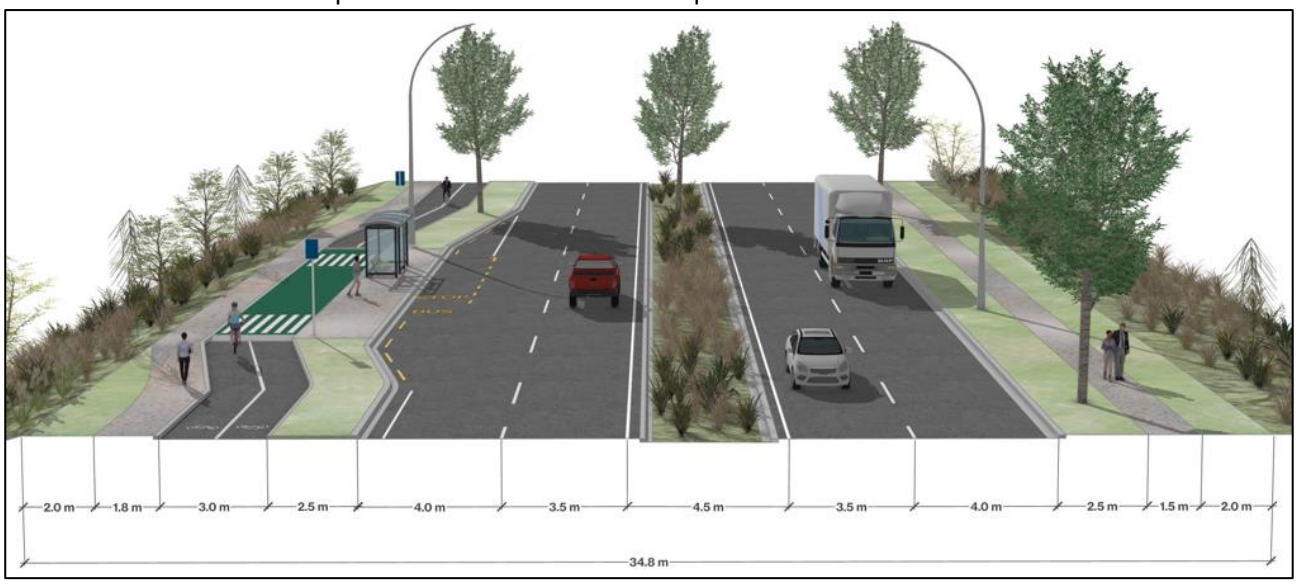


Figure 18: Indicative Typical Cross-Section of the Ultimate NRC Arterial (4 lanes)

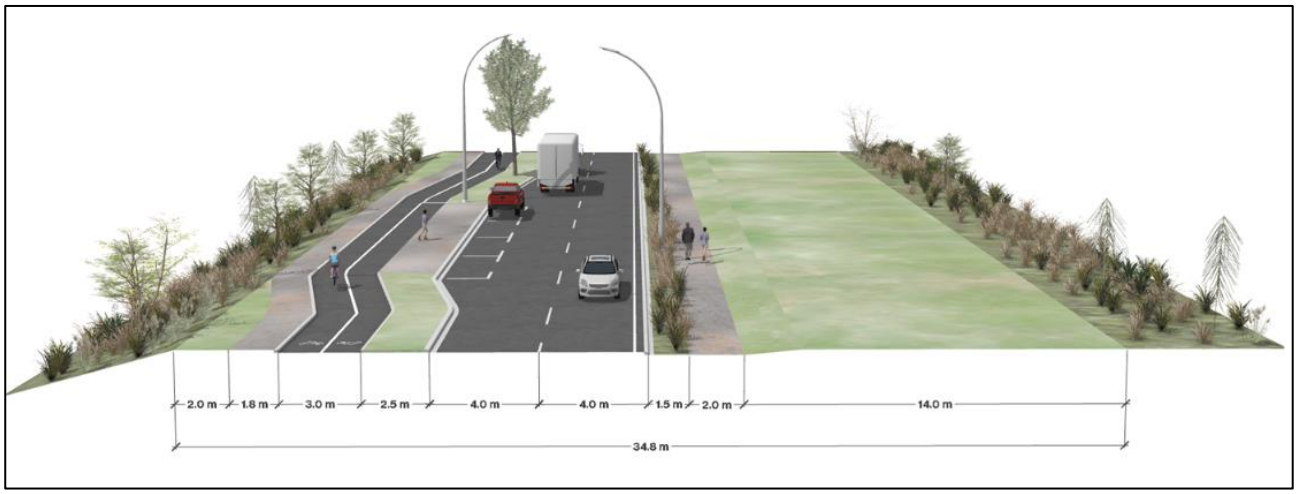


Figure 19: Indicative Typical Cross-section of East - West Local Road

5.5.2 Collector Road

The primary access into and through the Plan Change Area is proposed via the Structure Plan spine road. It is proposed as a collector road, connecting between the proposed signalised intersection at Access 1 and the proposed signalised intersection at Access 2. As the Plan Change Area develops, the road is proposed to be extended to connect to Old Ruffell Road (Access 3) such that an alternative access is provided for traffic to / from the west (i.e. Rotokauri and Waikato Districts to the southwest of Hamilton).

The indicative cross-section of the proposed Structure Plan spine road is illustrated in Figure 20. This industrial road typology provides a carriageway width of 11 m inclusive of a 2 m wide flush median within a 24.1 m wide road reserve. A 3 m wide shared walking and cycling path is provided on the eastern side of the road to enable a direct and efficient connection to public transport on Te Rapa Road via the paths provided on East - West Road. Recessed parallel parking bays are provided on both sides of the carriageway as per District Plan requirements.

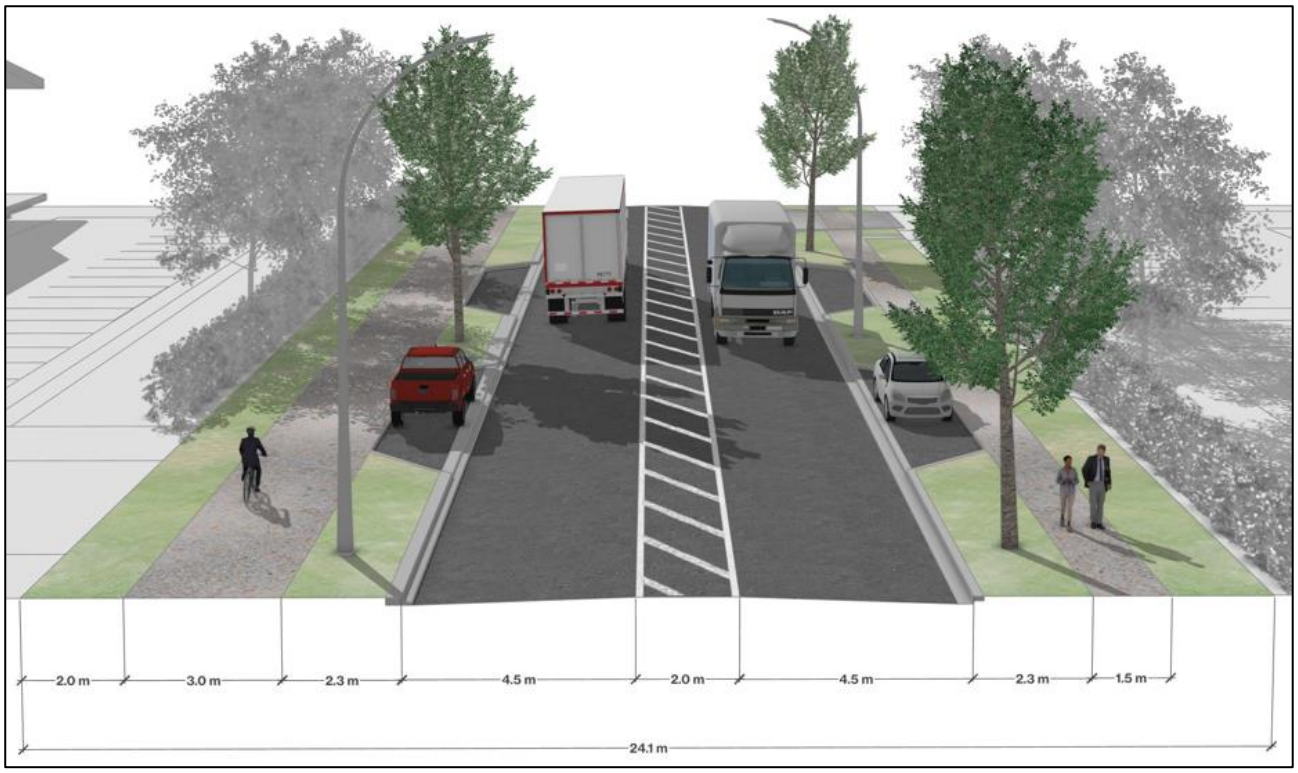


Figure 20: Indicative Typical Cross-section of Collector Road

5.5.3 Local Roads

All other internal roads will be designed as per the cross-section illustrated in Figure 21. This local industrial road typology provides a carriageway width of 10 m inclusive of a 2 m wide flush median within a 20.6 m wide road reserve. 1.5 m footpaths and 2 m wide recessed parallel parking bays are provided on both sides of the carriageway as per District Plan requirements. It is intended that cyclists can safely share the road with vehicles on local roads given the low vehicle speeds and volumes on these roads.

Figure 21: Indicative Typical Cross-section of Local Roads

5.6 Speed Management

The proposed design speed environments are 40 km/h on all internal roads which is aligned with Table 15-6a)ii of the District Plan. These design speed environments are supported by the cross-sections developed for PC17 and discussed in the preceding section.

5.7 Walking and Cycling Networks

PC17 and resulting future employment opportunities will create demand for walking, cycling and recreational exercises for residents / workers from the surrounding land uses. Therefore, all internal roads within the Plan Change Area will provide either dedicated footpaths and on-road cycling on local roads, or shared walking and cycling paths on the collector road. East - West Road between Te Rapa Road and the Structure Plan spine road (collector road) is proposed to accommodate a separated walking and cycling shared path on the northern side as shown in Figure 19.

As part of Te Rapa Road transitioning to a public rapid transit corridor, a 3 m wide shared walking and cycling path is proposed on both sides of Te Rapa Road, connecting East - West Road to proposed new bus stops on Te Rapa Road as illustrated in Figure 22.

A shared walking and cycling path alongside the Te Rapa Stream through the Plan Change Area as shown in Figure 22, could potentially be an attractive recreation route for active mode commuting and recreation. However, for it to be attractive the design requires numerous lateral path connections linking back to the north / south orientated roads so that users of the path can efficiently access their workplaces. The illustrative Masterplan and proposed Structure Plan do not yet indicate how the proposed shared walking

and cycling path along the Te Rapa Stream will link with the path on the proposed internal road network. This will be confirmed as part of resource consent or subdivision consent applications to develop the Plan Change Area once rezoned.

There is also a risk that future industrial sites having their back to the Te Rapa Stream will result in an under-utilised environment with little passive surveillance. Such environments impact negatively on perceived and actual personal security for pedestrians and cyclists, which results in low to negligible use of the paths.

Therefore, unless there is a strong focus in design toward visual amenity, personal security and connectivity between any paths along the Te Rapa Stream to public roads and view shafts, it is BBO's recommendation that the provision of a high-quality shared walking and cycling path on the collector road (i.e. spine road) berms will offer a superior, and more affordable solution. Quality of infrastructure, trip efficiency, user-friendliness, and safety are the key design components to maximise the attractiveness of walking and cycling as viable commuter travel modes.

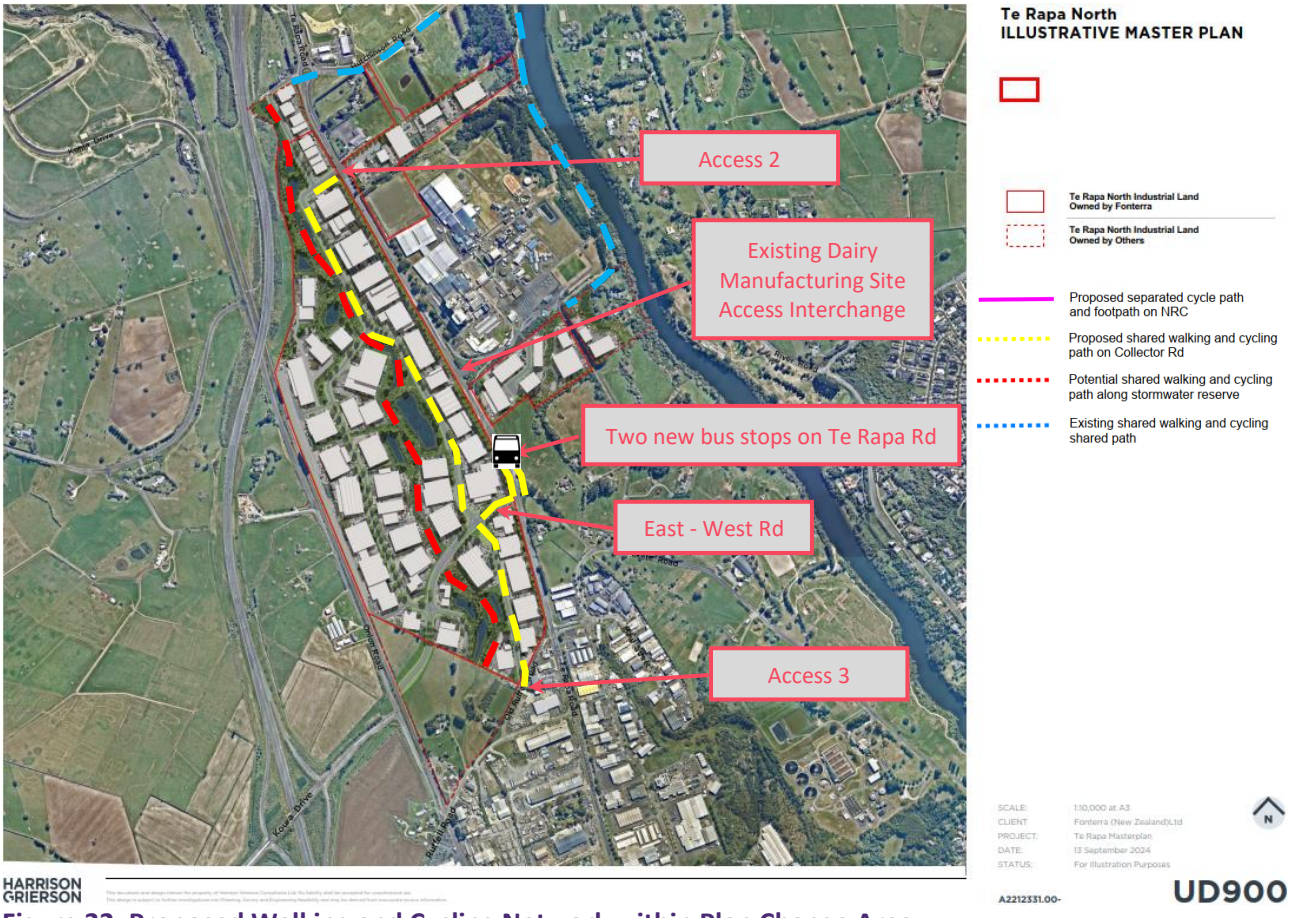


Figure 22: Proposed Walking and Cycling Network within Plan Change Area

5.8 Public Transport

PC17 and Te Awa Lakes development each support the need for improved public transport due to the creation of more employment opportunities and residential dwellings nearby. A pair of bus-stops are proposed north of East - West Road on Te Rapa Road, as shown in Figure 22. The indicative bus stop locations have been selected based on convenience and accessibility they offer to those expected to be employed within the Plan Change Area.

As stated in Section 4.3, the MSP Business Case indicates the long-term plan to provide a new rapid transit service (RT1) operating on a north-south corridor from Te Awa Lakes to Hamilton Airport and connecting to

an eastern rapid transit service and a south-west rapid transit service. This is a 30-year plan and at the time of writing this ITA, no designs or confirmed corridors or timing exists for any part of the rapid transit network.

5.9 Rail Freight Siding

The NIMT passes the western boundary of the Plan Change Area, providing a valuable opportunity for direct freight access via a siding. The illustrative Masterplan identified this railway siding opportunity and it has been adopted in the proposed Structure Plan for PC17.

6. Trip Generation

The trip generation anticipated by Rule 12.4.7b to Rule 12.4.7d in the District Plan around vehicle movements within Te Rapa North Industrial Zone are as follows:

b. *Vehicle movements within Stage 1A:*

   i. *Trip generation shall not exceed 15.4 trips / ha gross land area / peak hour (Rule 12.4.7b.i.).*

   ii. *Access(es) from internal roads, entrances, parking, loading, and manoeuvring are in accordance with Rule 25.14.4.*

   iii. *Access to the arterial and State Highway networks are generally in accordance with the indicative roading pattern shown in the approved Concept Development Consent for the stage.*

c. *Deferred Industrial Area, excluding Stage 1A refer to Chapter 25.14: City-wide – Transportation for rules around vehicle movements.*

The expected trip generation for PC17 was determined using recently surveyed volumes undertaken on the adjoining access roads to each of the Airport Business Zone precincts (i.e. Titanium Park). The Airport Business Zone has been gradually developed into one of the region's strategic industrial nodes and therefore provides a reasonable proxy to predict the number of trips that are likely to be generated by PC17. Together with the latest aerial photography, the actual trip generation rates of completed development in the Airport Business Zone were calculated and these are presented in Table No: 4 below.

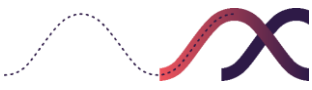
Table No: 4

2024 Surveyed Trip Generation Rates – Airport Business Zone			
	Daily (trips / ha (net) per day)	**AM Peak Hour (trips / ha (net) per peak hour)**	**PM Peak Hour (trips / ha (net) per peak hour)**
Southern Precinct (John Spencer Way) 7.8 ha (net) developed	67.3	8.4	6.6
Central Precinct (Ossie James Dr) 6.2 ha (net) developed	138.5	15.0	16.3
Raynes Precinct (Sharpe Rd) 10.8 ha (net) developed	102.3	6.7	9.8
Weighted Average	**100.3**	**9.3**	**10.4**
Overall Average Peak Hour Trip Rate		**9.9**	

Although PC17 involves a Plan Change Area of 91 ha, approximately 79 ha is capable of being developed for industrial purposes. The balance area is identified as riparian and flood prone area. Roads, reserves, landscape bunds, stormwater management devices and the proposed rail siding are expected to make up a combined use of 20% of the total Plan Change Area. Therefore, adopting an 80% net developable area (63 ha) and using the highest surveyed peak hour trip generation rate of 16.3 trips per net developable hectare, results in a total trip generation calculation of approximately 1,030 trips per peak hour.

6.1 Sensitivity Testing

A sensitivity test has been carried out by applying the typical trip generation rate of 15.4 trips per gross hectare per peak hour as per Rule 12.4.7(b)(i) in the District Plan. This results in a conservative total trip generation calculation of approximately 1,217 trips per peak hour for a gross area of 79 ha.



This assessment considers this figure to be relatively conservative considering the significant amount of land that is required for roads, reserves, landscape bunds, stormwater management devices and the proposed rail siding. Therefore, the total trip generation of 1,030 trips per peak hour calculated in the previous sections is considered more appropriate for PC17.

6.2 Public Transport and Active Mode Share

As highlighted in the previous sections, there are almost no walking and cycling trips within the vicinity of the Plan Change Area at present. With PC17 and Te Awa Lakes developed, and the recommended walking and cycling infrastructure upgrades (Section 5.7) completed, the active mode home to work / work to home trips are expected to significantly increase compared with the existing active mode-share, but is still likely to be a low overall percentage (less than 5%) relative to the potential for trips by private vehicles.

For comparison, a suburb like Pukete in Hamilton, which is approximately 2.5 km southeast of the Plan Change Area, has an active-mode uptake of between 2% and 3% according to Census 2018 data. Walking and cycling connectivity is plentiful between Pukete and the Plan Change Area, in the form of on-road cycle lanes as well as off-road shared paths. Road crossing opportunities and facilities are generally lacking for cycling convenience, and there are no dedicated off-road cycle paths for high-speed cycling with little interruption. Therefore, it is considered a baseline proxy for the active-mode share that is likely to be achieved by PC17. An active mode share of 2% to 3% (i.e. 20 – 30 trips per peak hour) is considered negligible overall.

Hence, for the purposes of this assessment we find that it is not beneficial to assess the reduction of estimated trips by private vehicle due to active mode share at this stage.

Long term it is conceivable that commuter cycling trips to and from the Plan Change Area could increase to 5% or more provided the NRC includes high-speed off-road cycling paths connecting Rotokauri and Rototuna North. However, the form and function of the NRC is not a certainty and therefore the findings should not be pre-empted.

Similarly for public transport, while this ITA acknowledges that Te Rapa Road is identified as a future rapid and frequent transit corridor, Fonterra does not control how, when, or if these services will be provided. This is the responsibility of HCC and the Waikato Regional Council to plan and adapt public transport as growth occurs. Therefore, the future uptake of trips by public transport cannot be predicted with certainty. For comparison, Pukete has a public transport uptake of about 2% according to Census 2018 data. It is considered appropriate for the purpose of assessing network and intersection capacity to conservatively assume public transport trips will be negligible relative to private vehicle trips. This is the basis adopted for the network assessment in Section 7.

7. Transport Modelling

BBO has undertaken a transport modelling exercise as an initial task for the PC17. This task included undertaking trip generation calculations for PC17, and transport modelling of those future trips on the surrounding network using the Waikato Regional Transportation Model ("WRTM") to assess the trip distribution and any resulting capacity or safety effects on affected intersections and the proposed accesses to the Plan Change Area.

7.1 WRTM Validity

The WRTM is presently the most appropriate strategic transport planning tool for predicting transport demands of proposed and consented land-use activity zones in the Waikato.

BBO obtained the latest WRTM models from the WRTM operators (Stantec) which incorporate:

- A 2018 validated base model;
- Modifications undertaken by the WRTM operators as part of the 2018 validated baseline model update where employment has been factored by area within Hamilton such that resulting traffic flows are more logical; and
- Future traffic volume forecasts aligned with Waikato WISE Projections[16].

BBO conducted a review of the WRTM network and zone structure around the Plan Change Area and identified that key employment and residential zones (i.e. Horotiu Industrial Park (Northgate), Te Awa Lakes development and Rotokauri) surrounding the Plan Change Area did not connect to the road network in the most representative locations, and that the land use and employment inputs within did not fully reflect future activities that have been consented in the zone thus far. This therefore necessitated further refinement work to the WRTM 2018 validated base model to better reflect predicted traffic volumes for the future road network surrounding the Plan Change Area.

7.2 WRTM Network Amendments

This section discusses the WRTM zone and road network amendments, as well as land use and employment modifications that have been made to the 2018 validated base model for the future year 2035.

7.2.1 Horotiu Industrial Park (Northgate)

Modifications include:

- Adding Kohia Drive into the road network connecting to Holmes Road;
- Adding another zone for Stage 3A of the Horotiu Industrial Park, connecting to Kohia Drive;
- Modifying Horotiu Road intersection to reflect design illustrated in Figure 24; and
- Updating land use / employment levels within Horotiu Industrial Park to reflect the modelling undertaken in the 2036 Hamilton TRACKS Model RTJ Network and used for the original Horotiu Industrial Park Plan Change and subsequent ITAs as land has developed.

[16] https://www.creatingfutures.org.nz/waikato-projections-demographic-and-economic/

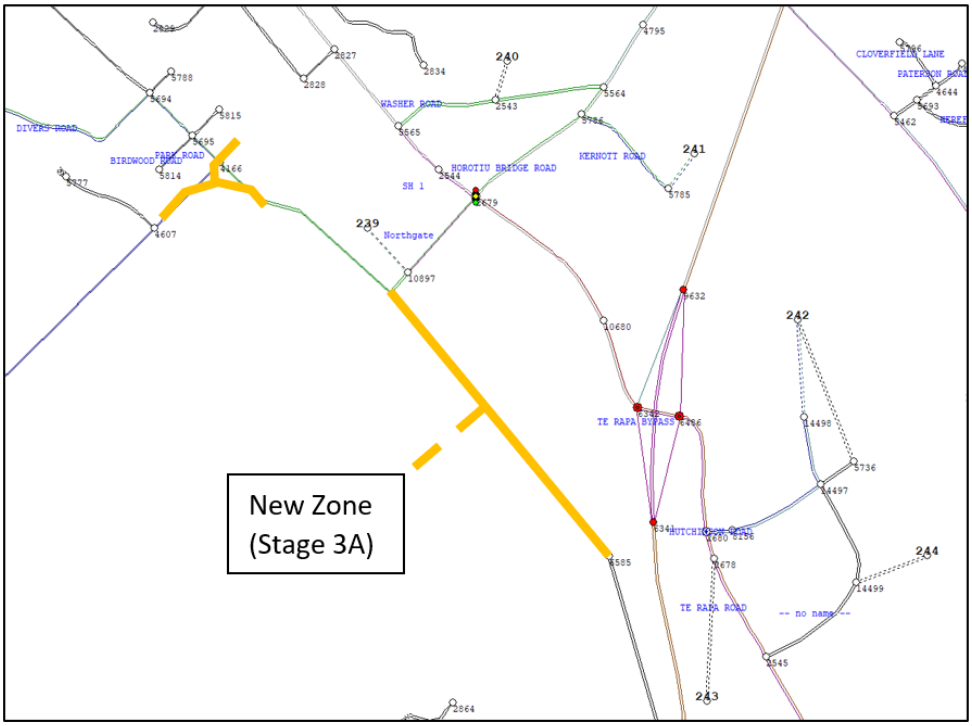


Figure 23: Modifications to WRTM within Horotiu Industrial Park

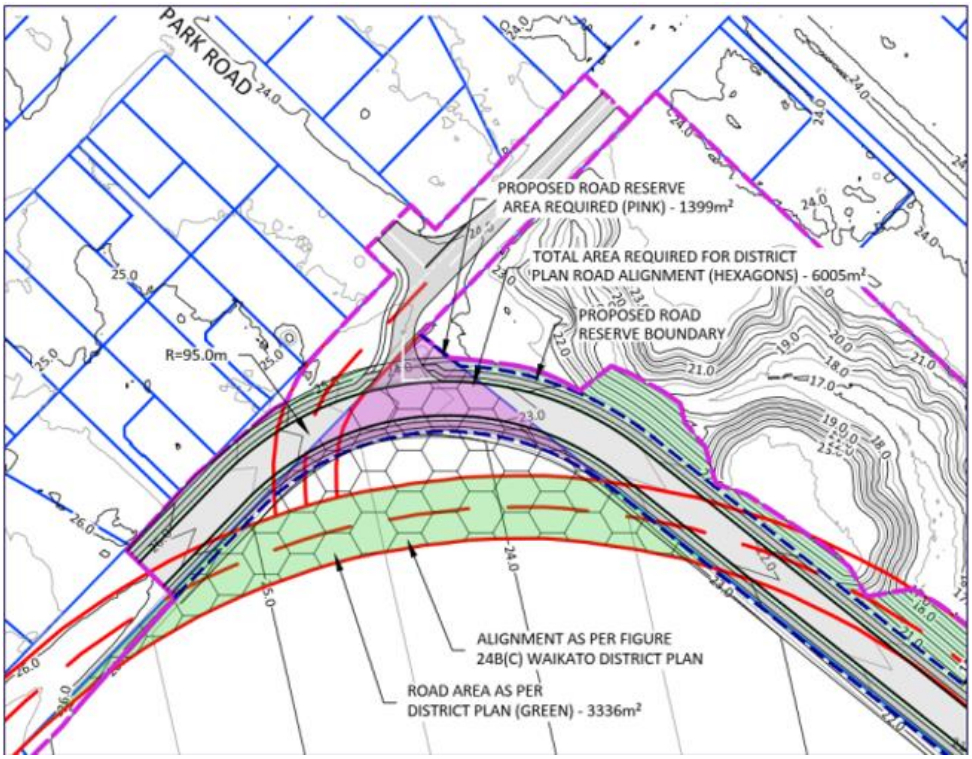


Figure 24: Realignment of Horotiu Rd

7.2.2 Te Awa Lakes

Modifications include:

- Signalisation of Te Rapa Road / McKee Street intersection;
- Deleting link (between node 14497 and 2545) and connecting zone 244 to node 5736 in accordance with Te Awa Lakes Structure Plan, as shown in Figure 25; and

- Updating land use / employment levels in Zones 242 to reflect the traffic volumes in the Te Awa Lakes project model run.

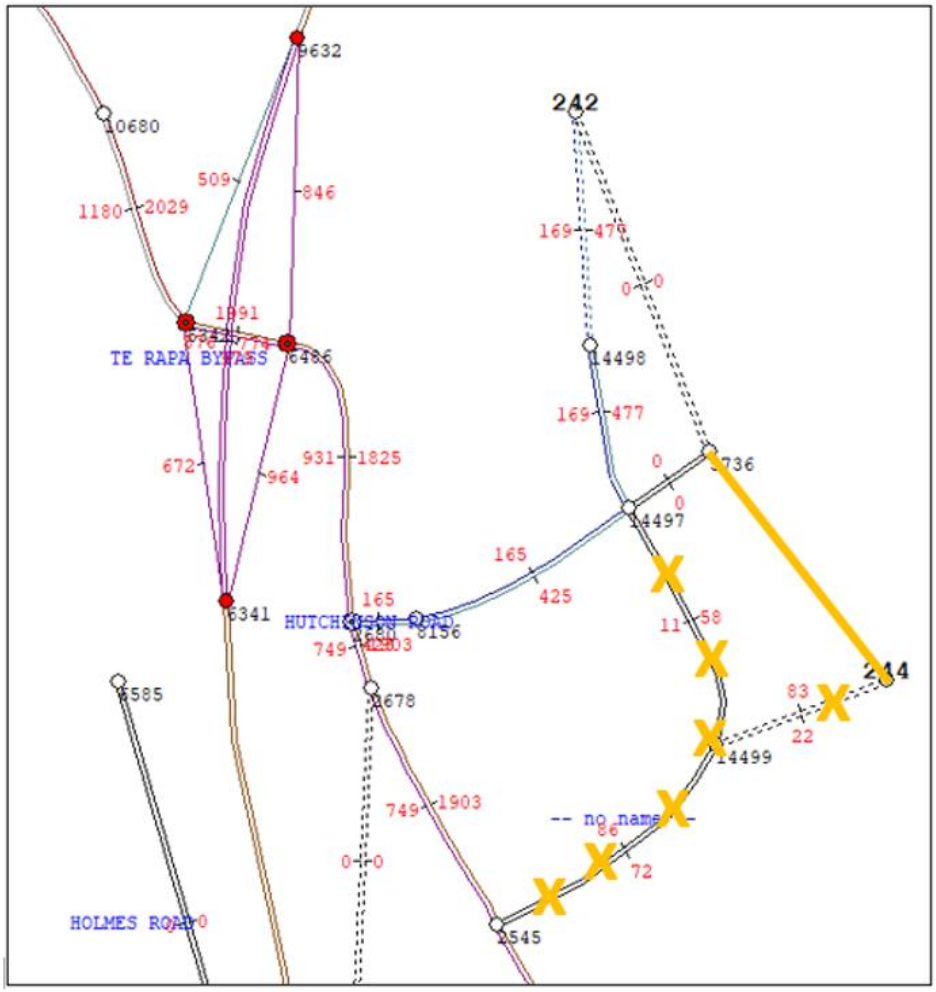


Figure 25: Modifications to WRTM within Te Awa Lake Structure Plan Area

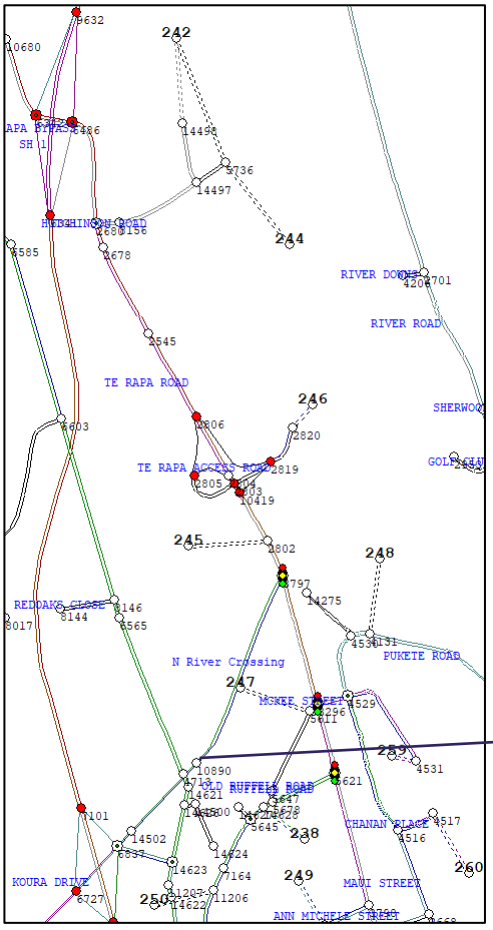
7.2.3 Rotokauri Structure Plan Area

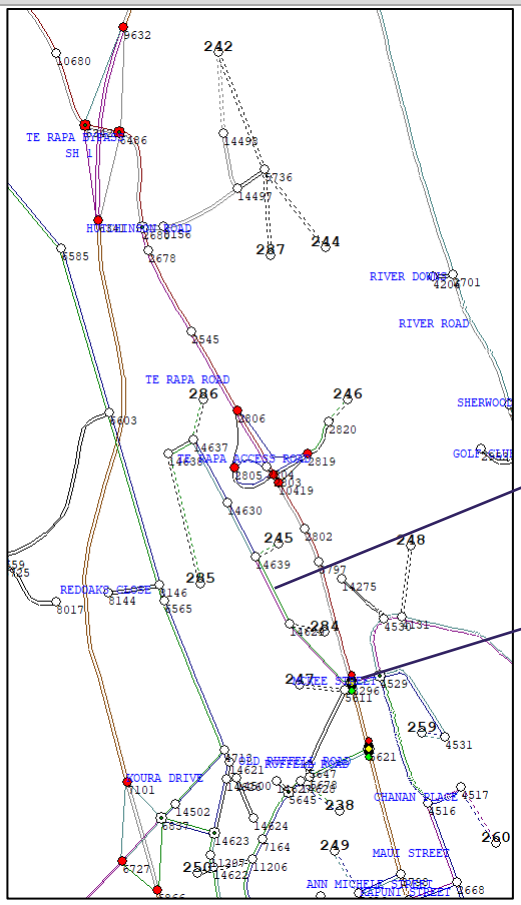
Modifications include updating land use / employment levels in the Rotokauri Structure Plan Area to reflect the traffic volumes in the Rotokauri North model run (year 2041).

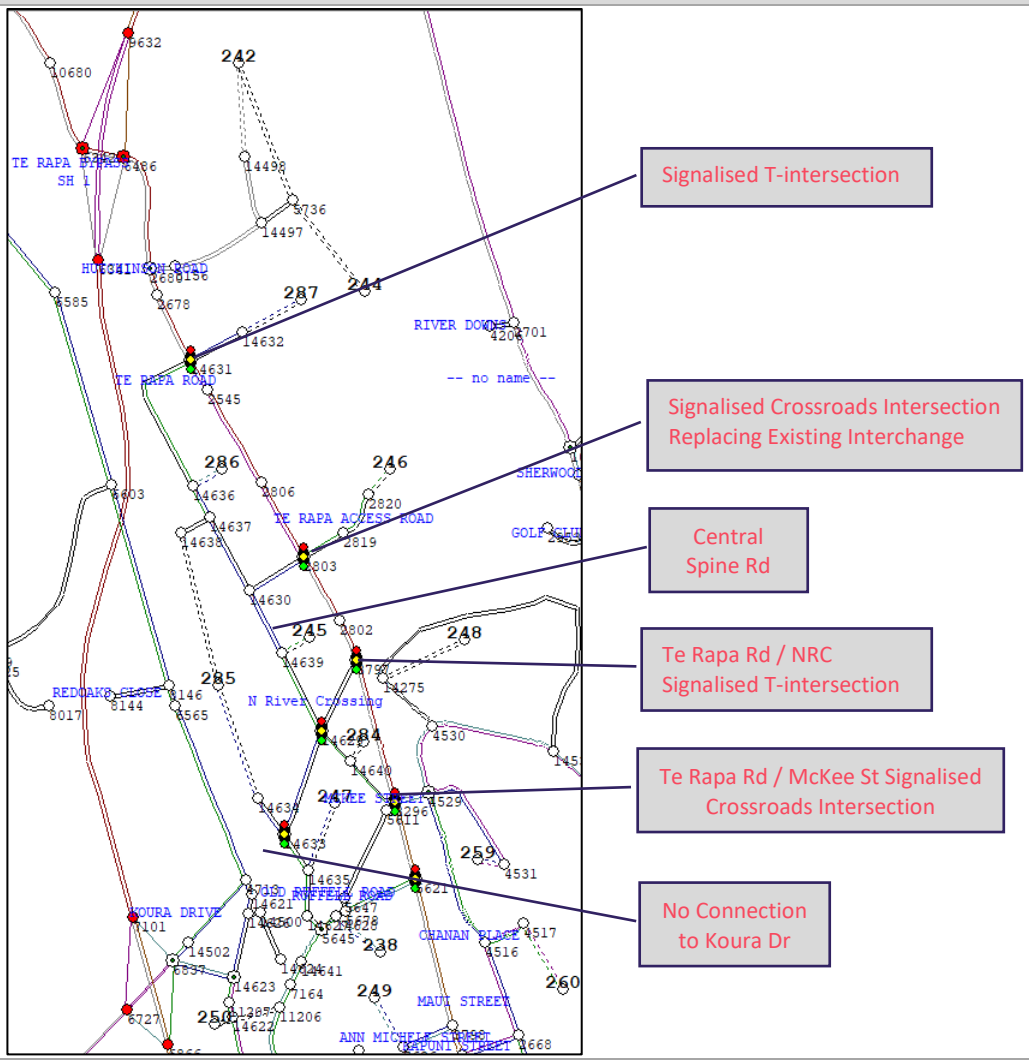
7.3 Modelled Scenarios

Table No: 5 summarises the access scenarios that have been assessed with the WRTM for PC17 by incorporating the amendments mentioned in the preceding section.

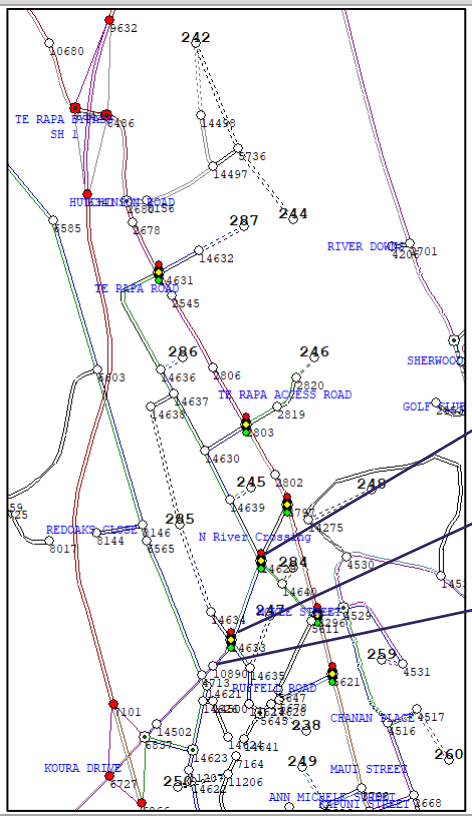
Table No: 5

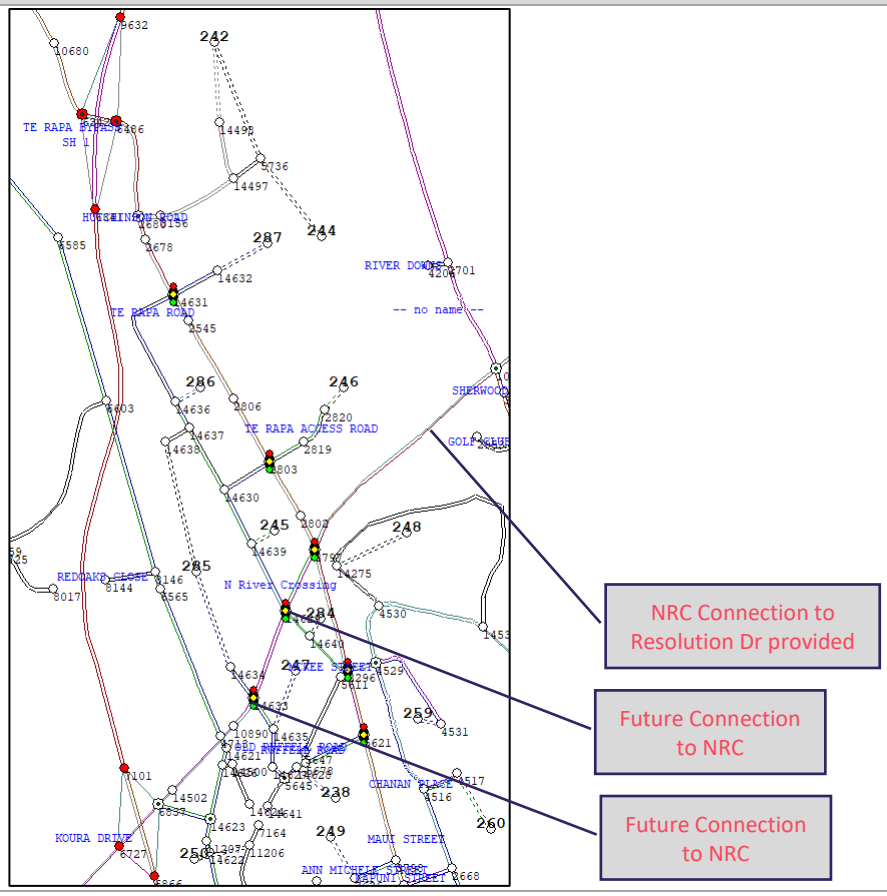
Modelling Scenarios	
WRTM Test	**Description**
Baseline	• Year 2035 with the NRC included between Koura Drive and Te Rapa Road • No development within Plan Change Area 
1	• Year 2035 Stage 1 development with approx. 44 ha of developable area. • No NRC arterial. Therefore, no NRC / Te Rapa Rd signalised intersection. • New North/South spine road (collector) from Te Rapa Rd / McKee St intersection. • Operating speed on North / South spine road = 40km/h. • Existing Dairy Manufacturing Site access interchange remains. • All movement T-intersection at Koura Dr / Onion Rd.

Modelling Scenarios	
WRTM Test	**Description**
	
2	• 2045 full buildout. • As for Scenario 1 but with two lane NRC between new signalised access on NRC and Te Rapa Rd. • New signalised access on NRC to link back to Ruffell Rd roundabout. • Operating speed on NRC = 60km/h. • East - West Road / Te Rapa Road signalised intersection. • North / South spine road between Te Rapa Rd / Mckee St signals and new signalised intersection on Te Rapa Rd to the north (330m from Hutchinson Rd). • New signalized intersection where north / south spine road intersects with East - West Road. • New Te Rapa Road signalized intersection replacing existing Dairy Manufacturing Site access interchange. Underpass removed. • All movement T-intersection at Koura Dr / Onion Rd.

Modelling Scenarios	
WRTM Test	**Description**
	

3	• 2045 full buildout.
	• As for Scenario 2 except:
	  ○ NRC four lane arterial extends between Koura Drive and Te Rapa Road, with grade separation over Onion Rd and Rail.
	  ○ Operating speed on NRC = 60km/h (Design Speed of 70 km/h).
	  ○ Ruffell Road rail level crossing permanently closed.

Modelling Scenarios	
WRTM Test	**Description**
	
4	• 2045 full buildout. • As for Scenario 3, but with full NRC four lane arterial from Koura Drive to Resolution Drive. • Operating speed on NRC (between Koura Dr and Te Rapa Rd) = 60km/h (Design Speed of 70 km/h). • Operating speed on NRC (between Te Rapa Rd and Resolution Dr) = 80km/h (Design Speed of 90 km/h).

Modelling Scenarios	
WRTM Test	**Description**
	

The purpose of Scenarios 1 and 2 is to assess the level of development that can be accommodated within the Plan Change Area ahead of the delivery of the NRC connection to Koura Drive. The baseline model run provides a comparison of the 'without PC17' scenario.

For this assessment, all previously zoned and / or assumed land use activities in the Plan Change Area have been removed from the WRTM project model run. As such, all analyses in this ITA compare the land uses that are now proposed with a zero baseline.

7.4 Future Transport Connection to NRC

As illustrated in Scenarios 3 and 4 in Table No: 5, Fonterra proposes two road connections from the Plan Change Area to the NRC. These are envisaged to be signalised intersections to enable public transport and freight priority in future.

7.5 Summary of Findings from WRTM Modelling

The following are key findings based on the outputs obtained from the WRTM modelling:

- **Finding 1:**

  Scenario 1 and Scenario 2 outputs indicated that if access to the Plan Change Area was provided via a fourth arm connecting to the Te Rapa Road / McKee Street signalised intersection, then a much

larger intersection footprint is required over that needed to accommodate the Te Awa Lakes development traffic, as shown in Figure 26.

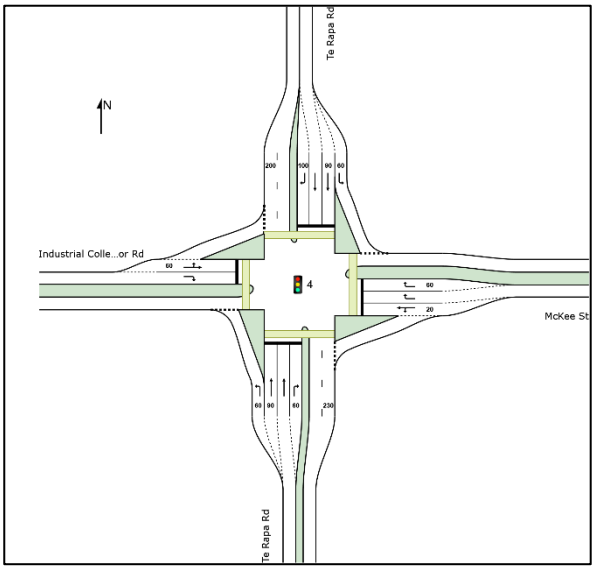


Figure 26: Te Rapa Rd / McKee St Crossroads Intersection

- **Finding 2:**

  Scenario 1 outputs indicated that an initial development area of 44 ha would likely exceed the capacity of this intersection to operate.

- **Finding 3:**

  Access 1 is clearly underutilised in Scenario 2 as it excludes the connection to Koura Drive.

- **Finding 4:**

  Scenario 2 outputs indicated that a significant number of trips utilise the connection provided to Ruffell Rd roundabout to access the Plan Change Area. These trips are mainly arriving / departing to the west and southwest of the Plan Change Area.

- **Finding 5:**

  The right turn movement from Te Rapa Road to Ruffell Road perform unsatisfactorily in Scenarios 1 and 2 when the Ruffell Road rail level crossing remains open.

- **Finding 6:**

  Te Rapa Road / Kapuni Street give way-controlled intersection will have to be upgraded from the outset to a signalised T-intersection to accommodate the additional trips generated by PC17 as well as the Te Awa Lakes development.

- **Finding 7:**

  Scenario 2 outputs indicated that the full development of the Plan Change Area can be serviced by the proposed accesses to Te Rapa Road without the need of the NRC connection to Koura Drive.

- **Finding 8:**

Scenario 2 outputs indicated that trips generated from the West Block of the Plan Change Area do not generally utilise the signalised intersection which replaced the existing Dairy Manufacturing Site access interchange.

7.6 Proposed Road Network Changes following WRTM Modelling

This section discusses the amendments that BBO adopted following the initial scenario modelling to address the key findings in Section 7.5.

- **Change #1:**

  Access to the Stage 1 development in the Plan Change Area is provided via Access 1 from the outset. No access to be provided to Te Rapa Road / McKee Street intersection. This means the Structure Plan spine road does not connect to Te Rapa Road at McKee St intersection.

- **Change #2:**

  An incremental evaluative approach was applied to determine the land areas that can be supported a single access onto Te Rapa Road without causing adverse effects on the adjoining road network.

- **Change #3:**

  The connection to Ruffell Road was provided through private land adjacent to the Plan Change Area in the WRTM modelling. However, with no connection provided to the McKee Street intersection, there is an opportunity to connect Old Ruffell Road to the PC17 Structure Plan spine road.

- **Change #4:**

  An additional northbound through lane is required at the Te Rapa Road / Ruffell Road intersection from the onset to service any development within the Plan Change Area.

- **Change #5:**

  The Te Rapa Road / Kapuni Street intersection will have to be signalised to support PC17 and the full development of Te Awa Lakes development.

- **Change #6:**

  The existing Dairy Manufacturing Site access interchange does not need to be replaced with a signalised intersection to service PC17. A signalised intersection is only required if Fonterra wishes to maximise the developable land within the West Block of the Plan Change Area that is currently occupied by the footprint of the interchange (approximately 4 ha). As such, there is no need for the proposed Structure Plan to identify the delivery of a signalised intersection at this location.

The changes proposed above were evaluated by manually refining future traffic flows using the trip distribution outputs derived from the WRTM modelling. This assessment considers that re-running the WRTM models was not required to understand the effects of these changes.

7.7 Proposed Future Development Staging

This section of the ITA provides a summary of how future development staging of the Plan Change Area may be approached and the transportation infrastructure required to service each stage based on the findings from the WRTM modelling (Section 7.5) and the proposed changes identified in Section 7.6.

7.7.1 Stage 1

Intersection modelling using SIDRA v9.1 and refined WRTM-predicted future traffic volumes indicates that approximately **33 ha of the Plan Change Area (net developable area)** can be serviced by a single access to Te Rapa Road (Access 1) as identified in Figure 27. Peak hour trip generation for 33ha equates to approximately **540 trips per peak hour** based on a trip generation rate of 16.3 trips per hectare (net).

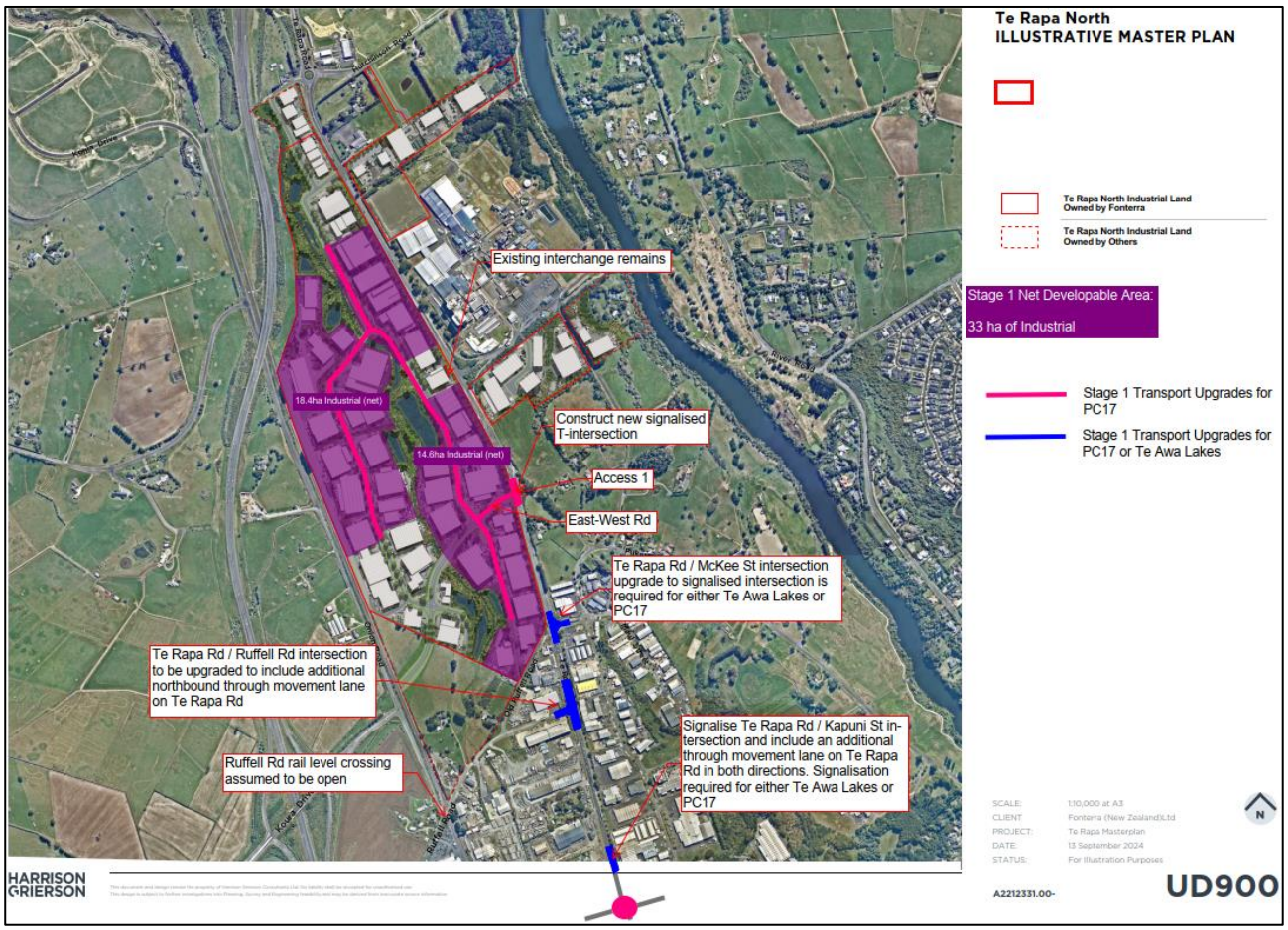


Figure 27: Stage 1 Development of the Plan Change Area

7.7.2 Stage 2

Stage 2 enables a further 26 ha of industrial land to be developed and occupied, bringing the total to approximately **59 ha (net developable area)** and serviced by Access 2, Access 3 and the existing Dairy Manufacturing Site access interchange as illustrated in Figure 28. The peak hour trip generation for 59 ha equates to approximately **960 trips per peak hour** (based on a trip generation rate of 16.3 trips per hectare (net).

The small holding of land located at the northern most extent of the West Block, the Sikh Temple land and two land parcels located at the eastern most extent of South-East Block (each shown in yellow) are not owned by Fonterra but are all included in PC17 to rezone as live Industrial land to protect Fonterra's future Dairy

Manufacturing site from potential future reverse sensitivity issues. This assessment assumes these four land parcels are developed for Industrial purposes as a worst-case scenario (compared to their existing uses) to understand the overall combined transport effects of the Plan Change area on the adjoining road network.

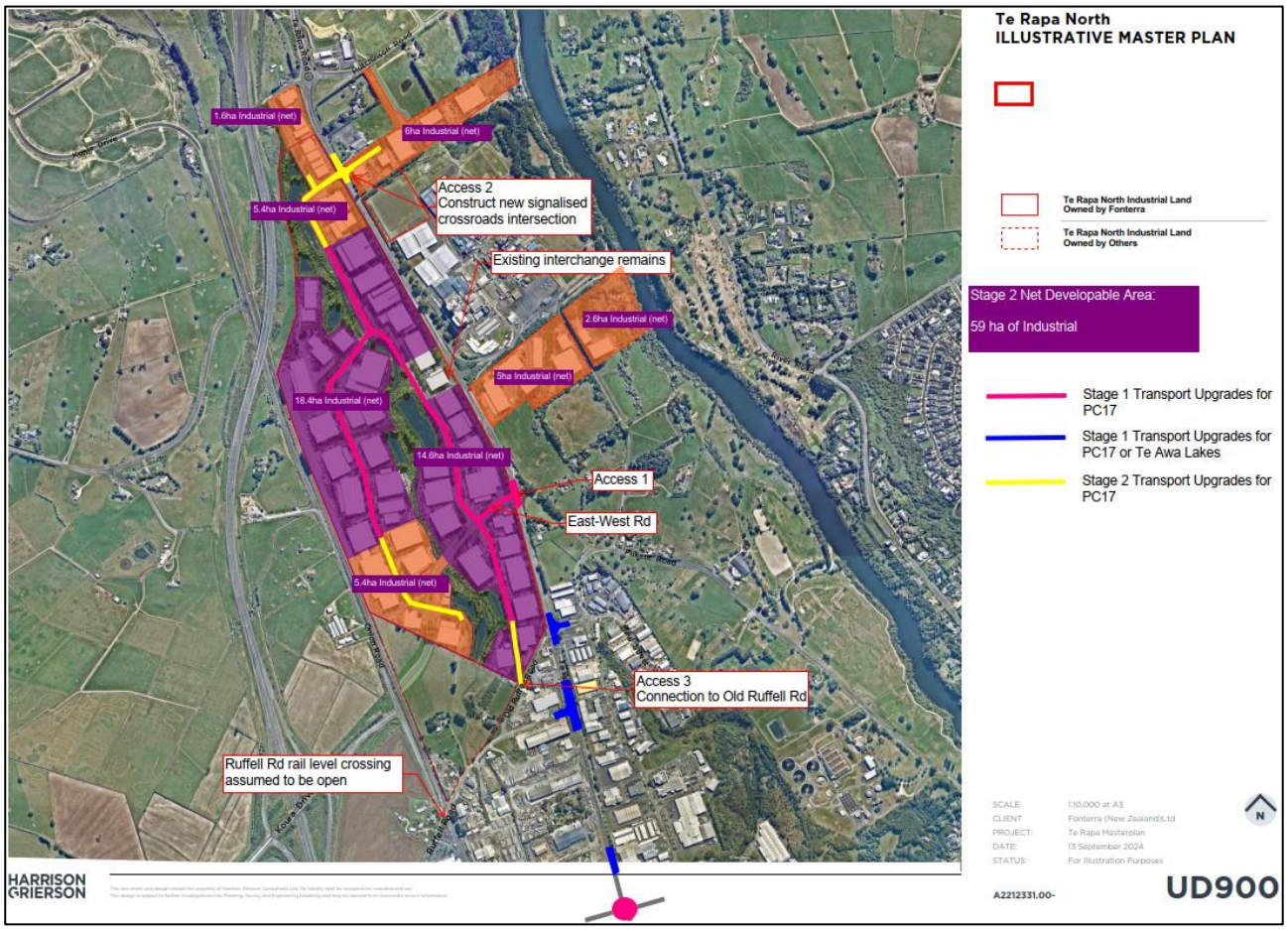


Figure 28: Stage 2 Development of the Plan Change Area

7.7.3 Stage 2B

Stage 2b is optional for Fonterra as it involves replacing the existing Dairy Manufacturing Site access interchange with an at-grade signalised T-intersection.

As mentioned in Change #6 in Section 7.6, the primary benefit of this change is the enabling of a further 4 ha of developable land in the West Block that is currently occupied by the interchange on and off ramps. Accordingly, it is optional for Fonterra as it is not driven by network capacity of safety effects of PC17 traffic.

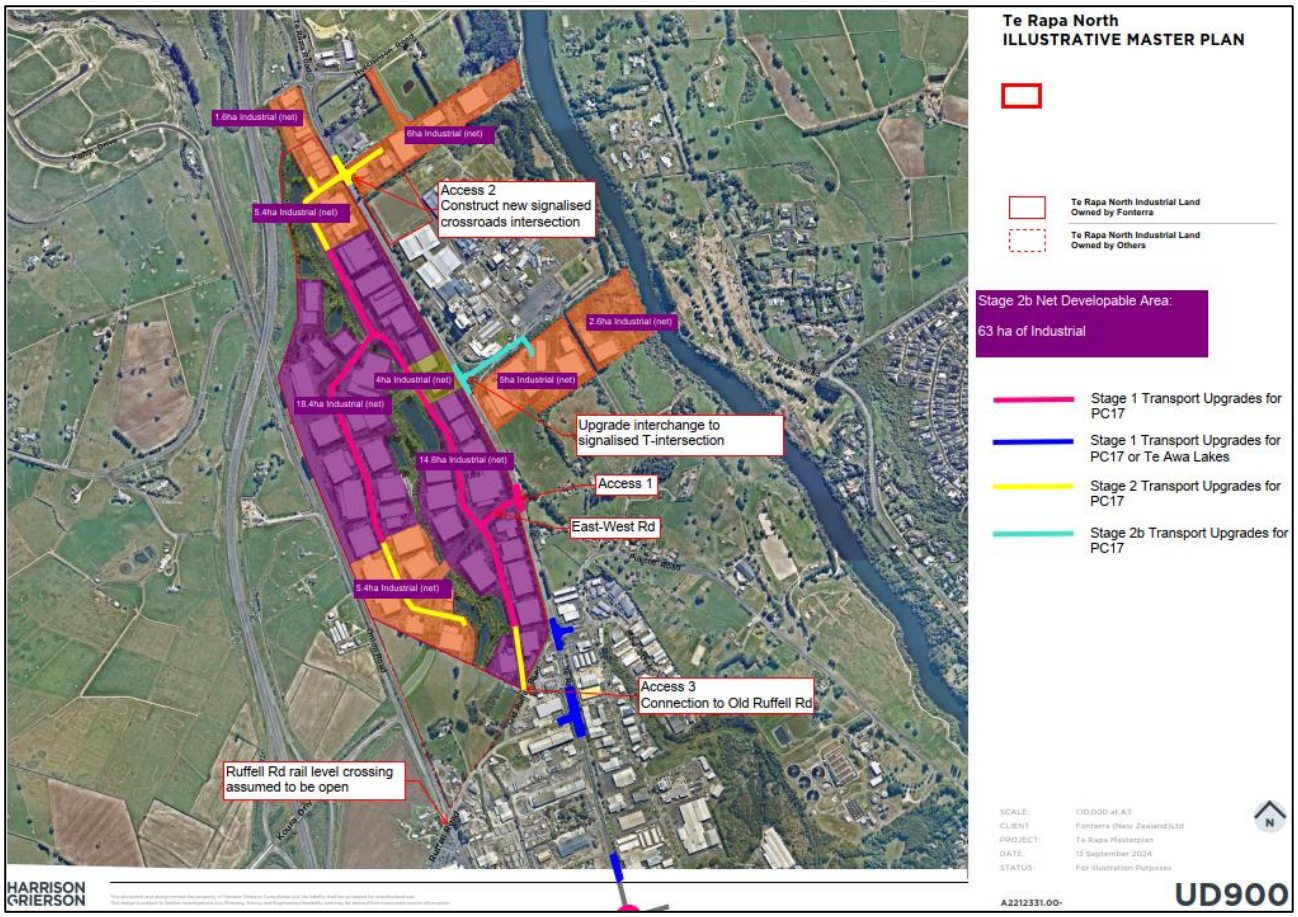


Figure 29: Stage 2B Development of the Plan Change Area

7.8 Infrastructure Scenarios

The WRTM Tests (Section 7.3) and the future development stages (Section 7.7) have informed the following infrastructure scenarios which provide the basis for the intersection performance assessment described in Section 8.3.

Table No: 6

Infrastructure Scenarios								
Infrastructure Scenario	PC17 Stage 1 (33ha)	PC17 Stage 2 (63ha)	East - West Road (between Te Rapa Rd and Structure Plan Spine Rd)	Partial NRC (Koura Dr to Te Rapa Rd)	Completed NRC (With River Crossing)	Access 2	Access 3 (Connection to Old Ruffell Rd)	Ruffell Rd Rail Level Crossing Closed
Baseline				x				
1	x		x					
2		x	x			x	x	
3		x	x	x		x		x
4		x	x	x	x	x	x	x

8. Assessment of Transportation Effects

8.1 Safety

8.1.1 Road Safety

The existing 10-year safety record, as identified in Section 3.4, has seven death or serious injuries ("DSI") crashes in the immediate vicinity of the Plan Change Area (i.e. three at intersections and four at mid-block sections). All three DSI crashes at various intersections were due to drivers' negligence. However, the DSI crashes recorded at mid-block sections on Te Rapa Road had a trend of drivers crossing the centreline to either overtake another vehicle or losing control at high speed and colliding head-on with a vehicle in the opposite direction. The mean operating speed on Te Rapa Road along the frontage of the Plan Change Area is recorded to be 75 km/h based on MegaMaps which is above the safe system survivable speed of 70 km/h for a head-on crash.

With PC17, there will be an increase in traffic volumes on Te Rapa Road which increases the road users' exposure to harm. The proposal to introduce two signalised intersections (i.e. Accesses 1 and 2) along the Plan Change Area's frontage to Te Rapa Road and the signalisation of Te Rapa Road / McKee Street intersection will significantly reduce the operating speed of Te Rapa Road between these intersections. If a crash does occur, it is less likely to result in less harm, because the slower speeds mean the crash forces are lower.

Although signalised intersections typically give rise to intersection crashes, it is evident from the existing 10-year safety record that the crashes recorded at signalised intersections have a lower number of death or serious injuries relative to uncontrolled or priority-controlled intersections.

8.1.2 Vulnerable Road Users

Off-road shared paths (shared between cyclists, wheeled recreation devices and pedestrians) are proposed on the Structure Plan spine road (collector road). A separated walking and cycling shared path is proposed on East - West Road, between the Structure Plan spine road and Te Rapa Road. This reduces the risk of motor vehicle versus vulnerable road user collisions. Safe system crossing points should also be designed and provided within the Plan Change Area where pedestrians and cyclists desire to cross roads that carry concentrated traffic flow (i.e. on collector roads). Current best practice is to provide raised safety platform crossings at these locations to reduce vehicle speeds to no more than 30 km/hr.

8.2 Average Daily Traffic Volume Changes

Table No: 7 provides a comparison of the changes in ADT on strategic roads surrounding the Plan Change Area in the various WRTM tests undertaken for PC17. Intersections that the WRTM demonstrates will experience more than 10% volume change relative to the 2035 WRTM baseline scenario, have been carried through for further assessment.

The table below has omitted data for Test 1 as the land use and employment levels in this model were significantly greater than the now proposed Stage 1 development (refer to Section 7.5).

It is also noted that Tests 2, 3 and 4 include traffic growth on the network associated with other land use in 2045, defined by Future Proof growth projections.

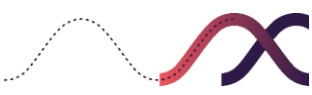
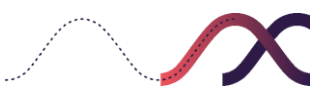


Table No: 7

Changes in ADT (vehicles per day)				
Road Section	Baseline Scenario (Partial NRC Constructed)	Test 2 (% Change)	Test 3 (Partial NRC Constructed) (% Change)	Test 4 (Full NRC Constructed) (% Change)
Te Rapa Road (between SH1C interchange and Hutchinson Rd)	23,183	30,095 (29.8%)	29,738 (28.3%)	23,506 (1.4%)
Te Rapa Road (between Dairy Manufacturing Site and East - West Rd)	21,151	21,777 (3.0%)	21,820 (3.2%)	22,000 (4.0%)
Te Rapa Road (between Ruffell Rd and Kapuni St)	14,596	19,232 (31.8%)	18,000 (23.3%)	17,363 (19.0%)
Te Rapa Road (between Kapuni St and Church Rd)	18,231	22,972 (26.0%)	21,869 (20.0%)	20,135 (10.4%)
Te Rapa Road (between Church Rd and The Base Parade)	21,160	24,739 (16.9%)	23,713 (12.1%)	20,128 (-4.9%)
Te Rapa Road (between The Base Parade and Wairere Dr)	34,039	37,309 (9.6%)	36,403 (6.9%)	32,720 (-3.9%)
East - West Rd between Central Spine Rd and Te Rapa Rd	3,312	500 (-85%)	659 (-80.1%)	6,200 (87.2%)
Hutchinson Rd	18,178	18,108 (-0.4%)	18,108 (-0.4%)	18,108 (-0.4%)
McKee St	11,126	9,993 (-10.2%)	10,216 (-8.2%)	11,777 (5.9%)
Ruffell Rd (between Te Rapa Rd and Old Ruffell Rd)	5,113	7,115 (39.2%)	5,972 (16.8%)	6,505 (27.2%)
Ruffell Rd (between Old Ruffell Rd and Rail Crossing)	5,113	5,208 (1.9%)	0	0
Kapuni St	2,912	3,748 (28.7%)	3,638 (24.9%)	3,677 (26.3%)
Te Kowhai Rd	8,739	11,774 (34.7%)	11,702 (33.9%)	11,193 (28.1%)
Church Rd	6,748	8,308 (23.1%)	8,163 (21.0%)	7,597 (12.6%)

It can be observed from the table above that traffic generated by PC17 on Te Rapa Road towards the south disperses at McKee Street, Ruffell Road, Kapuni Street, Church Road and Eagle Way. There is little effect at the Te Rapa Road / Wairere Drive signalised intersection, where the increase in traffic volumes on the section of Te Rapa Road between The Base Parade / Eagle Way and Wairere Drive remains below 10%.



8.3 Intersection Capacity Performance

Based on Table No: 7, the area of influence of PC17 can be summarised as incorporating the following intersections which have been modelled using the industry-recognised SIDRA Intersection 9.1 software ("SIDRA") to assess the effects of traffic associated with PC17.

A. Access 1: Te Rapa Road / East - West Road signalised intersection
B. Access 2: Signalised intersection south of Hutchinson Road
C. Te Rapa Road / Hutchinson Road roundabout
D. Te Rapa Road / McKee Street signalised intersection
E. Te Rapa Road / Ruffell Road signalised intersection
F. Te Rapa Road / Kapuni Street signalised intersection
G. Te Rapa Road / Te Kowhai Road / Church Road roundabout
H. Te Rapa Road / The Base Parade / Eagle Way signalised intersection
I. East - West Road / Structure Plan spine road signalised intersection
J. SH1C / Te Rapa Road interchange (Horotiu Interchange)

Figure 3 shows the location of these intersections in context with the Plan Change Area.

The future (2035 and 2045) intersection performances of these intersections were assessed based on the Infrastructure Scenarios outlined in Section 7.8.

The capacity assessment results are summarised in the following sub-sections in terms of Level of Service ("LOS") with full SIDRA outputs provided in Appendix C. LOS is a standard measure for intersection performance and is based on the average delay experienced by drivers in each lane, by arm. In general, LOS levels A to C are considered acceptable, LOS D to E are considered permissible where reasonable improvements cannot be made, provided safety effects can be mitigated. LOS F is generally considered to be an unsatisfactory level of service. Delay thresholds in seconds of delay for LOS A to F are given in Table No: 8 below.

Table No: 8

SIDRA Level of Service Definitions		
Level of Service	Average Control Delay per Vehicle (seconds)	
	Signalised Intersections	Roundabout (SIDRA Roundabout LOS method)
A	≤ 10	≤ 10
B	10 - 20	10 - 20
C	20 – 35	20 – 35
D	35 – 55	35 – 50
E	55 – 80	50 – 70
F	> 80	> 70

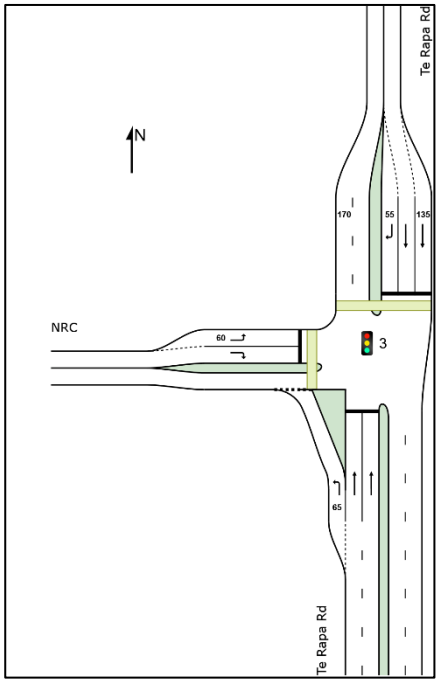
8.3.1 Access 1: Te Rapa Road / East - West Road Signalised Intersection

Access 1's intersection form and layout will vary as the NRC is developed by HCC. The signalised intersection layouts modelled with SIDRA and the signal phase sequences for the various infrastructure scenarios are

shown in Figure 30 to Figure 32. The intersection performance results for the peak hours are presented in Table No: 9.

A 150 m auxiliary exit lane is required for the intersection to perform satisfactorily in all infrastructure scenarios, but geometrically a further 70 m[17] merge length is required given the operating speed on Te Rapa Road is likely to be 60 km/h with the introduction of signalised intersections. This brings the total auxiliary lane length to 220 m.

Considering that the separation distance between East - West Road and McKee Street is approximately 480 m, and that an additional southbound through approach lane is required at Te Rapa Road / McKee Street intersection (refer to Section 8.3.4), it is practical that the section of Te Rapa Road between East - West Road and McKee Street be widened to four full length lanes for all infrastructure scenarios.



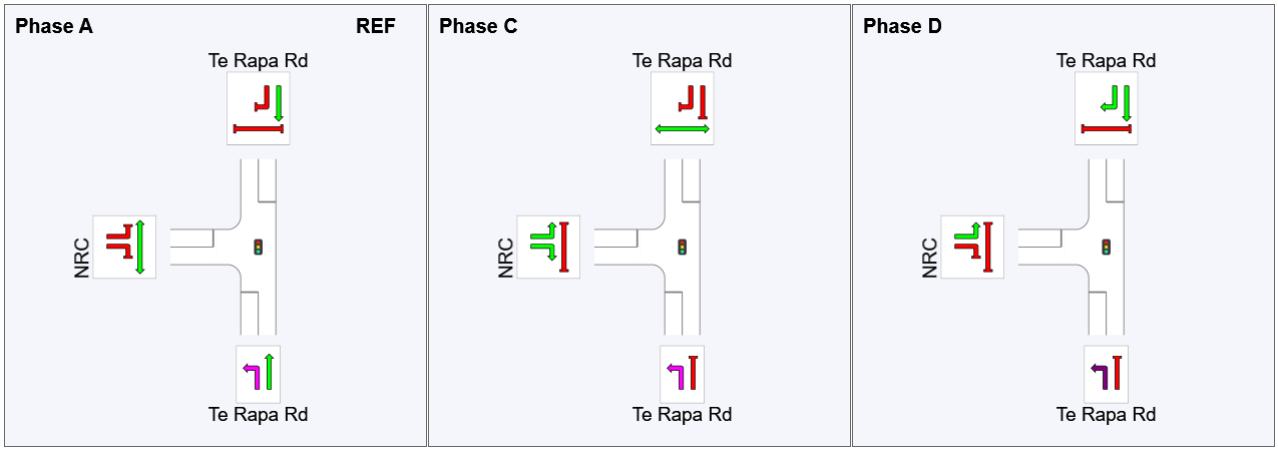
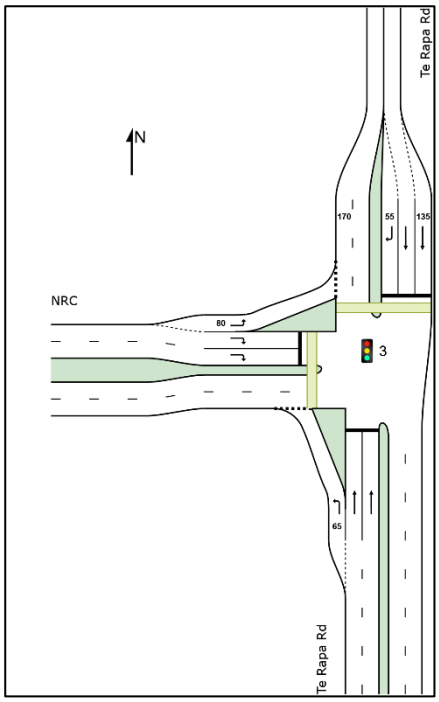


Figure 30: Access 1 Intersection Layout and Phase Sequence – Infrastructure Scenarios Baseline, 1 and 2

[17] In accordance with Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections Table 5.5 for a design speed of 70 km/h.



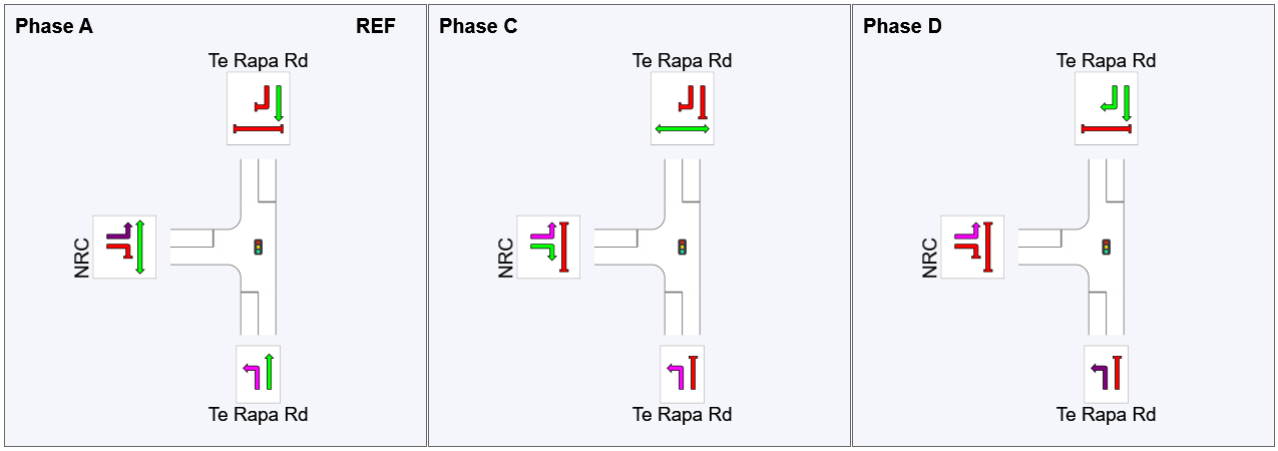
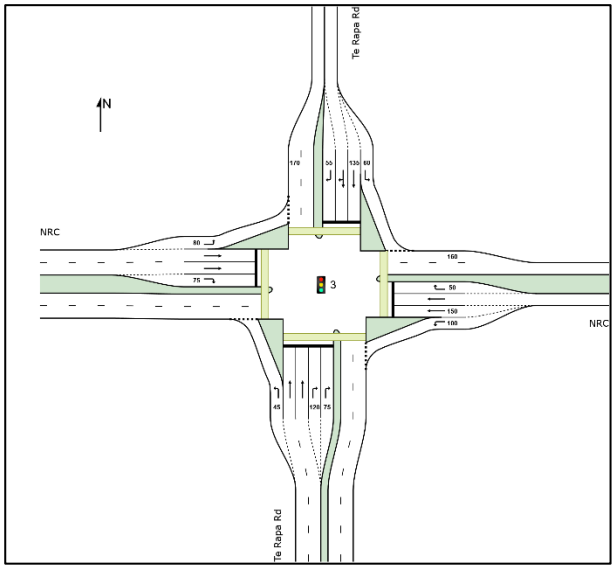


Figure 31: Access 1 Intersection Layout and Phase Sequence – Infrastructure Scenario 3



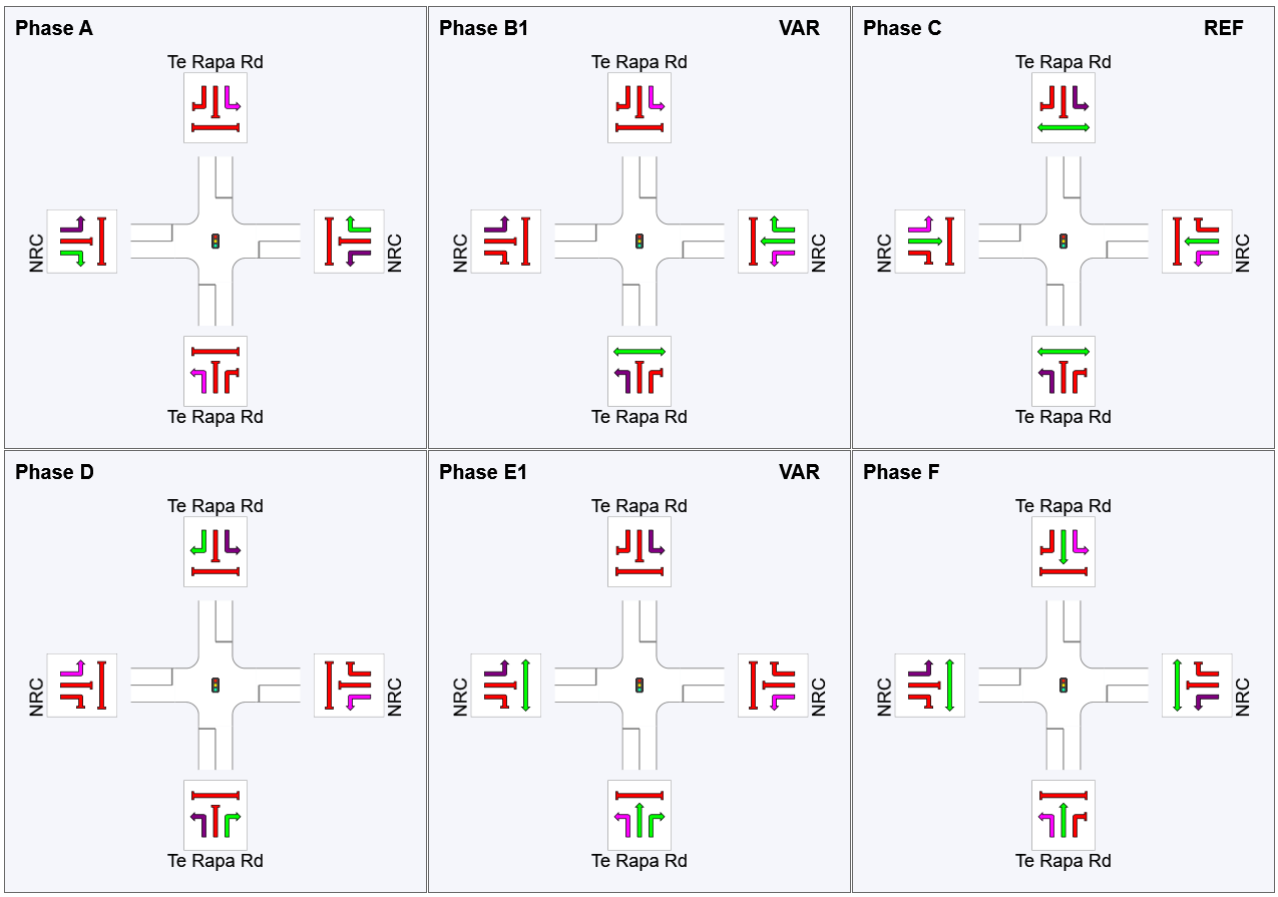


Figure 32: Access 1 Intersection Layout and Phase Sequence – Infrastructure Scenario 4

Table No: 9

Access 1: Te Rapa Rd / East - West Rd Signalised Intersection									
Infrastructure Scenario	Peak	Intersection Average				Worst Movements (based on delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline	AM	0.48	13.9	80.4 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	40.5	18.1	D
	PM	0.67	16.3	141.2 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	49.4	36.3	D
1	AM	0.64	15.2	127.1 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	42.8	30.5	D
	PM	0.75	19.3	171.0 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	49.4	13.3	D
2	AM	0.56	12.7	131.3 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	58.5	13.6	E
	PM	0.54	13.4	151.9 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	68.8	17.6	E
3	AM	0.51	11.1	132.7 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	68.6	14.1	E
	PM	0.55	14.4	157.7 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	67.9	26.0	E
4	AM	0.86	36.3	196.9 Te Rapa Rd (N)	D	RT from Te Rapa Rd (N)	68.0	2.3	E
	PM	0.82	39.3	144.6 Te Rapa Rd (S)	D	RT from Te East - West Rd	60.6	30.1	E

The District Plan Appendix 15 Table 15-2b provides guidance on efficiency indicating that an average delay per vehicle of no greater than 55 seconds during peak periods on the approaches to the intersections on strategic network, major and minor arterial transport corridors and no greater than 80 seconds during peak periods on the approaches of all other transport corridors should be maintained to achieve desirable level of service.

Analysis of the modelling results indicate that the critical movement is the right turn movement from Te Rapa Road to East - West Road. The average delay for this movement exceeds 55 seconds when PC17 is fully developed, with or without the NRC (i.e. Infrastructure Scenarios 2, 3 and 4).

The LOS and average delay issues highlighted in Table No: 9 for Infrastructure Scenarios 2 and 3 arise because of the signal green time that is required by the through movements on Te Rapa Road, when SIDRA optimises the phase times across all approaches. The green time for the through movements on Te Rapa Road (i.e. Phase A) exceed 70 seconds during the peak periods.

This can be mitigated by restricting the maximum green time on major movements such as the through and left turn movements on all approaches to 50 seconds. Table No: 10 below presents the changes in the intersection performance results by restricting the maximum green time on major movements. While the degree of saturation has generally increased, the intersection will operate well within practical capacity.

Although average delay for the intersection has generally increased, the LOS target for the through movements on Te Rapa Road remain no worse than LOS C (average delay no greater than 35 s/veh), which is an efficient level of performance.

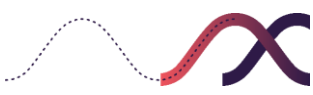


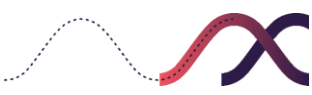
Table No: 10

Access 1: Te Rapa Rd / East - West Rd Signalised Intersection with Revised Signal Phasing									
Infrastructure Scenario	Peak	Intersection Average				Worst Movements (based on delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
2 Cycle time reduces from 99s to 66s during AM peak hour and from 120s to 78s during PM peak hour)	AM	0.72	17.5	130.1 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	40.5	8.8	D
	PM	0.78	18.4	152.6 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	44.9	11.1	D
3 Cycle time reduces from 120s to 65s during AM peak hour and from 120s to 79s during PM peak hour)	AM	0.72	17.3	128.6 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	39.7	7.4	D
	PM	0.78	19.0	154.8 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	46.1	16.9	D

With regards to Infrastructure Scenario 4, two right turn lanes are necessary on the southern approach to accommodate the high right turn demand (i.e. 754 vph) in the PM peak period. Although average delay experienced by most of the right turning movements at the intersections is close or slightly greater than one minute, the 95th percentile back of queue is not significant.

8.3.2 Access 2: Te Rapa Road Signalised Intersection south of Hutchinson Road

Figure 33 illustrates the signalised intersection layout modelled in SIDRA for Access 2. The results of the peak hour modelling for the infrastructure scenarios are presented in Table No: 11.



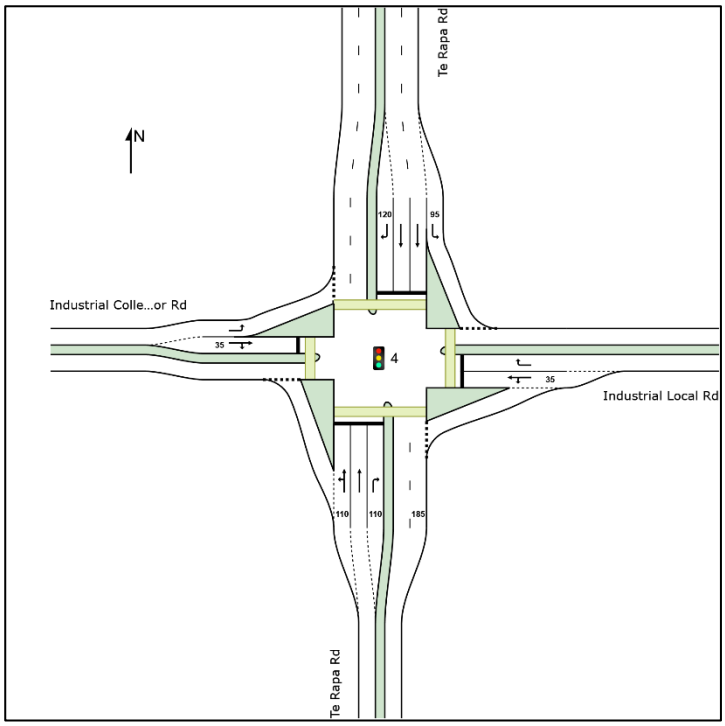


Figure 33: Te Rapa Road / Access 2 Signalised Intersection Layout

Table No: 11

Access 2: Te Rapa Rd Signalised Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (based on delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
2	AM	0.76	31.2	236.6 Te Rapa Rd (N)	C	RT from Te Rapa Rd (S)	65.7	15.9	E
	PM	0.69	23.0	178.3 Te Rapa Rd (S)	C	RT from Te Rapa Rd (S)	68.1	8.2	E
3	AM	0.74	30.5	231.2 Te Rapa Rd (N)	C	RT from Te Rapa Rd (S)	66.1	19.3	E
	PM	0.65	23.3	184.4 Te Rapa Rd (S)	C	RT from Te Rapa Rd (S)	69.6	8.8	E
4	AM	0.61	25.1	157.4 Te Rapa Rd (N)	C	RT from Te Rapa Rd (S)	62.7	25.4	E
	PM	0.48	20.0	114.4 Te Rapa Rd (N)	B	RT from Industrial Local Rd (E)	65.4	19.4	E

The phase sequence proposed for the intersection is a typical "Variable Phasing Lead-Lag Right Turn" sequence, as shown in Figure 34.

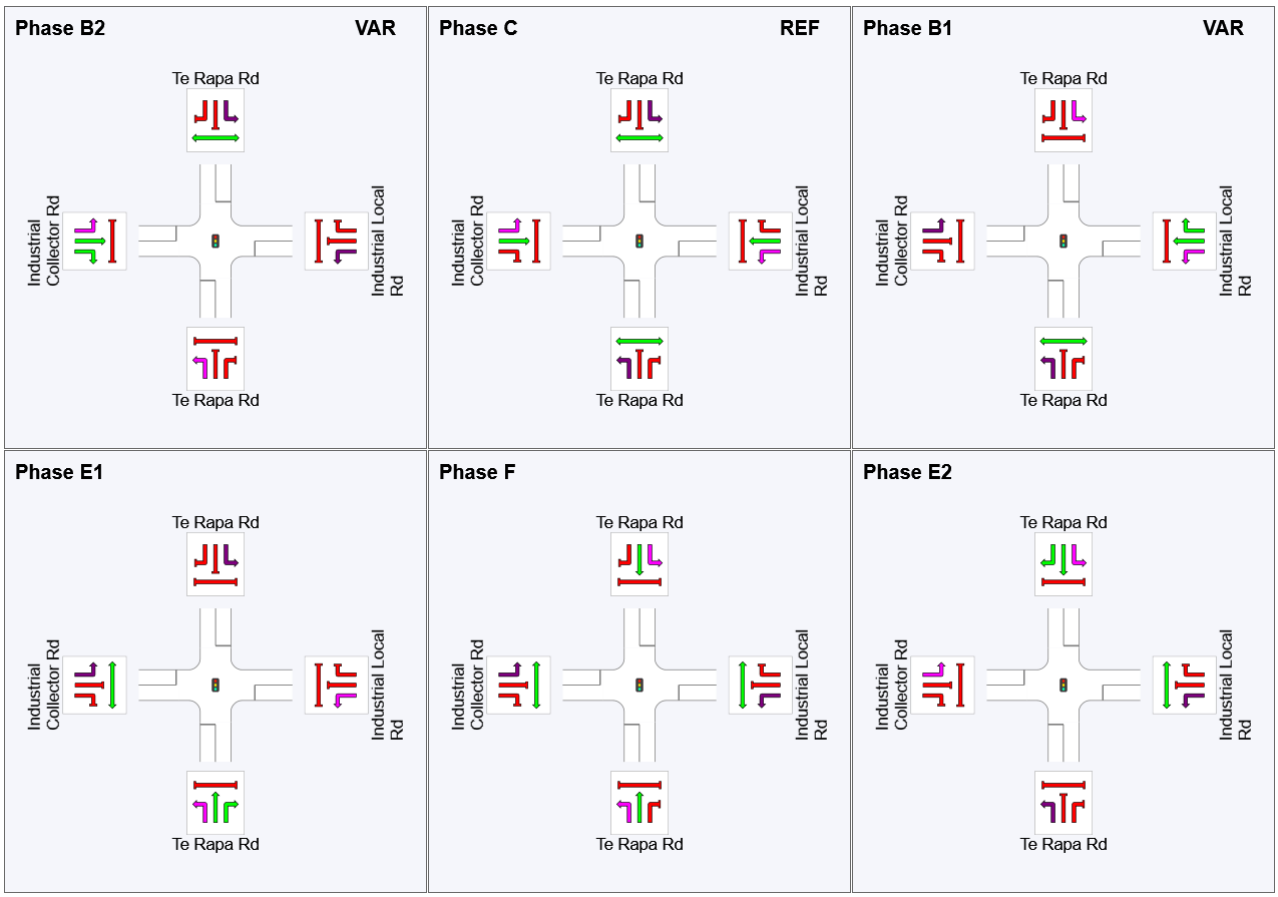


Figure 34: Proposed Phase Sequence – Access 2 / Te Rapa Road Intersection

The Access 2 signalised intersection was modelled with two continuous approach and exit lanes on Te Rapa Road northern arm between Hutchinson Road roundabout and Access 2 due to the relatively short distance between the two intersections. Figure 35 below illustrates this.

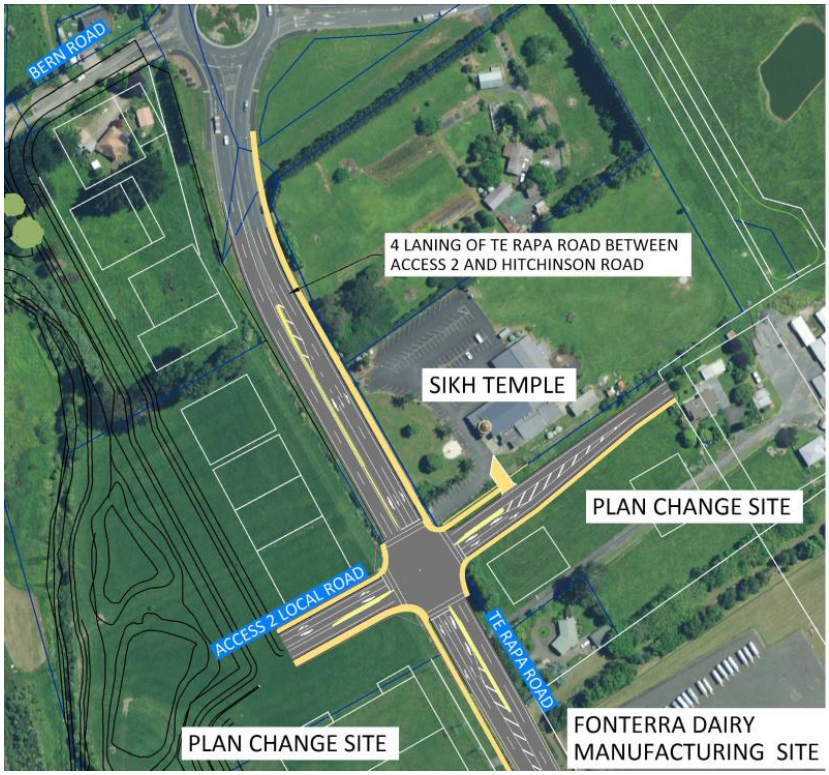


Figure 35: Four Lanes on Te Rapa Road between Hutchinson Rd and Access 2 Intersections

Although the right turn movements from Te Rapa Road operate with an average delay of more than a minute in all infrastructure scenarios, the 95th percentile back of queue distance is not significant and queued vehicles clear the intersection in one green phase in most cases.

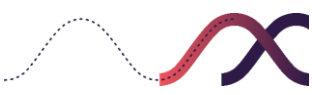
The performance of the intersection can be improved, if the northbound right turn movement is banned. The demand for the right turn is expected to be low, and these vehicles can travel straight through to the Te Rapa Road / Hutchinson Road roundabout and perform a U-turn movement followed by a left turn into the site back at the Access 2 intersection. This will not undermine the performance of the Te Rapa Road / Hutchinson Road roundabout, as the U-turning vehicles experiencing a maximum average delay of approximately 32 seconds per vehicle during the PM peak period in Infrastructure Scenario 2. The overall performance of the roundabout remains LOS B with an average delay of 14 seconds per vehicle and a worst-case 95th percentile queue distance of 152 m on the southern approach. Table No: 12 shows the improved (relative to Table No: 11) performance results for the Access 2 intersection with the banned northbound right turn movement.

Table No: 12

Access 2: Te Rapa Rd Signalised Intersection with RT Movement from the Southern Approach Banned									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (based on delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
2	AM	0.68	22.9	177.2 Te Rapa Rd (N)	C	RT from Industrial Local Rd (E)	53.0	6.2	D
	PM	0.68	19.6	181.1 Te Rapa Rd (S)	C	RT from Industrial Local Rd (E)	66.1	28.2	E
3	AM	0.68	22.1	173.6 Te Rapa Rd (N)	C	RT from Industrial Local Rd (E)	52.8	5.0	D
	PM	0.74	20.4	175.9 Te Rapa Rd (S)	C	RT from Te Rapa Rd (N)	55.8	25.9	E
4	AM	0.53	19.2	119.5 Te Rapa Rd (N)	B	RT from Industrial Local Rd (E)	52.9	5.4	D
	PM	0.45	16.8	105.4 Te Rapa Rd (S)	B	RT from Industrial Local Rd (E)	61.8	18.3	E

8.3.3 Te Rapa Road / Hutchinson Road Roundabout

The existing roundabout configuration modelled in SIDRA is illustrated in Figure 36, and Figure 37 demonstrates the update proposed with four-lanes on the southern arm of the roundabout to connect to the Access 2 intersection to the south as part of Infrastructure Scenario 2. The intersection performance results for all infrastructure scenarios during peak periods are presented in Table No: 13.



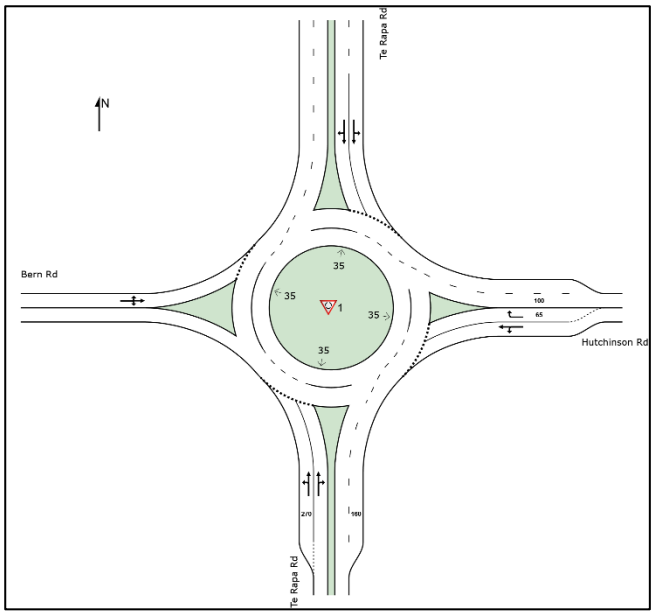


Figure 36: Existing Te Rapa Rd / Hutchinson Rd Roundabout Layout

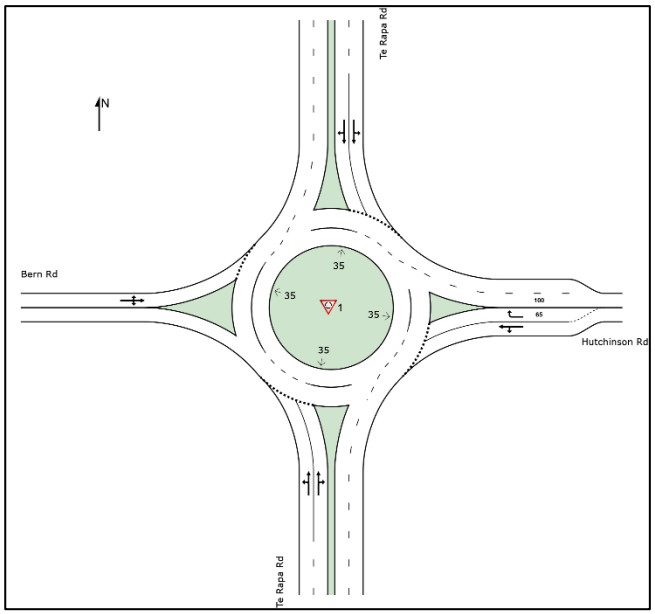


Figure 37: Four Lanes on Southern Arm of Te Rapa Rd / Hutchinson Rd Roundabout Layout

Table No: 13

Te Rapa Rd / Hutchinson Rd Roundabout									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline (Figure 36)	AM	0.47	5.0	24.0 Te Rapa Rd (N)	A	RT from Hutchinson Rd	9.9	13.2	A
	PM	0.58	6.2	37.2 Te Rapa Rd (S)	A	RT from Te Rapa Rd (S)	11.6	34.8	B
1 (Figure 36)	AM	0.65	6.5	44.1 Te Rapa Rd (N)	A	RT from Hutchinson Rd	12.8	29.0	B

Te Rapa Rd / Hutchinson Rd Roundabout									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
	PM	0.82	10.0	90.2 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	19.7	81.7	B
2 (Figure 37)	AM	0.75	6.6	64.0 Te Rapa Rd (N)	A	RT from Hutchinson Rd	16.2	38.3	B
	PM	0.91	13.2	140.6 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	27.8	126.2	C
3 (Figure 37)	AM	0.73	6.2	57.5 Te Rapa Rd (N)	A	RT from Hutchinson Rd	15.3	35.7	B
	PM	0.90	12.3	129.7 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	25.6	116.9	C
4 (Figure 37)	AM	0.56	5.7	32.2 Te Rapa Rd (N)	A	RT from Hutchinson Rd	10.6	18.4	B
	PM	0.50	5.9	26.0 Te Rapa Rd (N)	A	RT from Te Rapa Rd (S)	10.5	24.3	B

The modelling assessment indicates that the roundabout will continue to operate well within its practical capacity for all infrastructure scenarios.

The worst performing movement at the roundabout will be the northbound right turn movement from Te Rapa Road to Hutchinson Road during the PM peak hour when PC17 is fully developed (Infrastructure Scenario 2). The average delay for the right turning movement increases by approximately 16 s/veh while the 95th percentile back of queue on the southern approach increases by approximately 103 m relative to the Infrastructure Baseline Scenario with no PC17 development.

Although the intersection modelling indicates that the existing roundabout performs satisfactorily with PC17, the 400 m section of Te Rapa Road between the roundabout and Access 2 is proposed to incorporate two full length lanes in both directions (i.e. four lane corridor) to mitigate the capacity / efficiency effects at Access 2 (refer to Section 8.3.2).

8.3.4 Te Rapa Road / McKee Street Signalised Intersection

The Te Rapa Road / McKee Street intersection is to be upgraded to signal control as part of the effects mitigation by Te Awa Lakes development[18]. The intersection layout that was modelled by Stantec in the Te Awa Lakes Plan Change ITA proposed a 230 m auxiliary lane on the southbound exit of Te Rapa Road and a 150 m auxiliary approach lane for northbound vehicles.

However, the latest WRTM baseline volumes identify that such extensive additional lane lengths are unlikely to be required. Instead, auxiliary lane lengths of 80 m are sufficient on the southbound approach and exit lanes. Figure 38 presents the intersection layout that is required to accommodate the Infrastructure Baseline Scenario volumes with no PC17 and Table No: 14 presents the intersection performance.

[18] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006

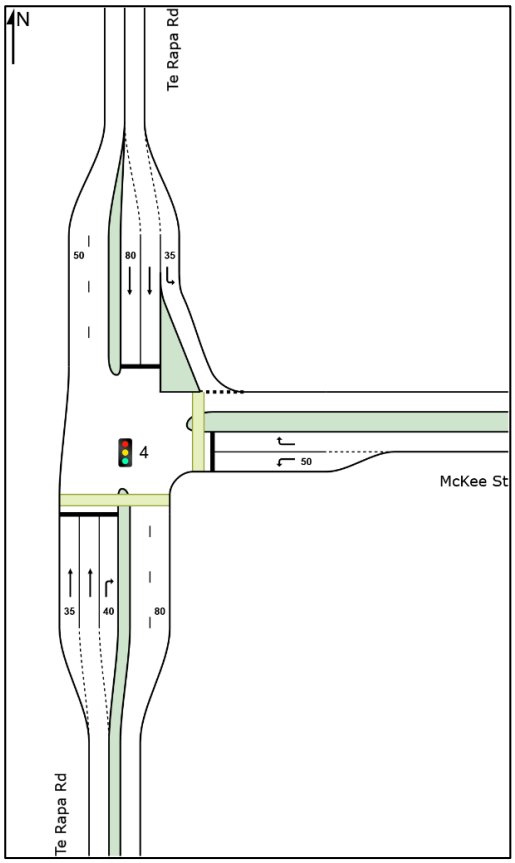


Figure 38: Te Rapa Rd / McKee St Signalised Intersection Layout for Infrastructure Baseline Scenario

Table No: 14

Te Rapa Rd / McKee St Signalised Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline (Figure 38)	AM	0.70	15.3	74.8 Te Rapa Rd (N)	B	RT from Te Rapa Rd (S)	34.0	34.0	C
	PM	0.85	20.0	107.2 McKee St	B	RT from Te Rapa Rd (S)	32.8	23.3	C

An 80 m auxiliary exit lane is required for the intersection to perform satisfactorily in the Infrastructure Baseline Scenario, but geometrically a further 70 m[19] merge length is required given the operating speed on Te Rapa Road is likely to be 60 km/h with the introduction of signalised intersections. This brings the total auxiliary lane length to 150 m.

Considering that the separation distance between McKee Street and Ruffell Road is approximately 230 m, and that an additional northbound through approach and exit lane is required at Te Rapa Road / Ruffell Road intersection for the Infrastructure Baseline Scenario (refer to Section 8.3.5), it is practical that the section of Te Rapa Road between McKee Street and Ruffell Road be widened to four full length lanes for the Infrastructure Baseline Scenario.

[19] In accordance with Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections Table 5.5 for a design speed of 70 km/h.

Four laning of Te Rapa Road between the East-West Road intersection and McKee Street intersection will also be required as described in Section 8.3.1.

Figure 39 illustrates the intersection layout with Te Rapa Road widened to four lanes. The results of the intersection performance for all infrastructure scenarios during peak periods are presented in Table No: 15.

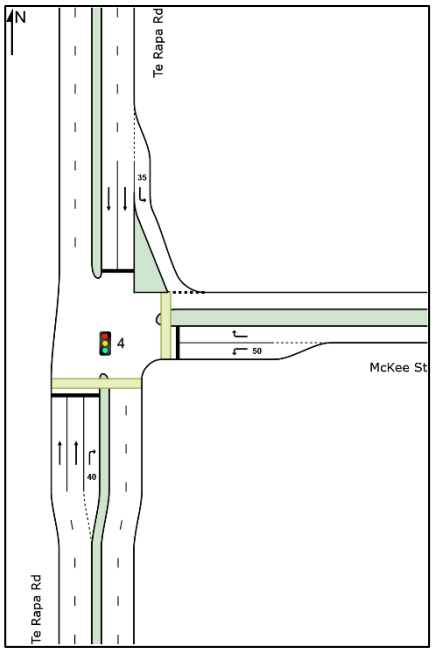


Figure 39: Te Rapa Rd / McKee St Signalised Intersection Layout – Four Lanes on Te Rapa Rd

Table No: 15

Te Rapa Rd / McKee St Signalised Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline (Figure 39)	AM	0.72	15.0	51.1 Te Rapa Rd (N)	B	RT from Te Rapa Rd (S)	31.1	30.5	C
	PM	0.82	17.2	102.6 McKee St	B	RT from Te Rapa Rd (S)	31.9	23.8	C
1 (Figure 39)	AM	0.77	19.9	148.3 Te Rapa Rd (N)	B	RT from Te Rapa Rd (S)	44.4	53.6	D
	PM	0.88	20.8	120.8 Te Rapa Rd (N)	C	RT from McKee St	36.7	115.1	D
2 (Figure 39)	AM	0.75	20.3	141.3 Te Rapa Rd (N)	C	RT from Te Rapa Rd (S)	42.9	56.0	D
	PM	0.82	16.9	97.9 McKee St	B	RT from Te Rapa Rd (S)	31.1	22.8	C
3 (Figure 39)	AM	0.75	21.5	144.9 Te Rapa Rd (N)	C	RT from Te Rapa Rd (S)	43.1	66.1	D
	PM	0.80	16.6	93.1 McKee St	B	RT from Te Rapa Rd (S)	31.5	24.8	C
4 (Figure 39)	AM	0.97	28.8	214.0 Te Rapa Rd (N)	C	RT from Te Rapa Rd (S)	60.2	63.8	E

Te Rapa Rd / McKee St Signalised Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
	PM	0.85	26.0	184.3 McKee St	C	RT from Te Rapa Rd (S	47.4	27.2	D

The modelling results indicate that average delay achieved by all approaches to the intersection during peak periods in all Infrastructure Scenarios 1 to 3 are well within the guidance provided in Appendix 15 Table 15-2b of the District Plan (i.e. average delay not exceeding 55 seconds on strategic network major and minor arterial roads, and no greater than 80 seconds for all other transport corridors) based on the intersection layout shown in Figure 39.

However, in Infrastructure Scenario 4 with the NRC fully constructed, the average delay for the right turn movement from Te Rapa Road to McKee Street exceeds the 55 seconds guidance and 95th percentile back of queue distances achieved on Te Rapa Road and McKee Street are significant.

The capacity and efficiency of the intersection during this scenario can be improved by the following (refer to Figure 40 and

Table **No: 16**):

- Modifying the northbound through movement lane on Te Rapa Road to a shared through and right turn lane; and
- Modifying the left turn lane on McKee Street to a shared left turn and right turn lane.

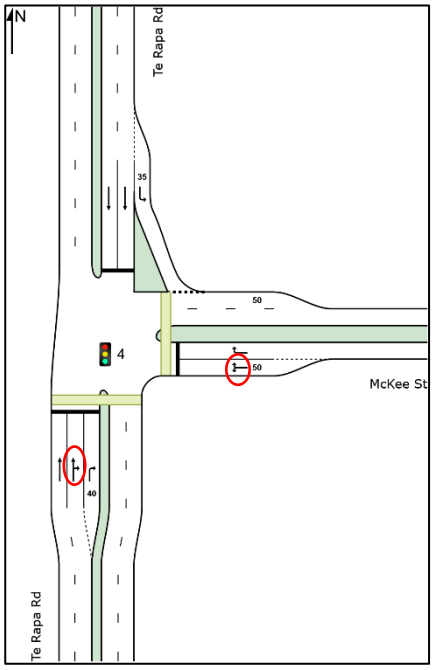


Figure 40: Te Rapa Rd / McKee St Signalised Intersection Layout – Infrastructure Scenario 4

Table No: 16

Te Rapa Rd / McKee St Signalised Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
4 (Figure 40)	AM	0.89	23.3	190.4 Te Rapa Rd (N)	C	RT from Te Rapa Rd (S)	42.5	38.9	D
	PM	0.75	16.9	108.2 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	30.1	18.9	C

The proposed phase sequence for all infrastructure scenarios is shown in Figure 41.

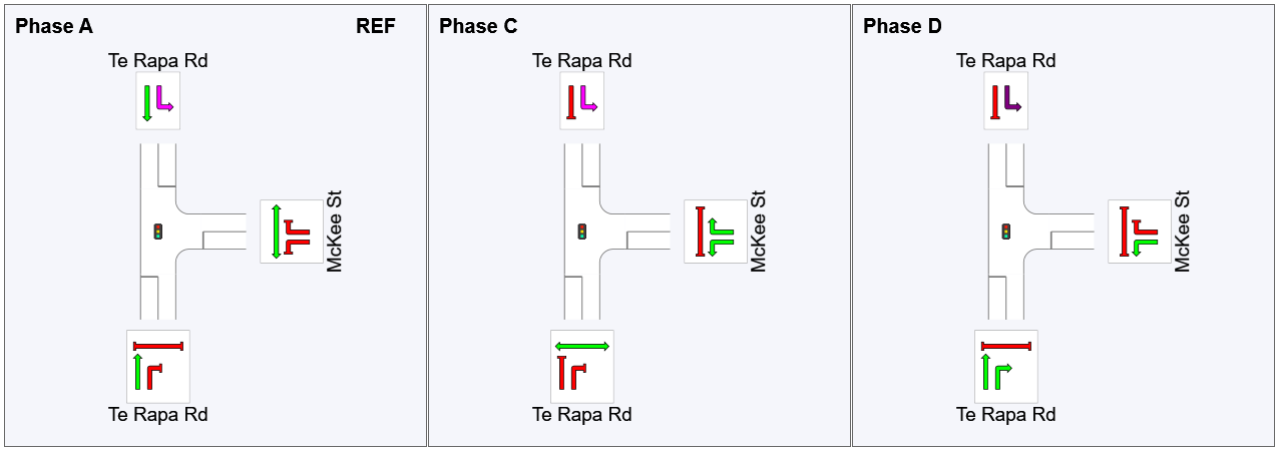


Figure 41: Proposed Phase Sequence – Te Rapa Rd / McKee St Intersection

8.3.5 Te Rapa Road / Ruffell Road Signalised Intersection

The modelling of this intersection was based on the existing phase sequence provided by HCC. The Infrastructure Baseline Scenario results presented below are based on the existing intersection layout (Figure 42).

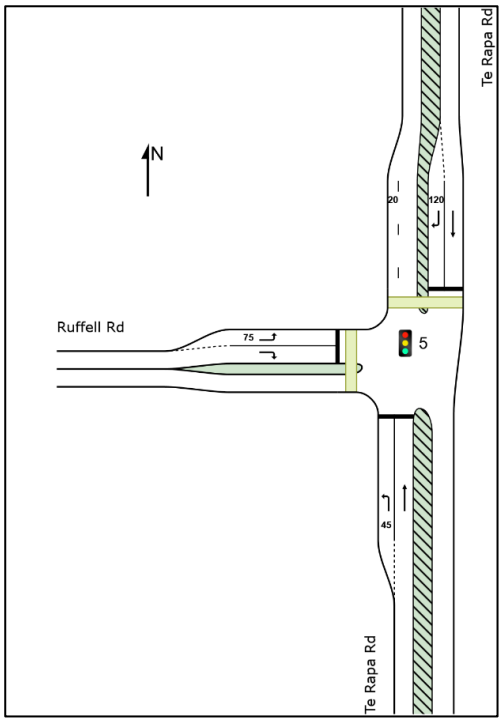


Figure 42: Existing Te Rapa Rd / Ruffell Road Signalised Intersection Layout

Table No: 17

Te Rapa Rd / Ruffell Rd Signalised Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline (Figure 42)	AM	0.61	12.9	87.5 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	32.9	13.8	C
	PM	0.70	19.3	204.6 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	66.8	19.5	E

Due to the significant delay experienced by the right turn movement from Te Rapa Road during the PM peak period, this assessment identified that an additional northbound through lane is required at Te Rapa Road / Ruffell Road intersection for the Infrastructure Baseline Scenario. Considering that four lanes are required for the section of Te Rapa Road between McKee Street and Ruffell Road to mitigate the effects at Te Rapa Road / McKee Street intersection (refer to Section 8.3.4), Figure 43 illustrates the intersection layout required for the baseline scenario.

The results of the intersection performance for all infrastructure scenarios during peak periods are presented in Table No: 18.

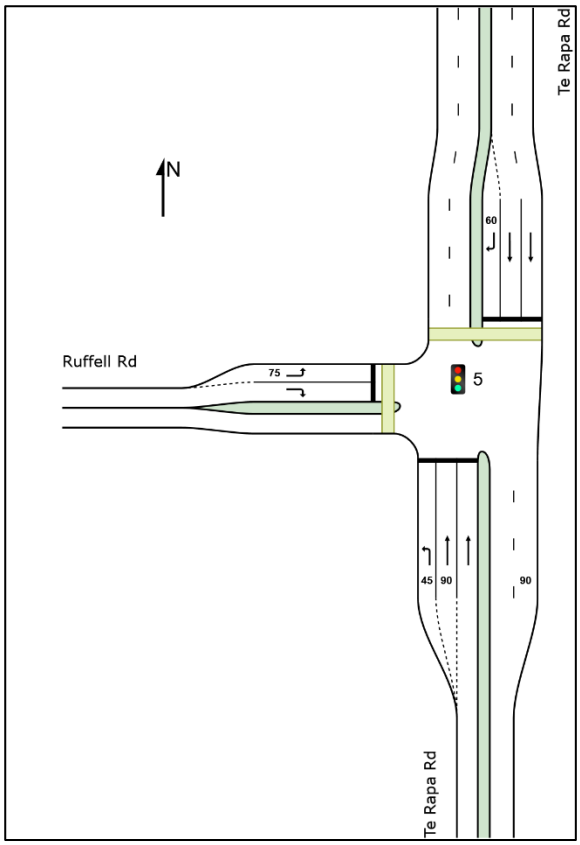


Figure 43: Proposed Te Rapa Rd / Ruffell Road Signalised Intersection Layout

Table No: 18

Te Rapa Rd / Ruffell Rd Signalised Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline (Figure 43)	AM	0.42	12.5	53.8 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	32.3	13.5	C
	PM	0.42	13.5	72.8 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	45.4	13.1	D
1 (Figure 43)	AM	0.65	14.5	92.3 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	33.9	25.1	C
	PM	0.71	18.0	104.1 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	37.0	46.5	D
2 (Figure 43)	AM	0.62	14.0	92.2 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	31.1	27.8	C
	PM	0.69	16.2	68.2 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	32.2	25.2	C
3 (Figure 43)	AM	0.56	12.3	93.5	B	RT from Te Rapa Rd (N)	38.3	16.2	D

Te Rapa Rd / Ruffell Rd Signalised Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
				Te Rapa Rd (N)					
	PM	0.66	15.9	70 Te Rapa Rd (S)	B	RT from Te Rapa Rd (N)	34.3	26.7	C
4 (Figure 43)	AM	0.66	14.2	101.5 Te Rapa Rd (N)	B	RT from Te Rapa Rd (N)	28.9	31.0	C
	PM	0.84	21.6	96.9 Ruffell Rd	C	RT from Te Rapa Rd (N)	33.3	24.7	C

The modelling results indicate that average delay achieved by all approaches to the intersection during peak periods in all infrastructure scenarios are well within the guidance provided in Appendix 15 Table 15-2b of the District Plan.

8.3.6 Te Rapa Road / Kapuni Street Signalised Intersection

The Infrastructure Baseline Scenario results presented below relate to the existing give-way controlled intersection layout, as shown in Figure 44, for which the right turn movement from Kapuni Street fails before any PC17 traffic is added to the network.

This demonstrates that an upgrade of the intersection to signal control will be required to mitigate Te Awa Lakes development traffic effects. The signal upgrade is also necessary if PC17 development proceeds ahead of Te Awa Lakes.

Figure 45 presents the upgraded intersection layout necessary to accommodate the Infrastructure Baseline Scenario volumes (including Te Awa Lakes traffic) with no PC17, and
Table No: **19** presents the modelled performance results.

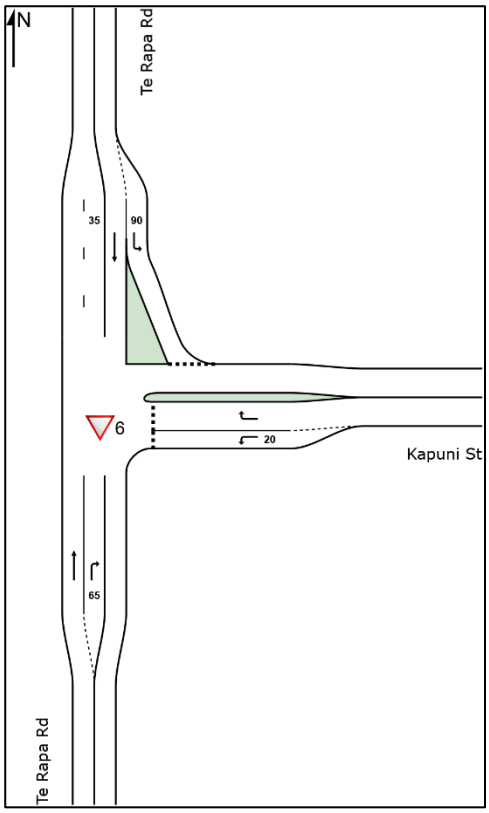


Figure 44: Existing Te Rapa Rd / Kapuni St Intersection Layout

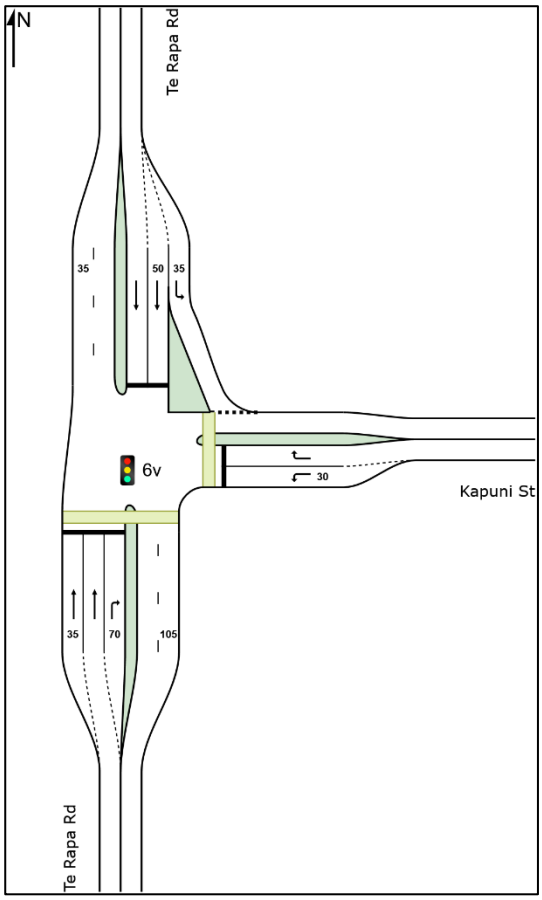


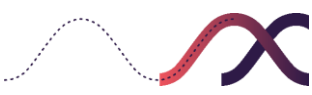
Figure 45: Te Rapa Rd / Kapuni St Signalised Intersection Layout for Infrastructure Baseline Scenario

Table No: 19

Te Rapa Rd / Kapuni St Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline (Figure 44)	AM	0.39	2.6	13.3 Te Rapa Rd (S)	N/A	RT from Kapuni St	119.1	4.2	F
	PM	0.70	0.55	2.7 Kapuni St	N/A	RT from Kapuni St	127.9	8.5	F
Baseline (Figure 45)	AM	0.75	19.5	99.5 Te Rapa Rd (N)	B	RT from Te Rapa Rd (S)	34.4	68.4	C
	PM	0.69	16.0	112.8 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	39.5	24.2	D
1 (Figure 45)	AM	0.82	28.9	212.2 Te Rapa Rd (S)	C	RT from Te Rapa Rd (S)	59.3	126.2	E
	PM	0.77	20.7	154.0 Te Rapa Rd (S)	C	RT from Te Rapa Rd (S)	50.0	32.4	D

As evident from Table No: 19, when trips are generated by PC17 Stage 1 development the right turn movement from Te Rapa Road deteriorates to LOS E with the average delay exceeding 55 s/veh. Therefore, the intersection will have to be upgraded to a layout and signal control represented by Figure 46 before any industrial activity generating traffic from PC17 accesses Te Rapa Road. The upgrade involves increasing the lengths of the auxiliary approach and exit lanes to the intersection.

An upgrade of Te Rapa Road to four lanes either side of Kapuni Street intersection is not required for the completed PC17 since the adjacent Ruffell Road and Church Road intersections with Te Rapa Road are more than 500 m and 1 km to the north and south respectively, while the auxiliary approach and exit lanes required at the signalised Kapuni Street intersection are only 70 m to the north and 170 m to the south.



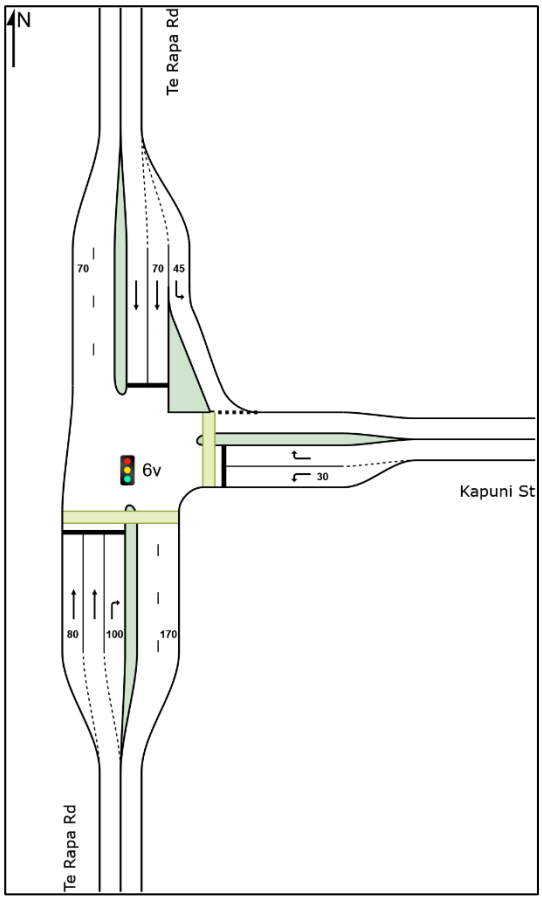


Figure 46: Proposed Te Rapa Rd / Kapuni St Signalised Intersection Layout

Table No: 20

Te Rapa Rd / Kapuni St Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
1 (Figure 46)	AM	0.76	19.8	145.1 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	38.7	84.5	D
	PM	0.66	15.2	115.2 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	40.0	26.3	D
2 (Figure 46)	AM	0.73	19.3	135.9 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	39.0	80.4	D
	PM	0.65	15.3	109.2 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	40.1	27.0	D
3 (Figure 46)	AM	0.73	19.3	122.9 Te Rapa Rd (N)	B	RT from Te Rapa Rd (S)	38.4	80.1	D
	PM	0.64	15.3	100.4 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	39.0	31.0	D

Te Rapa Rd / Kapuni St Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
4 (Figure 46)	AM	0.73	19.5	124.1 Te Rapa Rd (N)	B	RT from Te Rapa Rd (S)	38.8	76.7	D
	PM	0.69	14.7	108.8 Te Rapa Rd (S)	B	RT from Te Rapa Rd (S)	32.8	28.7	C

The proposed phase sequence for all infrastructure scenarios is shown in Figure 47.

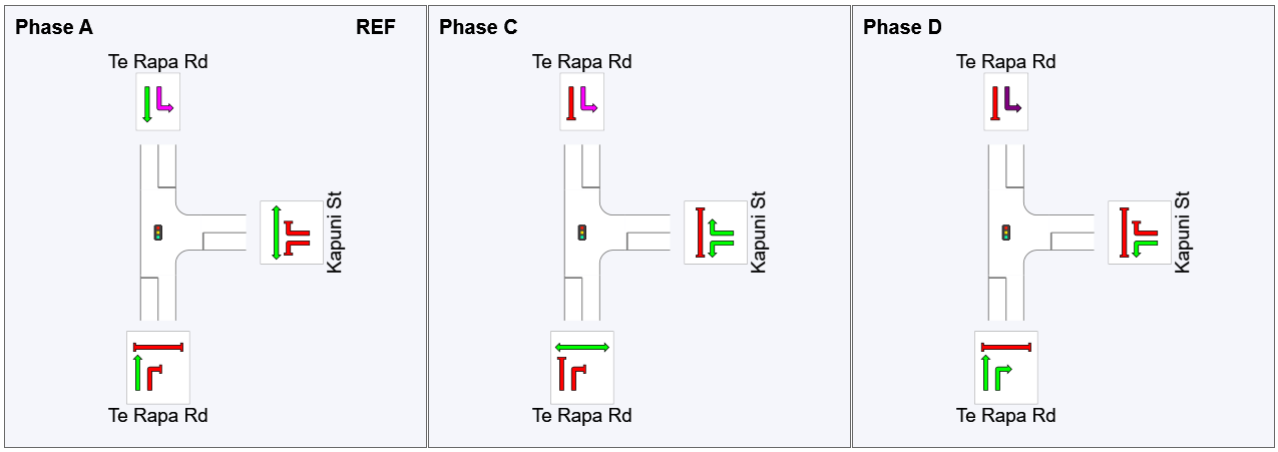


Figure 47: Proposed Phase Sequence – Te Rapa Rd / Kapuni St Intersection

The modelling results indicate that average delay achieved by all approaches to the intersection during peak periods in all infrastructure scenarios are well within the guidance provided in Appendix 15 Table 15-2b of the District Plan.

8.3.7 Te Rapa Road / Te Kowhai Road / Church Road Roundabout

The existing roundabout layout modelled within SIDRA is shown Figure 48. The results of the intersection performance for Infrastructure Baseline and Scenario 1 during peak periods are presented in Table No: 21.

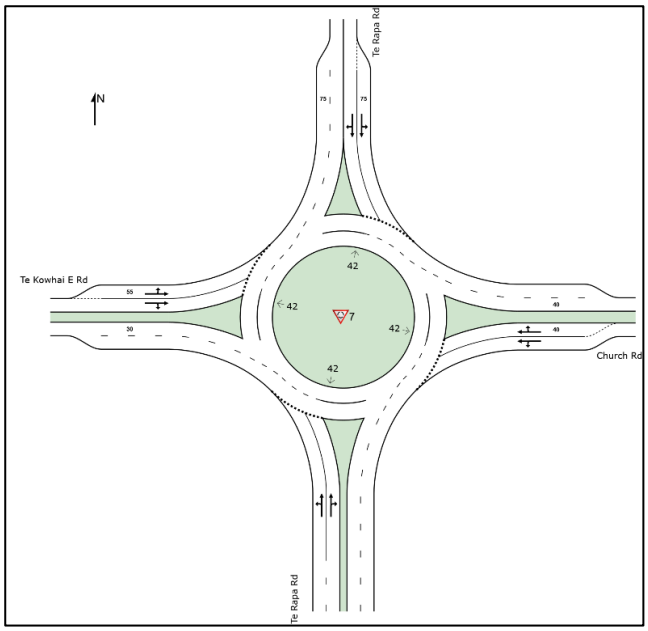


Figure 48: Existing Te Rapa Rd / Te Kowhai Rd / Church Rd Roundabout Layout

Table No: 21

Te Rapa Rd / Te Kowhai Rd / Church Rd Roundabout (existing layout)									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline (Figure 48)	AM	0.62	4.8	34.7 Te Rapa Rd (S)	A	RT from Te Kowhai Rd	12.5	6.6	B
	PM	0.59	5.2	30.7 Te Rapa Rd (S)	A	RT from Te Kowhai Rd	11.3	7.4	B
1 (Figure 48)	AM	0.99	18.6	198.5 Te Rapa Rd (S)	B	LT from Te Kowhai Rd	73.7	169.0	F
	PM	0.81	7.9	65.4 Te Rapa Rd (S)	A	RT from Te Rapa Rd (S)	15.0	65.4	B

Table No: 21 shows that the addition of PC17 Stage 1 development traffic to the network causes the left turn movement from Te Kowhai Road to Te Rapa Road to fail during the AM peak period.

This is because of the increase in northbound traffic volume on Te Rapa Road generated by PC17. A simple solution to increase the capacity for this movement is to modify the lane configuration of the shared through and left turning lane on Te Kowhai Road, to a left turn only lane while the adjacent right turn lane remains marked as shared through and right, as shown in Figure 49. The performance improvement of this lane marking change is presented in Table No: 22.

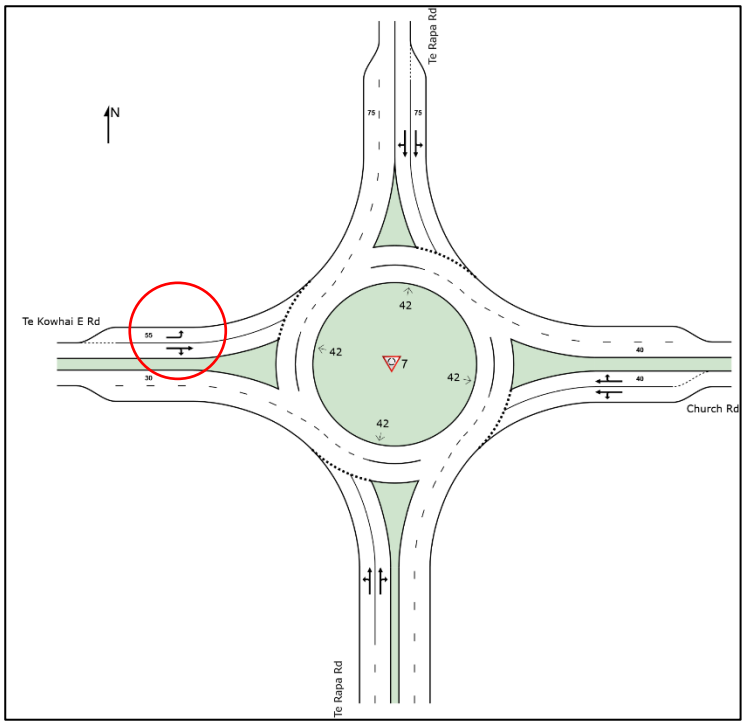


Figure 49: Recommended Te Rapa Rd / Te Kowhai Rd / Church Rd Roundabout Layout

Table No: 22

Te Rapa Rd / Te Kowhai Rd / Church Rd Roundabout (modified layout)									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline	AM	0.62	4.8	34.7 Te Rapa Rd (S)	A	RT from Te Kowhai Rd	12.5	6.6	B
	PM	0.59	5.2	30.7 Te Rapa Rd (S)	A	RT from Te Kowhai Rd	11.3	7.4	B
1 (Figure 49)	AM	0.97	14.9	210.5 Te Rapa Rd (S)	B	LT from Te Kowhai Rd	32.2	51.2	C
	PM	0.82	8.7	66.4 Te Rapa Rd (S)	A	RT from Te Rapa Rd (S)	15.1	66.4	B
2 (Figure 49)	AM	0.95	16.4	177.5 Te Rapa Rd (S)	B	RT from Te Kowhai Rd	51.9	109.6	E
	PM	0.88	9.3	86.7 Te Rapa Rd (S)	A	RT from Te Rapa Rd (S)	16.9	86.7	B
3 (Figure 49)	AM	0.89	10.8	110.4 Te Rapa Rd (S)	B	RT from Te Kowhai Rd	26.3	61.9	C
	PM	0.85	8.6	75.1 Te Rapa Rd (S)	A	RT from Te Rapa Rd (S)	13.3	28.5	B

Te Rapa Rd / Te Kowhai Rd / Church Rd Roundabout (modified layout)									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
4 (Figure 49)	AM	0.78	7.4	66.1 Te Rapa Rd (S)	A	RT from Te Kowhai Rd	14.5	37.0	B
	PM	0.75	7.0	52.1 Te Rapa Rd (S)	A	RT from Te Rapa Rd (S)	13.1	52.1	B

The modelling results indicate that while the roundabout performs satisfactorily (LOS A or B) in all infrastructure scenarios, a 95th percentile back of queue distance of approximately 211 m results on the southern approach during the AM peak period for Infrastructure Scenario 1. This is a long queue but is not considered detrimental to the operation of the strategic network as it does not block any intersection to the south. The Base car park access road is the nearest intersection south, as shown in Figure 50.

An average delay of about 52 seconds per vehicle is also achieved for the right turn movement from Te Kowahai Road during the AM peak hour Infrastructure Scenario 2. However, it is to be noted that there is an alternative route for this right turn movement to Te Rapa Road via Maahanga Drive and The Base Parade which is not highly trafficked during the AM peak period.

It is noted that the results show this queue length reduces in scenarios with the NRC arterial constructed.

Figure 50: 95th Percentile Back of Queue on Te Rapa Rd (AM Peak Hour – Infrastructure Scenario 1)

8.3.8 Te Rapa Road / The Base Parade

The modelling of this intersection was based on the existing phase sequence provided by HCC. The existing signalised intersection layout modelled within SIDRA is shown in Figure 51. The intersection performance results for all infrastructure scenarios during peak periods are presented in Table No: 23.

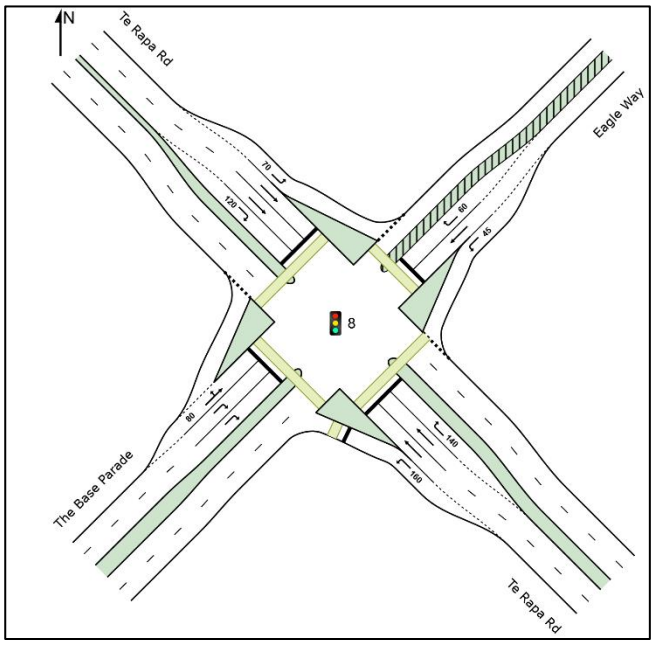


Figure 51: Existing Te Rapa Rd / The Base Parade / Eagle Way Signalised Intersection Layout

Table No: 23

Te Rapa Rd / The Base Parade / Eagle Way Intersection – Existing Phase Sequence									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline	AM	0.83	34.7	251.2 Te Rapa Rd (S)	C	RT from Te Rapa Rd (N)	67.0	20.1	E
	PM	0.92	44.1	195.4 Te Rapa Rd (N)	D	RT from Te Rapa Rd (S)	75.4	121.2	E
1	AM	1.04	82.3	697.1 Te Rapa Rd (S)	F	Through from Te Rapa Rd (S)	122.2	697.1	F
	PM	1.02	68.2	354.9 Te Rapa Rd (N)	E	Through from Te Rapa Rd (N)	117.5	354.9	F
2	AM	1.03	79.9	676.4 Te Rapa Rd (S)	E	Through from Te Rapa Rd (S)	115.2	676.4	F
	PM	1.16	90.4	481.5 Te Rapa Rd (N)	F	RT from Te Rapa Rd (S)	217.9	206.5	F
3	AM	0.96	60.6	533.7 Te Rapa Rd (S)	E	RT from Te Rapa Rd (N)	92.8	27.1	F

Te Rapa Rd / The Base Parade / Eagle Way Intersection – Existing Phase Sequence									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
	PM	1.12	83.3	456.4 Te Rapa Rd (N)	F	Through from Te Rapa Rd (N)	193.1	456.4	F
4	AM	0.79	39.0	311.8 Te Rapa Rd (S)	D	RT from Te Rapa Rd (N)	87.3	36.1	F
	PM	0.93	47.0	208.3 Te Rapa Rd (N)	D	RT from Te Rapa Rd (S)	78.1	130.4	E

The Te Rapa Road / The Base Parade / Eagle Way intersection fails in Scenarios 1, 2 and 3 as demonstrated by the volume / capacity ratios reaching or exceeding 1.0, average delays over 60 seconds, and excessively long queue lengths. Scenario 4 sees the intersection performance improve because the NRC arterial provides an alternative routing option for trips to and from the northeast parts of Hamilton to connect with the northwest (Rotokauri).

The above results reflect the intersection's weekday AM and PM period performance. The Saturday mid-day peak hour for this intersection has not been assessed as PC17, being industrial activities is likely to generate only around 24% of its weekday peak hour volumes during a Saturday mid-day peak period, which is. approximately 250 vph. This has been determined using SCATS data[20] obtained for the following industrial roads in Hamilton between 21st to 26th November 2024:

- Gallagher Drive (Saturday mid-day peak period volume is approximately 23% of a weekday peak period volume)
- Foreman Road (Saturday mid-day peak period volume is approximately 25% of a weekday peak period volume)

In addition to the significantly reduced trip generation by industrial zones for a Saturday mid-day peak period, it is expected that PC17 traffic will disperse as weekday traffic does throughout the network key roads; Te Rapa Road north, McKee Street, Ruffell Road, Kapuni Street and Church Road. This would mean about 25 vph out of the 250 vph generated by PC17 during the Saturday peak hour travels south through The Base Parade / Eagle Way intersection (estimated using the 9.6% volume increase on Te Rapa Road south of The Base Parade for Scenario 2 in Table 7).

On that basis, it is anticipated that any efficiency/performance effects due to PC17 during the Saturday mid-day peak hour are likely to be no more than minor at this intersection.

8.3.8.1 Mitigation Options

Improving the capacity of the intersection by adding more lanes is not considered to be feasible due to the intersection being already very large and there is no available land surrounding it. The southern two corner properties are comprehensively developed (Woolworths and The Base Te Awa) and the respective owners of the two northern corner properties (Food Stuffs and Waikato Tainui) have development plans for their land.

[20]https://app.powerbi.com/view?r=eyJrIjoiNTIwMmNlODYtMjc1OC00NGQ0LTg3NDYtNDQ3MmI4YmIzOWY3IiwidCI6ImViODEzNzU2LTBiMjUtNGQwYS05OTkxLWIxNGZkMjE2YTU1YyIsImMiOjEwfQ==

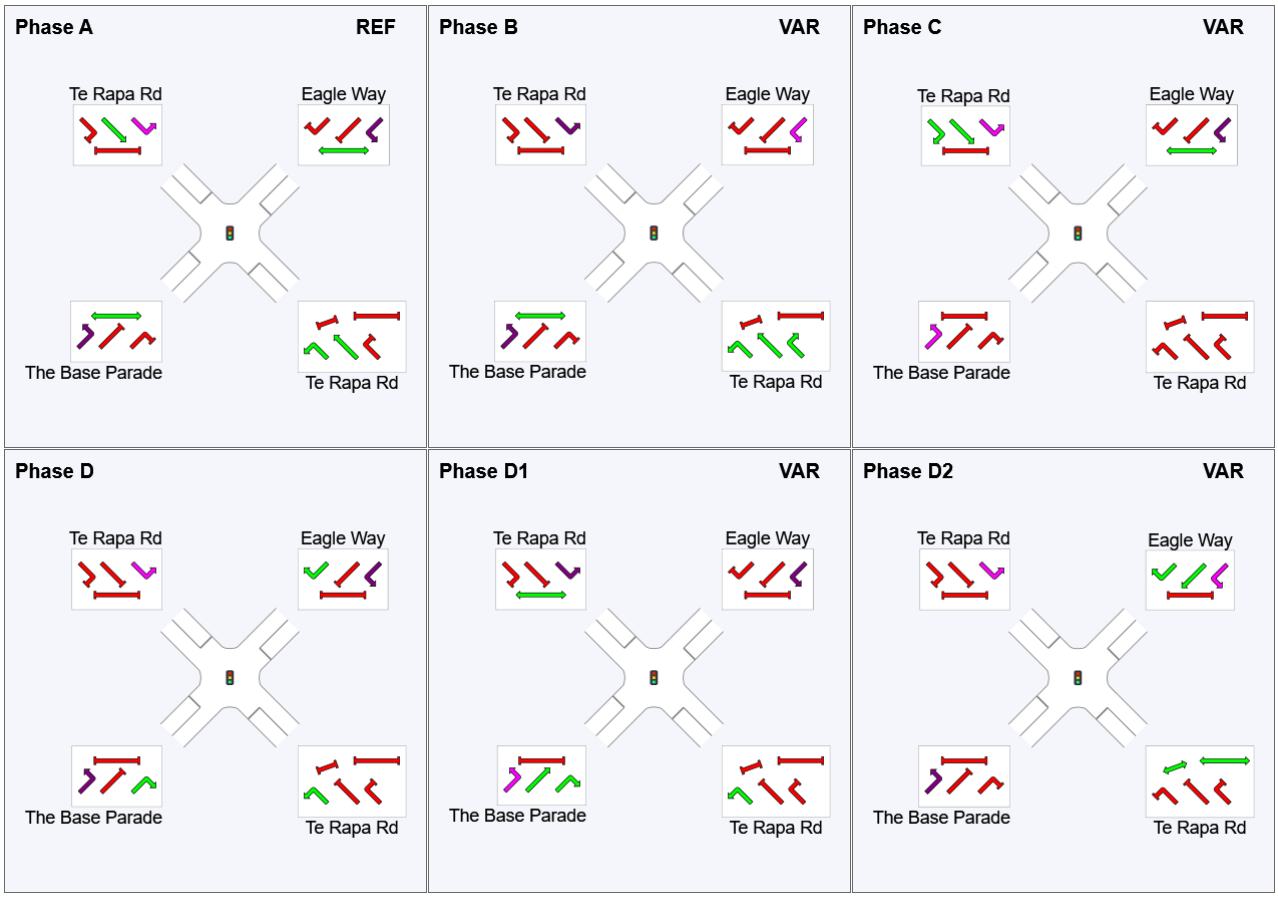
Therefore, options to mitigate the declining intersection performance under Scenarios 1, 2 and 3, are effectively limited to the following:

- signal phase sequence and timing optimisation
- travel demand management requirements for businesses
- investment to improve public transport

8.3.8.2 Signal Phase Sequence and Timing Optimisation

SIDRA modelling demonstrates that changing the intersection's peak period signal phase sequence to a 'double diamond overlap' design (as shown in Figure 52) results in delays and queue lengths reducing and the level of service improving back to LOS C during the AM peak period and LOS E during the PM peak period.

While the average delay for the right turn and through movements on Te Rapa Road still exceed one minute, the movements typically clear the intersection in less than two cycles. Without the phase sequence changes these movements would typically take more than two cycles to clear the intersection. The results of the intersection performance with the modified phase sequence are presented in Table No: 24.



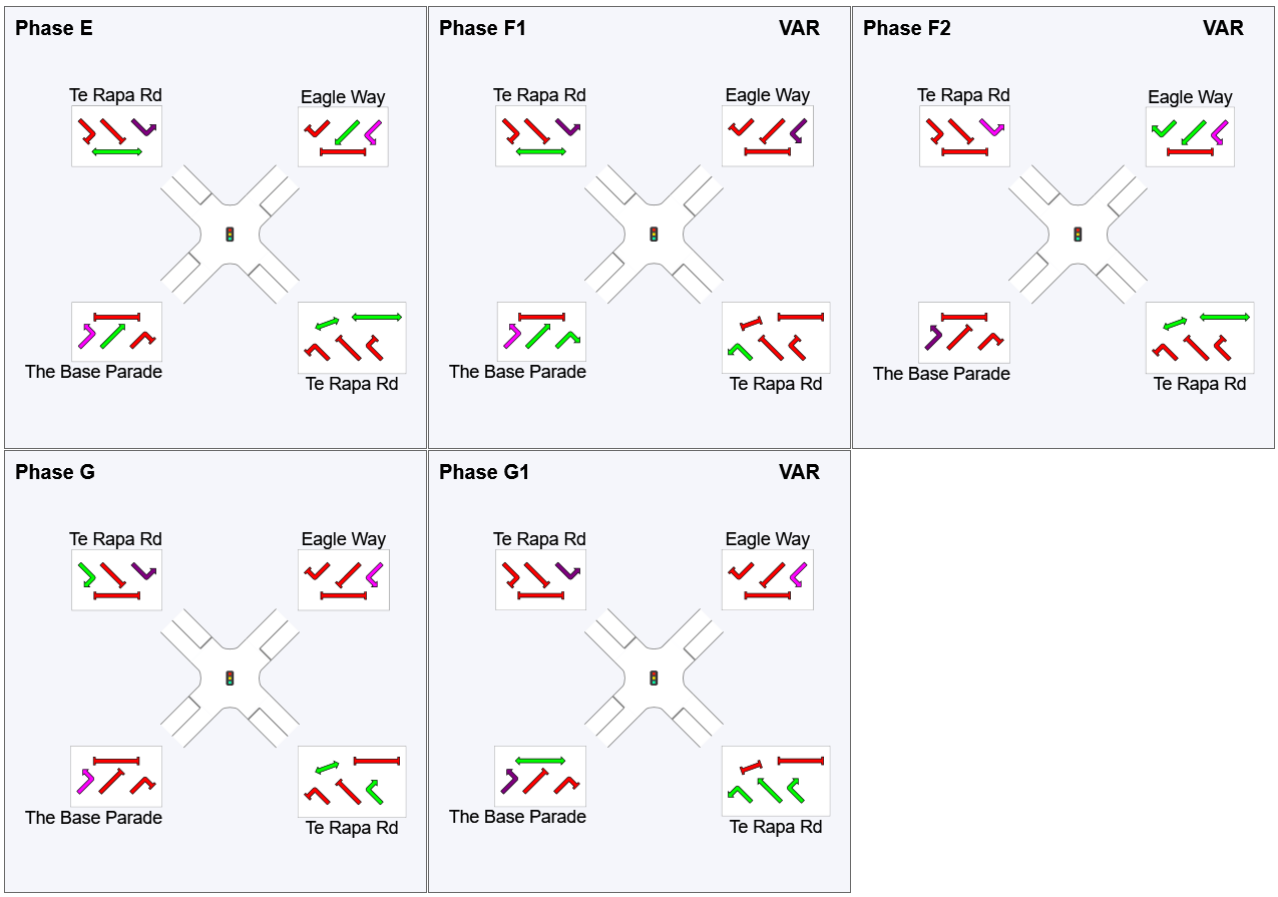


Figure 52: Proposed Signal Phase Sequence at Te Rapa Rd / The Base Parade / Eagle Way Signalised Intersection

Table No: 24

Te Rapa Rd / The Base Parade / Eagle Way Intersection – Signal Phase Re-optimised									
Infrastructure Scenarios	Peak	Intersection				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
1	AM	0.84	34.1	383.2 Te Rapa Rd (S)	C	RT from Te Rapa Rd (N)	89.9	30.9	F
	PM	0.97	65.6	328.3 Te Rapa Rd (N)	E	RT from Te Rapa Rd (S)	100.8	161.5	F
2	AM	0.83	34.9	374.3 Te Rapa Rd (S)	C	RT from Te Rapa Rd (N)	90.9	24.6	F
	PM	1.01	73.6	436.7 Te Rapa Rd (N)	E	Through from Te Rapa Rd (N)	122.6	436.7	F
3	AM	0.76	32.7	324.2 Te Rapa Rd (S)	C	RT from Te Rapa Rd (N)	91.1	27.7	F
	PM	1.02	67.9	372.8 Te Rapa Rd (N)	E	RT from Te Rapa Rd (S)	105.7	164.0	F

Te Rapa Rd / The Base Parade / Eagle Way Intersection – Signal Phase Re-optimised									
Infrastructure Scenarios	Peak	Intersection				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
4	AM	0.74	29.4	241.2 Te Rapa Rd (S)	C	RT from Te Rapa Rd (N)	72.2	29.9	E
	PM	0.89	44.7	182.5 Te Rapa Rd (N)	D	RT from Te Rapa Rd (S)	68.7	118.6	E

Although signal phase changes improve the Level of Service back to Baseline levels during the AM peak hour, the intersection still has significant delays for right turning and through movements, and extensive queues on Te Rapa Road in the Infrastructure Scenarios 1, 2 and 3.

8.3.8.3 Effects Mitigation through Public Transport investment

The MSP Business Case (refer Section 4.3 of this report) identifies that implementation of the recommended Bus Rapid Transit Network to completion over the next 30 years would be the catalyst for a "transformational shift" in public transport patronage up to 32% mode share[21] in the identified BRT corridors of Hamilton City.

It also identifies that "the total recommended [RTN] programme costs for the 30-year investment period (2024-2054) are $2.8bn CAPEX and $1.2bn for OPEX' for a total cost of $4.0 billion (assuming a 50th percentile infrastructure cost estimate)".

This substantial expense inevitably requires funding from multiple sources if the plan is to be successfully implemented.

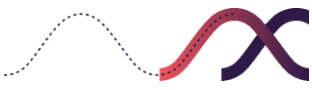
Development contributions targeting public transport is one option to support increased throughput of "people per hour" along a transport corridor. It therefore is an appropriate traffic mitigation alternative to adding more traffic lanes to increase vehicle-per-hour capacity. The value of contributions from private development toward public transport could also involve land where required to accommodate BRT infrastructure along the corridor. It is likely that the retrofitting of BRT infrastructure along on Te Rapa Road will require widening of the road reserve at several locations along the PC17 site frontage. In anticipation of this, Fonterra is continuing to engage with HCC to agree an appropriate building setback along the Te Rapa Road site frontage to enable future retrofitting of the BRT infrastructure. The appropriate set-back distance is not yet quantifiable without further work by Hamilton City Council to determine the minimum corridor width to accommodate the expected number of traffic lanes, and BRT lanes and stops, including at intersections.

8.3.8.4 Travel Demand Management Measures

Travel Demand Management (TDM) strategies collectively enhance network efficiency and safety by mitigating congestion and improving overall travel reliability. Therefore, TDM offers another alternative form of effects mitigation to increasing vehicle capacity on the network.

The use of TDM in combination with Public Transport helps to influence travel behaviour and reduce reliance on single-occupancy vehicles on the network. Key TDM options for PC17 include promotion of public transit,

[21] Hamilton-Waikato Metro Spatial Plan Programme Business Case Executive Summary (16/8/2022), Section 1.8



cycling, and walking through improved infrastructure and requirements on businesses in the zone to establish travel management incentives for employees. Consideration should be given to incentives such as restricting car parking on site, offering carpooling programs or ride-sharing services, implementing flexible work hours, staggering shift or employee start and end times outside of commuter peak periods, allowing working from home options, and avoiding making or receiving deliveries during commuter peak periods to help distribute traffic volumes more evenly throughout the day and improve business efficiencies.

The integration of residential and employment land is also an effective long-term TDM measure. The proposed PC17 industrial zone is situated a short distance (approximately 500m) from the future Te Awa Lakes residential growth area. The proximity together with the proposed off-road shared path connecting the two sites, and the flat terrain will enable walking and cycling to be viable transport mode choices that help to reduce the number of private vehicle trips on the network.

8.3.9 East - West Road / Structure Plan spine road Signalised Intersection (Future NRC Arterial)

A future signalised intersection is proposed where NRC arterial intersects with the proposed Structure Plan north / south spine road. Modelling shows this intersection performs satisfactorily (LOS D) with the completed development of PC17 area and strengthens the long-term connectivity and resilience of the transport network by creating a parallel north / south route to Te Rapa Road for approximately 2 km when complete.

The signalised intersection is required in Infrastructure Scenarios 3 and 4. In the interim period, a Give-Way controlled T-intersection with the Structure Plan spine road is suitable for servicing the completed PC17 development since the spine road is also connected to Access 2 at its northern end and to Old Ruffell Road at its southern end.

The intersection layouts modelled within SIDRA are shown in Figure 53 and Figure 54. The results of the intersection performance for the various infrastructure scenarios during peak periods are presented in Table No: 25.

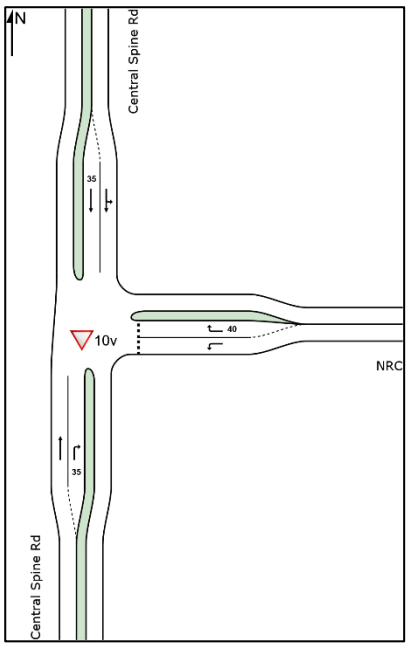


Figure 53: East - West Rd / Structure Plan Spine Rd Intersection – Infrastructure Scenarios 1 and 2

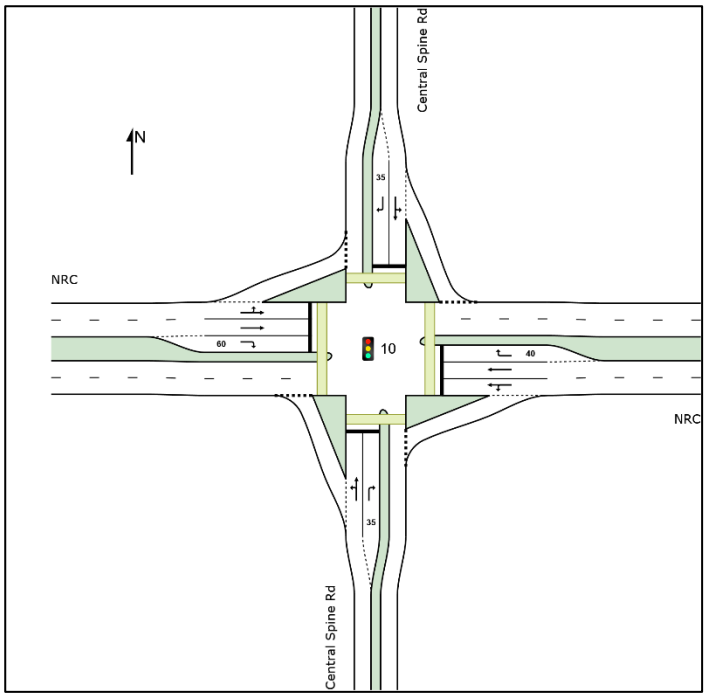


Figure 54: Future NRC / Structure Plan Spine Rd Signalised Intersection – Infrastructure Scenarios 3 and 4

Table No: 25

East - West Rd / Spine Rd Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (based on delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
2	AM	0.15	1.2	1.0 East - West Rd	N/A	RT from East - West Rd	9.5	1.0	A
	PM	0.13	1.2	0.9 East - West Rd	N/A	RT from East - West Rd	9.1	0.6	A
3	AM	0.77	26.4	63.8 NRC (W)	C	RT from NRC (W)	44.9	63.8	D
	PM	0.79	24.6	34.7 NRC (W)	C	RT from NRC (W)	47.2	34.7	D
4	AM	0.80	29.7	56.7 NRC (W)	C	RT from NRC (W)	46.3	56.7	D
	PM	0.68	21.5	38.8 NRC (W)	C	RT from NRC (W)	44.9	28.4	D

The phase sequence proposed for this signalised crossroads intersection is a typical 'Four Phase Leading Right Turns' sequence as shown in Figure 55.

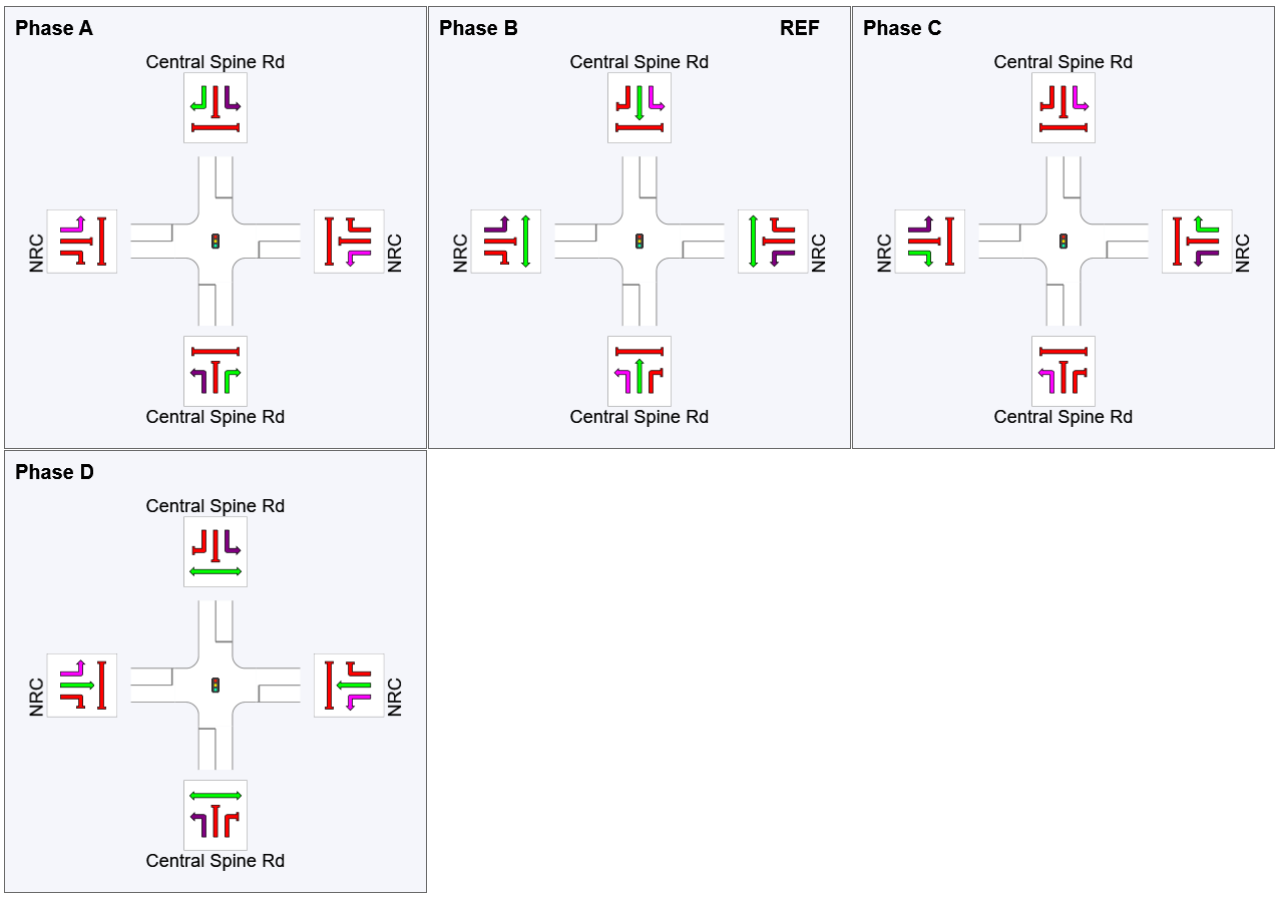


Figure 55: Proposed Phase Sequence – NRC / Structure Plan spine road Signalised Intersection

8.3.10 Horotiu Interchange

The Horotiu interchange was analysed as a network in SIDRA with a pair of 'teardrop' style roundabouts as illustrated in Figure 56. The interchange performance results for all infrastructure scenarios during peak periods are presented in Table No: 26 and Table No: 27.

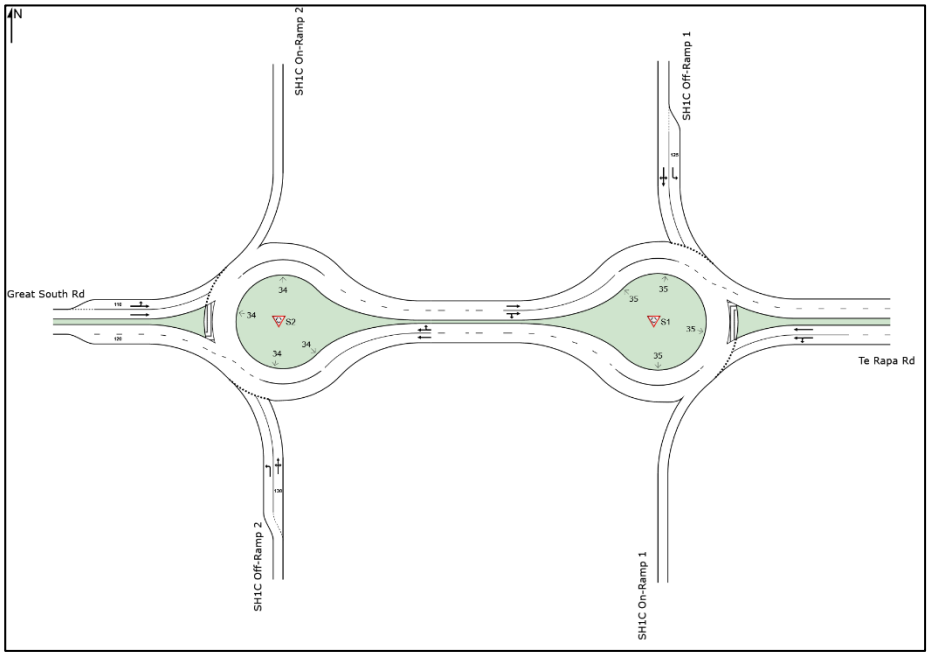


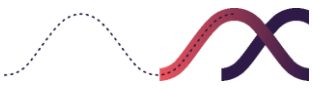
Figure 56: Existing Horotiu Interchange Layout

Table No: 26

Horotiu Interchange – Eastern Roundabout									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline	AM	0.38	7.1	8.4 Te Rapa Rd (E)	A	RT from SH1C SB Off-ramp	16.4	4.2	B
	PM	0.54	6.2	13.2 Te Rapa Rd (E)	A	RT from SH1C SB Off-ramp	14.7	3.0	B
1	AM	0.50	8.3	13.3 Te Rapa Rd (E)	A	RT from SH1C SB Off-ramp	20.2	8.3	C
	PM	0.70	7.7	25.4 Te Rapa Rd (E)	A	RT from SH1C SB Off-ramp	15.2	3.7	B
2	AM	0.66	9.4	15.9 SH1C Off-ramp	A	RT from SH1C SB Off-ramp	24.0	13.5	C
	PM	0.79	9.7	39.1 Te Rapa Rd (E)	A	RT from SH1C SB Off-ramp	15.6	4.1	B
3	AM	0.65	9.4	15.6 SH1C Off-ramp	A	RT from SH1C SB Off-ramp	23.6	13.3	C
	PM	0.79	9.6	38.3 Te Rapa Rd (E)	A	RT from SH1C SB Off-ramp	15.6	4.2	B
4	AM	0.44	7.7	10.4 Te Rapa Rd (E)	A	RT from SH1C SB Off-ramp	17.3	5.9	B
	PM	0.48	6.5	10.9 Te Rapa Rd (E)	A	RT from SH1C SB Off-ramp	15.0	3.4	B

Table No: 27

Horotiu Interchange – Western Roundabout									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
Baseline	AM	0.52	7.4	12.4 Great South Rd	A	RT from SH1C NB Off-ramp	13.7	4.3	B
	PM	0.47	9.2	12.4 Great South Rd	A	RT from SH1C NB Off-ramp	16.0	6.4	B
1	AM	0.70	10.2	27.8 Great South Rd	B	RT from SH1C NB Off-ramp	14.5	6.2	B
	PM	0.62	12.3	24.1 Great South Rd	B	EB Through from Great South Rd	20.8	24.1	C
2	AM	0.79	12.8	40.7 Great South Rd	B	EB Through from Great South Rd	17.3	40.7	B



Horotiu Interchange – Western Roundabout									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Ave Delay (s)	95th % Queue (m)	LOS	Movement	Ave Delay (s)	95th % Queue (m)	LOS
	PM	0.88	26.8	72.8 Great South Rd	C	EB Through from Great South Rd	68.5	72.8	E
3	AM	0.77	11.8	36.9 Great South Rd	B	EB Through from Great South Rd	15.5	36.9	B
	PM	0.90	29.3	81.4 Great South Rd	C	EB Through from Great South Rd	76.3	80.6	F
4	AM	0.55	8.4	15.4 Great South Rd	A	RT from SH1C NB Off-ramp	14.2	6.1	B
	PM	0.42	7.9	9.3 Great South Rd	A	RT from SH1C NB Off-ramp	14.8	6.5	B

8.3.10.1 Eastern Horotiu Interchange Roundabout

The modelling assessment indicates that the eastern roundabout at the Horotiu Interchange will continue to operate well within its practical capacity for all infrastructure scenarios. The AM Peak under Scenario 2 generates the worst-case performance where the southbound off-ramp right turn operates at LOS C with an average delay of 24 s/veh and a 95th percentile queue length of 13.5 metres.

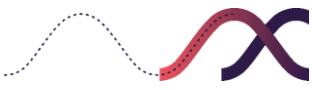
A critical consideration for interchange performance and safety is ensuring that queues on the interchange off-ramps do not extend down the ramp and on to the expressway mainline, or to a point that causes vehicles exiting the expressway to not be able to safely decelerate to a stop before the back of the queue. For the southbound off-ramp, the storage length of the right turn lane is 100 m, and the deceleration distance is a further 335 m from the start of the off-ramp (diverge taper excluded). Austroads[22] identifies the desirable deceleration distance for cars travelling at 110 km/h to stop on a 3% to 4% grade, is 167 m. Therefore, the safety performance of the off-ramp will not be adversely affected by the worst-case queue length.

8.3.10.2 Western Horotiu Interchange Roundabout

The same conclusion applies for the SH1C northbound off-ramp at the western roundabout, where the worst-case queue length is just two vehicles (refer model results in Appendix C) while the queue storage length is 103 m.

However, for Scenarios 2 and 3 the average delay during the PM peak periods for the eastbound Great South Road through movement at the western roundabout, increases from 16 s/veh in the 2035 baseline to over one minute (refer Table 27), culminating in LOS F and a 95th percentile queue length of 81 m under Scenario 3. This is due to the relatively high pm peak volumes on both the eastbound through movement and the westbound right turn to the on-ramp. Compared to the 2035 baseline, the eastbound through movement under Scenario 3 (2045) has increased by 150 vph to 870 vph while the westbound right turn volume has increased by 375 vph to 976 vph.

[22] Austroads Guide to road design Part 4A, Table 5.2 and Table 5.3

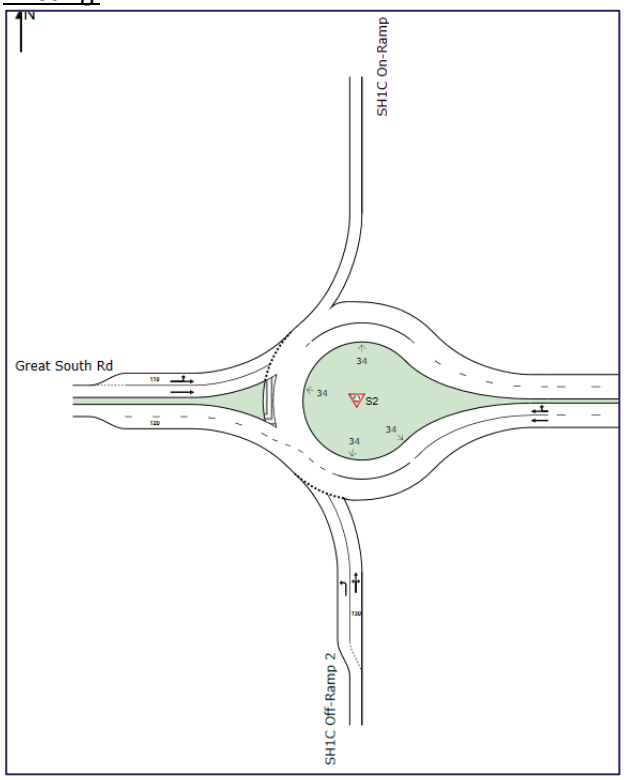


It is noted that the delay for the eastbound through movement increases by around 8 seconds from Scenario 2 to 3, with the key difference being that scenario 3 has the Onion Road and rail overbridge connecting Koura Drive to Te Rapa Road via the East-west Road in PC17.

Model results for Scenario 4 (for 2045) show that completion of the Northern River Crossing from Te Rapa Road to Resolution Drive improves the performance of the Horotiu Interchange back to 2035 baseline levels.

However, if that connection is delayed beyond 2045, or is never completed, a solution exists to mitigate the increased delays and queues identified under Infrastructure Scenario 2 and 3, by modifying the western roundabout to provide two westbound right turning lanes. This involves widening the circulating lane and adding an auxiliary lane of 80-100m length to the northbound on-ramp. The following figure conceptualises the upgrade compared to the existing west roundabout configuration.

Existing



Modified

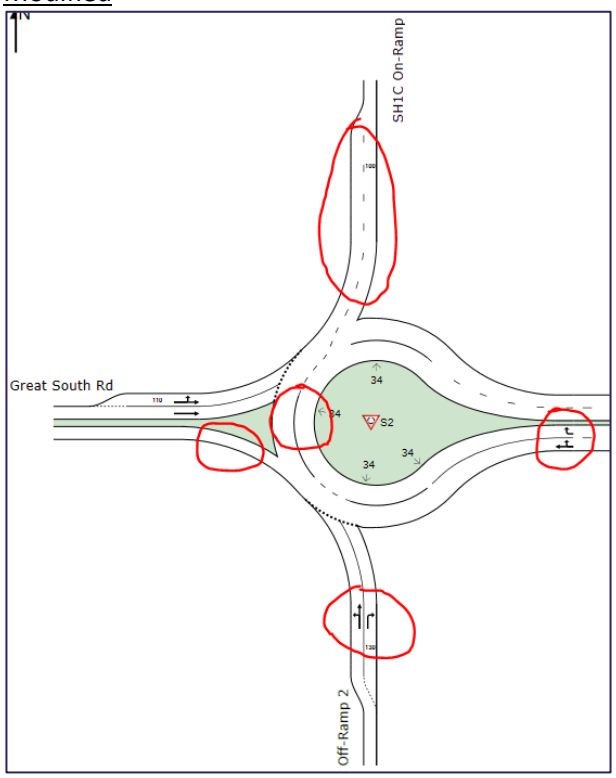


Figure 57: Existing Western Roundabout and Potential future Capacity Improvement.

The resulting performance improvement of the upgrade is significant, with the delays on the eastbound through movement from Great South Road decreasing from 76 to 16 s/veh, and the 95th percentile queue reducing from 80.6 to 18.5 m.

An alternative mitigation option involving less physical upgrade work is retrofitting the westbound lanes on Great South Road overbridge with metering signals that operate during the PM peak when queues on the eastbound through lane of Great South Road reach a detector position.

A similar flow metering solution presently operates at the Silverdale interchange on SH1 northern motorway (illustrated in Figure 58), which successfully mitigates unsafe queue lengths on the northbound off-ramp during high flow periods.

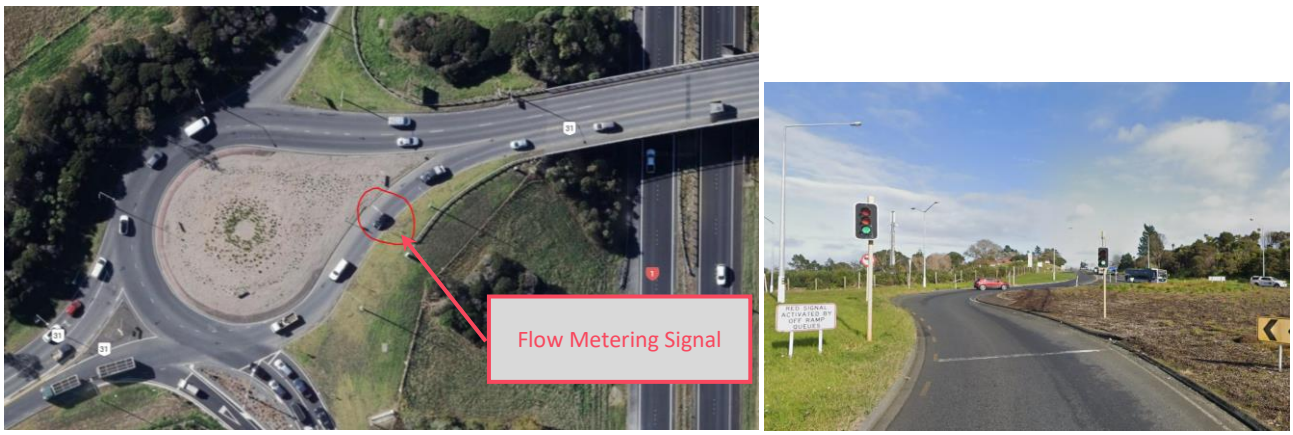


Figure 58: Flow Metering Signal at Silverdale Interchange, SH1 Northern Motorway.

Notwithstanding the above mitigation options, it is worth noting that the increased delays on Great South Road eastbound during the PM peak under Scenarios 2 and 3 are unlikely to cause anything more than increased queue lengths and minor nose to tail crashes. The modelled 95th percentile queue length of 81 m is not excessive for peak hour traffic, and it does not exceed the existing queue storage capacity on Great South road on approach to the west roundabout, and there is no sightline hinderance to the back of such a queue. Neither would it block an upstream intersection.

Furthermore, the roundabout intersections at the Horotiu Interchange generally align with Safe System principles (other than for motorcyclists) as roundabouts inherently reduce vehicle speeds on the approaches before the conflict zones. However, the crash record in Section 3.4 contains many loss-of-control type crashes on the circulating lanes and some truck over-turning crashes, suggesting that the roundabouts are potentially too small for the speed at which drivers interpret they can safely negotiate them. Although not orthodox, the addition of a speed advisory figure (ie 25 or 35 km/h) on the roundabout island chevrons would improve awareness for drivers of the need to reduce their speed further than they had anticipated by the approach geometry.

8.4 Four Lane Upgrade of Te Rapa Road

From the intersection capacity, performance and traffic queue assessments undertaken in the preceding sections, BBO concludes that the Te Rapa Road corridor between the Access 1 intersection and Ruffell Road intersection, as shown in Figure 59, requires widening to four lanes to accommodate the anticipated city-wide traffic growth including that of Te Awa Lakes development and PC17.

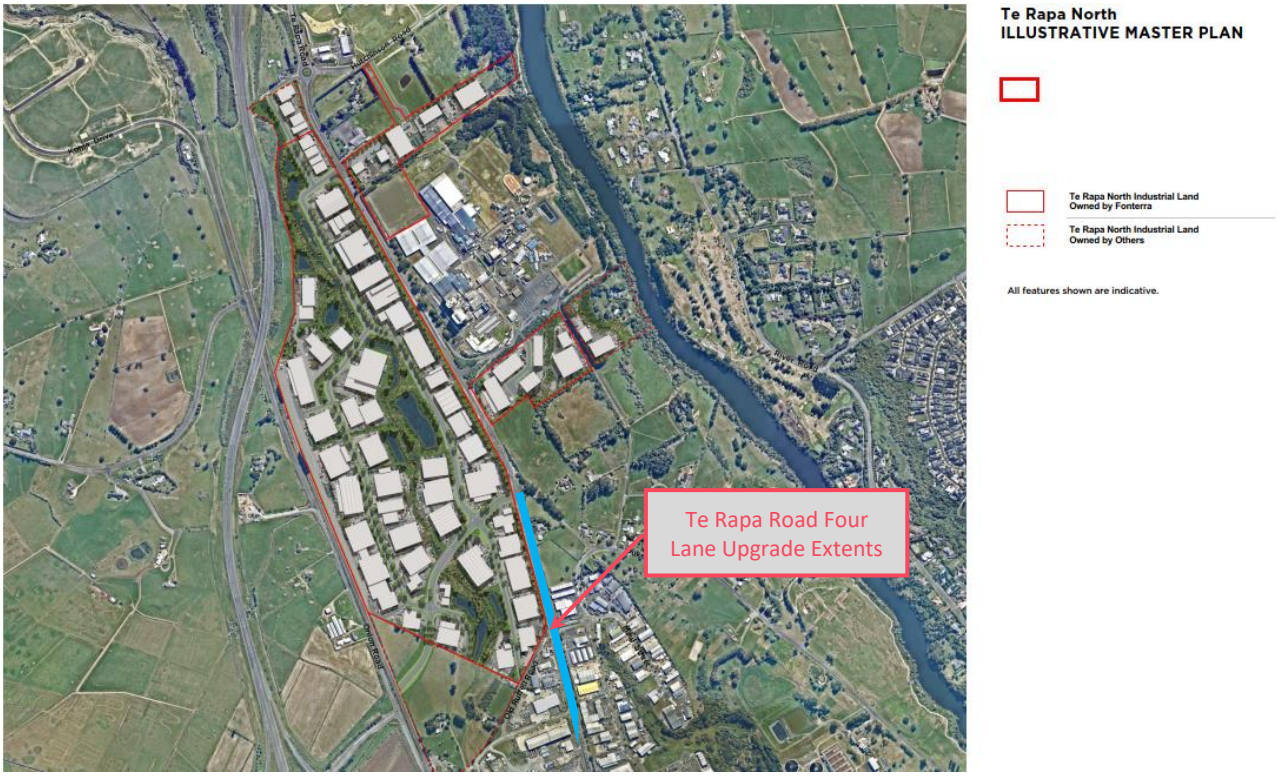


Figure 59: Four Lane Upgrade Extents on Te Rapa Rd

8.5 Dairy Manufacturing Site Access Interchange

Rule 12.4.7d in the District Plan identifies traffic volume thresholds that are permitted to use the Dairy Manufacturing Site access interchange during peak periods as:

d. Vehicle movements onto Te Rapa Dairy Manufacturing Site Interchange if the peak hour traffic flows do not exceed the following limits:

i. AM Peak (7.30 – 9.30 am):

- *All ramps – 300 vehicles per hour ("vph")*

ii. PM Peak (4.00 – 6.00pm):

- *North Bound On-Ramp – 150 vph*
- *South Bound Off-Ramp, South Bound On-Ramp, North Bound Off-Ramp – 300 vph*

Table No: 28 below presents the traffic demand at the Dairy Manufacturing Site access interchange for the various infrastructure scenarios and it is evident that the volumes on the interchange ramps are well within the District Plan rule limits.

Table No: 28

Traffic Demand at Dairy Manufacturing Site Interchange Ramps				
Infrastructure Scenario	Northbound On-ramp AM Peak / (PM Peak)	Northbound Off-ramp AM Peak / (PM Peak)	Southbound On-ramp AM Peak / (PM Peak)	Southbound Off-ramp AM Peak / (PM Peak)
Baseline	8 / 18	54 / 22	19 / 41	34 / 12

1	11 / 23	58 / 21	21 / 46	46 / 17
2	20 / 55	106 / 41	32 / 79	78 / 25
3	19 / 54	107 / 40	34 / 83	77 / 25
4	16 / 29	146 / 36	29 / 103	39 / 19

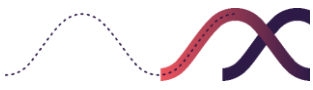
8.6 Staging of Transportation Infrastructure Improvements

Table No: 29 provides a summary of the recommended infrastructure improvements and development triggers/staging from the preceding section.

The triggers associated with each improvement are related to capacity and safety improvements associated with the advancement of the future development stages of the Plan Change Area. These improvements relate to the associated number of trips that are expected to be generated and distributed on the local road network as the Plan Change Area is successively developed.

Table No: 29

Staging of Transportation Infrastructure Improvements			
No.	**Infrastructure Requirement**	**Trigger**	**Delivered By**
1	A new signalised T-intersection on Te Rapa Road providing access to the Plan Change Area (Access 1), including: • new northbound and southbound bus stops located on the north arm of the intersection • shared walking and cycling paths on both sides of Te Rapa Road connecting East - West Road paths to the new bus stops. • four continuous traffic lanes on Te Rapa Road between East - West Road and McKee Street intersections.	Prior to: • Any section 224c certificate for subdivision under the Resource Management Act 1991 ("RMA") being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant
2	A new public road (East - West Road) between Te Rapa Road and the Structure Plan spine road to be designed and constructed in general accordance with the East - West Road typical cross-section in Figure 19, including the intersection of East - West Road with the Structure Plan spine road.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and Hamilton City Council
3	A new signalised cross-roads intersection on Te Rapa Road providing northern access to the Plan Change Area (Access 2). Includes: • closure of two existing vehicle crossings to #1426 Te Rapa Road	To be completed prior to: • Any section 224c certificate being issued under the RMA for any subdivision in PC17 that takes the cumulative developed area with sole access to Te Rapa Rd / East - West Rd intersection over 33 ha (net developable); or	The Applicant

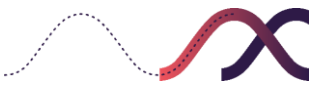


	and provision of one new commercial vehicle crossing to the same property from the new eastern road of the signalised intersection • provision of four continuous traffic lanes on Te Rapa Road between the Hutchinson Road roundabout and the new signalised intersection • provision of a shared walking and cycling path on the eastern side of Te Rapa Road connecting to the existing shared path from Hutchinson Road. •	• When the cumulative total consented land area in PC17 with sole access to Te Rapa Rd / East - West Rd intersection, exceeds 33 ha (net developable).	
4	Upgrading of Te Rapa Road / McKee Street intersection to a signalised T-intersection and upgrading Te Rapa Road to four continuous lanes between McKee Street and Ruffell Road intersections.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and/ or Te Awa Lakes Developers[23]
5	Capacity increase at Te Rapa Road / Ruffell Road signalised intersection to add a second northbound through movement auxiliary lane and a second southbound auxiliary exit lane on Te Rapa Road.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and/or Te Awa Lakes Developers[24]
6	Upgrading Te Rapa Road / Kapuni Street intersection to a signalised T-intersection, providing sufficient capacity to accommodate PC17 traffic.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and / or Te Awa Lakes Developers[25]
7	Lane marking changes on Te Kowhai Road at Te Rapa Road / Te Kowhai Road / Church Road roundabout, from shared through and left to left turn only from the kerbside lane.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or	The Applicant

[23] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006

[24] Rule 3.8.5.3.2(b) in the Hamilton City Operative District Plan

[25] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006



		• Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	
8	Extension of the Structure Plan spine road (collector road cross-section in Figure 20) south with connection to Old Ruffell Road (Access 3), and northward with connection to Access 2.	To be completed prior to: • Any 224c being issued under the RMA for any subdivision in PC17 that takes the cumulative developed area with sole access to Te Rapa Rd / East - West Rd intersection over 33 ha (net developable); or • When the cumulative total consented land area in PC17 with sole access to Te Rapa Rd / East - West Rd intersection, exceeds 33 ha (net developable).	The Applicant

9. Transport Strategies and Policy

9.1 Government Policy Statement on Land Transport 2024 – 34

The Government Policy Statement ("GPS 2024") was confirmed in June 2024, and it outlines the coalition Government's priorities for expenditure from the National Land Transport Fund over the next 10 years. It also provides guidance to decision-makers about where the Government will focus resources, consistent with the purpose of the Land Transport Management Act 2003, which is:

"*To contribute to an effective, efficient, and safe land transport system in the public interest.*"[26]

The four Strategic Priorities of GPS 2024 are:

- Economic Growth and Productivity
- Increased maintenance and resilience
- Safety
- Value for Money

The expected outcomes of the GPS 2024 are defined further as follows:

- Economic Growth and Productivity:
    - Reduced journey times and increased travel time reliability.
    - Less congestion and increased patronage on public transport.
    - Improved access to markets, employment and areas that contribute to economic growth.
    - More efficient supply chains for freight.
    - Unlocked access to greenfield land for housing development and supporting greater intensification.
- Increased Maintenance and Resilience:
    - More kilometres of the road network resealed and rehabilitated each year.
    - Fewer potholes.
    - A more resilient road and rail network.
- Improved Safety:
    - Reduction in deaths and serious injuries.
    - Increased enforcement.
    - The primary focus of this priority is to make transport substantially safer for all.
- Value for money:
    - Better use of existing capacity.
    - Less expenditure on temporary traffic management.

PC17 is consistent with the GPS 2024 by supporting the achievement of the following GPS outcomes:

[26] Section 3 of the Land Transport Management Act 2003

- Economic growth and prosperity: PC17 will provide access to more industrial land that can be developed, which will lead to more jobs and increased prosperity. It will also accommodate future connections with the NRC improving the efficiency of supply chains for freight.
- Increased resilience: PC17 proposes a Structure Plan spine road that runs parallel to Te Rapa Road and multiple mode choices increases the ability of the road network to recover from disruption and maintain an acceptable level of service.
- Improved safety: PC17 will provide a safe transport network that is integrated with land use and deliver safe travel speeds.

9.2 Waikato Regional Land Transport Plan 2024 – 2054

The Waikato Regional Land Transport Plan (2024 – 2054) ("WRLTP") sets out the strategic direction for land transport in the Waikato region over the next 30 years. The WRLTP is built around the region's key transport issues, namely:

- *Climate Change: an environmentally sustainable, energy efficient and low-carbon transport system that delivers emissions reductions and enhances communities' long-term resilience to the effects of climate change.*
- *Resilience: an efficient and resilient land transport system that ensures communities have route security and access to essential services.*
- *Growth and Economic Development: an integrated transport system that supports compact urban form and planned future growth; AND an efficient and resilient strategic corridor network that advances regional economic and social wellbeing.*
- *Accessibility and Transport Options: an integrated transport system that provides transport options for differing community access and mobility needs.*
- *Safety: a safe, accessible transport system in the Waikato region where no one is killed or seriously injured.*

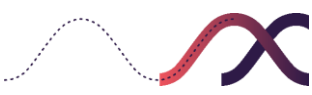
PC17 is well-aligned with the WRLTP by addressing the following key transport issues:

- Climate change: PC17 supports and encourages environmentally friendly modes of transport, protects significant natural areas and supports low emission travel options (walking, cycling and public transport).
- Resilience: Improving and increasing transport mode options improves the resilience of the transport network.
- Growth and economic development: PC17 supports growth by using existing transport corridors and improving connections which leads to economic benefits.
- Accessibility and transport options: PC17 increases feasibility of public transport and promotes a range of transport modes, making transport more inclusive.
- Safety: PC17 focuses on vulnerable road users / active modes by providing appropriate walking and cycling facilities. This reduces risk of conflict, improves safety and encourages healthy transport options.

10. Conclusions

The following key conclusions are established from this ITA:

- PC17 involves rezoning the Plan Change Area by removing the "Deferred Industrial Zone" Area to enable industrial land use. Of the 91 ha Plan Change Area, approximately 79 ha is likely to be developable for industrial purposes. The balance is identified as riparian and flood prone area.
- When completed the developed land is expected to generate approximately 1,030 vehicle trips per peak hour. It is anticipated that PC17 will generate approximately 9,700 trips per day.
- Four transport access points are proposed for the Plan Change Area. Three are located on Te Rapa Road (including the existing grade-separated interchange to the Dairy Manufacturing Site) and one via a connection to Old Ruffell Road. All but the Dairy Manufacturing Site access are internally connected through the Plan Change Area by the Structure Plan spine road.
- Access 1 is proposed as a signalised T-intersection on Te Rapa Road. The specific location of the intersection is to be confirmed through design and consultation with HCC during the consenting stage, taking due consideration for the future upgrade to a four-arm signalised intersection connecting the NRC to Te Rapa Road.
- The proposed alignment of the East - West Road and NRC through PC17 land (west of Te Rapa Road):
    - Maximises the developable industrial land within the Plan Change Area.
    - Avoids the widest part of the proposed storm water and riparian basin at the southern end of the Plan Change Area.
    - Meets the geometric standards for a 70 km/h design speed.
    - Seeks to minimise the impact on 3rd party land holdings (e.g Empire Corporation land).
    - Enables an intersection with Te Rapa Road that is at or near a right-angle.
    - Supports the anticipated alignment of the future overbridge connection to Koura Drive.
- BBO considers that East - West Road through the Plan Change Area does not preclude HCC from designating the NRC east of Te Rapa Road in a location that achieves the river crossing connection and location anticipated by the high-level plans currently available.
- Access 2 is proposed to be a signalised crossroads intersection.
- Transportation infrastructure upgrades that are required as part of the Te Awa Lakes development are included in the baseline conditions that inform the WRTM modelling work undertaken.
- Traffic modelling indicates that an initial development stage of approximately 33 ha can be accessed through Access 1 alone. This equates to approximately 538 trips (two-way) per peak hour.
- A new access is proposed to the Plan Change area when the section of NRC between Koura Drive and the Structure Plan spine road is constructed. This access point is envisaged to be in the form of a signalised cross-roads intersection to enable public transport priority to be easily retrofitted in future. This connection is intended to provide direct access to a 20-ha area that can potentially be developed as a logistics area with a rail siding connection to the NIMT.
- The internal public road network will be designed in accordance with the intended network hierarchy and will adhere to relevant design requirements of the District Plan. This includes, but is not limited to road cross-section design, vehicle crossing spacings, sight distance and a highly connected network of paths for walking and cycling within the Plan Change Area.



- To support the connection to future rapid transit corridor on Te Rapa Road, walking and cycling connections are proposed on both sides of Te Rapa Road connecting East - West Road to the proposed new bus stops on Te Rapa Road.
- It is likely that the retrofitting of BRT infrastructure along on Te Rapa Road will require widening of the road reserve at several locations along the PC17 site frontage. Fonterra is continuing to engage with HCC to agree an appropriate building setback along the Te Rapa Road site frontage to enable future retrofitting of the BRT infrastructure.
- Capacity assessment undertaken via SIDRA based on the infrastructure scenarios indicate that all intersections identified in this assessment, perform satisfactorily with the addition of the trips generated by PC17 subject to the recommended infrastructure upgrades. It also indicates that PC17 can be serviced by the proposed accesses to Te Rapa Road and Old Ruffell Road without the need of the NRC connection to Koura Drive.
- PC17 is well aligned with the national, regional and local strategic transport frameworks. These frameworks seek improvement access for all users, provide safe and resilient transport networks, provide for economic growth and climate change.

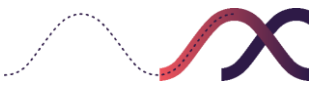
Overall, the transportation effects on the adjoining road network enabled by PC17 can be managed and mitigated to acceptable levels, subject to the recommended infrastructure upgrades and associated timing of each (in the following section) being adopted.

11. Recommendations

The following transportation infrastructure provisions are recommended to mitigate the potential effects of transport associated with PC17.

1. *Access 1: Te Rapa Road / East - West Road Intersection*
    - Construction of a new signalised T-intersection on Te Rapa Road connecting to a new public road (East - West Road) through the Plan Change Area, in general accordance with the location and form illustrated in Appendix B of this ITA.
    - Provision of a pair of bus stops on Te Rapa Road north of the East - West Road.
    - Provision of walking and cycling shared paths on both sides of Te Rapa Road connecting East - West Road to the proposed new bus stops on Te Rapa Road.
    - Four lanes to be provided on Te Rapa Road between East - West Road and McKee Street.
2. *East - West Road*
    - -East - West Road between Te Rapa Road and Structure Plan spine road is designed in accordance with the typical cross-section in Figure 19 and in consultation with HCC so that it is able to be upgraded to form part of the NRC if and when that project is progressed by HCC.
    - Construction of new East - West Road / Structure Plan spine road intersection in general accordance with the location presented in the proposed Structure Plan.
3. *Access 2: Te Rapa Road Access – South of Hutchinson Road*
    - Construction of a new four-arm signalised intersection on Te Rapa Road in general accordance with the location and form illustrated in Appendix B of this ITA, connecting to the Structure Plan spine road through the Plan Change Area and the new eastern local access road.
    - Four laning of Te Rapa Road between the Hutchinson Road roundabout and the signalised intersection.
    - Removal of existing right turn bay and relocation of vehicle crossings to 1426 Te Rapa Road to eastern arm of signalised intersection.
    - Provision of a walking and cycling shared path on the eastern side of Te Rapa Road connecting Access 2 intersection to the existing walking and cycling shared path on Hutchinson Road.
4. *Te Rapa Road / McKee Street Intersection*
    - The existing Te Rapa Road / McKee Street priority-controlled intersection should be upgraded to a signalised T-intersection with four lanes provided between McKee Street and Ruffell Road before any land use activity in PC17 generates operational traffic, and if the intersection has not been upgraded as part of Te Awa Lakes development[27].
5. *Te Rapa Road / Ruffell Road Intersection*
    - The capacity of the existing Te Rapa Road / Ruffell Road signalised intersection should be upgraded to add a second northbound through movement auxiliary lane and a second southbound auxiliary exit lane on Te Rapa Road before any land use activity in PC17 generates operational traffic.

[27] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006



6. *Te Rapa Road / Kapuni Street Intersection*

- The existing Te Rapa Road / Kapuni Street priority-controlled intersection should be upgraded to a signalised T-intersection before any land use activity in PC17 generates operational traffic.

7. *Te Rapa Road / Te Kowhai Road / Church Road Roundabout*

- The capacity of the existing Te Rapa Road / Te Kowhai Road / Church Road Roundabout should be increased by modifying the lane configuration on Te Kowhai Road from shared through and left turning lane to left turn only lane before any land use activity in PC17 generates operational traffic.

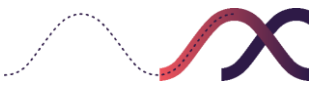
8. *Structure Plan Spine Road*

- Construction of a new public road in general accordance with the Structure Plan and the collector road typical cross-section in Figure 20, including connection to Access 2 / Te Rapa Road to the north and Old Ruffell Road to the south.

The following summarises the recommended transportation infrastructure upgrades and related timing and responsibilities for delivery, in relation to this rezoning submission.

Table No: 30

Staging of Transportation Infrastructure Improvements			
No.	**Infrastructure Requirement**	**Trigger**	**Delivered By**
1	A new signalised T-intersection on Te Rapa Road providing access to the Plan Change Area (Access 1), including: • new northbound and southbound bus stops located on the north arm of the intersection • shared walking and cycling paths on both sides of Te Rapa Road connecting East - West Road paths to the new bus stops. • four continuous traffic lanes on Te Rapa Road between East - West Road and McKee Street intersections.	Prior to: • Any section 224c certificate for subdivision under the Resource Management Act 1991 ("RMA") being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant
2	A new public road (East - West Road) between Te Rapa Road and the Structure Plan spine road to be designed and constructed in general accordance with the East - West Road typical cross-section in Figure 19, including the intersection of East - West Road with the Structure Plan spine road.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and Hamilton City Council
3	A new signalised cross-roads intersection on Te Rapa Road providing northern access to the Plan Change Area (Access 2). Includes:	To be completed prior to: • Any section 224c certificate being issued under the RMA for any subdivision in PC17 that takes the cumulative developed area with	The Applicant

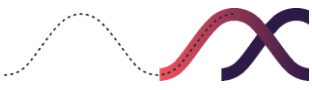


	• closure of two existing vehicle crossings to #1426 Te Rapa Road and provision of one new commercial vehicle crossing to the same property from the new eastern road of the signalised intersection • provision of four continuous traffic lanes on Te Rapa Road between the Hutchinson Road roundabout and the new signalised intersection • provision of a shared walking and cycling path on the eastern side of Te Rapa Road connecting to the existing shared path from Hutchinson Road. •	sole access to Te Rapa Rd / East - West Rd intersection over 33 ha (net developable); or • When the cumulative total consented land area in PC17 with sole access to Te Rapa Rd / East - West Rd intersection, exceeds 33 ha (net developable).	
4	Upgrading of Te Rapa Road / McKee Street intersection to a signalised T-intersection and upgrading Te Rapa Road to four continuous lanes between McKee Street and Ruffell Road intersections.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and/ or Te Awa Lakes Developers[28]
5	Capacity increase at Te Rapa Road / Ruffell Road signalised intersection to add a second northbound through movement auxiliary lane and a second southbound auxiliary exit lane on Te Rapa Road.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and/or Te Awa Lakes Developers[29]
6	Upgrading Te Rapa Road / Kapuni Street intersection to a signalised T-intersection, providing sufficient capacity to accommodate PC17 traffic.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or • Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	The Applicant and / or Te Awa Lakes Developers[30]
7	Lane marking changes on Te Kowhai Road at Te Rapa Road / Te Kowhai Road / Church Road roundabout, from shared through and left to left turn only from the kerbside lane.	To be completed prior to: • Any section 224c certificate for subdivision under the RMA being issued for the completion of any subdivision within PC17; or	The Applicant

[28] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006

[29] Rule 3.8.5.3.2(b) in the Hamilton City Operative District Plan

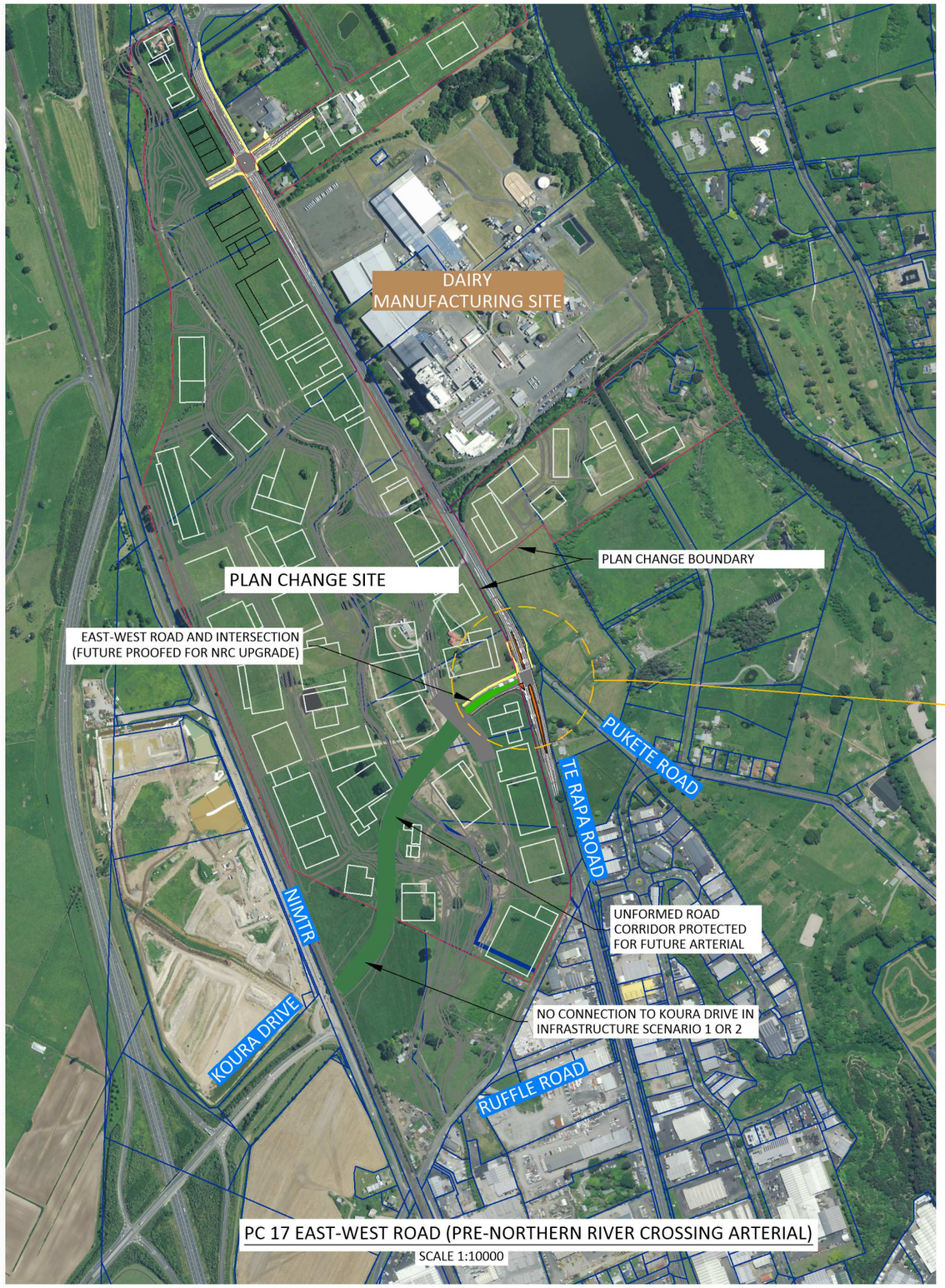
[30] Rule 3.8.5.3.1(a)(i) in the Hamilton City Operative District Plan and Condition 72(i) in resource consent number 010.2021.00011468.006



		• Any industrial activity being able to generate traffic that gains access off Te Rapa Road.	
8	Extension of the Structure Plan spine road south in general accordance with the collector road typical cross-section in Figure 20 including connection to Old Ruffell Road, (Access 3) and north with connection to Access 2 Road.	To be completed prior to: • Any 224c being issued under the RMA for any subdivision in PC17 that takes the cumulative developed area with sole access to Te Rapa Rd / East - West Rd intersection over 33 ha (net developable); or • When the cumulative total consented land area in PC17 with sole access to Te Rapa Rd / East - West Rd intersection, exceeds 33 ha (net developable).	The Applicant

Appendix A – Proposed Structure Plan and Illustrative Masterplan

Appendix B – Access Intersection Concept Designs



PC 17 EAST-WEST ROAD (PRE-NORTHERN RIVER CROSSING ARTERIAL)

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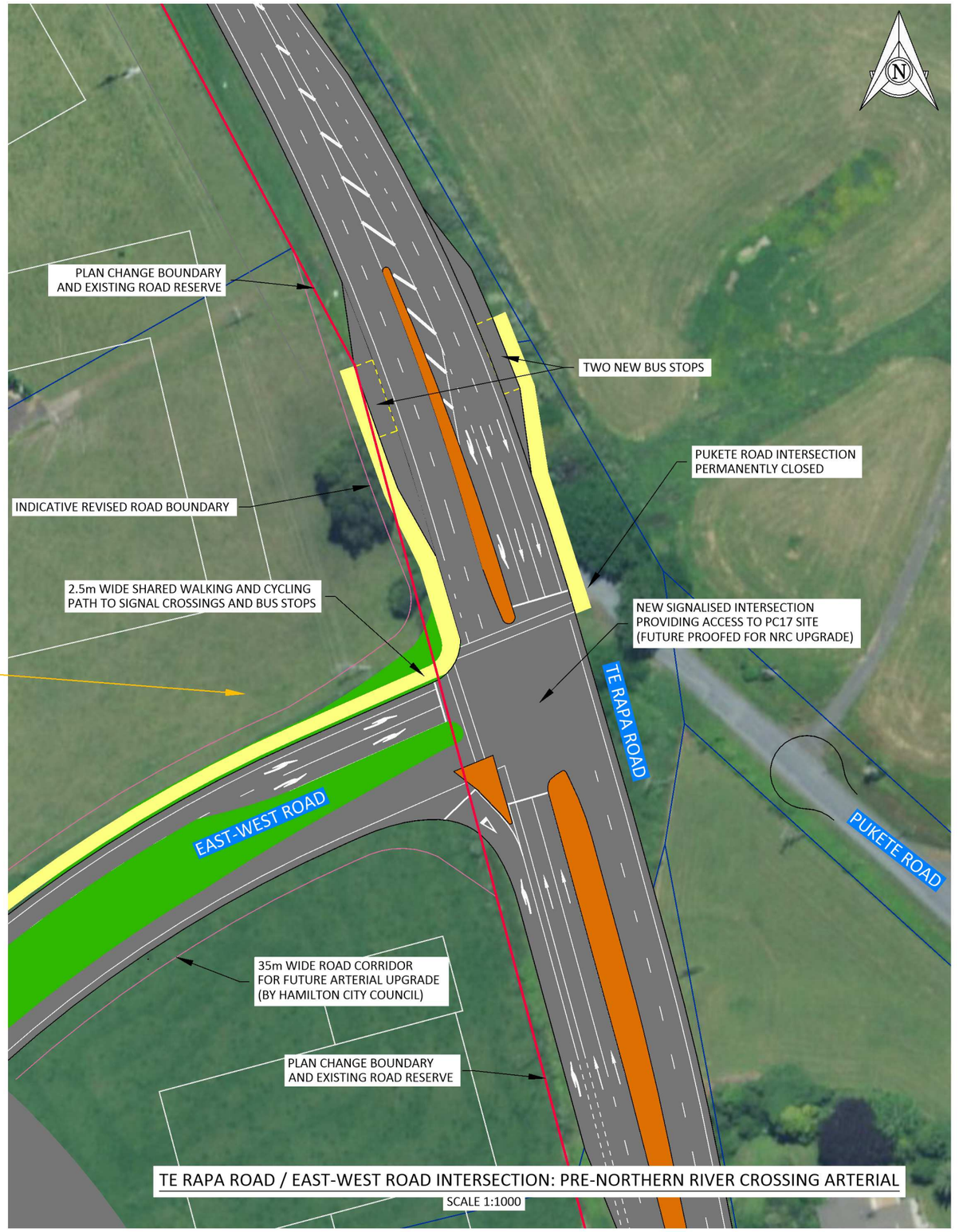

TE RAPA ROAD / EAST-WEST ROAD INTERSECTION: PRE-NORTHERN RIVER CROSSING ARTERIAL

SCALE 1:1000

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						DRAWN: CI	APPROVED: CI	
						mx model version:		
B	06/12/2024	FOR PLAN CHANGE	SKB	CI	CI			
	DATE	ISSUE/REVISION DETAIL	BY	CHK	APPR			

CLIENT: FONTERRA

PROJECT: TE RAPA NORTH PLAN CHANGE 17

DRAWING: TE RAPA RD / NORTHERN ARTERIAL CONCEPT INTERSECTION DESIGN EAST-WEST ROAD (PRE-NRC)

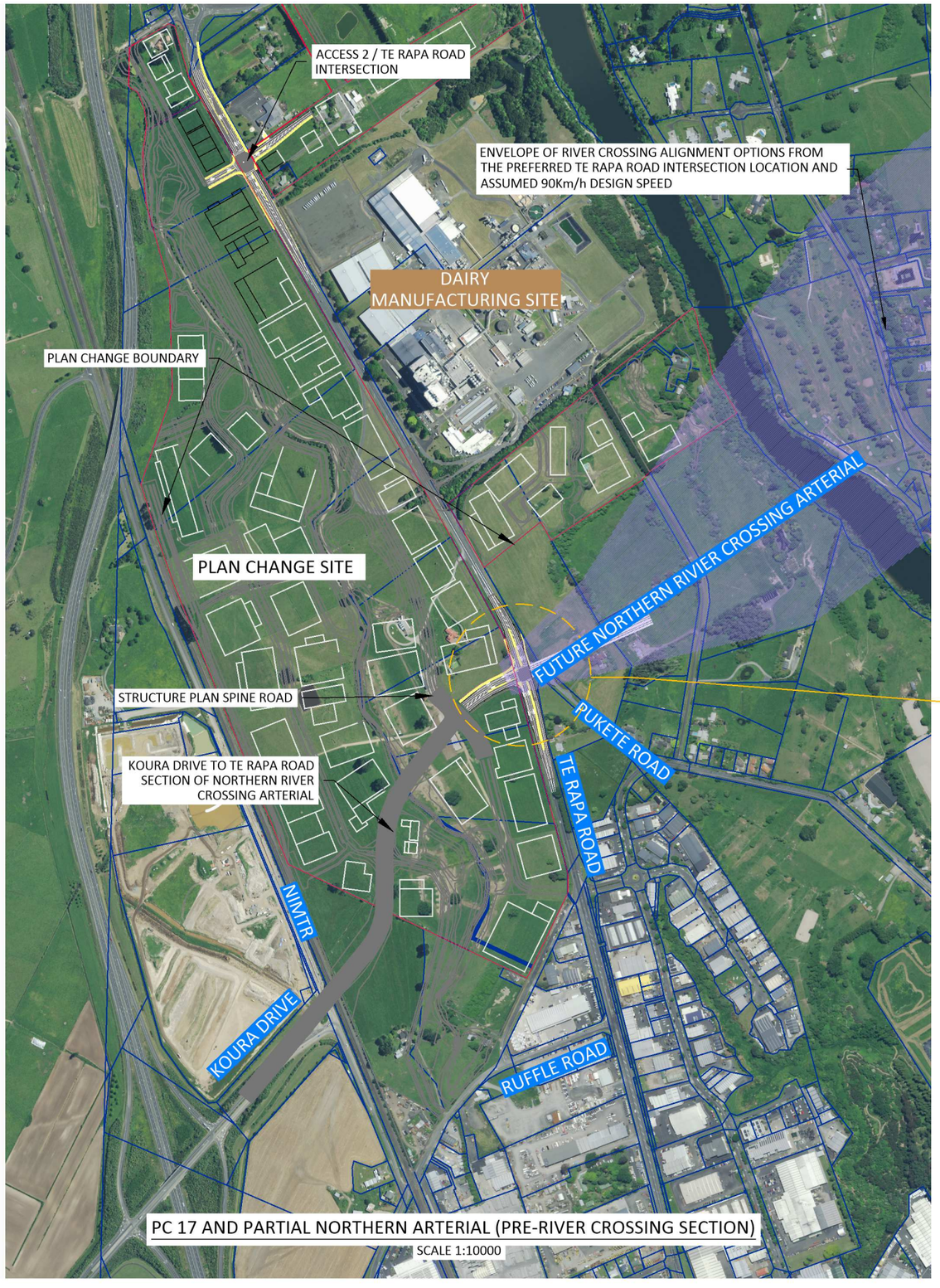
STATUS: PRELIMINARY

DATE: 30.08.2024

SCALE (ORIGINAL SIZE A3): 1:10000

DRAWING NUMBER: 148020-00-0101

REVISION: B



PC 17 AND PARTIAL NORTHERN ARTERIAL (PRE-RIVER CROSSING SECTION)

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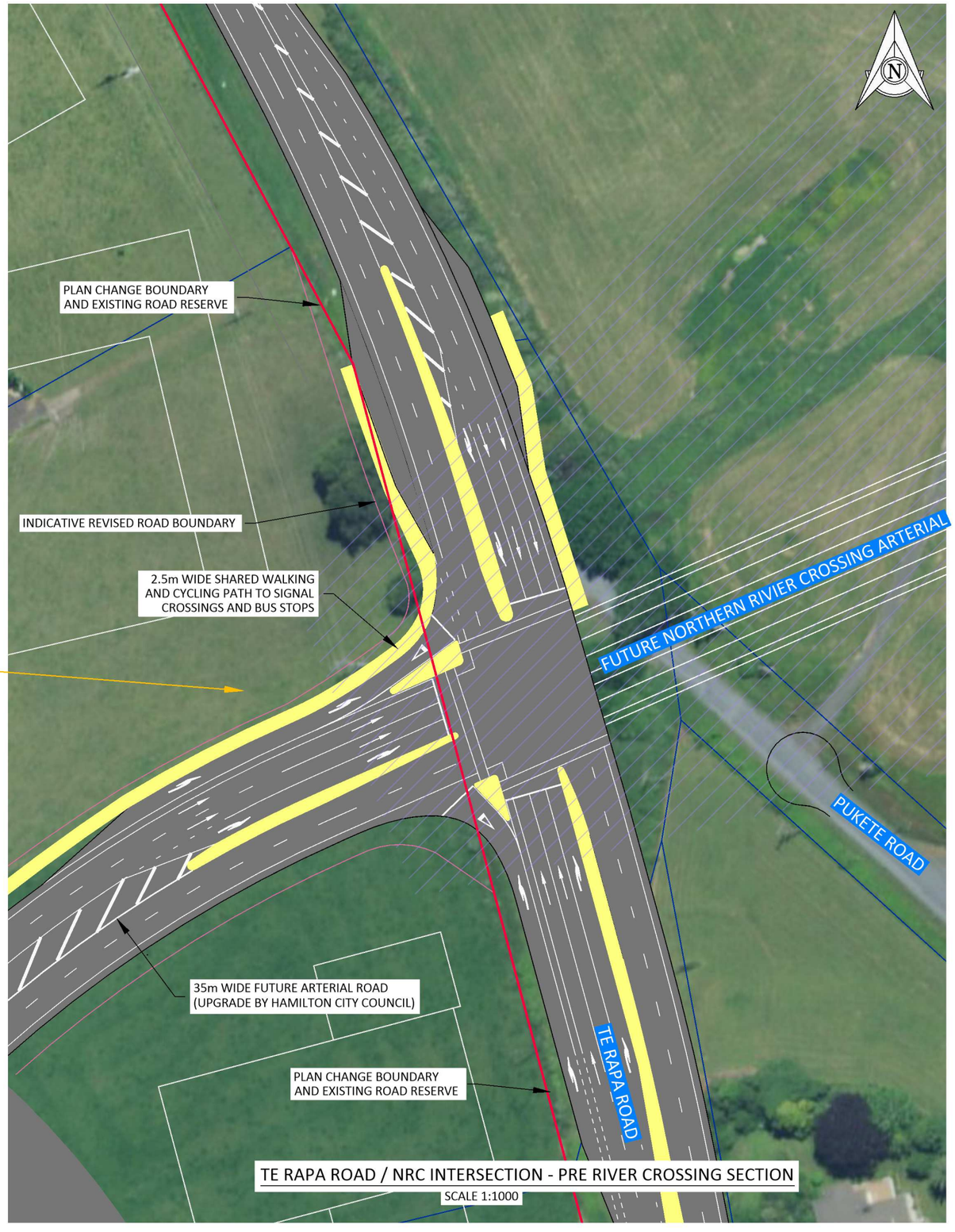

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	DATE	ISSUE/REVISION DETAIL	BY	CHK	APPR	DRAWN: CI	APPROVED: CI	
						mx model version:		

CLIENT: FONTERRA

PROJECT: TE RAPA NORTH PRIVATE PLAN CHANGE 17

DRAWING: TE RAPA RD / PARTIAL NRC ARTERIAL CONCEPT INTERSECTION DESIGN PRE-RIVER CROSSING SECTION

STATUS: PRELIMINARY

DATE: 30.08.2024 | SCALE (ORIGINAL SIZE A3): 1:10000

DRAWING NUMBER: 148020-00-0102 | REVISION: B

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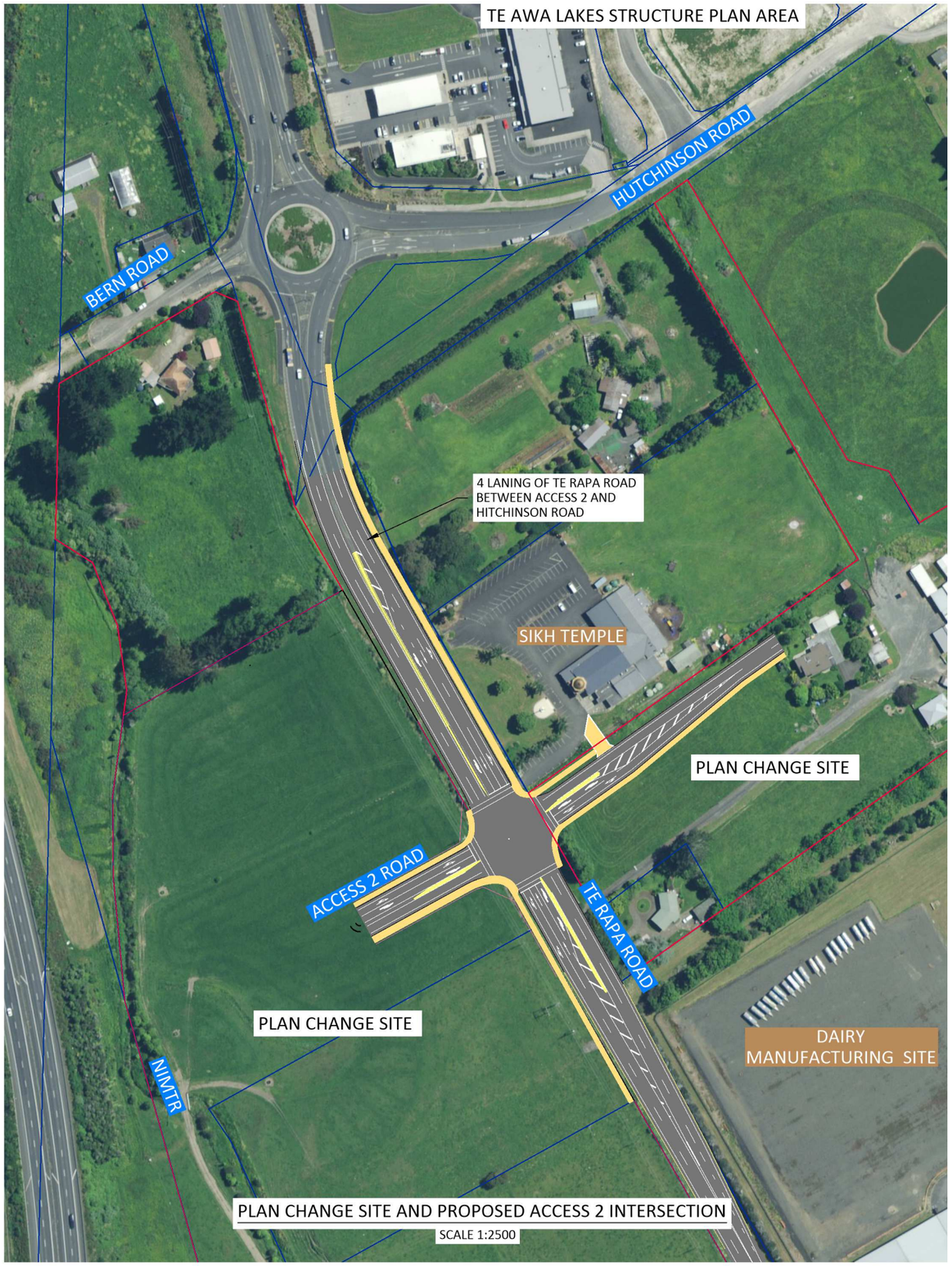

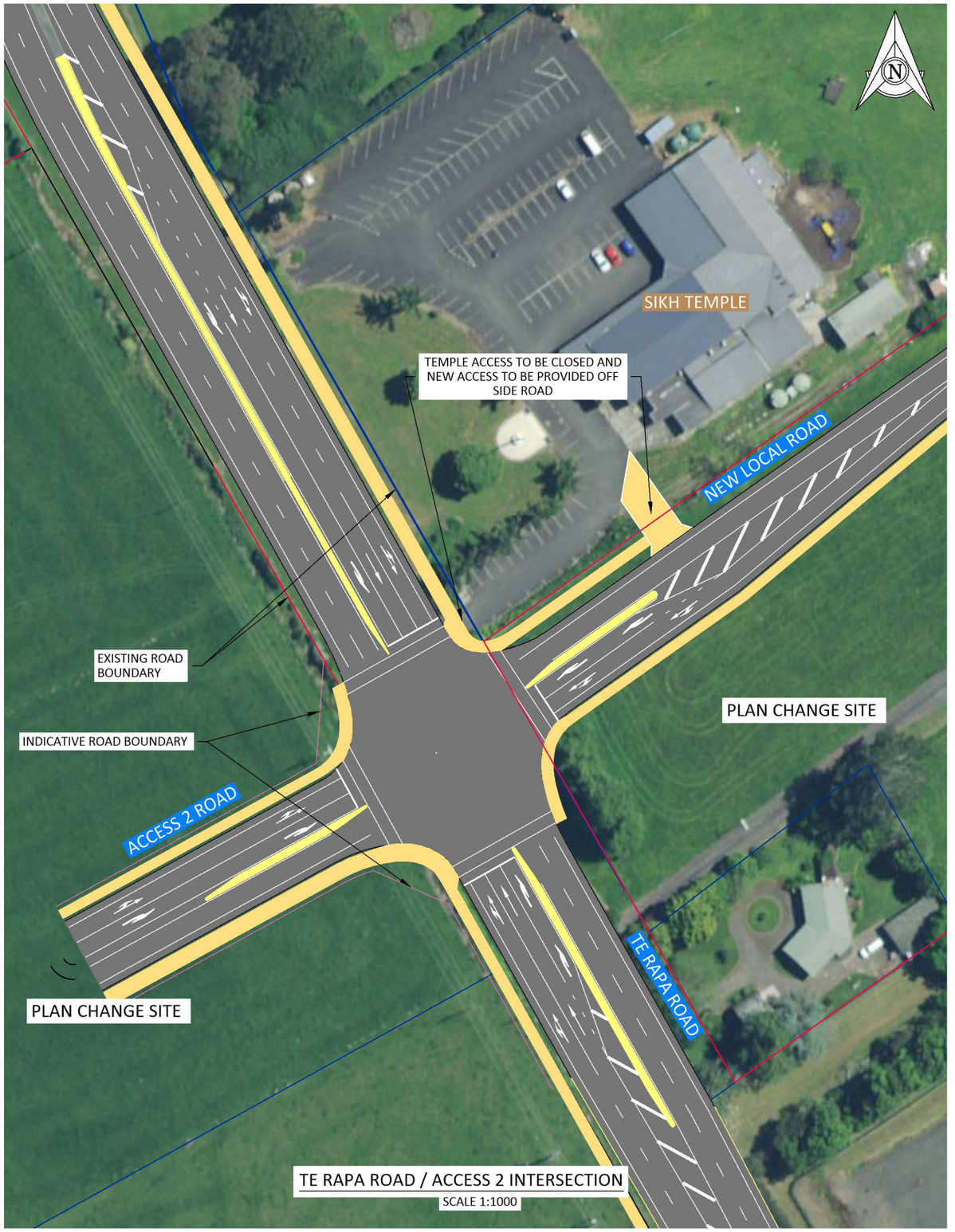

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						mx model version:		

CLIENT: FONTERRA

PROJECT: TE RAPA NORTH
PRIVATE PLAN CHANGE 17

DRAWING: TE RAPA RD / ACCESS 2 ROAD
CONCEPT SIGNAL INTERSECTION DESIGN

STATUS: PRELIMINARY

DATE: 30.08.2024

SCALE (ORIGINAL SIZE A3): REFER INSET

DRAWING NUMBER: 148020-00-0103

REVISION: B

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Version 4.0 - March 2020

Appendix C – SIDRA Movement Summaries

1. Access 1: Te Rapa Rd / East-West Rd Signalised Intersection

1.1 Baseline AM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 73 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	24	8.7	24	8.7	0.017	5.3	LOS A	0.1	0.8	0.20	0.54	0.20	45.4
2	T1	All MCs	528	16.5	528	16.5	* 0.389	17.0	LOS B	7.1	56.4	0.75	0.64	0.75	40.2
Approach			553	16.2	553	16.2	0.389	16.5	LOS B	7.1	56.4	0.73	0.63	0.73	40.4
North: Te Rapa Rd															
8	T1	All MCs	1024	8.8	1024	8.8	0.478	9.8	LOS A	10.7	80.4	0.63	0.56	0.63	43.8
9	R2	All MCs	67	7.8	67	7.8	* 0.406	40.5	LOS D	2.4	18.1	0.98	0.75	0.98	31.7
Approach			1092	8.8	1092	8.8	0.478	11.7	LOS B	10.7	80.4	0.65	0.57	0.65	42.8
West: NRC															
10	L2	All MCs	61	3.4	61	3.4	0.076	17.4	LOS B	1.3	9.1	0.61	0.68	0.61	39.6
12	R2	All MCs	59	1.8	59	1.8	* 0.122	27.0	LOS C	1.6	11.6	0.80	0.71	0.80	35.4
Approach			120	2.6	120	2.6	0.122	22.2	LOS C	1.6	11.6	0.70	0.70	0.70	37.5
All Vehicles			1764	10.7	1764	10.7	0.478	13.9	LOS B	10.7	80.4	0.68	0.60	0.68	41.6

1.2 Baseline PM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 87 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	132	1.6	132	1.6	0.086	6.7	LOS A	0.8	5.8	0.22	0.56	0.22	45.3
2	T1	All MCs	1116	6.5	1116	6.5	* 0.659	19.5	LOS B	19.1	141.2	0.81	0.72	0.81	39.4
Approach			1247	6.0	1247	6.0	0.659	18.2	LOS B	19.1	141.2	0.75	0.70	0.75	39.7
North: Te Rapa Rd															
8	T1	All MCs	792	8.8	792	8.8	0.336	8.0	LOS A	7.8	58.4	0.50	0.44	0.50	44.9
9	R2	All MCs	113	3.7	113	3.7	* 0.670	49.4	LOS D	5.0	36.3	1.00	0.85	1.12	29.5
Approach			904	8.1	904	8.1	0.670	13.1	LOS B	7.8	58.4	0.56	0.49	0.58	42.0
West: NRC															
10	L2	All MCs	16	13.3	16	13.3	0.024	22.4	LOS C	0.4	3.2	0.64	0.65	0.64	37.6
12	R2	All MCs	25	8.3	25	8.3	* 0.062	33.0	LOS C	0.8	6.3	0.81	0.69	0.81	33.4
Approach			41	10.3	41	10.3	0.062	28.9	LOS C	0.8	6.3	0.74	0.67	0.74	35.0
All Vehicles			2193	7.0	2193	7.0	0.670	16.3	LOS B	19.1	141.2	0.67	0.61	0.68	40.5

1.3 Infrastructure Scenario 1 AM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 76 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	351	10.0	351	10.0	0.249	5.8	LOS A	2.3	17.2	0.27	0.58	0.27	45.1
2	T1	All MCs	649	16.5	649	16.5	0.498	19.5	LOS B	9.7	77.5	0.81	0.69	0.81	39.1
Approach			1000	14.2	1000	14.2	0.498	14.7	LOS B	9.7	77.5	0.62	0.65	0.62	41.0
North: Te Rapa Rd															
8	T1	All MCs	1347	8.8	1347	8.8	* 0.635	12.5	LOS B	16.9	127.1	0.72	0.65	0.72	42.9
9	R2	All MCs	108	10.0	108	10.0	0.523	42.8	LOS D	4.0	30.5	0.98	0.78	0.98	31.7
Approach			1456	8.9	1456	8.9	0.635	14.8	LOS B	16.9	127.1	0.74	0.66	0.74	41.2
West: NRC															
10	L2	All MCs	28	15.0	28	15.0	0.036	16.8	LOS B	0.6	4.5	0.57	0.65	0.57	39.8
12	R2	All MCs	82	15.0	82	15.0	* 0.184	28.4	LOS C	2.4	19.0	0.81	0.73	0.81	34.9
Approach			111	15.0	111	15.0	0.184	25.4	LOS C	2.4	19.0	0.75	0.71	0.75	36.1
All Vehicles			2566	11.3	2566	11.3	0.635	15.2	LOS B	16.9	127.1	0.69	0.66	0.69	40.9

1.4 Infrastructure Scenario 1 PM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 87 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	132	10.0	132	10.0	0.087	8.3	LOS A	0.5	4.0	0.17	0.54	0.17	45.5
2	T1	All MCs	1266	6.5	1266	6.5	* 0.741	21.4	LOS C	23.1	171.0	0.85	0.76	0.85	39.2
Approach			1398	6.8	1398	6.8	0.741	20.1	LOS C	23.1	171.0	0.79	0.74	0.79	39.0
North: Te Rapa Rd															
8	T1	All MCs	909	8.8	909	8.8	0.393	8.8	LOS A	9.6	72.2	0.54	0.48	0.54	44.4
9	R2	All MCs	40	10.0	40	10.0	* 0.331	49.4	LOS D	1.7	13.3	0.99	0.73	0.99	29.5
Approach			949	8.8	949	8.8	0.393	10.5	LOS B	9.6	72.2	0.56	0.49	0.56	43.4
West: NRC															
10	L2	All MCs	85	10.0	85	10.0	0.128	24.4	LOS C	2.4	17.9	0.69	0.71	0.69	37.0
12	R2	All MCs	319	10.0	319	10.0	* 0.754	40.7	LOS D	13.5	102.6	0.99	0.90	1.08	31.1
Approach			404	10.0	404	10.0	0.754	37.3	LOS D	13.5	102.6	0.92	0.86	1.00	32.2
All Vehicles			2752	8.0	2752	8.0	0.754	19.3	LOS B	23.1	171.0	0.73	0.67	0.74	39.2

1.5 Infrastructure Scenario 2 AM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 99 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	19	10.0	19	10.0	0.012	5.1	LOS A	0.1	0.5	0.14	0.52	0.14	45.6
2	T1	All MCs	658	16.5	658	16.5	0.353	13.5	LOS B	9.2	73.7	0.60	0.52	0.60	41.9
Approach			677	16.4	677	16.4	0.353	13.3	LOS B	9.2	73.7	0.58	0.52	0.58	42.0
North: Te Rapa Rd															
8	T1	All MCs	1372	8.8	1372	8.8	* 0.556	10.4	LOS B	17.4	131.3	0.57	0.52	0.57	44.1
9	R2	All MCs	36	10.0	36	10.0	0.337	58.5	LOS E	1.8	13.6	0.99	0.73	0.99	27.9
Approach			1407	8.9	1407	8.9	0.556	11.6	LOS B	17.4	131.3	0.58	0.53	0.58	42.8
West: NRC															
10	L2	All MCs	22	15.0	22	15.0	0.039	28.6	LOS C	0.7	5.6	0.70	0.67	0.70	35.3
12	R2	All MCs	26	15.0	26	15.0	* 0.073	38.5	LOS D	1.0	8.1	0.83	0.69	0.83	31.7
Approach			48	15.0	48	15.0	0.073	34.0	LOS C	1.0	8.1	0.77	0.68	0.77	33.3
All Vehicles			2133	11.4	2133	11.4	0.556	12.7	LOS B	17.4	131.3	0.59	0.53	0.59	42.3

1.6 Infrastructure Scenario 2 AM Peak – Maximising Green Time on Major Movements

Signals - Actuated Isolated Cycle Time = 66 seconds (Site Practical Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	19	10.0	19	10.0	0.013	5.3	LOS A	0.1	0.5	0.20	0.53	0.20	45.4
2	T1	All MCs	658	16.5	658	16.5	* 0.578	20.8	LOS C	9.3	74.6	0.85	0.72	0.85	38.6
Approach			677	16.4	677	16.4	0.578	20.3	LOS C	9.3	74.6	0.83	0.72	0.83	38.7
North: Te Rapa Rd															
8	T1	All MCs	1372	8.8	1372	8.8	0.719	15.4	LOS B	17.3	130.1	0.81	0.73	0.81	41.6

9	R2	All MCs	36	10.0	36	10.0	* 0.225	40.5	LOS D	1.2	8.8	0.94	0.71	0.94	32.5
Approach			1407	8.9	1407	8.9	0.719	16.0	LOS B	17.3	130.1	0.82	0.73	0.82	40.6
West: NRC															
10	L2	All MCs	22	15.0	22	15.0	0.027	14.6	LOS B	0.4	2.9	0.53	0.63	0.53	40.8
12	R2	All MCs	26	15.0	26	15.0	* 0.051	22.9	LOS C	0.6	4.8	0.72	0.67	0.72	36.9
Approach			48	15.0	48	15.0	0.051	19.1	LOS B	0.6	4.8	0.63	0.65	0.63	38.6
All Vehicles			2133	11.4	2133	11.4	0.719	17.5	LOS B	17.3	130.1	0.82	0.72	0.82	40.0

1.7 Infrastructure Scenario 2 PM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	13	10.0	13	10.0	0.008	7.1	LOS A	0.1	0.4	0.12	0.51	0.12	45.6
2	T1	All MCs	1197	6.5	1197	6.5	* 0.536	15.2	LOS B	20.6	151.9	0.61	0.55	0.61	41.8
Approach			1209	6.5	1209	6.5	0.536	15.1	LOS B	20.6	151.9	0.60	0.55	0.60	41.3
North: Te Rapa Rd															
8	T1	All MCs	864	8.8	864	8.8	0.323	6.6	LOS A	9.1	68.6	0.40	0.35	0.40	45.7
9	R2	All MCs	38	10.0	38	10.0	* 0.433	68.8	LOS E	2.3	17.6	1.00	0.74	1.00	25.5
Approach			902	8.8	902	8.8	0.433	9.2	LOS A	9.1	68.6	0.42	0.37	0.42	44.1
West: NRC															
10	L2	All MCs	29	10.0	29	10.0	0.059	38.6	LOS D	1.2	9.5	0.76	0.69	0.76	32.3
12	R2	All MCs	32	10.0	32	10.0	* 0.098	48.7	LOS D	1.5	11.7	0.86	0.71	0.86	29.0
Approach			61	10.0	61	10.0	0.098	43.8	LOS D	1.5	11.7	0.81	0.70	0.81	30.6
All Vehicles			2173	7.6	2173	7.6	0.536	13.4	LOS B	20.6	151.9	0.53	0.48	0.53	42.0

1.8 Infrastructure Scenario 2 PM Peak – Maximising Green Time on Major Movements

Signals - Actuated Isolated Cycle Time = 78 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	13	10.0	13	10.0	0.009	7.9	LOS A	0.0	0.3	0.17	0.52	0.17	45.5
2	T1	All MCs	1197	6.5	1197	6.5	* 0.781	23.3	LOS C	20.6	152.6	0.89	0.79	0.89	38.2
Approach			1209	6.5	1209	6.5	0.781	23.2	LOS C	20.6	152.6	0.88	0.79	0.88	37.7
North: Te Rapa Rd															
8	T1	All MCs	864	8.8	864	8.8	0.402	10.1	LOS B	9.0	67.9	0.58	0.51	0.58	43.6
9	R2	All MCs	38	10.0	38	10.0	* 0.281	44.9	LOS D	1.5	11.1	0.95	0.72	0.95	30.6
Approach			902	8.8	902	8.8	0.402	11.6	LOS B	9.0	67.9	0.59	0.51	0.59	42.8
West: NRC															
10	L2	All MCs	29	10.0	29	10.0	0.040	19.7	LOS B	0.7	5.0	0.59	0.66	0.59	38.8
12	R2	All MCs	32	10.0	32	10.0	* 0.067	28.3	LOS C	0.9	6.8	0.75	0.68	0.75	34.9
Approach			61	10.0	61	10.0	0.067	24.2	LOS C	0.9	6.8	0.68	0.67	0.68	36.7
All Vehicles			2173	7.6	2173	7.6	0.781	18.4	LOS B	20.6	152.6	0.76	0.67	0.76	39.6

1.10 Infrastructure Scenario 3 AM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	13	8.7	13	8.7	0.008	5.0	LOS A	0.1	0.4	0.12	0.52	0.12	45.6
2	T1	All MCs	631	16.5	631	16.5	0.297	11.9	LOS B	8.8	70.6	0.51	0.44	0.51	42.8
Approach			643	16.4	643	16.4	0.297	11.8	LOS B	8.8	70.6	0.50	0.45	0.50	42.8
North: Te Rapa Rd															
8	T1	All MCs	1362	8.8	1362	8.8	* 0.513	9.1	LOS A	17.6	132.7	0.49	0.44	0.49	44.9
9	R2	All MCs	32	7.8	32	7.8	0.305	68.6	LOS E	1.9	14.1	0.99	0.72	0.99	26.0
Approach			1394	8.8	1394	8.8	0.513	10.4	LOS B	17.6	132.7	0.50	0.45	0.50	43.5
West: NRC															
10	L2	All MCs	59	3.4	59	3.4	0.059	6.0	LOS A	0.5	3.6	0.20	0.56	0.20	45.4
12	R2	All MCs	24	1.8	24	1.8	0.036	47.7	LOS D	0.6	4.1	0.85	0.67	0.85	29.4
Approach			83	3.0	83	3.0	0.059	18.2	LOS B	0.6	4.1	0.39	0.59	0.39	39.3
All Vehicles			2120	10.9	2120	10.9	0.513	11.1	LOS B	17.6	132.7	0.49	0.45	0.49	43.1

1.11 Infrastructure Scenario 3 AM Peak – Maximising Green Time on Major Movements

Signals - Actuated Isolated Cycle Time = 65 seconds (Site Practical Cycle Time)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	13	8.7	13	8.7	0.009	5.3	LOS A	0.0	0.3	0.20	0.53	0.20	45.4
2	T1	All MCs	631	16.5	631	16.5	* 0.560	20.9	LOS C	8.7	69.2	0.85	0.73	0.85	38.6
Approach			643	16.4	643	16.4	0.560	20.6	LOS C	8.7	69.2	0.84	0.72	0.84	38.7
North: Te Rapa Rd															
8	T1	All MCs	1362	8.8	1362	8.8	0.724	15.5	LOS B	17.1	128.6	0.82	0.74	0.82	41.6

9	R2	All MCs	32	7.8	32	7.8	* 0.192	39.7	LOS D	1.0	7.4	0.93	0.71	0.93	32.9
Approach			1394	8.8	1394	8.8	0.724	16.1	LOS B	17.1	128.6	0.82	0.74	0.82	40.7
West: NRC															
10	L2	All MCs	59	3.4	59	3.4	0.052	7.1	LOS A	0.5	3.5	0.34	0.59	0.34	44.8
12	R2	All MCs	24	1.8	24	1.8	* 0.021	21.9	LOS C	0.3	1.9	0.70	0.64	0.70	37.5
Approach			83	3.0	83	3.0	0.052	11.4	LOS B	0.5	3.5	0.45	0.60	0.45	42.4
All Vehicles			2120	10.9	2120	10.9	0.724	17.3	LOS B	17.1	128.6	0.81	0.73	0.81	40.1

1.12 Infrastructure Scenario 3 PM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	11	1.6	11	1.6	0.006	8.3	LOS A	0.0	0.4	0.13	0.52	0.13	45.7
2	T1	All MCs	1234	6.5	1234	6.5	* 0.549	16.6	LOS B	21.3	157.7	0.63	0.57	0.63	41.4
Approach			1244	6.5	1244	6.5	0.549	16.6	LOS B	21.3	157.7	0.62	0.57	0.62	40.7
North: Te Rapa Rd															
8	T1	All MCs	875	8.8	875	8.8	0.327	6.6	LOS A	9.3	69.7	0.40	0.35	0.40	45.7
9	R2	All MCs	59	3.7	59	3.7	* 0.553	67.9	LOS E	3.6	26.0	1.00	0.77	1.03	25.7
Approach			934	8.5	934	8.5	0.553	10.5	LOS B	9.3	69.7	0.44	0.38	0.44	43.5
West: NRC															
10	L2	All MCs	23	13.3	23	13.3	0.034	9.5	LOS A	0.4	2.8	0.32	0.58	0.32	43.7
12	R2	All MCs	34	8.3	34	8.3	* 0.052	48.1	LOS D	0.8	6.1	0.85	0.68	0.85	29.2
Approach			57	10.4	57	10.4	0.052	32.3	LOS C	0.8	6.1	0.64	0.64	0.64	34.0
All Vehicles			2235	7.4	2235	7.4	0.553	14.4	LOS B	21.3	157.7	0.55	0.49	0.55	41.6

1.13 Infrastructure Scenario 3 PM Peak – Maximising Green Time on Major Movements

Signals - Actuated Isolated Cycle Time = 79 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	11	1.6	11	1.6	0.007	9.1	LOS A	0.0	0.3	0.18	0.53	0.18	45.6
2	T1	All MCs	1234	6.5	1234	6.5	* 0.775	24.0	LOS C	20.9	154.8	0.89	0.79	0.89	38.2
Approach			1244	6.5	1244	6.5	0.775	23.9	LOS C	20.9	154.8	0.89	0.79	0.89	37.5
North: Te Rapa Rd															
8	T1	All MCs	875	8.8	875	8.8	0.403	10.0	LOS B	9.2	68.9	0.57	0.50	0.57	43.7
9	R2	All MCs	59	3.7	59	3.7	* 0.425	46.1	LOS D	2.3	16.9	0.97	0.74	0.97	30.4
Approach			934	8.5	934	8.5	0.425	12.3	LOS B	9.2	68.9	0.60	0.52	0.60	42.5
West: NRC															
10	L2	All MCs	23	13.3	23	13.3	0.027	11.5	LOS B	0.3	2.7	0.45	0.60	0.45	42.7
12	R2	All MCs	34	8.3	34	8.3	* 0.036	28.5	LOS C	0.5	3.6	0.75	0.66	0.75	35.0
Approach			57	10.4	57	10.4	0.036	21.5	LOS C	0.5	3.6	0.62	0.63	0.62	37.8
All Vehicles			2235	7.4	2235	7.4	0.775	19.0	LOS B	20.9	154.8	0.76	0.67	0.76	39.5

1.14 Infrastructure Scenario 4 AM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 99 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	24	8.7	24	8.7	0.019	6.8	LOS A	0.2	1.3	0.21	0.54	0.21	45.1
2	T1	All MCs	548	16.5	548	16.5	0.468	28.9	LOS C	10.7	85.2	0.84	0.71	0.84	35.7
3	R2	All MCs	67	5.0	67	5.0	* 0.320	56.0	LOS E	1.7	12.8	0.99	0.72	0.99	27.5
Approach			640	15.0	640	15.0	0.468	30.9	LOS C	10.7	85.2	0.83	0.71	0.83	34.7
East: NRC															
4	L2	All MCs	695	5.0	695	5.0	0.720	21.8	LOS C	18.6	135.5	0.81	0.94	0.81	37.5
5	T1	All MCs	407	8.0	407	8.0	0.363	29.2	LOS C	7.7	57.9	0.83	0.69	0.83	35.9
6	R2	All MCs	233	5.0	233	5.0	* 0.856	57.5	LOS E	12.5	91.5	1.00	1.01	1.28	27.8
Approach			1335	5.9	1335	5.9	0.856	30.3	LOS C	18.6	135.5	0.85	0.88	0.90	34.8
North: Te Rapa Rd															
7	L2	All MCs	119	5.0	119	5.0	0.084	15.3	LOS B	0.7	5.1	0.20	0.56	0.20	45.6
8	T1	All MCs	998	8.8	998	8.8	* 0.845	51.7	LOS D	26.1	196.9	0.99	0.99	1.14	31.9
9	R2	All MCs	6	7.8	6	7.8	0.059	68.0	LOS E	0.3	2.3	0.97	0.65	0.97	28.5
Approach			1123	8.4	1123	8.4	0.845	47.9	LOS D	26.1	196.9	0.91	0.94	1.04	29.8
West: NRC															
10	L2	All MCs	59	3.4	59	3.4	0.063	12.5	LOS B	1.1	8.0	0.46	0.63	0.46	42.1
11	T1	All MCs	165	5.0	165	5.0	* 0.210	35.0	LOS C	3.4	25.0	0.86	0.67	0.86	34.0
12	R2	All MCs	4	5.0	4	5.0	0.038	53.7	LOS D	0.2	1.5	0.96	0.63	0.96	28.1
Approach			228	4.6	228	4.6	0.210	29.5	LOS C	3.4	25.0	0.76	0.66	0.76	35.6
All Vehicles			3326	8.4	3326	8.4	0.856	36.3	LOS D	26.1	196.9	0.86	0.85	0.92	33.0

1.15 Infrastructure Scenario 4 PM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 101 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	19	5.0	19	5.0	0.016	21.3	LOS C	0.2	1.7	0.32	0.57	0.32	43.9
2	T1	All MCs	784	6.5	784	6.5	0.791	46.9	LOS D	19.6	144.6	0.99	0.92	1.08	31.8
3	R2	All MCs	774	5.0	774	5.0	* 0.780	43.2	LOS D	19.4	141.3	0.97	0.88	1.02	30.9
Approach			1577	5.8	1577	5.8	0.791	44.8	LOS D	19.6	144.6	0.97	0.90	1.04	30.5
East: NRC															
4	L2	All MCs	189	5.0	189	5.0	0.148	7.8	LOS A	2.4	17.6	0.33	0.60	0.33	44.1
5	T1	All MCs	160	8.0	160	8.0	0.182	33.2	LOS C	3.2	23.6	0.84	0.65	0.84	34.5
6	R2	All MCs	77	5.0	77	5.0	* 0.721	60.6	LOS E	4.1	30.1	1.00	0.87	1.20	27.2
Approach			426	6.1	426	6.1	0.721	26.9	LOS C	4.1	30.1	0.64	0.67	0.68	36.1
North: Te Rapa Rd															
7	L2	All MCs	347	5.0	347	5.0	0.426	16.9	LOS B	10.0	73.0	0.67	0.75	0.67	40.3
8	T1	All MCs	386	8.8	386	8.8	* 0.581	42.5	LOS D	9.0	67.4	0.97	0.79	0.97	31.3
9	R2	All MCs	292	3.7	292	3.7	0.820	53.2	LOS D	15.2	109.9	1.00	0.96	1.18	29.0
Approach			1025	6.1	1025	6.1	0.820	36.8	LOS D	15.2	109.9	0.88	0.83	0.93	32.9
West: NRC															
10	L2	All MCs	4	13.3	4	13.3	0.004	11.7	LOS B	0.1	0.6	0.42	0.56	0.42	42.4
11	T1	All MCs	431	5.0	431	5.0	* 0.489	37.3	LOS D	9.5	69.7	0.91	0.76	0.91	33.6
12	R2	All MCs	11	8.3	11	8.3	0.100	55.7	LOS E	0.5	3.9	0.97	0.67	0.97	27.6
Approach			445	5.2	445	5.2	0.489	37.5	LOS D	9.5	69.7	0.91	0.75	0.91	33.5
All Vehicles			3474	5.8	3474	5.8	0.820	39.3	LOS D	19.6	144.6	0.89	0.83	0.94	32.2

2. Access 2: Te Rapa Rd Signalised Intersection South of Hutchinson Rd

2.1 Infrastructure Scenario 2 AM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 115 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.505	6.9	LOS A	12.8	103.3	0.87	0.74	0.87	29.5
2	T1	All MCs	557	17.8	557	17.8	0.505	35.5	LOS D	12.8	103.3	0.87	0.74	0.87	30.3
3	R2	All MCs	36	9.9	36	9.9	* 0.391	65.7	LOS E	2.1	15.9	1.00	0.73	1.00	13.6
Approach			594	17.3	594	17.3	0.505	37.3	LOS D	12.8	103.3	0.88	0.74	0.88	29.2
East: Industrial Local Rd															
4	L2	All MCs	13	16.9	13	16.9	0.027	14.4	LOS B	0.3	2.3	0.60	0.61	0.60	29.8
5	T1	All MCs	1	10.0	1	10.0	* 0.027	44.5	LOS D	0.3	2.3	0.60	0.61	0.60	37.1
6	R2	All MCs	17	14.3	17	14.3	0.190	64.6	LOS E	1.0	7.6	0.99	0.69	0.99	20.0
Approach			31	15.3	31	15.3	0.190	43.1	LOS D	1.0	7.6	0.81	0.66	0.81	22.6
North: Te Rapa Rd															
7	L2	All MCs	84	7.9	84	7.9	0.054	11.1	LOS B	0.3	2.6	0.13	0.53	0.13	43.2
8	T1	All MCs	1442	9.0	1442	9.0	* 0.756	27.8	LOS C	31.4	236.6	0.85	0.77	0.85	35.4
9	R2	All MCs	238	8.0	238	8.0	0.497	45.1	LOS D	11.3	84.8	0.90	0.81	0.90	31.1
Approach			1764	8.8	1764	8.8	0.756	29.4	LOS C	31.4	236.6	0.82	0.77	0.82	33.2
West: Industrial Collector Rd															
10	L2	All MCs	44	15.0	44	15.0	0.052	14.0	LOS B	1.0	7.7	0.47	0.62	0.47	41.2
11	T1	All MCs	1	15.0	1	15.0	0.017	48.6	LOS D	0.1	0.9	0.95	0.60	0.95	21.8
12	R2	All MCs	1	15.0	1	15.0	* 0.017	67.3	LOS E	0.1	0.9	0.95	0.60	0.95	24.1
Approach			46	15.0	46	15.0	0.052	16.0	LOS B	1.0	7.7	0.49	0.62	0.49	40.2
All Vehicles			2435	11.1	2435	11.1	0.756	31.2	LOS C	31.4	236.6	0.83	0.76	0.83	32.2

2.2 Infrastructure Scenario 2 AM Peak – RT Movement from Southern Approach Banned

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 95 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.577	6.9	LOS A	11.3	91.4	0.92	0.78	0.92	30.2
2	T1	All MCs	557	17.8	557	17.8	0.577	33.3	LOS C	11.3	91.4	0.92	0.78	0.92	31.1
Approach			558	17.8	558	17.8	0.577	33.2	LOS C	11.3	91.4	0.92	0.78	0.92	31.1
East: Industrial Local Rd															
4	L2	All MCs	13	16.9	13	16.9	0.027	11.5	LOS B	0.2	1.8	0.53	0.60	0.53	32.6
5	T1	All MCs	1	10.0	1	10.0	0.027	32.1	LOS C	0.2	1.8	0.53	0.60	0.53	39.5
6	R2	All MCs	17	14.3	17	14.3	* 0.157	53.0	LOS D	0.8	6.2	0.98	0.69	0.98	22.4
Approach			31	15.3	31	15.3	0.157	35.1	LOS D	0.8	6.2	0.78	0.65	0.78	25.1
North: Te Rapa Rd															
7	L2	All MCs	84	7.9	84	7.9	0.054	5.8	LOS A	0.3	2.0	0.14	0.53	0.14	43.2
8	T1	All MCs	1442	9.0	1442	9.0	* 0.684	17.1	LOS B	23.5	177.2	0.76	0.69	0.76	38.9
9	R2	All MCs	238	8.0	238	8.0	0.579	40.2	LOS D	10.0	74.8	0.94	0.82	0.94	31.8
Approach			1764	8.8	1764	8.8	0.684	19.7	LOS B	23.5	177.2	0.76	0.70	0.76	37.4
West: Industrial Collector Rd															
10	L2	All MCs	44	15.0	44	15.0	0.050	12.0	LOS B	0.8	6.1	0.46	0.62	0.46	42.2
11	T1	All MCs	1	15.0	1	15.0	0.014	38.2	LOS D	0.1	0.7	0.94	0.60	0.94	24.4
12	R2	All MCs	1	15.0	1	15.0	0.014	55.7	LOS E	0.1	0.7	0.94	0.60	0.94	26.6
Approach			46	15.0	46	15.0	0.050	13.5	LOS B	0.8	6.1	0.49	0.62	0.49	41.3
All Vehicles			2399	11.1	2399	11.1	0.684	22.9	LOS C	23.5	177.2	0.79	0.72	0.79	35.7

2.3 Infrastructure Scenario 2 PM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 114 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.631	5.8	LOS A	24.2	177.9	0.78	0.70	0.78	35.0
2	T1	All MCs	1221	6.1	1221	6.1	* 0.631	23.5	LOS C	24.2	178.3	0.78	0.70	0.78	35.9
3	R2	All MCs	19	10.3	19	10.3	0.206	68.1	LOS E	1.1	8.2	0.99	0.70	0.99	13.8
Approach			1241	6.2	1241	6.2	0.631	24.1	LOS C	24.2	178.3	0.78	0.70	0.78	34.5
East: Industrial Local Rd															
4	L2	All MCs	39	10.1	39	10.1	0.047	8.6	LOS A	0.6	4.3	0.41	0.60	0.41	34.9
5	T1	All MCs	1	10.0	1	10.0	0.047	46.1	LOS D	0.6	4.3	0.41	0.60	0.41	41.3
6	R2	All MCs	65	5.8	65	5.8	* 0.688	67.5	LOS E	3.9	28.8	1.00	0.84	1.16	19.5
Approach			105	7.4	105	7.4	0.688	45.4	LOS D	3.9	28.8	0.77	0.75	0.87	22.1
North: Te Rapa Rd															
7	L2	All MCs	25	7.0	25	7.0	0.016	5.0	LOS A	0.1	0.6	0.12	0.52	0.12	43.3
8	T1	All MCs	808	9.9	808	9.9	0.415	17.5	LOS B	13.4	102.1	0.65	0.57	0.65	37.9
9	R2	All MCs	73	7.0	73	7.0	* 0.662	65.9	LOS E	4.3	31.9	1.00	0.83	1.12	26.0
Approach			906	9.6	906	9.6	0.662	21.1	LOS C	13.4	102.1	0.66	0.59	0.67	36.2
West: Industrial Collector Rd															
10	L2	All MCs	199	10.0	199	10.0	0.277	12.7	LOS B	4.5	34.2	0.49	0.67	0.49	41.8
11	T1	All MCs	1	10.0	1	10.0	0.017	48.0	LOS D	0.1	0.8	0.95	0.60	0.95	21.9
12	R2	All MCs	1	10.0	1	10.0	0.017	65.5	LOS E	0.1	0.8	0.95	0.60	0.95	24.2
Approach			201	10.0	201	10.0	0.277	13.1	LOS B	4.5	34.2	0.50	0.67	0.50	41.6
All Vehicles			2454	7.8	2454	7.8	0.688	23.0	LOS C	24.2	178.3	0.71	0.66	0.72	35.2

2.4 Infrastructure Scenario 2 PM Peak – RT Movement from Southern Approach Banned

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 112 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.654	5.6	LOS A	24.6	181.1	0.81	0.73	0.81	34.6
2	T1	All MCs	1221	6.1	1221	6.1	* 0.654	21.9	LOS C	24.6	181.1	0.80	0.72	0.80	35.7
Approach			1222	6.1	1222	6.1	0.654	21.9	LOS C	24.6	181.1	0.80	0.72	0.80	35.7
East: Industrial Local Rd															
4	L2	All MCs	39	10.1	39	10.1	0.052	8.1	LOS A	0.5	3.5	0.41	0.60	0.41	35.2
5	T1	All MCs	1	10.0	1	10.0	0.052	52.3	LOS D	0.5	3.5	0.41	0.60	0.41	41.5
6	R2	All MCs	65	5.8	65	5.8	* 0.676	66.1	LOS E	3.8	28.2	1.00	0.83	1.14	19.8
Approach			105	7.4	105	7.4	0.676	44.5	LOS D	3.8	28.2	0.78	0.74	0.87	22.4
North: Te Rapa Rd															
7	L2	All MCs	25	7.0	25	7.0	0.016	4.9	LOS A	0.1	0.6	0.11	0.52	0.11	43.3
8	T1	All MCs	808	9.9	808	9.9	0.349	10.8	LOS B	10.4	79.1	0.52	0.45	0.52	41.8
9	R2	All MCs	73	7.0	73	7.0	* 0.650	64.6	LOS E	4.2	31.2	1.00	0.82	1.11	26.3
Approach			906	9.6	906	9.6	0.650	15.0	LOS B	10.4	79.1	0.54	0.49	0.55	39.4
West: Industrial Collector Rd															
10	L2	All MCs	199	10.0	199	10.0	0.276	13.2	LOS B	4.6	34.9	0.51	0.68	0.51	41.6
11	T1	All MCs	1	10.0	1	10.0	0.016	46.9	LOS D	0.1	0.8	0.95	0.60	0.95	22.1
12	R2	All MCs	1	10.0	1	10.0	0.016	64.4	LOS E	0.1	0.8	0.95	0.60	0.95	24.4
Approach			201	10.0	201	10.0	0.276	13.6	LOS B	4.6	34.9	0.51	0.68	0.51	41.4
All Vehicles			2435	7.8	2435	7.8	0.676	19.6	LOS B	24.6	181.1	0.68	0.63	0.68	36.9

2.6 Infrastructure Scenario 3 AM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 115 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.479	6.7	LOS A	12.5	100.7	0.85	0.73	0.85	30.1
2	T1	All MCs	558	17.8	558	17.8	0.479	33.7	LOS C	12.5	100.7	0.85	0.73	0.85	30.9
3	R2	All MCs	43	9.9	43	9.9	* 0.472	66.1	LOS E	2.5	19.3	1.00	0.74	1.00	13.5
Approach			602	17.3	602	17.3	0.479	35.9	LOS D	12.5	100.7	0.86	0.73	0.86	29.6
East: Industrial Local Rd															
4	L2	All MCs	16	16.9	16	16.9	0.032	14.0	LOS B	0.3	2.8	0.58	0.62	0.58	30.4
5	T1	All MCs	1	10.0	1	10.0	* 0.032	44.7	LOS D	0.3	2.8	0.58	0.62	0.58	37.6
6	R2	All MCs	14	14.3	14	14.3	0.154	64.3	LOS E	0.8	6.1	0.98	0.68	0.98	20.1
Approach			31	15.5	31	15.5	0.154	37.6	LOS D	0.8	6.1	0.76	0.65	0.76	23.6
North: Te Rapa Rd															
7	L2	All MCs	76	7.9	76	7.9	0.049	10.7	LOS B	0.3	2.3	0.13	0.53	0.13	43.2
8	T1	All MCs	1424	9.0	1424	9.0	* 0.742	27.1	LOS C	30.7	231.2	0.84	0.76	0.84	35.5
9	R2	All MCs	221	8.0	221	8.0	0.494	46.2	LOS D	10.7	80.0	0.91	0.81	0.91	30.7
Approach			1721	8.8	1721	8.8	0.742	28.9	LOS C	30.7	231.2	0.82	0.76	0.82	33.3
West: Industrial Collector Rd															
10	L2	All MCs	45	15.0	45	15.0	0.053	13.6	LOS B	1.0	7.7	0.46	0.62	0.46	41.4
11	T1	All MCs	1	15.0	1	15.0	0.017	48.6	LOS D	0.1	0.9	0.95	0.60	0.95	21.8
12	R2	All MCs	1	15.0	1	15.0	* 0.017	67.2	LOS E	0.1	0.9	0.95	0.60	0.95	24.1
Approach			47	15.0	47	15.0	0.053	15.6	LOS B	1.0	7.7	0.48	0.62	0.48	40.4
All Vehicles			2401	11.1	2401	11.1	0.742	30.5	LOS C	30.7	231.2	0.82	0.75	0.82	32.4

2.7 Infrastructure Scenario 3 AM Peak – RT Movement from Southern Approach Banned

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 95 seconds (Site Optimum Cycle Time - Minimum Delay))

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.557	6.7	LOS A	11.2	90.1	0.90	0.77	0.90	30.6
2	T1	All MCs	558	17.8	558	17.8	0.557	32.2	LOS C	11.2	90.1	0.90	0.77	0.90	31.4
Approach			559	17.8	559	17.8	0.557	32.2	LOS C	11.2	90.1	0.90	0.77	0.90	31.4
East: Industrial Local Rd															
4	L2	All MCs	16	16.9	16	16.9	0.032	11.1	LOS B	0.3	2.2	0.50	0.60	0.50	33.1
5	T1	All MCs	1	10.0	1	10.0	0.032	32.1	LOS C	0.3	2.2	0.50	0.60	0.50	39.9
6	R2	All MCs	14	14.3	14	14.3	* 0.127	52.8	LOS D	0.6	5.0	0.97	0.68	0.97	22.4
Approach			31	15.5	31	15.5	0.127	30.5	LOS C	0.6	5.0	0.71	0.64	0.71	26.1
North: Te Rapa Rd															
7	L2	All MCs	119	7.9	119	7.9	0.076	5.5	LOS A	0.4	2.8	0.14	0.54	0.14	43.2
8	T1	All MCs	1424	9.0	1424	9.0	* 0.675	16.8	LOS B	23.0	173.6	0.76	0.69	0.76	39.0
9	R2	All MCs	221	8.0	221	8.0	0.563	40.8	LOS D	9.3	69.8	0.94	0.81	0.94	31.6
Approach			1764	8.8	1764	8.8	0.675	19.0	LOS B	23.0	173.6	0.74	0.69	0.74	37.6
West: Industrial Collector Rd															
10	L2	All MCs	45	15.0	45	15.0	0.051	12.0	LOS B	0.8	6.3	0.46	0.62	0.46	42.1
11	T1	All MCs	1	15.0	1	15.0	0.014	38.2	LOS D	0.1	0.7	0.94	0.60	0.94	24.4
12	R2	All MCs	1	15.0	1	15.0	0.014	55.7	LOS E	0.1	0.7	0.94	0.60	0.94	26.6
Approach			47	15.0	47	15.0	0.051	13.5	LOS B	0.8	6.3	0.49	0.62	0.49	41.3
All Vehicles			2401	11.1	2401	11.1	0.675	22.1	LOS C	23.0	173.6	0.77	0.71	0.77	36.0

2.8 Infrastructure Scenario 3 PM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 115 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.641	7.2	LOS A	24.3	179.0	0.77	0.70	0.77	35.1
2	T1	All MCs	1240	6.1	1240	6.1	* 0.641	24.5	LOS C	25.0	184.4	0.77	0.70	0.77	36.0
3	R2	All MCs	20	10.3	20	10.3	0.219	69.6	LOS E	1.1	8.8	0.99	0.70	0.99	13.7
Approach			1261	6.2	1261	6.2	0.641	25.2	LOS C	25.0	184.4	0.78	0.70	0.78	34.1
East: Industrial Local Rd															
4	L2	All MCs	51	10.1	51	10.1	0.059	8.3	LOS A	0.7	5.4	0.38	0.60	0.38	35.4
5	T1	All MCs	1	10.0	1	10.0	0.059	44.1	LOS D	0.7	5.4	0.38	0.60	0.38	41.7
6	R2	All MCs	53	5.8	53	5.8	* 0.560	66.6	LOS E	3.1	22.9	1.00	0.77	1.04	19.7
Approach			104	7.9	104	7.9	0.560	38.1	LOS D	3.1	22.9	0.69	0.69	0.72	23.5
North: Te Rapa Rd															
7	L2	All MCs	24	7.0	24	7.0	0.015	4.9	LOS A	0.1	0.6	0.12	0.52	0.12	43.3
8	T1	All MCs	824	9.9	824	9.9	0.420	17.5	LOS B	13.8	104.6	0.65	0.57	0.65	37.9
9	R2	All MCs	71	7.0	71	7.0	* 0.648	66.3	LOS E	4.2	31.1	1.00	0.82	1.10	25.9
Approach			919	9.6	919	9.6	0.648	20.9	LOS C	13.8	104.6	0.66	0.59	0.67	36.3
West: Industrial Collector Rd															
10	L2	All MCs	181	10.0	181	10.0	0.254	12.8	LOS B	4.1	31.2	0.49	0.67	0.49	41.8
11	T1	All MCs	1	10.0	1	10.0	0.017	48.5	LOS D	0.1	0.9	0.95	0.60	0.95	21.8
12	R2	All MCs	1	10.0	1	10.0	0.017	66.1	LOS E	0.1	0.9	0.95	0.60	0.95	24.1
Approach			183	10.0	183	10.0	0.254	13.3	LOS B	4.1	31.2	0.49	0.67	0.49	41.5
All Vehicles			2467	7.8	2467	7.8	0.648	23.3	LOS C	25.0	184.4	0.71	0.65	0.71	35.1

2.9 Infrastructure Scenario 3 PM Peak – RT Movement from Southern Approach Banned

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 95 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.742	5.6	LOS A	23.9	175.9	0.89	0.80	0.89	33.9
2	T1	All MCs	1240	6.1	1240	6.1	* 0.742	23.9	LOS C	23.9	175.9	0.89	0.80	0.89	34.7
Approach			1241	6.1	1241	6.1	0.742	23.9	LOS C	23.9	175.9	0.89	0.80	0.89	34.7
East: Industrial Local Rd															
4	L2	All MCs	51	10.1	51	10.1	0.069	6.7	LOS A	0.5	3.5	0.34	0.58	0.34	37.2
5	T1	All MCs	1	10.0	1	10.0	0.069	36.0	LOS D	0.5	3.5	0.34	0.58	0.34	43.1
6	R2	All MCs	53	5.8	53	5.8	* 0.462	54.4	LOS D	2.5	18.7	1.00	0.75	1.00	22.1
Approach			104	7.9	104	7.9	0.462	31.1	LOS C	2.5	18.7	0.67	0.66	0.67	25.9
North: Te Rapa Rd															
7	L2	All MCs	44	7.0	44	7.0	0.028	5.0	LOS A	0.1	1.0	0.14	0.53	0.14	43.2
8	T1	All MCs	824	9.9	824	9.9	0.392	12.3	LOS B	10.5	79.7	0.60	0.52	0.60	40.9
9	R2	All MCs	71	7.0	71	7.0	* 0.625	55.8	LOS E	3.5	25.9	1.00	0.81	1.10	28.0
Approach			939	9.6	939	9.6	0.625	15.2	LOS B	10.5	79.7	0.60	0.55	0.61	39.2
West: Industrial Collector Rd															
10	L2	All MCs	181	10.0	181	10.0	0.253	16.7	LOS B	4.4	33.6	0.62	0.71	0.62	40.0
11	T1	All MCs	1	10.0	1	10.0	0.014	38.2	LOS D	0.1	0.7	0.94	0.59	0.94	24.4
12	R2	All MCs	1	10.0	1	10.0	0.014	54.5	LOS D	0.1	0.7	0.94	0.59	0.94	26.6
Approach			183	10.0	183	10.0	0.253	17.1	LOS B	4.4	33.6	0.62	0.70	0.62	39.8
All Vehicles			2467	7.8	2467	7.8	0.742	20.4	LOS C	23.9	175.9	0.75	0.69	0.76	36.4

2.10 Infrastructure Scenario 4 AM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 107 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.458	5.7	LOS A	12.4	100.0	0.78	0.68	0.78	33.2
2	T1	All MCs	648	17.8	648	17.8	0.458	25.5	LOS C	12.4	100.0	0.78	0.68	0.78	34.0
3	R2	All MCs	60	9.9	60	9.9	* 0.610	62.7	LOS E	3.3	25.4	1.00	0.80	1.09	14.0
Approach			709	17.2	709	17.2	0.610	28.6	LOS C	12.4	100.0	0.80	0.69	0.81	32.2
East: Industrial Local Rd															
4	L2	All MCs	15	16.9	15	16.9	0.024	11.3	LOS B	0.3	2.4	0.52	0.60	0.52	31.9
5	T1	All MCs	1	10.0	1	10.0	0.024	39.2	LOS D	0.3	2.4	0.52	0.60	0.52	38.9
6	R2	All MCs	15	14.3	15	14.3	* 0.154	59.8	LOS E	0.8	6.1	0.98	0.69	0.98	20.9
Approach			31	15.5	31	15.5	0.154	35.7	LOS D	0.8	6.1	0.74	0.64	0.74	24.3
North: Te Rapa Rd															
7	L2	All MCs	59	7.9	59	7.9	0.039	5.2	LOS A	0.3	2.0	0.15	0.54	0.15	43.2
8	T1	All MCs	1118	9.0	1118	9.0	* 0.606	21.2	LOS C	20.9	157.4	0.78	0.69	0.78	36.2
9	R2	All MCs	124	8.0	124	8.0	0.468	50.8	LOS D	6.1	45.7	0.96	0.79	0.96	29.1
Approach			1301	8.9	1301	8.9	0.606	23.3	LOS C	20.9	157.4	0.77	0.70	0.77	35.3
West: Industrial Collector Rd															
10	L2	All MCs	37	15.0	37	15.0	0.038	7.1	LOS A	0.4	3.0	0.27	0.56	0.27	44.7
11	T1	All MCs	1	15.0	1	15.0	0.016	44.2	LOS D	0.1	0.8	0.95	0.60	0.95	22.8
12	R2	All MCs	1	15.0	1	15.0	0.016	62.1	LOS E	0.1	0.8	0.95	0.60	0.95	25.0
Approach			39	15.0	39	15.0	0.038	9.6	LOS A	0.4	3.0	0.31	0.57	0.31	43.3
All Vehicles			2080	11.9	2080	11.9	0.610	25.1	LOS C	20.9	157.4	0.77	0.69	0.77	34.2

2.11 Infrastructure Scenario 4 AM Peak - RT Movement from Southern Approach Banned

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 95 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.499	5.9	LOS A	11.7	94.4	0.83	0.71	0.83	33.2
2	T1	All MCs	648	17.8	648	17.8	* 0.499	25.5	LOS C	11.7	94.5	0.83	0.71	0.83	34.1
Approach			649	17.8	649	17.8	0.499	25.5	LOS C	11.7	94.5	0.83	0.71	0.83	34.1
East: Industrial Local Rd															
4	L2	All MCs	15	16.9	15	16.9	0.027	10.1	LOS B	0.2	1.8	0.53	0.60	0.53	33.1
5	T1	All MCs	1	10.0	1	10.0	0.027	34.9	LOS C	0.2	1.8	0.53	0.60	0.53	39.9
6	R2	All MCs	15	14.3	15	14.3	* 0.137	52.9	LOS D	0.7	5.4	0.97	0.69	0.97	22.4
Approach			31	15.5	31	15.5	0.137	31.6	LOS C	0.7	5.4	0.74	0.64	0.74	25.8
North: Te Rapa Rd															
7	L2	All MCs	119	7.9	119	7.9	0.080	5.0	LOS A	0.4	2.8	0.14	0.54	0.14	43.2
8	T1	All MCs	1118	9.0	1118	9.0	0.528	13.9	LOS B	15.8	119.5	0.66	0.59	0.66	40.1
9	R2	All MCs	124	8.0	124	8.0	* 0.511	47.3	LOS D	5.6	41.6	0.97	0.79	0.97	30.0
Approach			1361	8.8	1361	8.8	0.528	16.2	LOS B	15.8	119.5	0.65	0.61	0.65	38.7
West: Industrial Collector Rd															
10	L2	All MCs	37	15.0	37	15.0	0.037	7.1	LOS A	0.4	2.9	0.29	0.57	0.29	44.6
11	T1	All MCs	1	15.0	1	15.0	0.014	38.2	LOS D	0.1	0.7	0.94	0.60	0.94	24.4
12	R2	All MCs	1	15.0	1	15.0	0.014	54.9	LOS D	0.1	0.7	0.94	0.60	0.94	26.6
Approach			39	15.0	39	15.0	0.037	9.3	LOS A	0.4	2.9	0.33	0.57	0.33	43.4
All Vehicles			2080	11.8	2080	11.8	0.528	19.2	LOS B	15.8	119.5	0.70	0.64	0.70	37.1

2.12 Infrastructure Scenario 4 PM Peak

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 114 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.428	5.3	LOS A	14.3	105.0	0.66	0.59	0.66	36.5
2	T1	All MCs	838	6.1	838	6.1	0.428	18.3	LOS B	14.3	105.1	0.66	0.59	0.66	37.4
3	R2	All MCs	21	10.3	21	10.3	* 0.229	64.2	LOS E	1.2	9.1	0.99	0.70	0.99	13.8
Approach			860	6.2	860	6.2	0.428	19.4	LOS B	14.3	105.1	0.67	0.59	0.67	36.7
East: Industrial Local Rd															
4	L2	All MCs	58	10.1	58	10.1	0.068	8.6	LOS A	0.9	6.5	0.38	0.60	0.38	35.3
5	T1	All MCs	1	10.0	1	10.0	0.068	43.1	LOS D	0.9	6.5	0.38	0.60	0.38	41.6
6	R2	All MCs	45	5.8	45	5.8	* 0.477	65.4	LOS E	2.6	19.4	1.00	0.74	1.00	19.9
Approach			104	8.2	104	8.2	0.477	33.6	LOS C	2.6	19.4	0.65	0.66	0.65	24.5
North: Te Rapa Rd															
7	L2	All MCs	22	7.0	22	7.0	0.014	5.0	LOS A	0.1	0.6	0.12	0.52	0.12	43.3
8	T1	All MCs	882	9.9	882	9.9	* 0.453	18.0	LOS B	15.1	114.4	0.67	0.59	0.67	37.7
9	R2	All MCs	51	7.0	51	7.0	0.460	64.0	LOS E	2.9	21.5	1.00	0.75	1.00	26.4
Approach			955	9.7	955	9.7	0.460	20.2	LOS C	15.1	114.4	0.67	0.60	0.67	36.6
West: Industrial Collector Rd															
10	L2	All MCs	99	10.0	99	10.0	0.115	7.8	LOS A	1.3	9.7	0.31	0.59	0.31	44.3
11	T1	All MCs	1	10.0	1	10.0	0.017	48.0	LOS D	0.1	0.8	0.95	0.60	0.95	21.9
12	R2	All MCs	1	10.0	1	10.0	0.017	65.6	LOS E	0.1	0.8	0.95	0.60	0.95	24.2
Approach			101	10.0	101	10.0	0.115	8.8	LOS A	1.3	9.7	0.32	0.59	0.32	43.7
All Vehicles			2020	8.2	2020	8.2	0.477	20.0	LOS B	15.1	114.4	0.65	0.60	0.65	36.5

2.13 Infrastructure Scenario 4 PM Peak - RT Movement from Southern Approach Banned

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 108 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	10.0	1	10.0	0.451	5.2	LOS A	14.3	105.4	0.70	0.62	0.70	36.0
2	T1	All MCs	838	6.1	838	6.1	* 0.451	19.3	LOS B	14.3	105.4	0.70	0.62	0.70	36.9
Approach			839	6.1	839	6.1	0.451	19.3	LOS B	14.3	105.4	0.70	0.62	0.70	36.9
East: Industrial Local Rd															
4	L2	All MCs	58	10.1	58	10.1	0.075	8.3	LOS A	0.8	5.8	0.39	0.60	0.39	35.6
5	T1	All MCs	1	10.0	1	10.0	0.075	42.8	LOS D	0.8	5.8	0.39	0.60	0.39	41.8
6	R2	All MCs	45	5.8	45	5.8	* 0.452	61.8	LOS E	2.5	18.3	1.00	0.74	1.00	20.5
Approach			104	8.2	104	8.2	0.452	31.9	LOS C	2.5	18.3	0.65	0.66	0.65	25.2
North: Te Rapa Rd															
7	L2	All MCs	43	7.0	43	7.0	0.028	4.9	LOS A	0.1	1.0	0.12	0.52	0.12	43.3
8	T1	All MCs	882	9.9	882	9.9	0.390	11.6	LOS B	11.7	88.7	0.55	0.49	0.55	41.4
9	R2	All MCs	51	7.0	51	7.0	* 0.436	60.5	LOS E	2.7	20.3	1.00	0.74	1.00	27.1
Approach			976	9.7	976	9.7	0.436	13.8	LOS B	11.7	88.7	0.55	0.50	0.55	40.0
West: Industrial Collector Rd															
10	L2	All MCs	99	10.0	99	10.0	0.114	7.9	LOS A	1.3	9.7	0.32	0.60	0.32	44.2
11	T1	All MCs	1	10.0	1	10.0	0.016	44.7	LOS D	0.1	0.8	0.95	0.60	0.95	22.6
12	R2	All MCs	1	10.0	1	10.0	0.016	62.3	LOS E	0.1	0.8	0.95	0.60	0.95	24.9
Approach			101	10.0	101	10.0	0.114	8.9	LOS A	1.3	9.7	0.33	0.60	0.33	43.7
All Vehicles			2020	8.1	2020	8.1	0.452	16.8	LOS B	14.3	105.4	0.61	0.56	0.61	38.2

3. Te Rapa Rd / Hutchinson Rd Roundabout

3.1 Baseline AM Peak (Figure 36 in the ITA)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	0.0	1	0.0	0.262	3.4	LOS A	1.5	12.1	0.52	0.37	0.52	44.5
2	T1	All MCs	363	22.3	363	22.3	0.262	3.2	LOS A	1.5	12.1	0.52	0.42	0.52	45.9
3	R2	All MCs	181	4.1	181	4.1	0.262	9.1	LOS A	1.4	10.9	0.52	0.57	0.52	43.4
Approach			545	16.2	545	16.2	0.262	5.2	LOS A	1.5	12.1	0.52	0.47	0.52	45.1
East: Hutchinson Rd															
4	L2	All MCs	342	3.7	342	3.7	0.413	6.1	LOS A	2.3	16.4	0.69	0.71	0.74	45.2
5	T1	All MCs	1	0.0	1	0.0	0.413	5.0	LOS A	2.3	16.4	0.69	0.71	0.74	41.6
6	R2	All MCs	353	2.1	353	2.1	0.346	9.9	LOS A	1.8	13.2	0.65	0.74	0.65	41.3
Approach			696	2.9	696	2.9	0.413	8.0	LOS A	2.3	16.4	0.67	0.72	0.70	43.1
North: Te Rapa Rd															
7	L2	All MCs	429	2.9	429	2.9	0.469	3.1	LOS A	3.2	23.8	0.44	0.38	0.44	45.6
8	T1	All MCs	764	10.9	764	10.9	0.469	3.1	LOS A	3.2	24.0	0.46	0.34	0.46	46.6
9	R2	All MCs	1	0.0	1	0.0	0.469	8.5	LOS A	3.1	24.0	0.47	0.32	0.47	25.6
Approach			1195	8.0	1195	8.0	0.469	3.1	LOS A	3.2	24.0	0.46	0.35	0.46	46.3
West: Bern Rd															
10	L2	All MCs	4	25.0	4	25.0	0.014	5.4	LOS A	0.1	0.5	0.59	0.63	0.59	41.2
11	T1	All MCs	1	0.0	1	0.0	0.014	4.2	LOS A	0.1	0.5	0.59	0.63	0.59	40.1
12	R2	All MCs	4	25.0	4	25.0	0.014	11.3	LOS B	0.1	0.5	0.59	0.63	0.59	41.7
Approach			9	22.2	9	22.2	0.014	7.9	LOS A	0.1	0.5	0.59	0.63	0.59	41.3
All Vehicles			2445	8.4	2445	8.4	0.469	5.0	LOS A	3.2	24.0	0.53	0.49	0.54	45.1

3.2 Baseline PM Peak (Figure 36 in the ITA)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	4	25.0	4	25.0	0.580	6.2	LOS A	4.9	37.2	0.76	0.65	0.86	42.3
2	T1	All MCs	782	8.5	782	8.5	0.580	5.3	LOS A	4.9	37.2	0.77	0.68	0.86	44.9
3	R2	All MCs	344	2.1	344	2.1	0.580	11.6	LOS B	4.8	34.8	0.77	0.76	0.88	42.5
Approach			1131	6.6	1131	6.6	0.580	7.2	LOS A	4.9	37.2	0.77	0.70	0.87	44.2
East: Hutchinson Rd															
4	L2	All MCs	364	2.9	364	2.9	0.403	4.9	LOS A	2.3	16.4	0.65	0.61	0.65	45.4
5	T1	All MCs	1	0.0	1	0.0	0.403	4.0	LOS A	2.3	16.4	0.65	0.61	0.65	42.0
6	R2	All MCs	503	1.3	503	1.3	0.455	9.6	LOS A	2.9	20.6	0.66	0.70	0.67	41.2
Approach			868	1.9	868	1.9	0.455	7.6	LOS A	2.9	20.6	0.66	0.66	0.66	43.0
North: Te Rapa Rd															
7	L2	All MCs	520	1.8	520	1.8	0.477	3.9	LOS A	3.5	24.9	0.62	0.52	0.62	44.9
8	T1	All MCs	509	12.2	509	12.2	0.477	3.9	LOS A	3.5	25.0	0.64	0.45	0.64	45.9
9	R2	All MCs	4	25.0	4	25.0	0.477	10.0	LOS B	3.2	25.0	0.64	0.44	0.64	25.0
Approach			1034	7.0	1034	7.0	0.477	3.9	LOS A	3.5	25.0	0.63	0.49	0.63	45.4
West: Bern Rd															
10	L2	All MCs	1	0.0	1	0.0	0.006	7.3	LOS A	0.0	0.2	0.78	0.67	0.78	40.2
11	T1	All MCs	1	0.0	1	0.0	0.006	7.0	LOS A	0.0	0.2	0.78	0.67	0.78	38.7
12	R2	All MCs	1	0.0	1	0.0	0.006	12.9	LOS B	0.0	0.2	0.78	0.67	0.78	41.0
Approach			3	0.0	3	0.0	0.006	9.0	LOS A	0.0	0.2	0.78	0.67	0.78	40.1
All Vehicles			3036	5.4	3036	5.4	0.580	6.2	LOS A	4.9	37.2	0.69	0.62	0.73	44.2

3.3 Infrastructure Scenario 1 AM Peak (Figure 36 in the ITA)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	0.0	1	0.0	0.337	3.9	LOS A	2.1	17.5	0.64	0.44	0.64	43.8
2	T1	All MCs	446	22.3	446	22.3	0.337	3.9	LOS A	2.1	17.5	0.64	0.48	0.64	45.4
3	R2	All MCs	181	4.1	181	4.1	0.337	9.8	LOS A	2.1	15.8	0.64	0.61	0.64	43.3
Approach			628	17.0	628	17.0	0.337	5.6	LOS A	2.1	17.5	0.64	0.52	0.64	44.9
East: Hutchinson Rd															
4	L2	All MCs	362	3.7	362	3.7	0.593	11.2	LOS B	4.1	29.5	0.85	0.95	1.13	42.5
5	T1	All MCs	1	0.0	1	0.0	0.593	9.0	LOS A	4.1	29.5	0.85	0.95	1.13	37.3
6	R2	All MCs	451	2.1	451	2.1	0.553	12.8	LOS B	4.1	29.0	0.85	0.93	1.05	40.1
Approach			814	2.8	814	2.8	0.593	12.1	LOS B	4.1	29.5	0.85	0.94	1.09	41.1
North: Te Rapa Rd															
7	L2	All MCs	541	2.9	541	2.9	0.652	3.4	LOS A	6.0	44.0	0.58	0.42	0.58	45.0
8	T1	All MCs	1119	10.9	1119	10.9	0.652	4.4	LOS A	6.0	44.1	0.60	0.38	0.60	46.0
9	R2	All MCs	1	0.0	1	0.0	0.652	8.8	LOS A	5.8	44.1	0.61	0.37	0.61	25.2
Approach			1661	8.3	1661	8.3	0.652	4.1	LOS A	6.0	44.1	0.59	0.40	0.59	45.8
West: Bern Rd															
10	L2	All MCs	4	25.0	4	25.0	0.016	6.2	LOS A	0.1	0.6	0.65	0.68	0.65	40.6
11	T1	All MCs	1	0.0	1	0.0	0.016	4.9	LOS A	0.1	0.6	0.65	0.68	0.65	39.3
12	R2	All MCs	4	25.0	4	25.0	0.016	13.0	LOS B	0.1	0.6	0.65	0.68	0.65	41.1
Approach			9	22.2	9	22.2	0.016	9.1	LOS A	0.1	0.6	0.65	0.68	0.65	40.7
All Vehicles			3113	8.7	3113	8.7	0.652	6.5	LOS A	6.0	44.1	0.67	0.56	0.73	44.3

3.4 Infrastructure Scenario 1 PM Peak (Figure 36 in the ITA)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	4	25.0	4	25.0	0.823	13.6	LOS B	12.2	90.2	1.00	1.11	1.55	38.4
2	T1	All MCs	956	6.2	956	6.2	0.823	12.7	LOS B	12.2	90.2	1.00	1.11	1.56	41.7
3	R2	All MCs	394	1.7	394	1.7	0.823	19.7	LOS B	11.3	81.7	1.00	1.12	1.58	38.5
Approach			1354	4.9	1354	4.9	0.823	14.7	LOS B	12.2	90.2	1.00	1.11	1.56	40.8
East: Hutchinson Rd															
4	L2	All MCs	322	3.0	322	3.0	0.413	5.7	LOS A	2.4	17.3	0.70	0.68	0.73	45.3
5	T1	All MCs	1	0.0	1	0.0	0.413	4.8	LOS A	2.4	17.3	0.70	0.68	0.73	41.7
6	R2	All MCs	661	0.9	661	0.9	0.636	11.6	LOS B	5.7	40.3	0.81	0.84	0.97	40.8
Approach			984	1.6	984	1.6	0.636	9.6	LOS A	5.7	40.3	0.77	0.78	0.89	42.2
North: Te Rapa Rd															
7	L2	All MCs	574	1.6	574	1.6	0.573	4.7	LOS A	5.1	36.5	0.75	0.61	0.79	44.4
8	T1	All MCs	596	9.1	596	9.1	0.573	5.0	LOS A	5.1	36.9	0.76	0.61	0.82	45.4
9	R2	All MCs	4	25.0	4	25.0	0.573	11.3	LOS B	4.9	36.9	0.76	0.61	0.83	24.8
Approach			1174	5.5	1174	5.5	0.573	4.9	LOS A	5.1	36.9	0.76	0.61	0.81	44.9
West: Bern Rd															
10	L2	All MCs	1	0.0	1	0.0	0.009	10.8	LOS B	0.1	0.4	0.88	0.74	0.88	37.5
11	T1	All MCs	1	0.0	1	0.0	0.009	10.5	LOS B	0.1	0.4	0.88	0.74	0.88	35.7
12	R2	All MCs	1	0.0	1	0.0	0.009	16.4	LOS B	0.1	0.4	0.88	0.74	0.88	38.5
Approach			3	0.0	3	0.0	0.009	12.6	LOS B	0.1	0.4	0.88	0.74	0.88	37.4
All Vehicles			3515	4.2	3515	4.2	0.823	10.0	LOS B	12.2	90.2	0.85	0.85	1.12	42.4

3.5 Infrastructure Scenario 2 AM Peak (Figure 37 in the ITA)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	0.0	1	0.0	0.337	3.9	LOS A	2.1	17.8	0.64	0.43	0.64	43.7
2	T1	All MCs	473	22.3	473	22.3	0.337	3.8	LOS A	2.1	17.8	0.64	0.48	0.64	45.5
3	R2	All MCs	152	4.1	152	4.1	0.337	9.7	LOS A	2.1	16.1	0.64	0.58	0.64	43.5
Approach			625	17.9	625	17.9	0.337	5.2	LOS A	2.1	17.8	0.64	0.50	0.64	45.0
East: Hutchinson Rd															
4	L2	All MCs	343	3.7	343	3.7	0.732	16.1	LOS B	5.7	40.8	0.93	1.13	1.47	39.0
5	T1	All MCs	1	0.0	1	0.0	0.732	15.3	LOS B	5.7	40.8	0.93	1.13	1.47	32.1
6	R2	All MCs	435	2.1	435	2.1	0.654	16.2	LOS B	5.4	38.3	0.94	1.05	1.31	38.2
Approach			779	2.8	779	2.8	0.732	16.2	LOS B	5.7	40.8	0.93	1.08	1.38	38.6
North: Te Rapa Rd															
7	L2	All MCs	519	2.9	519	2.9	0.748	3.5	LOS A	8.4	62.0	0.64	0.41	0.64	44.7
8	T1	All MCs	1443	10.9	1443	10.9	0.748	3.2	LOS A	8.4	64.0	0.67	0.41	0.67	45.8
9	R2	All MCs	1	0.0	1	0.0	0.748	9.0	LOS A	8.4	64.0	0.68	0.40	0.69	25.1
Approach			1963	8.8	1963	8.8	0.748	3.3	LOS A	8.4	64.0	0.66	0.41	0.66	45.5
West: Bern Rd															
10	L2	All MCs	4	25.0	4	25.0	0.016	6.1	LOS A	0.1	0.6	0.65	0.67	0.65	40.6
11	T1	All MCs	1	0.0	1	0.0	0.016	4.8	LOS A	0.1	0.6	0.65	0.67	0.65	39.4
12	R2	All MCs	4	25.0	4	25.0	0.016	11.6	LOS B	0.1	0.6	0.65	0.67	0.65	41.2
Approach			9	22.2	9	22.2	0.016	8.4	LOS A	0.1	0.6	0.65	0.67	0.65	40.8
All Vehicles			3377	9.1	3377	9.1	0.748	6.6	LOS A	8.4	64.0	0.72	0.58	0.82	43.8

3.6 Infrastructure Scenario 2 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	4	25.0	4	25.0	0.913	21.1	LOS C	19.1	140.6	1.00	1.43	2.04	34.2
2	T1	All MCs	1118	6.2	1118	6.2	0.913	20.4	LOS C	19.1	140.6	1.00	1.43	2.05	38.1
3	R2	All MCs	361	1.7	361	1.7	0.913	27.8	LOS C	17.5	126.2	1.00	1.43	2.09	35.2
Approach			1483	5.1	1483	5.1	0.913	22.2	LOS C	19.1	140.6	1.00	1.43	2.06	37.4
East: Hutchinson Rd															
4	L2	All MCs	258	3.0	258	3.0	0.359	5.6	LOS A	1.9	13.7	0.69	0.67	0.69	45.3
5	T1	All MCs	1	0.0	1	0.0	0.359	4.8	LOS A	1.9	13.7	0.69	0.67	0.69	41.8
6	R2	All MCs	666	0.9	666	0.9	0.657	12.0	LOS B	6.0	42.4	0.83	0.87	1.03	40.5
Approach			925	1.5	925	1.5	0.657	10.2	LOS B	6.0	42.4	0.79	0.82	0.93	41.8
North: Te Rapa Rd															
7	L2	All MCs	565	1.6	565	1.6	0.576	4.5	LOS A	5.1	36.4	0.73	0.58	0.75	44.5
8	T1	All MCs	649	9.1	649	9.1	0.576	4.5	LOS A	5.1	37.1	0.74	0.57	0.79	45.5
9	R2	All MCs	4	25.0	4	25.0	0.576	10.9	LOS B	4.9	37.1	0.74	0.57	0.80	24.8
Approach			1219	5.7	1219	5.7	0.576	4.5	LOS A	5.1	37.1	0.74	0.57	0.77	45.0
West: Bern Rd															
10	L2	All MCs	1	0.0	1	0.0	0.011	12.5	LOS B	0.1	0.4	0.90	0.76	0.90	36.3
11	T1	All MCs	1	0.0	1	0.0	0.011	12.2	LOS B	0.1	0.4	0.90	0.76	0.90	34.4
12	R2	All MCs	1	0.0	1	0.0	0.011	17.9	LOS B	0.1	0.4	0.90	0.76	0.90	37.5
Approach			3	0.0	3	0.0	0.011	14.2	LOS B	0.1	0.4	0.90	0.76	0.90	36.2
All Vehicles			3631	4.4	3631	4.4	0.913	13.2	LOS B	19.1	140.6	0.86	0.98	1.34	40.6

3.8 Infrastructure Scenario 3 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	0.0	1	0.0	0.334	3.9	LOS A	2.1	17.5	0.64	0.43	0.64	43.8
2	T1	All MCs	466	22.3	466	22.3	0.334	3.8	LOS A	2.1	17.5	0.64	0.48	0.64	45.5
3	R2	All MCs	151	4.1	151	4.1	0.334	9.7	LOS A	2.0	15.8	0.64	0.59	0.64	43.5
Approach			618	17.8	618	17.8	0.334	5.2	LOS A	2.1	17.5	0.64	0.50	0.64	45.0
East: Hutchinson Rd															
4	L2	All MCs	339	3.7	339	3.7	0.681	13.8	LOS B	5.0	35.9	0.91	1.07	1.34	40.2
5	T1	All MCs	1	0.0	1	0.0	0.681	12.9	LOS B	5.0	35.9	0.91	1.07	1.34	33.9
6	R2	All MCs	439	2.1	439	2.1	0.629	15.3	LOS B	5.0	35.7	0.92	1.02	1.25	38.7
Approach			779	2.8	779	2.8	0.681	14.6	LOS B	5.0	35.9	0.91	1.04	1.29	39.4
North: Te Rapa Rd															
7	L2	All MCs	519	2.9	519	2.9	0.725	3.4	LOS A	7.7	57.4	0.61	0.40	0.61	44.9
8	T1	All MCs	1383	10.9	1383	10.9	0.725	3.0	LOS A	7.7	57.5	0.64	0.38	0.64	45.9
9	R2	All MCs	1	0.0	1	0.0	0.725	8.8	LOS A	7.5	57.5	0.65	0.37	0.65	25.1
Approach			1903	8.7	1903	8.7	0.725	3.1	LOS A	7.7	57.5	0.63	0.39	0.63	45.7
West: Bern Rd															
10	L2	All MCs	4	25.0	4	25.0	0.016	6.1	LOS A	0.1	0.6	0.65	0.67	0.65	40.6
11	T1	All MCs	1	0.0	1	0.0	0.016	4.8	LOS A	0.1	0.6	0.65	0.67	0.65	39.4
12	R2	All MCs	4	25.0	4	25.0	0.016	11.6	LOS B	0.1	0.6	0.65	0.67	0.65	41.2
Approach			9	22.2	9	22.2	0.016	8.4	LOS A	0.1	0.6	0.65	0.67	0.65	40.8
All Vehicles			3309	9.1	3309	9.1	0.725	6.2	LOS A	7.7	57.5	0.70	0.56	0.79	44.0

3.9 Infrastructure Scenario 3 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	4	25.0	4	25.0	0.899	19.1	LOS B	17.6	129.7	1.00	1.35	1.91	35.2
2	T1	All MCs	1116	6.2	1116	6.2	0.899	18.3	LOS B	17.6	129.7	1.00	1.35	1.93	39.0
3	R2	All MCs	359	1.7	359	1.7	0.899	25.6	LOS C	16.2	116.9	1.00	1.36	1.96	36.1
Approach			1479	5.1	1479	5.1	0.899	20.1	LOS C	17.6	129.7	1.00	1.35	1.94	38.3
East: Hutchinson Rd															
4	L2	All MCs	268	3.0	268	3.0	0.369	5.6	LOS A	2.0	14.3	0.70	0.68	0.70	45.3
5	T1	All MCs	1	0.0	1	0.0	0.369	4.9	LOS A	2.0	14.3	0.70	0.68	0.70	41.8
6	R2	All MCs	656	0.9	656	0.9	0.647	11.9	LOS B	5.8	41.1	0.82	0.87	1.01	40.6
Approach			925	1.6	925	1.6	0.647	10.1	LOS B	5.8	41.1	0.79	0.81	0.92	41.9
North: Te Rapa Rd															
7	L2	All MCs	568	1.6	568	1.6	0.578	4.5	LOS A	5.1	36.6	0.73	0.58	0.75	44.5
8	T1	All MCs	652	9.1	652	9.1	0.578	4.5	LOS A	5.1	37.3	0.74	0.57	0.79	45.5
9	R2	All MCs	4	25.0	4	25.0	0.578	10.9	LOS B	4.9	37.3	0.74	0.57	0.79	24.8
Approach			1224	5.7	1224	5.7	0.578	4.5	LOS A	5.1	37.3	0.73	0.57	0.77	45.0
West: Bern Rd															
10	L2	All MCs	1	0.0	1	0.0	0.011	12.2	LOS B	0.1	0.4	0.89	0.76	0.89	36.5
11	T1	All MCs	1	0.0	1	0.0	0.011	11.9	LOS B	0.1	0.4	0.89	0.76	0.89	34.6
12	R2	All MCs	1	0.0	1	0.0	0.011	17.6	LOS B	0.1	0.4	0.89	0.76	0.89	37.7
Approach			3	0.0	3	0.0	0.011	13.9	LOS B	0.1	0.4	0.89	0.76	0.89	36.4
All Vehicles			3632	4.4	3632	4.4	0.899	12.3	LOS B	17.6	129.7	0.86	0.95	1.28	41.1

3.10 Infrastructure Scenario 4 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	1	0.0	1	0.0	0.348	3.7	LOS A	2.1	17.6	0.59	0.40	0.59	44.0
2	T1	All MCs	425	22.3	425	22.3	0.348	3.6	LOS A	2.1	17.6	0.59	0.44	0.59	45.7
3	R2	All MCs	274	4.1	274	4.1	0.348	9.4	LOS A	2.1	15.7	0.59	0.62	0.59	42.9
Approach			700	15.2	700	15.2	0.348	5.8	LOS A	2.1	17.6	0.59	0.51	0.59	44.6
East: Hutchinson Rd															
4	L2	All MCs	386	3.7	386	3.7	0.532	7.3	LOS A	3.4	24.7	0.79	0.85	0.96	44.1
5	T1	All MCs	1	0.0	1	0.0	0.532	6.6	LOS A	3.4	24.7	0.79	0.85	0.96	39.8
6	R2	All MCs	392	2.1	392	2.1	0.427	10.6	LOS B	2.6	18.4	0.75	0.81	0.80	41.0
Approach			779	2.9	779	2.9	0.532	9.0	LOS A	3.4	24.7	0.77	0.83	0.88	42.5
North: Te Rapa Rd															
7	L2	All MCs	396	2.9	396	2.9	0.562	3.8	LOS A	4.3	32.0	0.60	0.45	0.60	44.9
8	T1	All MCs	915	10.9	915	10.9	0.562	3.5	LOS A	4.3	32.2	0.62	0.44	0.62	46.0
9	R2	All MCs	1	0.0	1	0.0	0.562	9.3	LOS A	4.2	32.2	0.62	0.43	0.63	25.2
Approach			1312	8.5	1312	8.5	0.562	3.6	LOS A	4.3	32.2	0.61	0.44	0.62	45.7
West: Bern Rd															
10	L2	All MCs	4	25.0	4	25.0	0.016	6.1	LOS A	0.1	0.5	0.65	0.68	0.65	40.6
11	T1	All MCs	1	0.0	1	0.0	0.016	4.9	LOS A	0.1	0.5	0.65	0.68	0.65	39.4
12	R2	All MCs	4	25.0	4	25.0	0.016	11.6	LOS B	0.1	0.5	0.65	0.68	0.65	41.2
Approach			9	22.2	9	22.2	0.016	8.4	LOS A	0.1	0.5	0.65	0.68	0.65	40.8
All Vehicles			2800	8.6	2800	8.6	0.562	5.7	LOS A	4.3	32.2	0.65	0.57	0.68	44.5

3.11 Infrastructure Scenario 4 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	4	25.0	4	25.0	0.488	5.1	LOS A	3.5	25.6	0.69	0.48	0.71	42.7
2	T1	All MCs	607	6.2	607	6.2	0.488	4.1	LOS A	3.5	25.6	0.69	0.51	0.71	45.4
3	R2	All MCs	375	1.7	375	1.7	0.488	10.5	LOS B	3.4	24.3	0.70	0.69	0.73	42.6
Approach			986	4.6	986	4.6	0.488	6.5	LOS A	3.5	25.6	0.70	0.58	0.72	44.3
East: Hutchinson Rd															
4	L2	All MCs	447	3.0	447	3.0	0.478	5.2	LOS A	3.1	22.6	0.69	0.65	0.73	45.3
5	T1	All MCs	1	0.0	1	0.0	0.478	4.5	LOS A	3.1	22.6	0.69	0.65	0.73	41.8
6	R2	All MCs	477	0.9	477	0.9	0.431	9.5	LOS A	2.7	19.3	0.66	0.69	0.66	41.3
Approach			925	2.0	925	2.0	0.478	7.4	LOS A	3.1	22.6	0.67	0.67	0.69	43.2
North: Te Rapa Rd															
7	L2	All MCs	553	1.6	553	1.6	0.495	4.2	LOS A	3.6	25.9	0.65	0.54	0.65	44.9
8	T1	All MCs	508	9.1	508	9.1	0.495	4.0	LOS A	3.6	26.0	0.66	0.48	0.67	45.8
9	R2	All MCs	4	25.0	4	25.0	0.495	10.4	LOS B	3.4	26.0	0.66	0.48	0.67	25.0
Approach			1065	5.3	1065	5.3	0.495	4.1	LOS A	3.6	26.0	0.65	0.51	0.66	45.3
West: Bern Rd															
10	L2	All MCs	1	0.0	1	0.0	0.006	6.4	LOS A	0.0	0.2	0.73	0.64	0.73	40.8
11	T1	All MCs	1	0.0	1	0.0	0.006	6.1	LOS A	0.0	0.2	0.73	0.64	0.73	39.4
12	R2	All MCs	1	0.0	1	0.0	0.006	11.8	LOS B	0.0	0.2	0.73	0.64	0.73	41.5
Approach			3	0.0	3	0.0	0.006	8.1	LOS A	0.0	0.2	0.73	0.64	0.73	40.7
All Vehicles			2980	4.0	2980	4.0	0.495	5.9	LOS A	3.6	26.0	0.67	0.58	0.69	44.3

4. Te Rapa Rd / McKee St Signalised Intersection – 4 Lanes on Te Rapa Rd

4.1 Baseline AM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	313	17.8	313	17.8	0.185	8.1	LOS A	2.2	17.9	0.60	0.49	0.60	43.5
3	R2	All MCs	149	9.9	149	9.9	* 0.718	31.1	LOS C	4.0	30.5	1.00	0.91	1.24	21.6
Approach			462	15.3	462	15.3	0.718	15.5	LOS B	4.0	30.5	0.73	0.63	0.81	36.8
East: McKee St															
4	L2	All MCs	124	16.9	124	16.9	0.143	11.5	LOS B	1.6	12.7	0.55	0.68	0.55	32.3
6	R2	All MCs	242	14.3	242	14.3	* 0.508	21.7	LOS C	5.2	40.8	0.89	0.79	0.89	32.6
Approach			366	15.2	366	15.2	0.508	18.2	LOS B	5.2	40.8	0.77	0.76	0.77	32.5
North: Te Rapa Rd															
7	L2	All MCs	509	7.9	509	7.9	0.401	6.5	LOS A	3.3	24.7	0.43	0.63	0.43	41.9
8	T1	All MCs	573	9.0	573	9.0	* 0.644	19.9	LOS B	6.8	51.1	0.95	0.83	1.01	36.6
Approach			1082	8.5	1082	8.5	0.644	13.6	LOS B	6.8	51.1	0.70	0.73	0.73	38.7
All Vehicles			1911	11.4	1911	11.4	0.718	15.0	LOS B	6.8	51.1	0.72	0.71	0.76	37.1

4.2 Baseline PM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 54 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	758	6.1	758	6.1	0.452	11.4	LOS B	7.1	52.3	0.74	0.64	0.74	41.3
3	R2	All MCs	113	10.3	113	10.3	* 0.586	31.9	LOS C	3.1	23.8	0.99	0.81	1.08	21.4
Approach			871	6.7	871	6.7	0.586	14.1	LOS B	7.1	52.3	0.77	0.66	0.78	39.0
East: McKee St															
4	L2	All MCs	104	10.1	104	10.1	0.107	10.8	LOS B	1.3	9.9	0.50	0.66	0.50	33.0
6	R2	All MCs	489	5.8	489	5.8	* 0.815	27.6	LOS C	14.0	102.6	0.98	0.97	1.20	30.0
Approach			594	6.6	594	6.6	0.815	24.7	LOS C	14.0	102.6	0.89	0.92	1.07	30.3
North: Te Rapa Rd															
7	L2	All MCs	329	7.0	329	7.0	0.247	6.0	LOS A	1.9	13.7	0.34	0.60	0.34	42.4
8	T1	All MCs	487	9.9	487	9.9	* 0.596	21.4	LOS C	6.1	46.4	0.95	0.79	0.96	35.9
Approach			817	8.8	817	8.8	0.596	15.2	LOS B	6.1	46.4	0.70	0.72	0.71	37.9
All Vehicles			2281	7.4	2281	7.4	0.815	17.2	LOS B	14.0	102.6	0.78	0.75	0.83	36.3

4.3 Infrastructure Scenario 1 AM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 77 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	726	17.8	726	17.8	0.325	6.9	LOS A	6.2	50.4	0.49	0.43	0.49	44.4
3	R2	All MCs	174	9.9	174	9.9	* 0.771	44.4	LOS D	7.1	53.6	1.00	0.94	1.22	17.6
Approach			900	16.3	900	16.3	0.771	14.1	LOS B	7.1	53.6	0.59	0.53	0.63	38.6
East: McKee St															
4	L2	All MCs	65	16.9	65	16.9	0.094	19.4	LOS B	1.5	11.9	0.64	0.69	0.64	26.8
6	R2	All MCs	274	14.3	274	14.3	* 0.774	40.0	LOS D	10.8	84.6	1.00	0.92	1.16	25.6
Approach			339	14.8	339	14.8	0.774	36.0	LOS D	10.8	84.6	0.93	0.88	1.06	25.8
North: Te Rapa Rd															
7	L2	All MCs	447	7.9	447	7.9	0.328	10.7	LOS B	3.9	28.8	0.32	0.73	0.32	42.0
8	T1	All MCs	982	9.0	982	9.0	* 0.752	23.8	LOS C	19.7	148.3	0.90	0.87	0.96	35.6
Approach			1429	8.6	1429	8.6	0.752	19.7	LOS B	19.7	148.3	0.72	0.83	0.76	35.8
All Vehicles			2668	12.0	2668	12.0	0.774	19.9	LOS B	19.7	148.3	0.70	0.73	0.76	35.2

4.4 Infrastructure Scenario 1 PM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 59 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	947	6.1	947	6.1	0.494	10.4	LOS B	9.1	67.0	0.70	0.61	0.70	42.0
3	R2	All MCs	79	10.3	79	10.3	* 0.449	33.9	LOS C	2.3	17.8	0.98	0.76	0.98	20.7
Approach			1026	6.4	1026	6.4	0.494	12.2	LOS B	9.1	67.0	0.72	0.63	0.72	40.5
East: McKee St															
4	L2	All MCs	112	10.1	112	10.1	0.130	14.0	LOS B	1.8	13.3	0.57	0.69	0.57	30.8
6	R2	All MCs	451	5.8	451	5.8	* 0.876	36.7	LOS D	15.7	115.1	1.00	1.07	1.37	26.9
Approach			562	6.7	562	6.7	0.876	32.2	LOS C	15.7	115.1	0.91	0.99	1.21	27.1
North: Te Rapa Rd															
7	L2	All MCs	391	7.0	391	7.0	0.281	7.4	LOS A	2.1	15.2	0.31	0.65	0.31	42.6
8	T1	All MCs	838	9.9	838	9.9	* 0.856	30.0	LOS C	15.9	120.8	1.00	1.09	1.33	32.5
Approach			1228	9.0	1228	9.0	0.856	22.8	LOS C	15.9	120.8	0.78	0.95	1.00	34.3
All Vehicles			2817	7.6	2817	7.6	0.876	20.8	LOS C	15.9	120.8	0.79	0.84	0.94	34.9

4.5 Infrastructure Scenario 2 AM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 77 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	448	17.8	448	17.8	0.201	6.2	LOS A	3.5	28.2	0.44	0.38	0.44	44.9
3	R2	All MCs	185	9.9	185	9.9	* 0.747	42.9	LOS D	7.4	56.0	1.00	0.91	1.18	18.0
Approach			634	15.5	634	15.5	0.747	16.9	LOS B	7.4	56.0	0.61	0.53	0.66	36.2
East: McKee St															
4	L2	All MCs	103	16.9	103	16.9	0.144	19.1	LOS B	2.4	18.9	0.64	0.70	0.64	27.0
6	R2	All MCs	228	14.3	228	14.3	* 0.646	36.3	LOS D	8.3	64.9	0.97	0.84	1.00	26.8
Approach			332	15.2	332	15.2	0.646	31.0	LOS C	8.3	64.9	0.87	0.80	0.89	26.8
North: Te Rapa Rd															
7	L2	All MCs	462	7.9	462	7.9	0.343	10.2	LOS B	4.2	31.3	0.34	0.78	0.34	41.9
8	T1	All MCs	936	9.0	936	9.0	* 0.741	23.7	LOS C	18.7	141.3	0.90	0.88	0.96	35.5
Approach			1398	8.6	1398	8.6	0.741	19.2	LOS B	18.7	141.3	0.72	0.85	0.75	36.0
All Vehicles			2363	11.4	2363	11.4	0.747	20.3	LOS C	18.7	141.3	0.71	0.76	0.75	34.7

4.6 Infrastructure Scenario 2 PM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 53 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	737	6.1	737	6.1	0.432	10.8	LOS B	6.6	48.8	0.72	0.62	0.72	41.7
3	R2	All MCs	111	10.3	111	10.3	* 0.564	31.1	LOS C	3.0	22.8	0.99	0.80	1.05	21.7
Approach			847	6.7	847	6.7	0.564	13.5	LOS B	6.6	48.8	0.76	0.65	0.77	39.4
East: McKee St															
4	L2	All MCs	131	10.1	131	10.1	0.136	11.0	LOS B	1.7	12.6	0.52	0.67	0.52	32.8
6	R2	All MCs	472	5.8	472	5.8	* 0.816	27.8	LOS C	13.3	97.9	0.98	0.98	1.21	29.9
Approach			602	6.7	602	6.7	0.816	24.1	LOS C	13.3	97.9	0.88	0.91	1.06	30.3
North: Te Rapa Rd															
7	L2	All MCs	361	7.0	361	7.0	0.272	6.1	LOS A	2.0	15.2	0.36	0.61	0.36	42.3
8	T1	All MCs	534	9.9	534	9.9	* 0.640	21.5	LOS C	6.7	51.1	0.96	0.83	1.01	35.9
Approach			895	8.8	895	8.8	0.640	15.3	LOS B	6.7	51.1	0.71	0.74	0.75	37.9
All Vehicles			2344	7.5	2344	7.5	0.816	16.9	LOS B	13.3	97.9	0.77	0.75	0.84	36.5

4.8 Infrastructure Scenario 3 AM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	415	17.8	415	17.8	0.182	5.9	LOS A	3.2	25.8	0.42	0.36	0.42	45.1
3	R2	All MCs	213	9.9	213	9.9	* 0.754	43.1	LOS D	8.7	66.1	1.00	0.91	1.16	18.0
Approach			627	15.1	627	15.1	0.754	18.5	LOS B	8.7	66.1	0.62	0.54	0.67	35.0
East: McKee St															
4	L2	All MCs	106	16.9	106	16.9	0.145	19.2	LOS B	2.5	20.0	0.63	0.70	0.63	26.9
6	R2	All MCs	229	14.3	229	14.3	* 0.674	38.6	LOS D	8.8	69.0	0.98	0.85	1.03	26.1
Approach			336	15.2	336	15.2	0.674	32.4	LOS C	8.8	69.0	0.87	0.81	0.91	26.2
North: Te Rapa Rd															
7	L2	All MCs	465	7.9	465	7.9	0.350	11.0	LOS B	4.8	35.5	0.36	0.82	0.36	41.6
8	T1	All MCs	922	9.0	922	9.0	* 0.740	24.7	LOS C	19.2	144.9	0.91	0.88	0.96	35.1
Approach			1387	8.6	1387	8.6	0.740	20.1	LOS C	19.2	144.9	0.72	0.86	0.75	35.5
All Vehicles			2351	11.3	2351	11.3	0.754	21.5	LOS C	19.2	144.9	0.71	0.77	0.75	34.0

4.9 Infrastructure Scenario 3 PM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 53 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	774	6.1	774	6.1	0.453	10.9	LOS B	7.0	51.9	0.73	0.63	0.73	41.6
3	R2	All MCs	119	10.3	119	10.3	* 0.607	31.5	LOS C	3.3	24.8	1.00	0.83	1.10	21.5
Approach			893	6.7	893	6.7	0.607	13.7	LOS B	7.0	51.9	0.77	0.66	0.78	39.2
East: McKee St															
4	L2	All MCs	131	10.1	131	10.1	0.136	11.0	LOS B	1.7	12.6	0.52	0.67	0.52	32.8
6	R2	All MCs	461	5.8	461	5.8	* 0.798	26.8	LOS C	12.7	93.1	0.97	0.96	1.17	30.4
Approach			592	6.8	592	6.8	0.798	23.3	LOS C	12.7	93.1	0.87	0.90	1.03	30.7
North: Te Rapa Rd															
7	L2	All MCs	374	7.0	374	7.0	0.283	6.1	LOS A	2.2	16.0	0.36	0.61	0.36	42.3
8	T1	All MCs	535	9.9	535	9.9	* 0.641	21.5	LOS C	6.7	51.2	0.96	0.83	1.01	35.9
Approach			908	8.7	908	8.7	0.641	15.2	LOS B	6.7	51.2	0.71	0.74	0.74	37.9
All Vehicles			2393	7.5	2393	7.5	0.798	16.6	LOS B	12.7	93.1	0.77	0.75	0.83	36.6

4.10 Infrastructure Scenario 4 AM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 64 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	402	17.8	402	17.8	0.198	6.9	LOS A	3.0	24.2	0.51	0.42	0.51	44.4
3	R2	All MCs	184	9.9	184	9.9	* 0.971	60.2	LOS E	8.4	63.8	1.00	1.30	1.98	14.4
Approach			586	15.3	586	15.3	0.971	23.7	LOS C	8.4	63.8	0.66	0.70	0.97	32.6
East: McKee St															
4	L2	All MCs	104	16.9	104	16.9	0.142	16.4	LOS B	2.0	15.8	0.63	0.70	0.63	28.7
6	R2	All MCs	238	14.3	238	14.3	* 0.596	29.2	LOS C	6.9	54.3	0.94	0.81	0.94	29.3
Approach			342	15.1	342	15.1	0.596	25.3	LOS C	6.9	54.3	0.85	0.78	0.85	29.2
North: Te Rapa Rd															
7	L2	All MCs	654	7.9	654	7.9	0.476	9.5	LOS A	4.7	34.9	0.37	0.93	0.37	42.1
8	T1	All MCs	1043	9.0	1043	9.0	* 0.939	45.0	LOS D	28.4	214.0	1.00	1.35	1.56	27.7
Approach			1697	8.6	1697	8.6	0.939	31.3	LOS C	28.4	214.0	0.76	1.19	1.10	30.6
All Vehicles			2625	10.9	2625	10.9	0.971	28.8	LOS C	28.4	214.0	0.75	1.03	1.04	30.8

4.11 Infrastructure Scenario 4 PM Peak (Figure 39 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 71 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	896	6.1	896	6.1	0.693	24.5	LOS C	14.0	103.3	0.92	0.81	0.94	35.6
3	R2	All MCs	96	10.3	96	10.3	* 0.655	47.4	LOS D	3.6	27.2	1.00	0.84	1.15	18.1
Approach			992	6.5	992	6.5	0.693	26.7	LOS C	14.0	103.3	0.92	0.82	0.96	32.9
East: McKee St															
4	L2	All MCs	118	10.1	118	10.1	0.104	16.1	LOS B	1.5	11.6	0.40	0.64	0.40	34.0
6	R2	All MCs	682	5.8	682	5.8	* 0.853	36.5	LOS D	25.1	184.3	0.95	0.97	1.13	29.0
Approach			800	6.4	800	6.4	0.853	33.5	LOS C	25.1	184.3	0.87	0.92	1.02	26.9
North: Te Rapa Rd															
7	L2	All MCs	360	7.0	360	7.0	0.252	5.7	LOS A	2.1	15.5	0.27	0.58	0.27	42.7
8	T1	All MCs	225	9.9	225	9.9	* 0.334	28.2	LOS C	3.5	26.9	0.91	0.72	0.91	33.0
Approach			585	8.1	585	8.1	0.334	14.4	LOS B	3.5	26.9	0.52	0.63	0.52	37.8
All Vehicles			2377	6.9	2377	6.9	0.853	26.0	LOS C	25.1	184.3	0.80	0.81	0.87	31.9

4.12 Infrastructure Scenario 4 AM Peak (Figure 40 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 65 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	402	17.8	402	17.8	0.394	7.9	LOS A	6.9	55.7	0.58	0.50	0.58	43.7
3	R2	All MCs	184	9.9	184	9.9	* 0.854	42.5	LOS D	5.1	38.9	0.99	0.96	1.37	18.2
Approach			586	15.3	586	15.3	0.854	18.8	LOS B	6.9	55.7	0.71	0.65	0.83	35.1
East: McKee St															
4	L2	All MCs	104	16.9	104	16.9	0.402	20.8	LOS C	4.9	39.0	0.86	0.78	0.86	23.6
6	R2	All MCs	238	14.3	238	14.3	* 0.402	29.7	LOS C	4.9	39.0	0.88	0.78	0.88	30.1
Approach			342	15.1	342	15.1	0.402	27.0	LOS C	4.9	39.0	0.87	0.78	0.87	28.5
North: Te Rapa Rd															
7	L2	All MCs	654	7.9	654	7.9	0.465	8.2	LOS A	4.2	31.4	0.35	0.92	0.35	42.3
8	T1	All MCs	1043	9.0	1043	9.0	* 0.893	34.2	LOS C	25.3	190.4	1.00	1.20	1.36	31.1
Approach			1697	8.6	1697	8.6	0.893	24.2	LOS C	25.3	190.4	0.75	1.09	0.97	33.5
All Vehicles			2625	10.9	2625	10.9	0.893	23.3	LOS C	25.3	190.4	0.76	0.95	0.93	33.2

4.13 Infrastructure Scenario 4 PM Peak (Figure 40 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 52 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	896	6.1	896	6.1	0.738	12.1	LOS B	14.7	108.2	0.80	0.74	0.85	40.9
3	R2	All MCs	96	10.3	96	10.3	* 0.480	30.1	LOS C	2.5	18.9	0.98	0.77	0.98	22.1
Approach			992	6.5	992	6.5	0.738	13.9	LOS B	14.7	108.2	0.82	0.74	0.86	39.4
East: McKee St															
4	L2	All MCs	118	10.1	118	10.1	0.752	16.8	LOS B	10.5	78.1	0.96	0.92	1.10	24.1
6	R2	All MCs	682	5.8	682	5.8	* 0.752	26.9	LOS C	10.5	78.1	0.96	0.92	1.11	31.0
Approach			800	6.4	800	6.4	0.752	25.4	LOS C	10.5	78.1	0.96	0.92	1.11	30.2
North: Te Rapa Rd															
7	L2	All MCs	360	7.0	360	7.0	0.270	5.9	LOS A	1.9	13.9	0.35	0.61	0.35	42.4
8	T1	All MCs	225	9.9	225	9.9	* 0.245	17.4	LOS B	2.4	18.1	0.84	0.66	0.84	37.9
Approach			585	8.1	585	8.1	0.270	10.3	LOS B	2.4	18.1	0.54	0.63	0.54	40.4
All Vehicles			2377	6.9	2377	6.9	0.752	16.9	LOS B	14.7	108.2	0.80	0.77	0.86	36.4

5. Te Rapa Rd / Ruffell Rd Signalised Intersection – 4 Lanes on Te Rapa Rd

5.1 Baseline AM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 57 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	133	4.0	133	4.0	0.109	7.9	LOS A	1.3	9.1	0.36	0.63	0.36	43.9
2	T1	All MCs	409	15.9	409	15.9	* 0.344	15.8	LOS B	4.4	35.0	0.80	0.66	0.80	41.1
Approach			542	13.0	542	13.0	0.344	13.9	LOS B	4.4	35.0	0.69	0.65	0.69	41.7
North: Te Rapa Rd															
8	T1	All MCs	634	11.0	634	11.0	0.423	8.1	LOS A	7.0	53.8	0.60	0.52	0.60	45.1
9	R2	All MCs	65	6.5	65	6.5	* 0.355	32.3	LOS C	1.8	13.5	0.97	0.75	0.97	33.8
Approach			699	10.5	699	10.5	0.423	10.4	LOS B	7.0	53.8	0.64	0.54	0.64	43.7
West: Ruffell Rd															
10	L2	All MCs	52	8.2	52	8.2	0.065	14.0	LOS B	0.8	6.0	0.59	0.67	0.59	40.8
12	R2	All MCs	66	7.9	66	7.9	* 0.154	23.4	LOS C	1.5	11.2	0.82	0.72	0.82	37.0
Approach			118	8.0	118	8.0	0.154	19.3	LOS B	1.5	11.2	0.72	0.70	0.72	38.6
All Vehicles			1359	11.3	1359	11.3	0.423	12.5	LOS B	7.0	53.8	0.67	0.60	0.67	42.5

5.2 Baseline PM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	114	3.7	114	3.7	0.082	6.9	LOS A	1.0	7.5	0.25	0.60	0.25	44.5
2	T1	All MCs	796	6.7	796	6.7	* 0.422	13.6	LOS B	9.8	72.8	0.68	0.59	0.68	42.1
Approach			909	6.4	909	6.4	0.422	12.8	LOS B	9.8	72.8	0.62	0.59	0.62	42.4
North: Te Rapa Rd															
8	T1	All MCs	546	10.0	546	10.0	0.303	6.3	LOS A	6.1	46.7	0.45	0.39	0.45	46.1
9	R2	All MCs	44	7.1	44	7.1	* 0.339	45.4	LOS D	1.8	13.1	0.98	0.73	0.98	30.1
Approach			591	9.8	591	9.8	0.339	9.3	LOS A	6.1	46.7	0.49	0.41	0.49	44.3
West: Ruffell Rd															
10	L2	All MCs	75	5.6	75	5.6	0.121	23.7	LOS C	2.0	14.6	0.71	0.71	0.71	36.7
12	R2	All MCs	109	3.8	109	3.8	* 0.303	34.8	LOS C	3.7	27.1	0.89	0.76	0.89	33.1
Approach			184	4.6	184	4.6	0.303	30.3	LOS C	3.7	27.1	0.82	0.74	0.82	34.5
All Vehicles			1684	7.4	1684	7.4	0.422	13.5	LOS B	9.8	72.8	0.60	0.55	0.60	42.0

5.3 Infrastructure Scenario 1 AM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 57 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	161	4.0	161	4.0	0.132	7.9	LOS A	1.5	11.2	0.37	0.64	0.37	43.9
2	T1	All MCs	772	15.9	772	15.9	* 0.648	18.2	LOS B	9.5	75.7	0.91	0.79	0.92	40.0
Approach			933	13.9	933	13.9	0.648	16.4	LOS B	9.5	75.7	0.81	0.76	0.83	40.6
North: Te Rapa Rd															
8	T1	All MCs	932	11.0	932	11.0	0.621	9.4	LOS A	12.1	92.3	0.69	0.61	0.69	44.5
9	R2	All MCs	115	6.5	115	6.5	* 0.624	33.9	LOS C	3.4	25.1	1.00	0.83	1.12	33.3
Approach			1046	10.5	1046	10.5	0.624	12.1	LOS B	12.1	92.3	0.72	0.63	0.74	42.9
West: Ruffell Rd															
10	L2	All MCs	127	8.2	127	8.2	0.162	14.5	LOS B	2.1	15.7	0.62	0.70	0.62	40.6
12	R2	All MCs	74	7.9	74	7.9	* 0.171	23.6	LOS C	1.7	12.5	0.82	0.73	0.82	37.0
Approach			201	8.1	201	8.1	0.171	17.8	LOS B	2.1	15.7	0.69	0.71	0.69	39.2
All Vehicles			2180	11.7	2180	11.7	0.648	14.5	LOS B	12.1	92.3	0.76	0.69	0.77	41.6

5.4 Infrastructure Scenario 1 PM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 67 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	142	3.7	142	3.7	0.119	11.3	LOS B	1.6	11.9	0.38	0.64	0.38	43.5
2	T1	All MCs	928	6.7	928	6.7	* 0.708	22.3	LOS C	14.1	104.1	0.92	0.83	0.96	38.8
Approach			1071	6.3	1071	6.3	0.708	20.9	LOS C	14.1	104.1	0.85	0.80	0.88	38.7
North: Te Rapa Rd															
8	T1	All MCs	765	10.0	765	10.0	0.462	7.9	LOS A	9.3	70.7	0.56	0.49	0.56	45.3
9	R2	All MCs	183	7.1	183	7.1	* 0.705	37.0	LOS D	6.3	46.5	1.00	0.88	1.14	32.4
Approach			948	9.5	948	9.5	0.705	13.5	LOS B	9.3	70.7	0.65	0.57	0.68	42.1
West: Ruffell Rd															
10	L2	All MCs	99	5.6	99	5.6	0.122	15.7	LOS B	1.8	13.5	0.60	0.69	0.60	40.1
12	R2	All MCs	138	3.8	138	3.8	* 0.341	29.0	LOS C	3.9	28.3	0.88	0.77	0.88	35.0
Approach			237	4.6	237	4.6	0.341	23.4	LOS C	3.9	28.3	0.76	0.74	0.76	36.9
All Vehicles			2256	7.5	2256	7.5	0.708	18.0	LOS B	14.1	104.1	0.75	0.70	0.78	39.9

5.5 Infrastructure Scenario 2 AM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 57 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	344	4.0	344	4.0	0.298	9.3	LOS A	4.2	30.2	0.46	0.68	0.46	43.2
2	T1	All MCs	543	15.9	543	15.9	* 0.510	18.4	LOS B	6.5	51.5	0.88	0.74	0.88	39.9
Approach			887	11.3	887	11.3	0.510	14.9	LOS B	6.5	51.5	0.72	0.72	0.72	41.1
North: Te Rapa Rd															
8	T1	All MCs	931	11.0	931	11.0	0.621	9.4	LOS A	12.0	92.2	0.69	0.61	0.69	44.5
9	R2	All MCs	135	6.5	135	6.5	* 0.549	31.1	LOS C	3.8	27.8	0.98	0.80	1.00	34.2
Approach			1065	10.4	1065	10.4	0.621	12.2	LOS B	12.0	92.2	0.72	0.63	0.73	42.9
West: Ruffell Rd															
10	L2	All MCs	89	8.2	89	8.2	0.105	13.0	LOS B	1.3	10.0	0.56	0.68	0.56	41.3
12	R2	All MCs	116	7.9	116	7.9	* 0.268	24.1	LOS C	2.7	20.2	0.85	0.75	0.85	36.7
Approach			205	8.0	205	8.0	0.268	19.3	LOS B	2.7	20.2	0.72	0.72	0.72	38.6
All Vehicles			2158	10.5	2158	10.5	0.621	14.0	LOS B	12.0	92.2	0.72	0.67	0.72	41.7

5.6 Infrastructure Scenario 2 PM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 54 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	283	3.7	283	3.7	0.238	8.4	LOS A	3.0	21.4	0.42	0.66	0.42	43.6
2	T1	All MCs	749	6.7	749	6.7	* 0.670	19.2	LOS B	9.2	68.2	0.93	0.83	0.98	39.6
Approach			1033	5.9	1033	5.9	0.670	16.3	LOS B	9.2	68.2	0.79	0.78	0.83	40.6
North: Te Rapa Rd															
8	T1	All MCs	681	10.0	681	10.0	0.474	8.9	LOS A	7.7	58.9	0.65	0.56	0.65	44.7
9	R2	All MCs	121	7.1	121	7.1	* 0.626	32.2	LOS C	3.4	25.2	1.00	0.84	1.12	33.8
Approach			802	9.6	802	9.6	0.626	12.4	LOS B	7.7	58.9	0.70	0.60	0.72	42.7
West: Ruffell Rd															
10	L2	All MCs	98	5.6	98	5.6	0.116	12.9	LOS B	1.4	10.5	0.58	0.68	0.58	41.3
12	R2	All MCs	325	3.8	325	3.8	* 0.694	26.1	LOS C	8.4	60.8	0.96	0.88	1.05	36.0
Approach			423	4.3	423	4.3	0.694	23.1	LOS C	8.4	60.8	0.87	0.83	0.94	37.1
All Vehicles			2258	6.9	2258	6.9	0.694	16.2	LOS B	9.2	68.2	0.77	0.73	0.81	40.6

5.8 Infrastructure Scenario 3 AM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 67 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	196	4.0	196	4.0	0.151	7.5	LOS A	1.9	13.8	0.32	0.63	0.32	44.1
2	T1	All MCs	615	15.9	615	15.9	0.412	14.9	LOS B	7.2	56.9	0.75	0.64	0.75	41.5
Approach			811	13.0	811	13.0	0.412	13.1	LOS B	7.2	56.9	0.64	0.64	0.64	42.1
North: Te Rapa Rd															
8	T1	All MCs	922	11.0	922	11.0	* 0.560	8.5	LOS A	12.2	93.5	0.61	0.54	0.61	44.9
9	R2	All MCs	65	6.5	65	6.5	0.417	38.3	LOS D	2.2	16.2	0.98	0.75	0.98	32.0
Approach			987	10.7	987	10.7	0.560	10.5	LOS B	12.2	93.5	0.63	0.55	0.63	43.8
West: Ruffell Rd															
10	L2	All MCs	17	8.2	17	8.2	0.024	17.5	LOS B	0.3	2.5	0.62	0.65	0.62	39.2
12	R2	All MCs	71	7.9	71	7.9	* 0.179	28.0	LOS C	1.9	14.3	0.84	0.73	0.84	35.3
Approach			87	8.0	87	8.0	0.179	26.0	LOS C	1.9	14.3	0.80	0.71	0.80	36.0
All Vehicles			1885	11.6	1885	11.6	0.560	12.3	LOS B	12.2	93.5	0.65	0.59	0.65	42.6

5.9 Infrastructure Scenario 3 PM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 57 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	191	3.7	191	3.7	0.156	8.0	LOS A	1.9	13.5	0.37	0.64	0.37	43.9
2	T1	All MCs	784	6.7	784	6.7	* 0.623	17.7	LOS B	9.4	70.0	0.90	0.77	0.90	40.2
Approach			975	6.2	975	6.2	0.623	15.8	LOS B	9.4	70.0	0.79	0.74	0.79	40.9
North: Te Rapa Rd															
8	T1	All MCs	545	10.0	545	10.0	0.362	7.9	LOS A	5.8	44.0	0.58	0.50	0.58	45.2
9	R2	All MCs	120	7.1	120	7.1	* 0.655	34.3	LOS C	3.6	26.7	1.00	0.85	1.15	33.2
Approach			665	9.5	665	9.5	0.655	12.6	LOS B	5.8	44.0	0.66	0.56	0.69	42.5
West: Ruffell Rd															
10	L2	All MCs	108	5.6	108	5.6	0.135	14.4	LOS B	1.8	12.9	0.61	0.69	0.61	40.7
12	R2	All MCs	245	3.8	245	3.8	* 0.552	25.7	LOS C	6.2	44.9	0.92	0.81	0.92	36.1
Approach			354	4.4	354	4.4	0.552	22.2	LOS C	6.2	44.9	0.83	0.77	0.83	37.4
All Vehicles			1994	7.0	1994	7.0	0.655	15.9	LOS B	9.4	70.0	0.75	0.69	0.76	40.7

5.10 Infrastructure Scenario 4 AM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 57 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	213	4.0	213	4.0	0.195	9.8	LOS A	2.6	18.8	0.47	0.67	0.47	42.9
2	T1	All MCs	466	15.9	466	15.9	* 0.496	19.9	LOS B	5.7	45.5	0.90	0.74	0.90	39.3
Approach			679	12.2	679	12.2	0.496	16.8	LOS B	5.7	45.5	0.76	0.72	0.76	40.3
North: Te Rapa Rd															
8	T1	All MCs	991	11.0	991	11.0	0.661	9.7	LOS A	13.3	101.5	0.71	0.63	0.71	44.3
9	R2	All MCs	157	6.5	157	6.5	* 0.512	28.9	LOS C	4.2	31.0	0.95	0.79	0.95	34.9
Approach			1147	10.3	1147	10.3	0.661	12.3	LOS B	13.3	101.5	0.74	0.65	0.74	42.8
West: Ruffell Rd															
10	L2	All MCs	120	8.2	120	8.2	0.132	12.1	LOS B	1.7	12.8	0.54	0.68	0.54	41.7
12	R2	All MCs	79	7.9	79	7.9	* 0.183	23.6	LOS C	1.8	13.4	0.83	0.73	0.83	36.9
Approach			199	8.1	199	8.1	0.183	16.7	LOS B	1.8	13.4	0.65	0.70	0.65	39.7
All Vehicles			2025	10.7	2025	10.7	0.661	14.2	LOS B	13.3	101.5	0.74	0.68	0.74	41.6

5.11 Infrastructure Scenario 4 PM Peak (Figure 43 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 56 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	241	3.7	241	3.7	0.199	8.2	LOS A	2.4	17.7	0.40	0.65	0.40	43.8
2	T1	All MCs	849	6.7	849	6.7	* 0.788	23.9	LOS C	12.2	90.4	0.98	0.96	1.16	37.7
Approach			1091	6.1	1091	6.1	0.788	20.4	LOS C	12.2	90.4	0.85	0.90	0.99	38.8
North: Te Rapa Rd															
8	T1	All MCs	228	10.0	228	10.0	0.165	8.2	LOS A	2.3	17.3	0.57	0.46	0.57	45.0
9	R2	All MCs	115	7.1	115	7.1	* 0.616	33.3	LOS C	3.3	24.7	1.00	0.83	1.11	33.5
Approach			343	9.1	343	9.1	0.616	16.6	LOS B	3.3	24.7	0.71	0.58	0.75	40.4
West: Ruffell Rd															
10	L2	All MCs	143	5.6	143	5.6	0.163	12.9	LOS B	2.1	15.7	0.57	0.69	0.57	41.4
12	R2	All MCs	433	3.8	433	3.8	* 0.838	31.5	LOS C	13.4	96.9	1.00	1.01	1.29	34.1
Approach			576	4.3	576	4.3	0.838	26.9	LOS C	13.4	96.9	0.89	0.93	1.11	35.7
All Vehicles			2009	6.1	2009	6.1	0.838	21.6	LOS C	13.4	96.9	0.84	0.85	0.98	38.1

6. Te Rapa Rd / Kapuni St Signalised Intersection

6.1 Baseline AM Peak (Figure 45 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 67 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	714	10.3	714	10.3	0.541	10.1	LOS B	10.8	82.6	0.60	0.53	0.60	45.0
3	R2	All MCs	278	5.7	278	5.7	* 0.737	34.4	LOS C	9.3	68.4	0.99	0.90	1.12	29.1
Approach			992	9.0	992	9.0	0.737	16.9	LOS B	10.8	82.6	0.71	0.63	0.75	39.7
East: Kapuni St															
4	L2	All MCs	44	35.7	44	35.7	0.057	13.5	LOS B	0.7	6.5	0.51	0.65	0.51	38.0
6	R2	All MCs	8	25.0	8	25.0	* 0.024	26.9	LOS C	0.2	1.9	0.80	0.65	0.80	31.8
Approach			53	34.0	53	34.0	0.057	15.6	LOS B	0.7	6.5	0.56	0.65	0.56	36.9
North: Te Rapa Rd															
7	L2	All MCs	46	9.1	46	9.1	0.038	6.9	LOS A	0.4	2.8	0.33	0.57	0.33	42.7
8	T1	All MCs	637	11.9	637	11.9	* 0.750	24.7	LOS C	12.9	99.5	0.92	0.83	0.99	37.7
Approach			683	11.7	683	11.7	0.750	23.5	LOS C	12.9	99.5	0.88	0.81	0.94	37.7
All Vehicles			1727	10.8	1727	10.8	0.750	19.5	LOS B	12.9	99.5	0.77	0.71	0.82	38.8

6.2 Baseline PM Peak (Figure 45 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 67 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	884	6.9	884	6.9	0.686	13.1	LOS B	15.2	112.8	0.68	0.60	0.68	44.4
3	R2	All MCs	86	18.3	86	18.3	* 0.581	39.5	LOS D	3.0	24.2	1.00	0.80	1.08	27.4
Approach			971	7.9	971	7.9	0.686	15.4	LOS B	15.2	112.8	0.71	0.62	0.71	41.1
East: Kapuni St															
4	L2	All MCs	165	8.3	165	8.3	0.231	19.1	LOS B	3.6	26.9	0.70	0.73	0.70	35.3
6	R2	All MCs	16	13.3	16	13.3	* 0.041	27.0	LOS C	0.4	3.2	0.81	0.67	0.81	31.9
Approach			181	8.7	181	8.7	0.231	19.8	LOS B	3.6	26.9	0.71	0.73	0.71	34.9
North: Te Rapa Rd															
7	L2	All MCs	36	17.6	36	17.6	0.027	5.7	LOS A	0.2	1.4	0.24	0.54	0.24	43.5
8	T1	All MCs	748	7.6	748	7.6	* 0.610	16.3	LOS B	12.2	91.2	0.79	0.69	0.79	41.1
Approach			784	8.1	784	8.1	0.610	15.8	LOS B	12.2	91.2	0.77	0.68	0.77	41.1
All Vehicles			1936	8.0	1936	8.0	0.686	16.0	LOS B	15.2	112.8	0.73	0.65	0.73	40.6

6.3 Infrastructure Scenario 1 AM Peak (Figure 46 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 78 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	1120	10.3	1120	10.3	0.678	9.3	LOS A	19.0	145.1	0.62	0.56	0.62	44.7
3	R2	All MCs	297	5.7	297	5.7	* 0.755	38.7	LOS D	11.5	84.5	0.99	0.90	1.12	27.7
Approach			1417	9.4	1417	9.4	0.755	15.5	LOS B	19.0	145.1	0.70	0.63	0.73	40.8
East: Kapuni St															
4	L2	All MCs	62	35.7	62	35.7	0.083	16.1	LOS B	1.2	11.2	0.55	0.67	0.55	36.7
6	R2	All MCs	24	25.0	24	25.0	* 0.074	32.4	LOS C	0.8	6.5	0.84	0.69	0.84	29.8
Approach			86	32.7	86	32.7	0.083	20.6	LOS C	1.2	11.2	0.63	0.67	0.63	34.4
North: Te Rapa Rd															
7	L2	All MCs	102	9.1	102	9.1	0.082	12.0	LOS B	1.0	7.7	0.34	0.59	0.34	42.4
8	T1	All MCs	879	11.9	879	11.9	* 0.746	27.7	LOS C	16.8	129.3	0.93	0.84	0.97	37.2
Approach			981	11.6	981	11.6	0.746	26.0	LOS C	16.8	129.3	0.87	0.81	0.90	36.6
All Vehicles			2484	11.1	2484	11.1	0.755	19.8	LOS B	19.0	145.1	0.76	0.71	0.79	38.8

6.4 Infrastructure Scenario 1 PM Peak (Figure 46 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 67 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	1020	6.9	1020	6.9	0.644	9.1	LOS A	15.5	115.2	0.65	0.58	0.65	44.6
3	R2	All MCs	93	18.3	93	18.3	* 0.623	40.0	LOS D	3.2	26.3	1.00	0.83	1.12	27.3
Approach			1113	7.9	1113	7.9	0.644	11.6	LOS B	15.5	115.2	0.68	0.60	0.69	43.0
East: Kapuni St															
4	L2	All MCs	249	8.3	249	8.3	0.359	20.2	LOS C	5.8	43.3	0.74	0.76	0.74	34.8
6	R2	All MCs	32	13.3	32	13.3	* 0.082	27.4	LOS C	0.8	6.5	0.82	0.69	0.82	31.7
Approach			281	8.8	281	8.8	0.359	21.0	LOS C	5.8	43.3	0.75	0.75	0.75	34.4
North: Te Rapa Rd															
7	L2	All MCs	62	17.6	62	17.6	0.047	7.2	LOS A	0.3	2.5	0.24	0.55	0.24	43.5
8	T1	All MCs	983	7.6	983	7.6	* 0.659	18.2	LOS B	13.8	102.7	0.85	0.74	0.85	40.6
Approach			1045	8.2	1045	8.2	0.659	17.5	LOS B	13.8	102.7	0.81	0.73	0.81	40.4
All Vehicles			2439	8.1	2439	8.1	0.659	15.2	LOS B	15.5	115.2	0.74	0.67	0.75	41.0

6.5 Infrastructure Scenario 2 AM Peak (Figure 46 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	1080	10.3	1080	10.3	0.639	8.6	LOS A	17.8	135.9	0.59	0.53	0.59	45.0
3	R2	All MCs	280	5.7	280	5.7	* 0.731	39.0	LOS D	10.9	80.4	0.99	0.88	1.08	27.6
Approach			1360	9.4	1360	9.4	0.731	14.8	LOS B	17.8	135.9	0.67	0.60	0.69	41.1
East: Kapuni St															
4	L2	All MCs	64	35.7	64	35.7	0.090	17.0	LOS B	1.3	12.3	0.56	0.67	0.56	36.2
6	R2	All MCs	24	25.0	24	25.0	* 0.076	33.5	LOS C	0.8	6.7	0.84	0.69	0.84	29.4
Approach			88	32.8	88	32.8	0.090	21.5	LOS C	1.3	12.3	0.64	0.68	0.64	34.0
North: Te Rapa Rd															
7	L2	All MCs	107	9.1	107	9.1	0.085	11.8	LOS B	1.0	7.7	0.32	0.58	0.32	42.6
8	T1	All MCs	887	11.9	887	11.9	* 0.725	26.8	LOS C	16.7	128.8	0.91	0.81	0.93	37.6
Approach			995	11.6	995	11.6	0.725	25.1	LOS C	16.7	128.8	0.85	0.79	0.86	36.9
All Vehicles			2443	11.1	2443	11.1	0.731	19.3	LOS B	17.8	135.9	0.74	0.68	0.76	39.0

6.6 Infrastructure Scenario 2 PM Peak (Figure 46 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 67 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	986	6.9	986	6.9	0.622	8.9	LOS A	14.7	109.2	0.64	0.57	0.64	44.7
3	R2	All MCs	95	18.3	95	18.3	* 0.637	40.1	LOS D	3.3	27.0	1.00	0.84	1.13	27.2
Approach			1081	7.9	1081	7.9	0.637	11.6	LOS B	14.7	109.2	0.67	0.59	0.68	43.0
East: Kapuni St															
4	L2	All MCs	274	8.3	274	8.3	0.393	20.5	LOS C	6.4	48.3	0.75	0.77	0.75	34.7
6	R2	All MCs	34	13.3	34	13.3	* 0.088	27.4	LOS C	0.9	7.0	0.82	0.70	0.82	31.7
Approach			307	8.8	307	8.8	0.393	21.2	LOS C	6.4	48.3	0.76	0.76	0.76	34.3
North: Te Rapa Rd															
7	L2	All MCs	48	17.6	48	17.6	0.036	7.0	LOS A	0.2	1.9	0.24	0.55	0.24	43.5
8	T1	All MCs	968	7.6	968	7.6	* 0.647	18.0	LOS B	13.4	100.2	0.84	0.74	0.84	40.7
Approach			1017	8.1	1017	8.1	0.647	17.4	LOS B	13.4	100.2	0.81	0.73	0.81	40.5
All Vehicles			2405	8.1	2405	8.1	0.647	15.3	LOS B	14.7	109.2	0.74	0.67	0.75	40.9

6.8 Infrastructure Scenario 3 AM Peak (Figure 46 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 79 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	967	10.3	967	10.3	0.576	8.1	LOS A	14.8	113.0	0.56	0.50	0.56	45.2
3	R2	All MCs	283	5.7	283	5.7	* 0.730	38.4	LOS D	10.9	80.1	0.99	0.88	1.08	27.8
Approach			1251	9.3	1251	9.3	0.730	15.0	LOS B	14.8	113.0	0.66	0.59	0.68	40.9
East: Kapuni St															
4	L2	All MCs	61	35.7	61	35.7	0.083	16.4	LOS B	1.2	11.3	0.55	0.67	0.55	36.5
6	R2	All MCs	21	25.0	21	25.0	* 0.065	32.8	LOS C	0.7	5.7	0.84	0.69	0.84	29.6
Approach			82	33.0	82	33.0	0.083	20.6	LOS C	1.2	11.3	0.63	0.67	0.63	34.4
North: Te Rapa Rd															
7	L2	All MCs	92	9.1	92	9.1	0.073	11.4	LOS B	0.9	6.5	0.32	0.58	0.32	42.6
8	T1	All MCs	865	11.9	865	11.9	* 0.714	26.4	LOS C	15.9	122.9	0.91	0.80	0.93	37.6
Approach			957	11.6	957	11.6	0.714	24.9	LOS C	15.9	122.9	0.86	0.78	0.87	37.0
All Vehicles			2289	11.1	2289	11.1	0.730	19.3	LOS B	15.9	122.9	0.74	0.67	0.76	38.9

6.9 Infrastructure Scenario 3 PM Peak (Figure 46 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 67 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	937	6.9	937	6.9	0.590	8.6	LOS A	13.5	100.4	0.62	0.55	0.62	44.8
3	R2	All MCs	111	18.3	111	18.3	* 0.637	39.0	LOS D	3.8	31.0	1.00	0.84	1.12	27.6
Approach			1047	8.1	1047	8.1	0.637	11.8	LOS B	13.5	100.4	0.66	0.58	0.67	42.8
East: Kapuni St															
4	L2	All MCs	276	8.3	276	8.3	0.372	19.5	LOS B	6.3	47.2	0.73	0.76	0.73	35.1
6	R2	All MCs	31	13.3	31	13.3	* 0.080	27.4	LOS C	0.8	6.3	0.82	0.69	0.82	31.7
Approach			306	8.8	306	8.8	0.372	20.3	LOS C	6.3	47.2	0.74	0.76	0.74	34.7
North: Te Rapa Rd															
7	L2	All MCs	39	17.6	39	17.6	0.030	6.3	LOS A	0.2	1.7	0.25	0.55	0.25	43.4
8	T1	All MCs	903	7.6	903	7.6	* 0.623	17.9	LOS B	12.5	92.9	0.84	0.73	0.84	40.5
Approach			942	8.0	942	8.0	0.623	17.5	LOS B	12.5	92.9	0.82	0.73	0.82	40.4
All Vehicles			2296	8.2	2296	8.2	0.637	15.3	LOS B	13.5	100.4	0.74	0.66	0.74	40.9

6.10 Infrastructure Scenario 4 AM Peak (Figure 46 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 78 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	817	10.3	817	10.3	0.489	7.5	LOS A	11.5	87.4	0.53	0.47	0.53	45.4
3	R2	All MCs	272	5.7	272	5.7	* 0.734	38.8	LOS D	10.4	76.7	0.99	0.89	1.10	27.7
Approach			1088	9.2	1088	9.2	0.734	15.3	LOS B	11.5	87.4	0.64	0.57	0.67	40.6
East: Kapuni St															
4	L2	All MCs	58	35.7	58	35.7	0.079	16.6	LOS B	1.2	10.7	0.56	0.67	0.56	36.4
6	R2	All MCs	32	25.0	32	25.0	* 0.097	32.5	LOS C	1.0	8.5	0.84	0.70	0.84	29.7
Approach			89	31.9	89	31.9	0.097	22.2	LOS C	1.2	10.7	0.66	0.68	0.66	33.7
North: Te Rapa Rd															
7	L2	All MCs	124	9.1	124	9.1	0.098	10.8	LOS B	1.1	8.6	0.32	0.59	0.32	42.7
8	T1	All MCs	875	11.9	875	11.9	* 0.719	25.8	LOS C	16.1	124.1	0.91	0.81	0.93	37.8
Approach			999	11.6	999	11.6	0.719	23.9	LOS C	16.1	124.1	0.84	0.78	0.85	37.3
All Vehicles			2177	11.2	2177	11.2	0.734	19.5	LOS B	16.1	124.1	0.73	0.67	0.75	38.7

6.11 Infrastructure Scenario 4 PM Peak (Figure 46 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 57 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
2	T1	All MCs	1003	6.9	1003	6.9	0.694	9.8	LOS A	14.7	108.8	0.73	0.64	0.73	44.2
3	R2	All MCs	122	18.3	122	18.3	* 0.599	32.8	LOS C	3.5	28.7	0.99	0.82	1.07	29.6
Approach			1125	8.1	1125	8.1	0.694	12.3	LOS B	14.7	108.8	0.75	0.66	0.76	42.6
East: Kapuni St															
4	L2	All MCs	248	8.3	248	8.3	0.296	14.8	LOS B	4.3	32.1	0.65	0.73	0.65	37.5
6	R2	All MCs	31	13.3	31	13.3	* 0.073	23.0	LOS C	0.7	5.2	0.80	0.69	0.80	33.6
Approach			279	8.8	279	8.8	0.296	15.7	LOS B	4.3	32.1	0.67	0.73	0.67	37.1
North: Te Rapa Rd															
7	L2	All MCs	49	17.6	49	17.6	0.039	5.8	LOS A	0.2	2.0	0.28	0.56	0.28	43.4
8	T1	All MCs	716	7.6	716	7.6	* 0.629	18.6	LOS B	9.1	68.2	0.90	0.77	0.90	40.0
Approach			765	8.2	765	8.2	0.629	17.8	LOS B	9.1	68.2	0.86	0.75	0.86	40.1
All Vehicles			2169	8.3	2169	8.3	0.694	14.7	LOS B	14.7	108.8	0.78	0.70	0.79	41.1

7. Te Rapa Rd / Te Kowhai Rd / Church Rd Roundabout

7.1 Baseline AM Peak - Existing Layout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	174	4.8	174	4.8	0.394	3.3	LOS A	2.0	15.1	0.47	0.37	0.47	45.5
2	T1	All MCs	786	9.0	786	9.0	0.623	2.7	LOS A	4.6	34.7	0.53	0.43	0.55	46.5
3	R2	All MCs	272	7.0	272	7.0	0.623	9.1	LOS A	4.6	34.7	0.56	0.45	0.58	44.1
Approach			1232	7.9	1232	7.9	0.623	4.2	LOS A	4.6	34.7	0.53	0.42	0.55	46.0
East: Church Rd															
4	L2	All MCs	37	20.0	37	20.0	0.147	4.0	LOS A	0.6	5.0	0.56	0.40	0.56	44.8
5	T1	All MCs	116	10.0	116	10.0	0.147	2.9	LOS A	0.6	5.0	0.56	0.42	0.56	40.5
6	R2	All MCs	33	9.7	33	9.7	0.061	10.5	LOS B	0.2	1.8	0.57	0.71	0.57	41.5
Approach			185	11.9	185	11.9	0.147	4.5	LOS A	0.6	5.0	0.57	0.46	0.57	41.9
North: Te Rapa Rd															
7	L2	All MCs	38	5.6	38	5.6	0.341	3.7	LOS A	1.7	13.4	0.56	0.37	0.56	44.9
8	T1	All MCs	526	12.8	526	12.8	0.341	3.1	LOS A	1.7	13.4	0.57	0.43	0.57	46.4
9	R2	All MCs	118	18.8	118	18.8	0.341	10.1	LOS B	1.6	13.0	0.58	0.54	0.58	28.5
Approach			682	13.4	682	13.4	0.341	4.3	LOS A	1.7	13.4	0.57	0.45	0.57	42.9
West: Te Kowhai E Rd															
10	L2	All MCs	174	9.1	174	9.1	0.402	6.7	LOS A	2.5	19.0	0.80	0.73	0.86	43.8
11	T1	All MCs	161	6.5	161	6.5	0.402	5.5	LOS A	2.5	19.0	0.80	0.74	0.86	38.0
12	R2	All MCs	95	7.8	95	7.8	0.185	12.5	LOS B	0.9	6.6	0.73	0.81	0.73	39.8
Approach			429	7.8	429	7.8	0.402	7.5	LOS A	2.5	19.0	0.79	0.75	0.83	41.3
All Vehicles			2528	9.7	2528	9.7	0.623	4.8	LOS A	4.6	34.7	0.59	0.49	0.60	44.3

7.2 Baseline PM Peak - Existing Layout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	108	5.8	108	5.8	0.371	4.5	LOS A	1.8	13.1	0.61	0.51	0.62	44.8
2	T1	All MCs	700	7.8	700	7.8	0.587	4.0	LOS A	4.1	30.7	0.67	0.58	0.75	46.1
3	R2	All MCs	146	9.4	146	9.4	0.587	10.6	LOS B	4.1	30.7	0.69	0.61	0.80	43.6
Approach			955	7.8	955	7.8	0.587	5.0	LOS A	4.1	30.7	0.66	0.58	0.74	45.7
East: Church Rd															
4	L2	All MCs	55	9.6	55	9.6	0.357	4.7	LOS A	1.9	13.6	0.70	0.48	0.71	44.1
5	T1	All MCs	286	4.4	286	4.4	0.357	3.6	LOS A	1.9	13.6	0.70	0.49	0.71	39.4
6	R2	All MCs	88	3.6	88	3.6	0.148	11.0	LOS B	0.6	4.4	0.65	0.79	0.65	40.8
Approach			429	4.9	429	4.9	0.357	5.3	LOS A	1.9	13.6	0.69	0.55	0.70	40.7
North: Te Rapa Rd															
7	L2	All MCs	33	6.5	33	6.5	0.420	3.5	LOS A	2.3	17.3	0.56	0.33	0.56	44.9
8	T1	All MCs	646	7.7	646	7.7	0.420	2.7	LOS A	2.3	17.3	0.56	0.40	0.56	46.4
9	R2	All MCs	235	8.1	235	8.1	0.420	9.5	LOS A	2.2	16.7	0.58	0.56	0.58	28.5
Approach			914	7.7	914	7.7	0.420	4.5	LOS A	2.3	17.3	0.57	0.44	0.57	41.3
West: Te Kowhai E Rd															
10	L2	All MCs	181	10.5	181	10.5	0.390	5.7	LOS A	2.4	17.9	0.77	0.64	0.79	44.1
11	T1	All MCs	155	7.5	155	7.5	0.390	4.4	LOS A	2.4	17.9	0.77	0.64	0.79	39.0
12	R2	All MCs	134	3.9	134	3.9	0.208	11.3	LOS B	1.0	7.4	0.71	0.79	0.71	40.2
Approach			469	7.6	469	7.6	0.390	6.9	LOS A	2.4	17.9	0.75	0.68	0.77	41.7
All Vehicles			2767	7.3	2767	7.3	0.587	5.2	LOS A	4.1	30.7	0.65	0.55	0.68	43.0

7.3 Infrastructure Scenario 1 AM Peak - Existing Layout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	301	4.8	301	4.8	0.610	5.2	LOS A	4.5	33.3	0.66	0.62	0.76	44.5
2	T1	All MCs	1139	9.0	1139	9.0	0.964	13.5	LOS B	26.5	198.5	0.92	1.23	1.66	41.9
3	R2	All MCs	341	7.0	341	7.0	0.964	22.1	LOS C	26.5	198.5	1.00	1.43	1.95	36.6
Approach			1781	7.9	1781	7.9	0.964	13.8	LOS B	26.5	198.5	0.89	1.17	1.56	41.4
East: Church Rd															
4	L2	All MCs	48	20.0	48	20.0	0.222	4.6	LOS A	1.1	8.4	0.69	0.47	0.69	44.1
5	T1	All MCs	147	10.0	147	10.0	0.222	3.5	LOS A	1.1	8.4	0.69	0.49	0.69	39.3
6	R2	All MCs	41	9.7	41	9.7	0.092	11.5	LOS B	0.4	2.9	0.66	0.77	0.66	41.2
Approach			237	12.0	237	12.0	0.222	5.1	LOS A	1.1	8.4	0.68	0.54	0.68	41.1
North: Te Rapa Rd															
7	L2	All MCs	41	5.6	41	5.6	0.530	5.2	LOS A	3.6	27.9	0.72	0.59	0.82	44.0
8	T1	All MCs	717	12.8	717	12.8	0.530	4.7	LOS A	3.6	27.9	0.73	0.65	0.84	45.7
9	R2	All MCs	183	18.8	183	18.8	0.530	12.2	LOS B	3.4	26.9	0.74	0.79	0.87	28.0
Approach			941	13.6	941	13.6	0.530	6.2	LOS A	3.6	27.9	0.73	0.68	0.84	41.8
West: Te Kowhai E Rd															
10	L2	All MCs	237	9.1	237	9.1	0.992	73.7	LOS F	22.6	169.0	1.00	2.09	3.58	20.1
11	T1	All MCs	233	6.5	233	6.5	0.992	62.6	LOS E	22.6	169.0	0.99	1.92	3.22	12.8
12	R2	All MCs	108	7.8	108	7.8	0.456	20.6	LOS C	3.0	22.2	0.95	0.98	1.14	35.8
Approach			578	7.8	578	7.8	0.992	59.3	LOS E	22.6	169.0	0.99	1.81	2.97	19.7
All Vehicles			3537	9.7	3537	9.7	0.992	18.6	LOS B	26.5	198.5	0.85	1.10	1.54	37.2

7.4 Infrastructure Scenario 1 PM Peak - Existing Layout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	155	5.8	155	5.8	0.514	6.7	LOS A	3.0	22.4	0.74	0.78	0.89	43.8
2	T1	All MCs	799	7.8	799	7.8	0.813	7.9	LOS A	8.7	65.4	0.86	0.99	1.26	44.6
3	R2	All MCs	199	9.4	199	9.4	0.813	15.0	LOS B	8.7	65.4	0.90	1.07	1.39	41.2
Approach			1153	7.8	1153	7.8	0.813	8.9	LOS A	8.7	65.4	0.85	0.98	1.23	44.1
East: Church Rd															
4	L2	All MCs	52	9.6	52	9.6	0.552	7.1	LOS A	3.7	27.4	0.85	0.82	1.05	43.2
5	T1	All MCs	392	4.4	392	4.4	0.552	6.0	LOS A	3.7	27.4	0.85	0.82	1.03	37.8
6	R2	All MCs	102	3.6	102	3.6	0.229	11.9	LOS B	1.1	7.6	0.75	0.83	0.75	40.6
Approach			545	4.7	545	4.7	0.552	7.2	LOS A	3.7	27.4	0.83	0.83	0.98	39.4
North: Te Rapa Rd															
7	L2	All MCs	38	6.5	38	6.5	0.611	5.1	LOS A	4.7	35.0	0.71	0.57	0.83	44.1
8	T1	All MCs	829	7.7	829	7.7	0.611	4.4	LOS A	4.7	35.0	0.72	0.62	0.84	45.7
9	R2	All MCs	365	8.1	365	8.1	0.611	11.6	LOS B	4.5	33.8	0.73	0.79	0.88	27.9
Approach			1233	7.7	1233	7.7	0.611	6.5	LOS A	4.7	35.0	0.72	0.67	0.85	39.9
West: Te Kowhai E Rd															
10	L2	All MCs	212	10.5	212	10.5	0.571	9.3	LOS A	4.6	34.8	0.91	0.91	1.14	42.5
11	T1	All MCs	194	7.5	194	7.5	0.571	7.7	LOS A	4.6	34.8	0.91	0.91	1.14	36.2
12	R2	All MCs	154	3.9	154	3.9	0.293	12.6	LOS B	1.6	11.5	0.81	0.84	0.81	39.5
Approach			559	7.6	559	7.6	0.571	9.6	LOS A	4.6	34.8	0.89	0.89	1.05	40.1
All Vehicles			3489	7.3	3489	7.3	0.813	7.9	LOS A	8.7	65.4	0.81	0.83	1.03	41.4

7.5 Infrastructure Scenario 1 AM Peak – Exclusive LT on Te Kowhai Rd (Figure 49 in ITA)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	301	4.8	301	4.8	0.614	5.3	LOS A	4.6	34.1	0.67	0.62	0.77	44.5
2	T1	All MCs	1139	9.0	1139	9.0	0.971	14.5	LOS B	28.1	210.5	0.92	1.28	1.73	41.4
3	R2	All MCs	341	7.0	341	7.0	0.971	23.4	LOS C	28.1	210.5	1.00	1.50	2.04	35.9
Approach			1781	7.9	1781	7.9	0.971	14.7	LOS B	28.1	210.5	0.89	1.21	1.62	40.9
East: Church Rd															
4	L2	All MCs	48	20.0	48	20.0	0.233	4.6	LOS A	1.2	9.1	0.72	0.47	0.72	43.9
5	T1	All MCs	147	10.0	147	10.0	0.233	3.5	LOS A	1.2	9.1	0.71	0.50	0.71	39.0
6	R2	All MCs	41	9.7	41	9.7	0.096	11.5	LOS B	0.4	3.1	0.68	0.77	0.68	41.1
Approach			237	12.0	237	12.0	0.233	5.1	LOS A	1.2	9.1	0.71	0.54	0.71	41.0
North: Te Rapa Rd															
7	L2	All MCs	41	5.6	41	5.6	0.590	8.0	LOS A	5.6	43.0	0.87	0.80	1.07	43.1
8	T1	All MCs	717	12.8	717	12.8	0.590	7.7	LOS A	5.6	43.0	0.87	0.82	1.07	44.8
9	R2	All MCs	183	18.8	183	18.8	0.590	15.4	LOS B	5.1	40.2	0.86	0.87	1.09	27.2
Approach			941	13.6	941	13.6	0.590	9.2	LOS A	5.6	43.0	0.87	0.83	1.08	40.9
West: Te Kowhai E Rd															
10	L2	All MCs	237	9.1	237	9.1	0.777	32.2	LOS C	6.8	51.2	1.00	1.23	1.72	30.2
11	T1	All MCs	233	6.5	233	6.5	0.773	24.8	LOS C	8.4	62.6	1.00	1.25	1.73	23.5
12	R2	All MCs	108	7.8	108	7.8	0.773	31.2	LOS C	8.4	62.6	1.00	1.25	1.73	31.9
Approach			578	7.8	578	7.8	0.777	29.0	LOS C	8.4	62.6	1.00	1.24	1.72	28.5
All Vehicles			3537	9.7	3537	9.7	0.971	14.9	LOS B	28.1	210.5	0.89	1.07	1.43	39.1

7.6 Infrastructure Scenario 1 PM Peak - Exclusive LT on Te Kowhai Rd (Figure 49 in ITA)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	155	5.8	155	5.8	0.516	6.7	LOS A	3.0	22.6	0.75	0.78	0.90	43.7
2	T1	All MCs	799	7.8	799	7.8	0.817	8.0	LOS A	8.9	66.4	0.86	1.00	1.27	44.6
3	R2	All MCs	199	9.4	199	9.4	0.817	15.1	LOS B	8.9	66.4	0.90	1.07	1.41	41.2
Approach			1153	7.8	1153	7.8	0.817	9.0	LOS A	8.9	66.4	0.85	0.98	1.24	44.0
East: Church Rd															
4	L2	All MCs	52	9.6	52	9.6	0.587	7.4	LOS A	4.2	30.5	0.89	0.88	1.10	43.0
5	T1	All MCs	392	4.4	392	4.4	0.587	6.4	LOS A	4.2	30.5	0.88	0.87	1.09	37.5
6	R2	All MCs	102	3.6	102	3.6	0.243	11.9	LOS B	1.2	8.4	0.78	0.84	0.78	40.6
Approach			545	4.7	545	4.7	0.587	7.5	LOS A	4.2	30.5	0.86	0.87	1.03	39.2
North: Te Rapa Rd															
7	L2	All MCs	38	6.5	38	6.5	0.657	7.3	LOS A	6.9	51.3	0.85	0.77	1.04	43.3
8	T1	All MCs	829	7.7	829	7.7	0.657	6.6	LOS A	6.9	51.3	0.85	0.79	1.05	45.0
9	R2	All MCs	365	8.1	365	8.1	0.657	14.0	LOS B	6.5	48.3	0.85	0.85	1.08	27.3
Approach			1233	7.7	1233	7.7	0.657	8.9	LOS A	6.9	51.3	0.85	0.81	1.06	39.2
West: Te Kowhai E Rd															
10	L2	All MCs	212	10.5	212	10.5	0.407	8.9	LOS A	2.4	18.6	0.84	0.84	0.94	42.3
11	T1	All MCs	194	7.5	194	7.5	0.479	6.4	LOS A	3.5	25.9	0.89	0.86	1.01	35.5
12	R2	All MCs	154	3.9	154	3.9	0.479	12.7	LOS B	3.5	25.9	0.89	0.86	1.01	41.0
Approach			559	7.6	559	7.6	0.479	9.1	LOS A	3.5	25.9	0.87	0.85	0.99	40.3
All Vehicles			3489	7.3	3489	7.3	0.817	8.7	LOS A	8.9	66.4	0.86	0.88	1.10	41.1

7.7 Infrastructure Scenario 2 AM Peak - Exclusive LT on Te Kowhai Rd (Figure 49 in ITA)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	289	4.8	289	4.8	0.601	5.0	LOS A	4.4	32.8	0.66	0.59	0.74	44.6
2	T1	All MCs	1114	9.0	1114	9.0	0.951	11.2	LOS B	23.7	177.5	0.91	1.10	1.47	42.9
3	R2	All MCs	366	7.0	366	7.0	0.951	19.4	LOS B	23.7	177.5	1.00	1.28	1.73	38.1
Approach			1769	7.9	1769	7.9	0.951	11.9	LOS B	23.7	177.5	0.89	1.05	1.40	42.3
East: Church Rd															
4	L2	All MCs	57	20.0	57	20.0	0.249	4.8	LOS A	1.3	10.2	0.75	0.51	0.75	43.8
5	T1	All MCs	140	10.0	140	10.0	0.249	3.7	LOS A	1.3	10.2	0.75	0.53	0.75	38.7
6	R2	All MCs	42	9.7	42	9.7	0.103	11.6	LOS B	0.5	3.4	0.71	0.79	0.71	41.0
Approach			239	12.3	239	12.3	0.249	5.3	LOS A	1.3	10.2	0.74	0.57	0.74	40.9
North: Te Rapa Rd															
7	L2	All MCs	41	5.6	41	5.6	0.667	11.2	LOS B	7.4	57.4	0.96	0.95	1.31	40.8
8	T1	All MCs	746	12.8	746	12.8	0.667	11.1	LOS B	7.4	57.4	0.95	0.97	1.32	43.1
9	R2	All MCs	166	18.8	166	18.8	0.667	19.1	LOS B	6.6	52.0	0.94	0.99	1.33	26.2
Approach			954	13.5	954	13.5	0.667	12.5	LOS B	7.4	57.4	0.95	0.97	1.32	39.7
West: Te Kowhai E Rd															
10	L2	All MCs	205	9.1	205	9.1	0.663	23.7	LOS C	5.0	38.0	0.98	1.11	1.43	33.8
11	T1	All MCs	256	6.5	256	6.5	0.918	45.5	LOS D	14.8	109.6	1.00	1.65	2.59	16.6
12	R2	All MCs	154	7.8	154	7.8	0.918	51.9	LOS E	14.8	109.6	1.00	1.65	2.59	25.1
Approach			615	7.7	615	7.7	0.918	39.8	LOS D	14.8	109.6	0.99	1.47	2.20	24.5
All Vehicles			3577	9.7	3577	9.7	0.951	16.4	LOS B	23.7	177.5	0.91	1.07	1.48	38.4

7.8 Infrastructure Scenario 2 PM Peak - Exclusive LT on Te Kowhai Rd (Figure 49 in ITA)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	247	5.8	247	5.8	0.554	6.7	LOS A	3.5	25.5	0.75	0.80	0.92	43.6
2	T1	All MCs	819	7.8	819	7.8	0.876	9.5	LOS A	11.6	86.7	0.91	1.11	1.49	43.7
3	R2	All MCs	202	9.4	202	9.4	0.876	16.9	LOS B	11.6	86.7	0.94	1.19	1.63	40.0
Approach			1268	7.7	1268	7.7	0.876	10.2	LOS B	11.6	86.7	0.88	1.06	1.40	43.2
East: Church Rd															
4	L2	All MCs	118	9.6	118	9.6	0.665	8.7	LOS A	5.1	37.7	0.92	0.99	1.22	42.5
5	T1	All MCs	379	4.4	379	4.4	0.665	7.5	LOS A	5.1	37.7	0.91	0.97	1.19	36.7
6	R2	All MCs	106	3.6	106	3.6	0.275	12.0	LOS B	1.3	9.6	0.79	0.84	0.79	40.7
Approach			603	5.3	603	5.3	0.665	8.5	LOS A	5.1	37.7	0.89	0.95	1.12	39.3
North: Te Rapa Rd															
7	L2	All MCs	38	6.5	38	6.5	0.662	7.3	LOS A	7.0	52.2	0.85	0.78	1.05	43.3
8	T1	All MCs	900	7.7	900	7.7	0.662	6.7	LOS A	7.0	52.2	0.85	0.80	1.06	45.0
9	R2	All MCs	303	8.1	303	8.1	0.662	14.2	LOS B	6.6	49.2	0.86	0.85	1.09	27.4
Approach			1241	7.7	1241	7.7	0.662	8.6	LOS A	7.0	52.2	0.85	0.81	1.07	40.2
West: Te Kowhai E Rd															
10	L2	All MCs	157	10.5	157	10.5	0.334	9.0	LOS A	1.9	14.5	0.85	0.81	0.87	42.3
11	T1	All MCs	169	7.5	169	7.5	0.506	7.6	LOS A	4.0	29.3	0.93	0.89	1.09	34.5
12	R2	All MCs	172	3.9	172	3.9	0.506	13.9	LOS B	4.0	29.3	0.93	0.89	1.09	40.4
Approach			498	7.2	498	7.2	0.506	10.2	LOS B	4.0	29.3	0.90	0.87	1.02	39.7
All Vehicles			3611	7.2	3611	7.2	0.876	9.3	LOS A	11.6	86.7	0.88	0.93	1.19	41.2

7.10 Infrastructure Scenario 3 AM Peak - Exclusive LT on Te Kowhai Rd (Figure 49 in ITA)

Vehicle Movement Performance														
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	272	4.8	272	4.8	0.560	4.5	LOS A	3.8	27.9	0.62	0.53	0.67	44.8
2	T1	All MCs	1031	9.0	1031	9.0	0.886	6.9	LOS A	14.7	110.4	0.83	0.84	1.10	45.0
3	R2	All MCs	359	7.0	359	7.0	0.886	14.0	LOS B	14.7	110.4	0.91	0.95	1.25	41.6
Approach			1661	7.9	1661	7.9	0.886	8.0	LOS A	14.7	110.4	0.81	0.81	1.06	44.4
East: Church Rd															
4	L2	All MCs	52	20.0	52	20.0	0.240	4.7	LOS A	1.2	9.7	0.74	0.49	0.74	43.8
5	T1	All MCs	148	10.0	148	10.0	0.240	3.7	LOS A	1.2	9.7	0.73	0.52	0.73	38.8
6	R2	All MCs	36	9.7	36	9.7	0.099	11.4	LOS B	0.4	3.3	0.70	0.76	0.70	41.4
Approach			236	12.1	236	12.1	0.240	5.1	LOS A	1.2	9.7	0.73	0.55	0.73	40.9
North: Te Rapa Rd															
7	L2	All MCs	39	5.6	39	5.6	0.635	10.1	LOS B	6.6	51.4	0.93	0.90	1.23	41.6
8	T1	All MCs	733	12.8	733	12.8	0.635	9.9	LOS A	6.6	51.4	0.93	0.92	1.24	43.7
9	R2	All MCs	155	18.8	155	18.8	0.635	17.8	LOS B	5.9	46.9	0.92	0.95	1.25	26.5
Approach			926	13.5	926	13.5	0.635	11.3	LOS B	6.6	51.4	0.93	0.92	1.24	40.4
West: Te Kowhai E Rd															
10	L2	All MCs	185	9.1	185	9.1	0.507	15.3	LOS B	3.4	25.4	0.93	0.98	1.17	38.2
11	T1	All MCs	247	6.5	247	6.5	0.765	19.9	LOS B	8.3	61.9	1.00	1.22	1.69	25.8
12	R2	All MCs	153	7.8	153	7.8	0.765	26.3	LOS C	8.3	61.9	1.00	1.22	1.69	33.9
Approach			585	7.7	585	7.7	0.765	20.1	LOS C	8.3	61.9	0.98	1.14	1.53	32.7
All Vehicles			3408	9.7	3408	9.7	0.886	10.8	LOS B	14.7	110.4	0.87	0.88	1.17	41.3

7.11 Infrastructure Scenario 3 PM Peak - Exclusive LT on Te Kowhai Rd (Figure 49 in ITA)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	244	5.8	244	5.8	0.537	6.6	LOS A	3.2	24.0	0.75	0.79	0.90	43.7
2	T1	All MCs	791	7.8	791	7.8	0.849	8.5	LOS A	10.0	75.1	0.89	1.06	1.38	44.3
3	R2	All MCs	188	9.4	188	9.4	0.849	15.6	LOS B	10.0	75.1	0.92	1.12	1.49	40.9
Approach			1223	7.7	1223	7.7	0.849	9.2	LOS A	10.0	75.1	0.86	1.01	1.30	43.8
East: Church Rd															
4	L2	All MCs	86	9.6	86	9.6	0.635	8.0	LOS A	4.8	34.9	0.90	0.95	1.16	42.8
5	T1	All MCs	418	4.4	418	4.4	0.635	6.9	LOS A	4.8	34.9	0.89	0.94	1.13	37.2
6	R2	All MCs	97	3.6	97	3.6	0.263	11.9	LOS B	1.3	9.1	0.78	0.82	0.78	40.9
Approach			601	5.0	601	5.0	0.635	7.8	LOS A	4.8	34.9	0.87	0.92	1.08	39.3
North: Te Rapa Rd															
7	L2	All MCs	27	6.5	27	6.5	0.629	6.8	LOS A	6.2	46.6	0.83	0.74	0.99	43.4
8	T1	All MCs	859	7.7	859	7.7	0.629	6.2	LOS A	6.2	46.6	0.83	0.76	1.00	45.1
9	R2	All MCs	293	8.1	293	8.1	0.629	13.7	LOS B	5.9	44.0	0.84	0.82	1.03	27.6
Approach			1179	7.7	1179	7.7	0.629	8.1	LOS A	6.2	46.6	0.83	0.78	1.01	40.3
West: Te Kowhai E Rd															
10	L2	All MCs	159	10.5	159	10.5	0.320	8.3	LOS A	1.8	13.6	0.83	0.79	0.83	42.8
11	T1	All MCs	179	7.5	179	7.5	0.498	7.0	LOS A	3.9	28.5	0.91	0.87	1.06	34.9
12	R2	All MCs	176	3.9	176	3.9	0.498	13.3	LOS B	3.9	28.5	0.91	0.87	1.06	40.6
Approach			514	7.2	514	7.2	0.498	9.6	LOS A	3.9	28.5	0.88	0.85	0.99	40.0
All Vehicles			3517	7.2	3517	7.2	0.849	8.6	LOS A	10.0	75.1	0.86	0.89	1.12	41.5

7.12 Infrastructure Scenario 4 AM Peak - Exclusive LT on Te Kowhai Rd (Figure 49 in ITA)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	258	4.8	258	4.8	0.491	4.2	LOS A	2.9	21.6	0.59	0.50	0.62	44.9
2	T1	All MCs	861	9.0	861	9.0	0.776	4.8	LOS A	8.8	66.1	0.73	0.70	0.87	45.6
3	R2	All MCs	306	7.0	306	7.0	0.776	11.5	LOS B	8.8	66.1	0.78	0.76	0.95	42.7
Approach			1425	7.8	1425	7.8	0.776	6.1	LOS A	8.8	66.1	0.72	0.67	0.84	45.0
East: Church Rd															
4	L2	All MCs	48	20.0	48	20.0	0.212	4.6	LOS A	1.1	8.2	0.70	0.48	0.70	44.0
5	T1	All MCs	134	10.0	134	10.0	0.212	3.5	LOS A	1.1	8.2	0.70	0.50	0.70	39.1
6	R2	All MCs	37	9.7	37	9.7	0.088	11.2	LOS B	0.4	2.8	0.68	0.76	0.68	41.2
Approach			219	12.2	219	12.2	0.212	5.0	LOS A	1.1	8.2	0.70	0.54	0.70	41.1
North: Te Rapa Rd															
7	L2	All MCs	53	5.6	53	5.6	0.566	7.2	LOS A	5.1	39.1	0.84	0.75	0.99	43.3
8	T1	All MCs	693	12.8	693	12.8	0.566	6.9	LOS A	5.1	39.1	0.84	0.78	1.00	45.0
9	R2	All MCs	191	18.8	191	18.8	0.566	14.5	LOS B	4.7	37.0	0.83	0.83	1.03	27.4
Approach			936	13.6	936	13.6	0.566	8.5	LOS A	5.1	39.1	0.84	0.79	1.01	40.9
West: Te Kowhai E Rd															
10	L2	All MCs	191	9.1	191	9.1	0.395	9.9	LOS A	2.4	17.8	0.86	0.86	0.96	41.5
11	T1	All MCs	231	6.5	231	6.5	0.512	8.1	LOS A	4.0	29.5	0.92	0.90	1.11	34.9
12	R2	All MCs	115	7.8	115	7.8	0.512	14.5	LOS B	4.0	29.5	0.92	0.90	1.11	40.7
Approach			536	7.7	536	7.7	0.512	10.1	LOS B	4.0	29.5	0.90	0.89	1.06	39.3
All Vehicles			3116	9.8	3116	9.8	0.776	7.4	LOS A	8.8	66.1	0.78	0.74	0.92	42.7

7.13 Infrastructure Scenario 4 PM Peak - Exclusive LT on Te Kowhai Rd (Figure 49 in ITA)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Te Rapa Rd															
1	L2	All MCs	149	5.8	149	5.8	0.474	6.0	LOS A	2.6	19.5	0.70	0.70	0.81	44.1
2	T1	All MCs	801	7.8	801	7.8	0.749	6.3	LOS A	7.0	52.1	0.80	0.87	1.07	45.4
3	R2	All MCs	163	9.4	163	9.4	0.749	13.1	LOS B	7.0	52.1	0.84	0.93	1.16	42.6
Approach			1114	7.8	1114	7.8	0.749	7.3	LOS A	7.0	52.1	0.79	0.86	1.05	45.0
East: Church Rd															
4	L2	All MCs	73	9.6	73	9.6	0.483	5.6	LOS A	3.0	22.1	0.78	0.64	0.89	43.6
5	T1	All MCs	356	4.4	356	4.4	0.483	4.6	LOS A	3.0	22.1	0.78	0.65	0.89	38.7
6	R2	All MCs	111	3.6	111	3.6	0.200	11.3	LOS B	0.9	6.4	0.70	0.81	0.70	40.7
Approach			539	4.9	539	4.9	0.483	6.1	LOS A	3.0	22.1	0.76	0.68	0.85	40.3
North: Te Rapa Rd															
7	L2	All MCs	37	6.5	37	6.5	0.484	4.6	LOS A	3.5	26.1	0.70	0.47	0.72	44.1
8	T1	All MCs	613	7.7	613	7.7	0.484	3.8	LOS A	3.5	26.1	0.71	0.51	0.72	45.8
9	R2	All MCs	314	8.1	314	8.1	0.484	11.0	LOS B	3.4	25.5	0.71	0.69	0.75	28.0
Approach			963	7.7	963	7.7	0.484	6.2	LOS A	3.5	26.1	0.71	0.57	0.73	39.4
West: Te Kowhai E Rd															
10	L2	All MCs	215	10.5	215	10.5	0.391	8.5	LOS A	2.3	17.4	0.82	0.82	0.90	42.6
11	T1	All MCs	168	7.5	168	7.5	0.420	5.6	LOS A	2.9	21.0	0.85	0.78	0.92	35.9
12	R2	All MCs	151	3.9	151	3.9	0.420	11.9	LOS B	2.9	21.0	0.85	0.78	0.92	41.3
Approach			534	7.7	534	7.7	0.420	8.5	LOS A	2.9	21.0	0.84	0.80	0.91	40.8
All Vehicles			3149	7.3	3149	7.3	0.749	7.0	LOS A	7.0	52.1	0.77	0.73	0.90	41.8

8. Te Rapa Rd / The Base Parade / Eagle Way Signalised Intersection

8.1 Baseline AM Peak – Existing Phase Sequence

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 118 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	256	0.4	256	0.4	* 0.244	13.4	LOS B	4.9	34.4	0.54	0.71	0.54	41.7
2	T1	All MCs	1237	7.7	1237	7.7	* 0.827	37.7	LOS D	33.7	251.2	0.97	0.91	1.02	36.5
3	R2	All MCs	152	4.4	152	4.4	0.655	60.8	LOS E	8.7	63.0	1.00	0.83	1.04	29.0
Approach			1644	6.2	1644	6.2	0.827	36.0	LOS D	33.7	251.2	0.90	0.87	0.95	36.0
NorthEast: Eagle Way															
4	L2	All MCs	100	16.4	100	16.4	0.111	9.0	LOS A	1.5	12.3	0.34	0.60	0.34	43.4
5	T1	All MCs	26	0.0	26	0.0	0.075	43.5	LOS D	1.3	8.8	0.86	0.63	0.86	25.6
6	R2	All MCs	33	27.3	33	27.3	* 0.117	49.1	LOS D	1.6	13.8	0.87	0.71	0.87	29.4
Approach			159	15.9	159	15.9	0.117	22.9	LOS C	1.6	13.8	0.54	0.63	0.54	36.7
NorthWest: Te Rapa Rd															
7	L2	All MCs	111	6.2	111	6.2	0.076	10.0	LOS B	0.5	3.5	0.14	0.58	0.14	52.4
8	T1	All MCs	746	14.5	746	14.5	0.641	38.0	LOS D	18.7	147.0	0.91	0.79	0.91	37.0
9	R2	All MCs	48	0.0	48	0.0	* 0.435	67.0	LOS E	2.9	20.1	1.00	0.74	1.00	20.8
Approach			905	12.7	905	12.7	0.641	36.2	LOS D	18.7	147.0	0.82	0.76	0.82	36.7
SouthWest: The Base Parade															
10	L2	All MCs	142	0.0	142	0.0	0.209	13.0	LOS B	4.7	32.8	0.59	0.66	0.59	35.5
11	T1	All MCs	27	0.0	27	0.0	0.209	35.5	LOS D	4.7	32.8	0.59	0.66	0.59	36.6
12	R2	All MCs	94	1.1	94	1.1	0.158	50.9	LOS D	2.3	16.6	0.90	0.73	0.90	22.6
Approach			263	0.4	263	0.4	0.209	28.8	LOS C	4.7	32.8	0.70	0.69	0.70	29.7
All Vehicles			2972	8.2	2972	8.2	0.827	34.7	LOS C	33.7	251.2	0.84	0.81	0.87	35.8

8.2 Baseline PM Peak – Existing Phase Sequence

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 116 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	439	0.8	439	0.8	0.447	15.3	LOS B	9.4	66.3	0.66	0.76	0.66	40.2
2	T1	All MCs	803	9.0	803	9.0	0.695	38.0	LOS D	20.0	151.2	0.94	0.82	0.94	36.3
3	R2	All MCs	235	10.8	235	10.8	* 0.920	75.4	LOS E	15.8	121.2	1.00	1.05	1.39	25.9
Approach			1477	6.9	1477	6.9	0.920	37.2	LOS D	20.0	151.2	0.87	0.84	0.93	34.5
NorthEast: Eagle Way															
4	L2	All MCs	392	3.1	392	3.1	0.462	23.7	LOS C	13.1	93.8	0.70	0.76	0.70	38.0
5	T1	All MCs	86	0.0	86	0.0	0.242	47.0	LOS D	4.2	29.6	0.90	0.70	0.90	25.4
6	R2	All MCs	118	16.7	118	16.7	* 0.388	50.6	LOS D	6.0	48.0	0.93	0.78	0.93	29.1
Approach			596	5.3	596	5.3	0.462	32.4	LOS C	13.1	93.8	0.77	0.75	0.77	33.4
NorthWest: Te Rapa Rd															
7	L2	All MCs	182	5.5	182	5.5	0.160	16.7	LOS B	2.9	21.6	0.35	0.65	0.35	49.7
8	T1	All MCs	788	7.3	788	7.3	* 0.888	60.0	LOS E	26.3	195.4	1.00	1.05	1.23	30.4
9	R2	All MCs	111	0.0	111	0.0	0.683	64.8	LOS E	6.5	45.4	1.00	0.84	1.09	21.2
Approach			1081	6.3	1081	6.3	0.888	53.2	LOS D	26.3	195.4	0.89	0.96	1.07	30.7
SouthWest: The Base Parade															
10	L2	All MCs	274	0.8	274	0.8	0.741	16.1	LOS B	17.1	122.4	0.94	0.97	0.94	28.1
11	T1	All MCs	211	5.0	211	5.0	* 0.741	55.1	LOS E	17.1	122.4	0.94	0.97	0.94	28.9
12	R2	All MCs	700	0.2	700	0.2	0.875	61.9	LOS E	21.8	153.0	1.00	1.00	1.22	20.2
Approach			1184	1.2	1184	1.2	0.875	50.1	LOS D	21.8	153.0	0.97	0.99	1.10	23.0
All Vehicles			4338	5.0	4338	5.0	0.920	44.1	LOS D	26.3	195.4	0.89	0.90	0.99	30.2

8.3 Infrastructure Scenario 1 AM Peak – Existing Phase Sequence

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	286	0.4	286	0.4	* 0.237	26.1	LOS C	5.7	40.3	0.44	0.68	0.44	42.8
2	T1	All MCs	1786	7.7	1786	7.7	* 1.037	122.2	LOS F	93.5	697.1	1.00	1.35	1.44	21.2
3	R2	All MCs	180	4.4	180	4.4	0.674	89.9	LOS F	12.8	92.7	1.00	0.83	1.02	26.5
Approach			2253	6.5	2253	6.5	1.037	107.4	LOS F	93.5	697.1	0.93	1.22	1.28	20.4
NorthEast: Eagle Way															
4	L2	All MCs	101	16.4	101	16.4	0.127	12.0	LOS B	2.3	18.6	0.38	0.62	0.38	41.9
5	T1	All MCs	27	0.0	27	0.0	0.095	59.5	LOS E	1.7	12.1	0.90	0.66	0.90	21.7
6	R2	All MCs	35	27.3	35	27.3	* 0.151	65.5	LOS E	2.2	19.4	0.91	0.72	0.91	26.0
Approach			163	15.9	163	15.9	0.151	31.4	LOS C	2.3	19.4	0.58	0.65	0.58	33.6
NorthWest: Te Rapa Rd															
7	L2	All MCs	127	6.2	127	6.2	0.089	20.8	LOS C	0.9	6.6	0.15	0.59	0.15	52.2
8	T1	All MCs	937	14.5	937	14.5	0.680	47.4	LOS D	29.3	230.5	0.88	0.78	0.88	36.0
9	R2	All MCs	56	0.0	56	0.0	* 0.637	90.2	LOS F	4.3	30.1	1.00	0.80	1.08	17.5
Approach			1120	12.9	1120	12.9	0.680	46.5	LOS D	29.3	230.5	0.80	0.76	0.81	33.0
SouthWest: The Base Parade															
10	L2	All MCs	149	0.0	149	0.0	0.335	40.2	LOS D	10.4	72.5	0.84	0.84	0.84	24.3
11	T1	All MCs	27	0.0	27	0.0	0.335	72.9	LOS E	10.4	72.5	0.84	0.84	0.84	25.0
12	R2	All MCs	108	1.1	108	1.1	0.210	66.5	LOS E	3.5	25.1	0.92	0.74	0.92	19.4
Approach			285	0.4	285	0.4	0.335	53.3	LOS D	10.4	72.5	0.87	0.81	0.87	22.3
All Vehicles			3821	8.3	3821	8.3	1.037	82.3	LOS F	93.5	697.1	0.87	1.03	1.08	23.7

8.4 Infrastructure Scenario 1 PM Peak – Existing Phase Sequence

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 123 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	471	0.8	471	0.8	0.450	14.7	LOS B	10.3	72.6	0.63	0.75	0.63	40.7
2	T1	All MCs	969	9.0	969	9.0	0.745	37.8	LOS D	25.6	192.7	0.94	0.83	0.94	36.4
3	R2	All MCs	245	10.8	245	10.8	* 1.019	116.3	LOS F	21.3	163.0	1.00	1.20	1.69	20.0
Approach			1685	7.0	1685	7.0	1.019	42.8	LOS D	25.6	192.7	0.86	0.87	0.96	32.6
NorthEast: Eagle Way															
4	L2	All MCs	415	3.1	415	3.1	0.557	40.5	LOS D	17.6	126.6	0.82	0.80	0.82	34.7
5	T1	All MCs	87	0.0	87	0.0	0.260	58.7	LOS E	4.6	32.1	0.91	0.71	0.91	24.3
6	R2	All MCs	119	16.7	119	16.7	* 0.415	54.6	LOS D	6.5	52.0	0.94	0.78	0.94	28.2
Approach			621	5.2	621	5.2	0.557	45.7	LOS D	17.6	126.6	0.85	0.78	0.85	29.5
NorthWest: Te Rapa Rd															
7	L2	All MCs	157	5.5	157	5.5	0.137	28.3	LOS C	2.8	20.2	0.36	0.65	0.36	49.3
8	T1	All MCs	1017	7.3	1017	7.3	* 1.023	117.5	LOS F	47.7	354.9	1.00	1.41	1.59	21.3
9	R2	All MCs	108	0.0	108	0.0	0.790	77.8	LOS E	7.0	49.0	1.00	0.90	1.22	19.8
Approach			1282	6.5	1282	6.5	1.023	103.2	LOS F	47.7	354.9	0.92	1.27	1.41	21.2
SouthWest: The Base Parade															
10	L2	All MCs	302	0.8	302	0.8	0.830	28.5	LOS C	23.2	166.0	0.98	1.13	1.06	25.1
11	T1	All MCs	214	5.0	214	5.0	* 0.830	71.5	LOS E	23.2	166.0	0.98	1.13	1.06	25.9
12	R2	All MCs	747	0.2	747	0.2	0.992	99.1	LOS F	32.2	225.3	1.00	1.22	1.52	15.2
Approach			1263	1.1	1263	1.1	0.992	77.6	LOS E	32.2	225.3	0.99	1.18	1.33	17.8
All Vehicles			4852	5.1	4852	5.1	1.023	68.2	LOS E	47.7	354.9	0.91	1.04	1.16	24.4

8.5 Infrastructure Scenario 1 AM Peak – Signal Phase Re-optimised

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	286	0.4	286	0.4	0.221	18.9	LOS B	7.4	51.8	0.39	0.67	0.39	41.0
2	T1	All MCs	1786	7.7	1786	7.7	* 0.835	30.4	LOS C	51.4	383.2	0.86	0.79	0.86	42.4
3	R2	All MCs	180	4.4	180	4.4	* 0.674	50.6	LOS D	8.3	60.4	1.00	0.82	1.01	34.0
Approach			2253	6.5	2253	6.5	0.835	30.5	LOS C	51.4	383.2	0.81	0.78	0.81	38.5
NorthEast: Eagle Way															
4	L2	All MCs	101	16.4	101	16.4	0.091	10.8	LOS B	2.1	16.5	0.35	0.60	0.35	42.5
5	T1	All MCs	27	0.0	27	0.0	0.095	59.5	LOS E	1.7	12.1	0.90	0.66	0.90	21.7
6	R2	All MCs	35	27.3	35	27.3	0.553	87.5	LOS F	2.7	23.5	1.00	0.76	1.05	22.4
Approach			163	15.9	163	15.9	0.553	35.3	LOS D	2.7	23.5	0.58	0.64	0.59	32.3
NorthWest: Te Rapa Rd															
7	L2	All MCs	127	6.2	127	6.2	0.115	24.5	LOS C	3.3	24.3	0.41	0.66	0.41	46.5
8	T1	All MCs	937	14.5	937	14.5	0.584	35.6	LOS D	25.9	204.0	0.79	0.70	0.79	39.2
9	R2	All MCs	56	0.0	56	0.0	0.743	89.9	LOS F	4.4	30.9	1.00	0.84	1.20	17.1
Approach			1120	12.9	1120	12.9	0.743	37.1	LOS D	25.9	204.0	0.76	0.70	0.77	36.3
SouthWest: The Base Parade															
10	L2	All MCs	149	0.0	149	0.0	0.271	21.2	LOS C	7.7	54.1	0.68	0.71	0.68	30.6
11	T1	All MCs	27	0.0	27	0.0	* 0.271	55.6	LOS E	7.7	54.1	0.68	0.71	0.68	31.5
12	R2	All MCs	108	1.1	108	1.1	* 0.736	88.7	LOS F	4.3	30.4	1.00	0.85	1.19	16.1
Approach			285	0.4	285	0.4	0.736	50.2	LOS D	7.7	54.1	0.80	0.76	0.87	23.0
All Vehicles			3821	8.3	3821	8.3	0.835	34.1	LOS C	51.4	383.2	0.79	0.75	0.80	36.3

8.6 Infrastructure Scenario 1 PM Peak – Signal Phase Re-optimised

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 138 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	471	0.8	471	0.8	0.458	17.4	LOS B	13.5	94.8	0.64	0.76	0.64	38.7
2	T1	All MCs	969	9.0	969	9.0	0.799	47.5	LOS D	30.5	230.1	0.98	0.89	1.01	33.1
3	R2	All MCs	245	10.8	245	10.8	* 0.972	100.8	LOS F	21.1	161.5	1.00	1.10	1.47	21.9
Approach			1685	7.0	1685	7.0	0.972	46.8	LOS D	30.5	230.1	0.89	0.89	0.98	31.3
NorthEast: Eagle Way															
4	L2	All MCs	415	3.1	415	3.1	0.545	53.2	LOS D	18.5	132.9	0.81	0.94	0.81	32.5
5	T1	All MCs	87	0.0	87	0.0	* 0.306	73.8	LOS E	5.3	37.3	0.94	0.73	0.94	22.1
6	R2	All MCs	119	16.7	119	16.7	0.890	85.6	LOS F	9.1	72.7	1.00	1.02	1.37	22.7
Approach			621	5.2	621	5.2	0.890	62.3	LOS E	18.5	132.9	0.86	0.92	0.93	25.8
NorthWest: Te Rapa Rd															
7	L2	All MCs	157	5.5	157	5.5	0.144	31.9	LOS C	3.0	22.1	0.35	0.65	0.35	49.1
8	T1	All MCs	1017	7.3	1017	7.3	* 0.952	90.7	LOS F	44.1	328.3	1.00	1.16	1.29	26.0
9	R2	All MCs	108	0.0	108	0.0	0.664	51.3	LOS D	4.3	30.0	1.00	0.80	1.06	27.1
Approach			1282	6.5	1282	6.5	0.952	80.2	LOS F	44.1	328.3	0.92	1.07	1.16	24.8
SouthWest: The Base Parade															
10	L2	All MCs	302	0.8	302	0.8	0.726	39.2	LOS D	22.5	160.8	0.90	1.15	0.90	26.0
11	T1	All MCs	214	5.0	214	5.0	0.726	64.0	LOS E	22.5	160.8	0.90	1.15	0.90	26.7
12	R2	All MCs	747	0.2	747	0.2	* 0.965	96.5	LOS F	34.0	238.6	1.00	1.16	1.38	15.8
Approach			1263	1.1	1263	1.1	0.965	77.3	LOS E	34.0	238.6	0.96	1.16	1.18	17.9
All Vehicles			4852	5.1	4852	5.1	0.972	65.6	LOS E	44.1	328.3	0.91	1.01	1.07	25.0

8.7 Infrastructure Scenario 2 AM Peak – Signal Phase Re-optimised

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	253	0.4	253	0.4	0.195	18.7	LOS B	6.4	44.7	0.38	0.67	0.38	41.1
2	T1	All MCs	1777	7.7	1777	7.7	* 0.826	29.8	LOS C	50.2	374.3	0.85	0.78	0.85	42.5
3	R2	All MCs	187	4.4	187	4.4	* 0.735	52.4	LOS D	9.0	65.6	1.00	0.84	1.06	33.3
Approach			2217	6.6	2217	6.6	0.826	30.5	LOS C	50.2	374.3	0.81	0.78	0.82	38.6
NorthEast: Eagle Way															
4	L2	All MCs	108	16.4	108	16.4	0.101	12.1	LOS B	2.5	19.6	0.38	0.61	0.38	41.9
5	T1	All MCs	27	0.0	27	0.0	0.095	59.5	LOS E	1.7	12.1	0.90	0.66	0.90	21.7
6	R2	All MCs	34	27.3	34	27.3	0.536	87.4	LOS F	2.6	22.7	1.00	0.76	1.04	22.5
Approach			169	15.9	169	15.9	0.536	34.7	LOS C	2.6	22.7	0.59	0.65	0.59	32.5
NorthWest: Te Rapa Rd															
7	L2	All MCs	126	6.2	126	6.2	0.114	26.9	LOS C	3.3	24.1	0.41	0.66	0.41	46.5
8	T1	All MCs	1032	14.5	1032	14.5	0.639	38.9	LOS D	29.4	231.5	0.81	0.73	0.81	38.9
9	R2	All MCs	45	0.0	45	0.0	0.603	90.9	LOS F	3.5	24.6	1.00	0.78	1.07	17.4
Approach			1203	13.1	1203	13.1	0.639	39.6	LOS D	29.4	231.5	0.78	0.72	0.78	35.5
SouthWest: The Base Parade															
10	L2	All MCs	145	0.0	145	0.0	0.264	19.9	LOS B	7.3	51.3	0.67	0.71	0.67	31.1
11	T1	All MCs	27	0.0	27	0.0	* 0.264	54.2	LOS D	7.3	51.3	0.67	0.71	0.67	32.1
12	R2	All MCs	106	1.1	106	1.1	* 0.721	88.4	LOS F	4.2	29.7	1.00	0.84	1.17	16.2
Approach			279	0.4	279	0.4	0.721	49.4	LOS D	7.3	51.3	0.79	0.76	0.86	23.2
All Vehicles			3868	8.6	3868	8.6	0.826	34.9	LOS C	50.2	374.3	0.79	0.75	0.80	36.1

8.8 Infrastructure Scenario 2 PM Peak – Signal Phase Re-optimised

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 146 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	441	0.8	441	0.8	0.383	13.7	LOS B	9.9	69.9	0.54	0.72	0.54	41.5
2	T1	All MCs	1107	9.0	1107	9.0	0.739	39.7	LOS D	33.3	250.9	0.92	0.82	0.92	35.8
3	R2	All MCs	237	10.8	237	10.8	* 0.993	115.0	LOS F	22.3	170.6	1.00	1.12	1.51	20.2
Approach			1785	7.2	1785	7.2	0.993	43.3	LOS D	33.3	250.9	0.83	0.84	0.90	32.7
NorthEast: Eagle Way															
4	L2	All MCs	395	3.1	395	3.1	0.537	50.2	LOS D	19.8	142.5	0.81	0.80	0.81	33.0
5	T1	All MCs	86	0.0	86	0.0	0.291	74.8	LOS E	5.5	38.5	0.93	0.73	0.93	21.6
6	R2	All MCs	118	16.7	118	16.7	* 0.933	96.8	LOS F	9.9	79.4	1.00	1.07	1.45	21.2
Approach			599	5.3	599	5.3	0.933	62.9	LOS E	19.8	142.5	0.87	0.84	0.95	25.7
NorthWest: Te Rapa Rd															
7	L2	All MCs	211	5.5	211	5.5	0.201	38.8	LOS D	5.6	40.7	0.43	0.68	0.43	47.0
8	T1	All MCs	1118	7.3	1118	7.3	* 1.007	122.6	LOS F	58.7	436.7	1.00	1.31	1.42	21.7
9	R2	All MCs	108	0.0	108	0.0	0.844	102.8	LOS F	8.4	58.9	1.00	0.93	1.27	17.5
Approach			1437	6.5	1437	6.5	1.007	108.8	LOS F	58.7	436.7	0.92	1.19	1.27	20.6
SouthWest: The Base Parade															
10	L2	All MCs	279	0.8	279	0.8	0.856	50.8	LOS D	32.2	230.8	0.99	1.11	1.07	22.3
11	T1	All MCs	257	5.0	257	5.0	* 0.856	92.1	LOS F	32.2	230.8	0.99	1.11	1.07	23.0
12	R2	All MCs	644	0.2	644	0.2	1.014	91.3	LOS F	25.2	176.9	1.00	1.27	1.53	12.7
Approach			1180	1.4	1180	1.4	1.014	81.9	LOS F	32.2	230.8	0.99	1.20	1.32	14.7
All Vehicles			5001	5.4	5001	5.4	1.014	73.6	LOS E	58.7	436.7	0.90	1.02	1.11	22.8

8.10 Infrastructure Scenario 3 AM Peak – Signal Phase Re-optimised

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	268	0.4	268	0.4	0.207	16.7	LOS B	6.8	48.0	0.38	0.67	0.38	41.1
2	T1	All MCs	1671	7.7	1671	7.7	* 0.763	25.8	LOS C	43.5	324.2	0.79	0.73	0.79	43.5
3	R2	All MCs	201	4.4	201	4.4	* 0.753	49.9	LOS D	9.7	70.5	1.00	0.85	1.07	33.3
Approach			2140	6.4	2140	6.4	0.763	26.9	LOS C	43.5	324.2	0.76	0.73	0.77	40.2
NorthEast: Eagle Way															
4	L2	All MCs	113	16.4	113	16.4	0.104	11.8	LOS B	2.5	20.0	0.37	0.61	0.37	42.0
5	T1	All MCs	27	0.0	27	0.0	0.095	59.5	LOS E	1.7	12.1	0.90	0.66	0.90	21.7
6	R2	All MCs	34	27.3	34	27.3	0.536	87.4	LOS F	2.6	22.7	1.00	0.76	1.04	22.5
Approach			174	15.9	174	15.9	0.536	34.0	LOS C	2.6	22.7	0.58	0.65	0.58	32.8
NorthWest: Te Rapa Rd															
7	L2	All MCs	126	6.2	126	6.2	0.115	27.0	LOS C	3.3	24.5	0.42	0.66	0.42	46.3
8	T1	All MCs	1005	14.5	1005	14.5	0.631	38.9	LOS D	28.7	226.0	0.81	0.73	0.81	38.7
9	R2	All MCs	51	0.0	51	0.0	0.673	91.1	LOS F	4.0	27.7	1.00	0.81	1.13	17.3
Approach			1182	13.0	1182	13.0	0.673	39.8	LOS D	28.7	226.0	0.78	0.72	0.79	35.4
SouthWest: The Base Parade															
10	L2	All MCs	144	0.0	144	0.0	0.251	15.4	LOS B	6.4	44.9	0.62	0.69	0.62	33.3
11	T1	All MCs	27	0.0	27	0.0	* 0.251	49.1	LOS D	6.4	44.9	0.62	0.69	0.62	34.3
12	R2	All MCs	105	1.1	105	1.1	* 0.714	88.3	LOS F	4.2	29.4	1.00	0.83	1.17	16.2
Approach			277	0.4	277	0.4	0.714	46.4	LOS D	6.4	44.9	0.76	0.74	0.83	23.9
All Vehicles			3773	8.5	3773	8.5	0.763	32.7	LOS C	43.5	324.2	0.76	0.73	0.77	36.9

8.11 Infrastructure Scenario 3 PM Peak – Signal Phase Re-optimised

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 142 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	442	0.8	442	0.8	0.396	14.2	LOS B	10.1	71.3	0.56	0.73	0.56	41.0
2	T1	All MCs	1056	9.0	1056	9.0	0.732	39.7	LOS D	31.0	233.7	0.92	0.82	0.92	35.7
3	R2	All MCs	240	10.8	240	10.8	* 0.978	105.7	LOS F	21.4	164.0	1.00	1.10	1.48	21.2
Approach			1738	7.2	1738	7.2	0.978	42.3	LOS D	31.0	233.7	0.84	0.84	0.91	33.0
NorthEast: Eagle Way															
4	L2	All MCs	408	3.1	408	3.1	0.526	44.7	LOS D	19.2	138.0	0.79	0.79	0.79	34.0
5	T1	All MCs	86	0.0	86	0.0	0.283	70.5	LOS E	5.3	37.3	0.93	0.73	0.93	22.1
6	R2	All MCs	118	16.7	118	16.7	0.907	90.2	LOS F	9.4	75.2	1.00	1.04	1.40	22.1
Approach			613	5.2	613	5.2	0.907	57.1	LOS E	19.2	138.0	0.85	0.83	0.92	26.9
NorthWest: Te Rapa Rd															
7	L2	All MCs	212	5.5	212	5.5	0.203	35.7	LOS D	5.5	40.0	0.43	0.68	0.43	47.1
8	T1	All MCs	1047	7.3	1047	7.3	* 0.974	102.3	LOS F	50.1	372.8	1.00	1.21	1.34	24.3
9	R2	All MCs	108	0.0	108	0.0	0.746	91.9	LOS F	7.9	55.0	1.00	0.87	1.14	18.6
Approach			1367	6.5	1367	6.5	0.974	91.2	LOS F	50.1	372.8	0.91	1.10	1.18	23.0
SouthWest: The Base Parade															
10	L2	All MCs	285	0.8	285	0.8	0.854	48.4	LOS D	31.5	226.0	0.98	1.11	1.07	22.7
11	T1	All MCs	258	5.0	258	5.0	* 0.854	89.6	LOS F	31.5	226.0	0.98	1.11	1.07	23.4
12	R2	All MCs	639	0.2	639	0.2	* 1.019	97.9	LOS F	21.0	147.1	1.00	1.31	1.56	12.7
Approach			1182	1.4	1182	1.4	1.019	84.1	LOS F	31.5	226.0	0.99	1.22	1.33	14.8
All Vehicles			4900	5.3	4900	5.3	1.019	67.9	LOS E	50.1	372.8	0.90	1.00	1.09	23.9

8.12 Infrastructure Scenario 4 AM Peak – Signal Phase Re-optimised

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	274	0.4	274	0.4	0.237	16.5	LOS B	7.0	49.5	0.48	0.70	0.48	39.3
2	T1	All MCs	1431	7.7	1431	7.7	* 0.738	24.1	LOS C	32.3	241.2	0.84	0.77	0.84	42.5
3	R2	All MCs	185	4.4	185	4.4	0.643	58.0	LOS E	10.4	75.8	0.99	0.82	1.00	29.7
Approach			1889	6.3	1889	6.3	0.738	26.3	LOS C	32.3	241.2	0.81	0.76	0.81	40.3
NorthEast: Eagle Way															
4	L2	All MCs	106	16.4	106	16.4	0.098	10.1	LOS B	1.8	14.7	0.37	0.61	0.37	42.9
5	T1	All MCs	27	0.0	27	0.0	0.076	43.6	LOS D	1.3	9.3	0.86	0.63	0.86	25.5
6	R2	All MCs	36	27.3	36	27.3	0.456	69.5	LOS E	2.2	19.1	1.00	0.74	1.00	25.2
Approach			169	16.0	169	16.0	0.456	28.0	LOS C	2.2	19.1	0.58	0.64	0.58	34.8
NorthWest: Te Rapa Rd															
7	L2	All MCs	140	6.2	140	6.2	0.102	12.1	LOS B	0.8	6.2	0.17	0.59	0.17	52.2
8	T1	All MCs	891	14.5	891	14.5	0.628	33.0	LOS C	21.4	168.4	0.85	0.75	0.85	39.5
9	R2	All MCs	67	0.0	67	0.0	* 0.718	72.2	LOS E	4.3	29.9	1.00	0.84	1.18	19.8
Approach			1098	12.6	1098	12.6	0.718	32.7	LOS C	21.4	168.4	0.77	0.74	0.79	38.0
SouthWest: The Base Parade															
10	L2	All MCs	145	0.0	145	0.0	0.225	14.5	LOS B	5.4	37.8	0.59	0.67	0.59	34.5
11	T1	All MCs	27	0.0	27	0.0	* 0.225	38.1	LOS D	5.4	37.8	0.59	0.67	0.59	35.6
12	R2	All MCs	108	1.1	108	1.1	* 0.588	69.5	LOS E	3.4	23.8	1.00	0.78	1.06	18.9
Approach			281	0.4	281	0.4	0.588	38.0	LOS D	5.4	37.8	0.75	0.71	0.77	26.3
All Vehicles			3438	8.3	3438	8.3	0.738	29.4	LOS C	32.3	241.2	0.78	0.75	0.79	38.1

8.13 Infrastructure Scenario 4 PM Peak – Signal Phase Re-optimised

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 114 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Te Rapa Rd															
1	L2	All MCs	457	0.8	457	0.8	0.417	19.2	LOS B	13.6	96.2	0.59	0.75	0.59	37.5
2	T1	All MCs	909	9.0	909	9.0	0.753	38.0	LOS D	23.0	173.8	0.96	0.86	0.98	36.3
3	R2	All MCs	244	10.8	244	10.8	* 0.888	68.7	LOS E	15.5	118.6	1.00	1.01	1.31	27.2
Approach			1611	7.0	1611	7.0	0.888	37.3	LOS D	23.0	173.8	0.86	0.85	0.92	34.5
NorthEast: Eagle Way															
4	L2	All MCs	452	3.1	452	3.1	0.495	29.0	LOS C	15.1	108.1	0.71	0.80	0.71	37.4
5	T1	All MCs	86	0.0	86	0.0	* 0.263	51.8	LOS D	4.2	29.7	0.91	0.71	0.91	25.1
6	R2	All MCs	138	16.7	138	16.7	0.781	64.1	LOS E	8.2	65.5	1.00	0.93	1.19	26.3
Approach			676	5.4	676	5.4	0.781	39.1	LOS D	15.1	108.1	0.80	0.82	0.84	31.4
NorthWest: Te Rapa Rd															
7	L2	All MCs	165	5.5	165	5.5	0.153	16.0	LOS B	2.5	18.5	0.35	0.65	0.35	49.9
8	T1	All MCs	788	7.3	788	7.3	* 0.861	55.3	LOS E	24.5	182.5	1.00	1.01	1.18	31.7
9	R2	All MCs	127	0.0	127	0.0	0.774	65.9	LOS E	7.6	52.9	1.00	0.90	1.19	21.0
Approach			1081	6.2	1081	6.2	0.861	50.5	LOS D	24.5	182.5	0.90	0.94	1.05	31.4
SouthWest: The Base Parade															
10	L2	All MCs	297	0.8	297	0.8	0.670	22.6	LOS C	17.6	125.8	0.87	0.96	0.87	29.0
11	T1	All MCs	213	5.0	213	5.0	0.670	50.2	LOS D	17.6	125.8	0.87	0.96	0.87	29.8
12	R2	All MCs	698	0.2	698	0.2	* 0.893	65.7	LOS E	22.0	154.4	1.00	1.03	1.26	19.8
Approach			1207	1.2	1207	1.2	0.893	52.4	LOS D	22.0	154.4	0.94	1.00	1.10	22.5
All Vehicles			4575	5.0	4575	5.0	0.893	44.7	LOS D	24.5	182.5	0.88	0.91	0.98	30.1

9. East – West Rd / Structure Plan Spine Rd Intersection

9.1 Infrastructure Scenario 2 AM Peak – Give-way Controlled (Figure 53 in the ITA)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Central Spine Rd															
2	T1	All MCs	286	7.0	286	7.0	0.152	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
3	R2	All MCs	21	8.0	21	8.0	0.016	3.7	LOS A	0.1	0.5	0.17	0.43	0.17	37.2
Approach			307	7.1	307	7.1	0.152	0.3	NA	0.1	0.5	0.01	0.03	0.01	39.8
East: NRC															
4	L2	All MCs	27	6.0	27	6.0	0.022	5.8	LOS A	0.1	0.6	0.12	0.54	0.12	50.2
6	R2	All MCs	19	19.0	19	19.0	0.034	9.5	LOS A	0.1	1.0	0.49	0.67	0.49	46.9
Approach			46	11.3	46	11.3	0.034	7.3	LOS A	0.1	1.0	0.27	0.59	0.27	48.8
North: Central Spine Rd															
7	L2	All MCs	26	20.0	26	20.0	0.016	3.5	LOS A	0.0	0.0	0.00	0.45	0.00	37.5
8	T1	All MCs	46	10.0	46	10.0	0.025	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach			73	13.6	73	13.6	0.025	1.3	NA	0.0	0.0	0.00	0.16	0.00	39.2
All Vehicles			426	8.6	426	8.6	0.152	1.2	NA	0.1	1.0	0.04	0.11	0.04	40.3

9.2 Infrastructure Scenario 2 PM Peak – Give-way Controlled (Figure 53 in the ITA)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Central Spine Rd															
2	T1	All MCs	107	8.0	107	8.0	0.057	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
3	R2	All MCs	19	9.0	19	9.0	0.019	4.8	LOS A	0.1	0.5	0.38	0.50	0.38	36.8
Approach			126	8.2	126	8.2	0.057	0.7	NA	0.1	0.5	0.06	0.08	0.06	39.6
East: NRC															
4	L2	All MCs	36	6.0	36	6.0	0.036	6.8	LOS A	0.1	0.9	0.34	0.59	0.34	49.4
6	R2	All MCs	13	8.0	13	8.0	0.021	9.1	LOS A	0.1	0.6	0.49	0.65	0.49	47.6
Approach			48	6.5	48	6.5	0.036	7.4	LOS A	0.1	0.9	0.38	0.61	0.38	48.9
North: Central Spine Rd															
7	L2	All MCs	32	10.0	32	10.0	0.026	3.5	LOS A	0.0	0.0	0.00	0.31	0.00	38.1
8	T1	All MCs	261	4.0	261	4.0	0.128	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	39.9
Approach			293	4.6	293	4.6	0.128	0.4	NA	0.0	0.0	0.00	0.05	0.00	39.8
All Vehicles			467	5.8	467	5.8	0.128	1.2	NA	0.1	0.9	0.05	0.11	0.05	40.3

9.4 Infrastructure Scenario 3 AM Peak – Signalised Intersection (Figure 54 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 79 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Central Spine Rd															
1	L2	All MCs	76	9.0	76	9.0	0.354	4.1	LOS A	4.8	35.5	0.82	0.75	0.82	31.4
2	T1	All MCs	118	7.0	118	7.0	* 0.354	31.6	LOS C	4.8	35.5	0.82	0.75	0.82	32.6
3	R2	All MCs	3	8.0	3	8.0	0.023	41.3	LOS D	0.1	0.9	0.95	0.62	0.95	24.9
Approach			197	7.8	197	7.8	0.354	21.2	LOS C	4.8	35.5	0.82	0.75	0.82	32.1
East: NRC															
4	L2	All MCs	13	6.0	13	6.0	0.035	7.5	LOS A	0.3	2.2	0.71	0.62	0.71	43.8
5	T1	All MCs	19	13.0	19	13.0	0.035	27.8	LOS C	0.4	3.1	0.79	0.59	0.79	36.9
6	R2	All MCs	13	19.0	13	19.0	0.050	37.4	LOS D	0.4	3.5	0.88	0.68	0.88	31.9
Approach			44	12.7	44	12.7	0.050	24.8	LOS C	0.4	3.5	0.80	0.62	0.80	36.9
North: Central Spine Rd															
7	L2	All MCs	24	20.0	24	20.0	0.088	4.5	LOS A	0.8	6.5	0.71	0.59	0.71	33.7
8	T1	All MCs	24	10.0	24	10.0	0.088	20.3	LOS C	0.8	6.5	0.71	0.59	0.71	35.3
9	R2	All MCs	23	9.0	23	9.0	* 0.173	42.7	LOS D	0.9	6.7	0.97	0.70	0.97	25.7
Approach			72	13.1	72	13.1	0.173	22.2	LOS C	0.9	6.7	0.79	0.63	0.79	31.2
West: NRC															
10	L2	All MCs	136	5.0	136	5.0	0.132	6.8	LOS A	1.3	9.5	0.39	0.64	0.39	49.8
11	T1	All MCs	57	9.0	57	9.0	* 0.132	29.5	LOS C	1.6	12.0	0.80	0.64	0.80	35.4
12	R2	All MCs	209	7.0	209	7.0	* 0.772	44.9	LOS D	8.6	63.8	1.00	0.92	1.19	31.4
Approach			402	6.6	402	6.6	0.772	29.8	LOS C	8.6	63.8	0.77	0.78	0.87	36.6
All Vehicles			715	8.0	715	8.0	0.772	26.4	LOS C	8.6	63.8	0.79	0.75	0.84	34.5

9.5 Infrastructure Scenario 3 PM Peak – Signalised Intersection (Figure 54 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 73 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Central Spine Rd															
1	L2	All MCs	159	11.0	159	11.0	0.305	5.4	LOS A	3.2	24.5	0.69	0.66	0.69	35.1
2	T1	All MCs	64	8.0	64	8.0	* 0.305	22.2	LOS C	3.2	24.5	0.69	0.66	0.69	36.0
3	R2	All MCs	6	9.0	6	9.0	0.044	38.3	LOS D	0.2	1.6	0.94	0.64	0.94	25.6
Approach			229	10.1	229	10.1	0.305	11.0	LOS B	3.2	24.5	0.70	0.66	0.70	35.1
East: NRC															
4	L2	All MCs	4	6.0	4	6.0	0.071	6.9	LOS A	0.6	4.2	0.80	0.61	0.80	41.8
5	T1	All MCs	55	8.0	55	8.0	* 0.071	22.1	LOS C	0.8	6.2	0.81	0.61	0.81	38.1
6	R2	All MCs	11	8.0	11	8.0	0.072	40.9	LOS D	0.4	2.7	0.95	0.67	0.95	30.8
Approach			69	7.9	69	7.9	0.072	24.1	LOS C	0.8	6.2	0.83	0.62	0.83	36.7
North: Central Spine Rd															
7	L2	All MCs	34	10.0	34	10.0	0.253	4.9	LOS A	3.4	24.6	0.79	0.70	0.79	30.7
8	T1	All MCs	111	4.0	111	4.0	0.253	24.9	LOS C	3.4	24.6	0.79	0.70	0.79	32.8
9	R2	All MCs	107	4.0	107	4.0	* 0.716	43.0	LOS D	4.2	30.2	1.00	0.90	1.21	25.6
Approach			252	4.8	252	4.8	0.716	29.9	LOS C	4.2	30.2	0.88	0.78	0.97	29.3
West: NRC															
10	L2	All MCs	40	6.0	40	6.0	0.035	6.4	LOS A	0.3	2.0	0.31	0.60	0.31	50.6
11	T1	All MCs	16	8.0	16	8.0	0.035	24.7	LOS C	0.4	3.0	0.76	0.57	0.76	37.2
12	R2	All MCs	115	9.0	115	9.0	* 0.792	47.2	LOS D	4.6	34.7	1.00	0.93	1.34	30.6
Approach			171	8.2	171	8.2	0.792	35.5	LOS D	4.6	34.7	0.82	0.82	1.04	34.3
All Vehicles			721	7.6	721	7.6	0.792	24.6	LOS C	4.6	34.7	0.80	0.74	0.89	32.7

9.6 Infrastructure Scenario 4 AM Peak – Signalised Intersection (Figure 54 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 77 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Central Spine Rd															
1	L2	All MCs	64	9.0	64	9.0	0.295	6.4	LOS A	3.6	27.1	0.79	0.75	0.79	31.3
2	T1	All MCs	101	7.0	101	7.0	* 0.295	30.3	LOS C	3.6	27.1	0.79	0.75	0.79	32.6
3	R2	All MCs	13	8.0	13	8.0	0.091	41.0	LOS D	0.5	3.5	0.96	0.67	0.96	24.9
Approach			178	7.8	178	7.8	0.295	22.4	LOS C	3.6	27.1	0.81	0.74	0.81	31.6
East: NRC															
4	L2	All MCs	15	6.0	15	6.0	0.419	7.7	LOS A	5.2	40.2	0.90	0.77	0.90	34.7
5	T1	All MCs	305	13.0	305	13.0	* 0.419	31.3	LOS C	5.3	41.4	0.91	0.75	0.91	33.0
6	R2	All MCs	120	19.0	120	19.0	0.559	41.8	LOS D	4.5	36.7	0.98	0.79	1.00	30.4
Approach			440	14.4	440	14.4	0.559	33.4	LOS C	5.3	41.4	0.93	0.76	0.93	32.2
North: Central Spine Rd															
7	L2	All MCs	17	20.0	17	20.0	0.134	4.8	LOS A	1.4	10.9	0.77	0.64	0.77	31.2
8	T1	All MCs	53	10.0	53	10.0	0.134	23.2	LOS C	1.4	10.9	0.77	0.64	0.77	33.3
9	R2	All MCs	20	9.0	20	9.0	* 0.146	41.4	LOS D	0.7	5.6	0.96	0.69	0.96	26.0
Approach			89	11.7	89	11.7	0.146	23.8	LOS C	1.4	10.9	0.81	0.65	0.81	31.1
West: NRC															
10	L2	All MCs	127	5.0	127	5.0	0.346	7.4	LOS A	3.3	24.6	0.81	0.73	0.81	44.6
11	T1	All MCs	199	9.0	199	9.0	0.346	29.7	LOS C	4.4	33.3	0.87	0.72	0.87	36.1
12	R2	All MCs	185	7.0	185	7.0	* 0.798	46.3	LOS D	7.6	56.7	1.00	0.94	1.26	30.9
Approach			512	7.3	512	7.3	0.798	30.2	LOS C	7.6	56.7	0.90	0.81	1.00	35.6
All Vehicles			1219	10.2	1219	10.2	0.798	29.7	LOS C	7.6	56.7	0.89	0.77	0.93	33.3

9.7 Infrastructure Scenario 4 PM Peak – Signalised Intersection (Figure 54 in the ITA)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 73 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Central Spine Rd															
1	L2	All MCs	199	11.0	199	11.0	0.393	4.8	LOS A	3.8	29.0	0.73	0.69	0.73	35.0
2	T1	All MCs	85	8.0	85	8.0	* 0.393	23.7	LOS C	3.8	29.0	0.73	0.69	0.73	35.9
3	R2	All MCs	13	9.0	13	9.0	0.087	38.7	LOS D	0.4	3.3	0.95	0.67	0.95	25.5
Approach			297	10.1	297	10.1	0.393	11.7	LOS B	3.8	29.0	0.74	0.69	0.74	34.8
East: NRC															
4	L2	All MCs	254	6.0	254	6.0	0.358	7.4	LOS A	3.9	28.8	0.66	0.72	0.66	46.1
5	T1	All MCs	189	8.0	189	8.0	0.358	28.7	LOS C	4.6	34.1	0.84	0.72	0.84	36.8
6	R2	All MCs	27	8.0	27	8.0	0.188	41.7	LOS D	1.0	7.3	0.96	0.71	0.96	30.6
Approach			471	6.9	471	6.9	0.358	18.0	LOS B	4.6	34.1	0.75	0.72	0.75	41.2
North: Central Spine Rd															
7	L2	All MCs	126	10.0	126	10.0	0.346	6.1	LOS A	3.8	28.6	0.77	0.73	0.77	32.6
8	T1	All MCs	98	4.0	98	4.0	0.346	26.7	LOS C	3.8	28.6	0.77	0.73	0.77	34.4
9	R2	All MCs	97	4.0	97	4.0	* 0.646	42.0	LOS D	3.7	26.7	1.00	0.85	1.13	25.9
Approach			321	6.4	321	6.4	0.646	23.2	LOS C	3.8	28.6	0.84	0.77	0.88	30.8
West: NRC															
10	L2	All MCs	33	6.0	33	6.0	0.402	6.6	LOS A	4.9	36.7	0.89	0.76	0.89	38.8
11	T1	All MCs	305	8.0	305	8.0	* 0.402	28.6	LOS C	5.2	38.8	0.89	0.74	0.89	34.9
12	R2	All MCs	98	9.0	98	9.0	* 0.675	44.9	LOS D	3.8	28.4	1.00	0.85	1.17	31.4
Approach			436	8.1	436	8.1	0.675	30.6	LOS C	5.2	38.8	0.92	0.77	0.95	34.2
All Vehicles			1524	7.7	1524	7.7	0.675	21.5	LOS C	5.2	38.8	0.81	0.74	0.83	35.1

10. Horotiu Interchange – Eastern Roundabout

10.1 Baseline AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	159	0.0	159	0.0	0.376	6.7	LOS A	1.1	8.4	0.74	0.62	0.74	54.5
2	T1	All MCs	557	15.9	557	15.9	0.376	7.6	LOS A	1.1	8.4	0.75	0.64	0.75	46.2
Approach			716	12.4	716	12.4	0.376	7.4	LOS A	1.1	8.4	0.75	0.64	0.75	48.8
North: SH1C Off-Ramp 1															
3	L2	All MCs	428	15.2	428	15.2	0.327	9.0	LOS A	0.6	4.5	0.64	0.79	0.67	53.9
5	T1	All MCs	1	0.0	1	0.0	0.327	9.4	LOS A	0.5	4.2	0.65	0.85	0.70	55.8
4	R2	All MCs	104	12.1	104	12.1	0.327	16.4	LOS B	0.5	4.2	0.65	0.85	0.70	48.1
Approach			534	14.6	534	14.6	0.327	10.4	LOS B	0.6	4.5	0.64	0.80	0.67	53.1
West: Te Rapa Rd															
5	T1	All MCs	764	3.9	764	3.9	0.383	3.2	LOS A	0.0	0.0	0.00	0.35	0.00	53.4
6	R2	All MCs	497	4.2	497	4.2	0.383	9.3	LOS A	0.0	0.0	0.00	0.62	0.00	50.0
Approach			1261	4.0	1261	4.0	0.383	5.6	LOS A	0.0	0.0	0.00	0.46	0.00	52.0
All Vehicles			2511	8.6	2511	8.6	0.383	7.1	LOS A	1.1	8.4	0.35	0.58	0.36	51.5

10.2 Baseline PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	139	0.0	139	0.0	0.538	5.6	LOS A	1.8	13.1	0.68	0.56	0.68	54.6
2	T1	All MCs	1147	6.3	1147	6.3	0.538	6.1	LOS A	1.8	13.2	0.70	0.58	0.72	46.6
Approach			1286	5.6	1286	5.6	0.538	6.0	LOS A	1.8	13.2	0.70	0.58	0.71	47.9
North: SH1C Off-Ramp 1															
3	L2	All MCs	395	11.7	395	11.7	0.254	7.7	LOS A	0.4	3.1	0.56	0.72	0.56	55.1
5	T1	All MCs	1	0.0	1	0.0	0.254	7.9	LOS A	0.4	3.0	0.57	0.77	0.57	58.1
4	R2	All MCs	76	9.7	76	9.7	0.254	14.7	LOS B	0.4	3.0	0.57	0.77	0.57	51.2
Approach			472	11.4	472	11.4	0.254	8.8	LOS A	0.4	3.1	0.56	0.73	0.56	54.7
West: Te Rapa Rd															
5	T1	All MCs	635	4.0	635	4.0	0.282	3.2	LOS A	0.0	0.0	0.00	0.37	0.00	53.0
6	R2	All MCs	293	4.7	293	4.7	0.282	9.3	LOS A	0.0	0.0	0.00	0.58	0.00	51.1
Approach			927	4.2	927	4.2	0.282	5.1	LOS A	0.0	0.0	0.00	0.44	0.00	52.3
All Vehicles			2685	6.2	2685	6.2	0.538	6.2	LOS A	1.8	13.2	0.43	0.56	0.44	51.0

10.3 Infrastructure Scenario 1 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	229	0.0	229	0.0	0.497	8.2	LOS A	1.8	13.3	0.83	0.71	0.90	53.5
2	T1	All MCs	667	15.9	667	15.9	0.497	9.8	LOS A	1.8	13.3	0.84	0.75	0.96	43.8
Approach			897	11.8	897	11.8	0.497	9.4	LOS A	1.8	13.3	0.84	0.74	0.94	47.2
North: SH1C Off-Ramp 1															
3	L2	All MCs	614	15.2	614	15.2	0.504	12.1	LOS B	1.2	9.4	0.75	0.94	1.02	51.2
5	T1	All MCs	1	0.0	1	0.0	0.504	13.0	LOS B	1.1	8.3	0.76	0.98	1.05	52.5
4	R2	All MCs	123	12.1	123	12.1	0.504	20.2	LOS C	1.1	8.3	0.76	0.98	1.05	43.7
Approach			738	14.7	738	14.7	0.504	13.5	LOS B	1.2	9.4	0.75	0.94	1.03	50.3
West: Te Rapa Rd															
5	T1	All MCs	1045	3.9	1045	3.9	0.484	3.2	LOS A	0.0	0.0	0.00	0.37	0.00	53.1
6	R2	All MCs	545	4.2	545	4.2	0.484	9.3	LOS A	0.0	0.0	0.00	0.60	0.00	50.8
Approach			1591	4.0	1591	4.0	0.484	5.3	LOS A	0.0	0.0	0.00	0.45	0.00	52.2
All Vehicles			3225	8.6	3225	8.6	0.504	8.3	LOS A	1.8	13.3	0.41	0.64	0.50	50.4

10.4 Infrastructure Scenario 1 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	238	0.0	238	0.0	0.695	8.1	LOS A	3.5	25.4	0.82	0.73	0.97	53.6
2	T1	All MCs	1379	6.3	1379	6.3	0.695	9.0	LOS A	3.5	25.4	0.84	0.76	1.03	44.6
Approach			1617	5.4	1617	5.4	0.695	8.9	LOS A	3.5	25.4	0.83	0.75	1.02	46.5
North: SH1C Off-Ramp 1															
3	L2	All MCs	464	11.7	464	11.7	0.304	8.1	LOS A	0.5	3.9	0.59	0.74	0.59	54.8
5	T1	All MCs	1	0.0	1	0.0	0.304	8.4	LOS A	0.5	3.7	0.61	0.79	0.61	57.8
4	R2	All MCs	79	9.7	79	9.7	0.304	15.2	LOS B	0.5	3.7	0.61	0.79	0.61	50.7
Approach			544	11.4	544	11.4	0.304	9.1	LOS A	0.5	3.9	0.59	0.75	0.59	54.5
West: Te Rapa Rd															
5	T1	All MCs	707	4.0	707	4.0	0.316	3.2	LOS A	0.0	0.0	0.00	0.37	0.00	53.0
6	R2	All MCs	329	4.7	329	4.7	0.316	9.3	LOS A	0.0	0.0	0.00	0.58	0.00	51.0
Approach			1037	4.2	1037	4.2	0.316	5.1	LOS A	0.0	0.0	0.00	0.44	0.00	52.3
All Vehicles			3198	6.0	3198	6.0	0.695	7.7	LOS A	3.5	25.4	0.52	0.65	0.62	50.1

10.5 Infrastructure Scenario 2 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	215	0.0	215	0.0	0.508	8.5	LOS A	1.9	14.1	0.85	0.73	0.94	53.3
2	T1	All MCs	686	15.9	686	15.9	0.508	10.2	LOS B	1.9	14.1	0.85	0.77	0.99	43.4
Approach			901	12.1	901	12.1	0.508	9.8	LOS A	1.9	14.1	0.85	0.76	0.98	46.6
North: SH1C Off-Ramp 1															
3	L2	All MCs	800	15.2	800	15.2	0.659	15.4	LOS B	2.0	15.9	0.82	1.06	1.37	48.6
5	T1	All MCs	1	0.0	1	0.0	0.659	16.6	LOS B	1.7	13.5	0.83	1.08	1.41	49.6
4	R2	All MCs	128	12.1	128	12.1	0.659	24.0	LOS C	1.7	13.5	0.83	1.08	1.41	40.1
Approach			929	14.8	929	14.8	0.659	16.6	LOS B	2.0	15.9	0.83	1.06	1.38	47.7
West: Te Rapa Rd															
5	T1	All MCs	1138	3.9	1138	3.9	0.515	3.2	LOS A	0.0	0.0	0.00	0.37	0.00	53.0
6	R2	All MCs	555	4.2	555	4.2	0.515	9.3	LOS A	0.0	0.0	0.00	0.59	0.00	51.0
Approach			1693	4.0	1693	4.0	0.515	5.2	LOS A	0.0	0.0	0.00	0.44	0.00	52.3
All Vehicles			3523	8.9	3523	8.9	0.659	9.4	LOS A	2.0	15.9	0.44	0.69	0.61	49.5

10.6 Infrastructure Scenario 2 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	272	0.0	272	0.0	0.792	11.3	LOS B	5.4	39.1	0.92	0.91	1.28	51.2
2	T1	All MCs	1513	6.3	1513	6.3	0.792	12.7	LOS B	5.4	39.1	0.94	0.94	1.36	40.7
Approach			1784	5.4	1784	5.4	0.792	12.5	LOS B	5.4	39.1	0.94	0.94	1.35	42.9
North: SH1C Off-Ramp 1															
3	L2	All MCs	491	11.7	491	11.7	0.325	8.4	LOS A	0.5	4.2	0.61	0.76	0.62	54.7
5	T1	All MCs	1	0.0	1	0.0	0.325	8.7	LOS A	0.5	4.1	0.62	0.81	0.65	57.4
4	R2	All MCs	80	9.7	80	9.7	0.325	15.6	LOS B	0.5	4.1	0.62	0.81	0.65	50.2
Approach			572	11.4	572	11.4	0.325	9.4	LOS A	0.5	4.2	0.61	0.77	0.63	54.3
West: Te Rapa Rd															
5	T1	All MCs	724	4.0	724	4.0	0.334	3.2	LOS A	0.0	0.0	0.00	0.37	0.00	53.1
6	R2	All MCs	374	4.7	374	4.7	0.334	9.3	LOS A	0.0	0.0	0.00	0.59	0.00	50.7
Approach			1098	4.2	1098	4.2	0.334	5.3	LOS A	0.0	0.0	0.00	0.44	0.00	52.2
All Vehicles			3454	6.0	3454	6.0	0.792	9.7	LOS A	5.4	39.1	0.59	0.75	0.80	48.0

10.8 Infrastructure Scenario 3 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	213	0.0	213	0.0	0.515	8.8	LOS A	1.9	14.6	0.86	0.74	0.96	53.1
2	T1	All MCs	693	15.9	693	15.9	0.515	10.5	LOS B	1.9	14.6	0.86	0.78	1.01	43.1
Approach			905	12.1	905	12.1	0.515	10.1	LOS B	1.9	14.6	0.86	0.77	1.00	46.3
North: SH1C Off-Ramp 1															
3	L2	All MCs	801	15.2	801	15.2	0.654	15.1	LOS B	2.0	15.6	0.82	1.05	1.35	48.8
5	T1	All MCs	1	0.0	1	0.0	0.654	16.2	LOS B	1.7	13.3	0.83	1.08	1.38	50.0
4	R2	All MCs	129	12.1	129	12.1	0.654	23.6	LOS C	1.7	13.3	0.83	1.08	1.38	40.5
Approach			932	14.8	932	14.8	0.654	16.2	LOS B	2.0	15.6	0.82	1.05	1.35	48.0
West: Te Rapa Rd															
5	T1	All MCs	1101	3.9	1101	3.9	0.506	3.2	LOS A	0.0	0.0	0.00	0.37	0.00	53.1
6	R2	All MCs	564	4.2	564	4.2	0.506	9.3	LOS A	0.0	0.0	0.00	0.59	0.00	50.8
Approach			1665	4.0	1665	4.0	0.506	5.3	LOS A	0.0	0.0	0.00	0.44	0.00	52.3
All Vehicles			3502	9.0	3502	9.0	0.654	9.4	LOS A	2.0	15.6	0.44	0.69	0.62	49.4

10.9 Infrastructure Scenario 3 PM Peak

Vehicle Movement Performance														
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	232	6.3	232	6.3	0.791	11.6	LOS B	5.3	39.5	0.92	0.91	1.29	50.1
2	T1	All MCs	1536	6.3	1536	6.3	0.791	12.7	LOS B	5.3	39.5	0.94	0.94	1.37	40.7
Approach			1767	6.3	1767	6.3	0.791	12.6	LOS B	5.3	39.5	0.94	0.94	1.36	42.5
North: SH1C Off-Ramp 1															
3	L2	All MCs	497	11.7	497	11.7	0.329	8.4	LOS A	0.6	4.3	0.61	0.76	0.62	54.6
5	T1	All MCs	1	0.0	1	0.0	0.329	8.8	LOS A	0.5	4.2	0.63	0.81	0.66	57.4
4	R2	All MCs	81	9.7	81	9.7	0.329	15.6	LOS B	0.5	4.2	0.63	0.81	0.66	50.2
Approach			579	11.4	579	11.4	0.329	9.4	LOS A	0.6	4.3	0.61	0.77	0.63	54.2
West: Te Rapa Rd															
5	T1	All MCs	722	4.0	722	4.0	0.334	3.2	LOS A	0.0	0.0	0.00	0.37	0.00	53.1
6	R2	All MCs	375	4.7	375	4.7	0.334	9.3	LOS A	0.0	0.0	0.00	0.60	0.00	50.7
Approach			1097	4.2	1097	4.2	0.334	5.3	LOS A	0.0	0.0	0.00	0.45	0.00	52.2
All Vehicles			3443	6.5	3443	6.5	0.791	9.7	LOS A	5.3	39.5	0.59	0.75	0.80	47.8

10.10 Infrastructure Scenario 4 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	226	0.0	226	0.0	0.442	7.2	LOS A	1.4	10.4	0.80	0.66	0.80	54.1
2	T1	All MCs	589	15.9	589	15.9	0.442	8.7	LOS A	1.4	10.4	0.80	0.69	0.84	45.1
Approach			816	11.5	816	11.5	0.442	8.3	LOS A	1.4	10.4	0.80	0.68	0.83	48.5
North: SH1C Off-Ramp 1															
3	L2	All MCs	532	15.2	532	15.2	0.409	9.7	LOS A	0.8	6.4	0.67	0.84	0.79	53.2
5	T1	All MCs	1	0.0	1	0.0	0.409	10.2	LOS B	0.8	5.9	0.68	0.89	0.83	54.9
4	R2	All MCs	128	12.1	128	12.1	0.409	17.3	LOS B	0.8	5.9	0.68	0.89	0.83	46.9
Approach			661	14.6	661	14.6	0.409	11.2	LOS B	0.8	6.4	0.67	0.85	0.80	52.4
West: Te Rapa Rd															
5	T1	All MCs	778	3.9	778	3.9	0.393	3.2	LOS A	0.0	0.0	0.00	0.35	0.00	53.4
6	R2	All MCs	516	4.2	516	4.2	0.393	9.3	LOS A	0.0	0.0	0.00	0.62	0.00	50.0
Approach			1294	4.0	1294	4.0	0.393	5.6	LOS A	0.0	0.0	0.00	0.46	0.00	52.0
All Vehicles			2771	8.7	2771	8.7	0.442	7.7	LOS A	1.4	10.4	0.40	0.62	0.43	51.1

10.11 Infrastructure Scenario 4 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Te Rapa Rd															
1	L2	All MCs	257	0.0	257	0.0	0.477	5.9	LOS A	1.5	10.9	0.70	0.59	0.70	54.8
2	T1	All MCs	827	6.3	827	6.3	0.477	6.4	LOS A	1.5	10.9	0.71	0.60	0.72	46.5
Approach			1084	4.8	1084	4.8	0.477	6.3	LOS A	1.5	10.9	0.71	0.60	0.71	49.3
North: SH1C Off-Ramp 1															
3	L2	All MCs	439	11.7	439	11.7	0.287	7.9	LOS A	0.5	3.6	0.58	0.73	0.58	54.9
5	T1	All MCs	1	0.0	1	0.0	0.287	8.2	LOS A	0.4	3.4	0.59	0.78	0.59	57.8
4	R2	All MCs	83	9.7	83	9.7	0.287	15.0	LOS B	0.4	3.4	0.59	0.78	0.59	50.8
Approach			523	11.4	523	11.4	0.287	9.0	LOS A	0.5	3.6	0.58	0.74	0.58	54.5
West: Te Rapa Rd															
5	T1	All MCs	622	4.0	622	4.0	0.300	3.2	LOS A	0.0	0.0	0.00	0.36	0.00	53.2
6	R2	All MCs	363	4.7	363	4.7	0.300	9.3	LOS A	0.0	0.0	0.00	0.61	0.00	50.3
Approach			985	4.2	985	4.2	0.300	5.5	LOS A	0.0	0.0	0.00	0.45	0.00	52.1
All Vehicles			2593	5.9	2593	5.9	0.477	6.5	LOS A	1.5	10.9	0.41	0.57	0.42	51.6

11. Horotiu Interchange – Western Roundabout

11.1 Baseline AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	379	5.3	379	5.3	0.314	7.8	LOS A	0.6	4.3	0.57	0.71	0.57	56.3
5	T1	All MCs	1	0.0	1	0.0	0.314	7.3	LOS A	0.6	4.3	0.57	0.71	0.57	56.3
2	R2	All MCs	138	2.3	138	2.3	0.314	13.7	LOS B	0.6	4.3	0.57	0.71	0.57	50.1
Approach			518	4.5	518	4.5	0.314	9.4	LOS A	0.6	4.3	0.57	0.71	0.57	55.3
East: Great South Rd															
3	T1	All MCs	382	9.1	382	9.1	0.232	3.4	LOS A	0.0	0.0	0.00	0.39	0.00	55.7
4	R2	All MCs	279	23.8	279	23.8	0.232	9.5	LOS A	0.0	0.0	0.00	0.58	0.00	45.7
Approach			661	15.3	661	15.3	0.232	6.0	LOS A	0.0	0.0	0.00	0.47	0.00	51.4
West: Great South Rd															
5	L2	All MCs	40	21.1	40	21.1	0.516	7.3	LOS A	1.7	12.4	0.72	0.60	0.72	54.4
6	T1	All MCs	1123	4.2	1123	4.2	0.516	7.3	LOS A	1.7	12.4	0.74	0.63	0.76	50.3
Approach			1163	4.8	1163	4.8	0.516	7.3	LOS A	1.7	12.4	0.74	0.62	0.76	50.5
All Vehicles			2342	7.7	2342	7.7	0.516	7.4	LOS A	1.7	12.4	0.49	0.60	0.50	52.0

11.2 Baseline PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	354	4.8	354	4.8	0.406	10.2	LOS B	0.9	6.4	0.70	0.82	0.75	54.0
5	T1	All MCs	1	0.0	1	0.0	0.406	9.5	LOS A	0.9	6.4	0.71	0.85	0.81	53.5
2	R2	All MCs	211	1.5	211	1.5	0.406	15.9	LOS B	0.9	6.4	0.71	0.85	0.81	46.1
Approach			565	3.5	565	3.5	0.406	12.3	LOS B	0.9	6.4	0.70	0.83	0.77	52.1
East: Great South Rd															
3	T1	All MCs	621	4.1	621	4.1	0.411	3.4	LOS A	0.0	0.0	0.00	0.37	0.00	56.1
4	R2	All MCs	601	8.9	601	8.9	0.411	9.4	LOS A	0.0	0.0	0.00	0.62	0.00	47.6
Approach			1222	6.5	1222	6.5	0.411	6.3	LOS A	0.0	0.0	0.00	0.49	0.00	51.9
West: Great South Rd															
5	L2	All MCs	47	13.3	47	13.3	0.469	10.8	LOS B	1.7	12.4	0.90	0.75	0.97	53.2
6	T1	All MCs	718	5.0	718	5.0	0.469	11.6	LOS B	1.7	12.4	0.90	0.78	1.00	47.1
Approach			765	5.5	765	5.5	0.469	11.5	LOS B	1.7	12.4	0.90	0.78	1.00	47.6
All Vehicles			2553	5.5	2553	5.5	0.469	9.2	LOS A	1.7	12.4	0.42	0.65	0.47	50.7

11.3 Infrastructure Scenario 1 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	440	5.3	440	5.3	0.406	8.6	LOS A	0.9	6.2	0.63	0.75	0.65	55.6
5	T1	All MCs	1	0.0	1	0.0	0.406	8.1	LOS A	0.9	6.2	0.64	0.77	0.68	55.4
2	R2	All MCs	198	2.3	198	2.3	0.406	14.5	LOS B	0.9	6.2	0.64	0.77	0.68	48.8
Approach			639	4.3	639	4.3	0.406	10.4	LOS B	0.9	6.2	0.63	0.76	0.66	54.2
East: Great South Rd															
3	T1	All MCs	448	9.1	448	9.1	0.278	3.4	LOS A	0.0	0.0	0.00	0.38	0.00	55.7
4	R2	All MCs	344	23.8	344	23.8	0.278	9.5	LOS A	0.0	0.0	0.00	0.58	0.00	45.5
Approach			793	15.5	793	15.5	0.278	6.1	LOS A	0.0	0.0	0.00	0.47	0.00	51.2
West: Great South Rd															
5	L2	All MCs	25	21.1	25	21.1	0.699	12.2	LOS B	3.8	27.8	0.91	0.86	1.21	52.1
6	T1	All MCs	1395	4.2	1395	4.2	0.699	12.5	LOS B	3.8	27.8	0.92	0.88	1.26	46.1
Approach			1420	4.5	1420	4.5	0.699	12.5	LOS B	3.8	27.8	0.92	0.88	1.26	46.3
All Vehicles			2852	7.5	2852	7.5	0.699	10.2	LOS B	3.8	27.8	0.60	0.74	0.77	49.6

11.4 Infrastructure Scenario 1 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	381	4.8	381	4.8	0.480	12.2	LOS B	1.2	8.8	0.76	0.89	0.91	52.4
5	T1	All MCs	1	0.0	1	0.0	0.480	11.5	LOS B	1.2	8.8	0.78	0.92	1.01	51.6
2	R2	All MCs	236	1.5	236	1.5	0.480	17.9	LOS B	1.2	8.8	0.78	0.92	1.01	43.5
Approach			618	3.5	618	3.5	0.480	14.4	LOS B	1.2	8.8	0.77	0.90	0.95	50.1
East: Great South Rd															
3	T1	All MCs	714	4.1	714	4.1	0.491	3.4	LOS A	0.0	0.0	0.00	0.36	0.00	56.3
4	R2	All MCs	745	8.9	745	8.9	0.491	9.4	LOS A	0.0	0.0	0.00	0.62	0.00	47.4
Approach			1459	6.6	1459	6.6	0.491	6.5	LOS A	0.0	0.0	0.00	0.50	0.00	51.7
West: Great South Rd															
5	L2	All MCs	52	13.3	52	13.3	0.623	19.5	LOS B	3.3	24.1	1.00	1.01	1.50	46.8
6	T1	All MCs	800	5.0	800	5.0	0.623	20.8	LOS C	3.3	24.1	1.00	1.02	1.52	38.6
Approach			852	5.5	852	5.5	0.623	20.7	LOS C	3.3	24.1	1.00	1.02	1.52	39.2
All Vehicles			2928	5.6	2928	5.6	0.623	12.3	LOS B	3.3	24.1	0.45	0.73	0.64	47.5

11.5 Infrastructure Scenario 2 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	Demand Flows HV] %	Arrival Flows [Total veh/h	Arrival Flows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Aver. Back Of Queue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	462	5.3	462	5.3	0.451	8.9	LOS A	1.0	7.4	0.65	0.77	0.69	55.2
5	T1	All MCs	1	0.0	1	0.0	0.451	8.5	LOS A	1.0	7.4	0.66	0.80	0.74	54.7
2	R2	All MCs	240	2.3	240	2.3	0.451	14.9	LOS B	1.0	7.4	0.66	0.80	0.74	47.8
Approach			703	4.3	703	4.3	0.451	11.0	LOS B	1.0	7.4	0.65	0.78	0.71	53.6
East: Great South Rd															
3	T1	All MCs	448	9.1	448	9.1	0.286	3.4	LOS A	0.0	0.0	0.00	0.38	0.00	55.8
4	R2	All MCs	365	23.8	365	23.8	0.286	9.5	LOS A	0.0	0.0	0.00	0.59	0.00	45.4
Approach			814	15.7	814	15.7	0.286	6.2	LOS A	0.0	0.0	0.00	0.47	0.00	51.0
West: Great South Rd															
5	L2	All MCs	47	21.1	47	21.1	0.788	16.7	LOS B	5.6	40.7	1.00	1.04	1.59	48.7
6	T1	All MCs	1453	4.2	1453	4.2	0.788	17.3	LOS B	5.6	40.7	1.00	1.06	1.63	41.4
Approach			1500	4.7	1500	4.7	0.788	17.3	LOS B	5.6	40.7	1.00	1.06	1.63	41.7
All Vehicles			3017	7.6	3017	7.6	0.788	12.8	LOS B	5.6	40.7	0.65	0.84	0.98	47.0

11.6 Infrastructure Scenario 2 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	361	4.8	361	4.8	0.495	13.6	LOS B	1.4	9.7	0.79	0.92	0.98	51.2
5	T1	All MCs	1	0.0	1	0.0	0.495	12.9	LOS B	1.4	9.7	0.82	0.95	1.11	50.2
2	R2	All MCs	234	1.5	234	1.5	0.495	19.3	LOS B	1.4	9.7	0.82	0.95	1.11	41.8
Approach			596	3.5	596	3.5	0.495	15.9	LOS B	1.4	9.7	0.80	0.93	1.03	48.7
East: Great South Rd															
3	T1	All MCs	638	4.1	638	4.1	0.430	3.3	LOS A	0.0	0.0	0.00	0.32	0.00	57.2
4	R2	All MCs	955	8.9	955	8.9	0.554	9.4	LOS A	0.0	0.0	0.00	0.64	0.00	46.7
Approach			1593	7.0	1593	7.0	0.554	6.9	LOS A	0.0	0.0	0.00	0.51	0.00	50.8
West: Great South Rd															
5	L2	All MCs	58	13.3	58	13.3	0.881	65.4	LOS E	9.9	72.8	1.00	1.82	3.24	28.4
6	T1	All MCs	863	5.0	863	5.0	0.881	68.5	LOS E	9.9	72.8	1.00	1.77	3.17	20.0
Approach			921	5.5	921	5.5	0.881	68.3	LOS E	9.9	72.8	1.00	1.77	3.18	20.6
All Vehicles			3109	5.9	3109	5.9	0.881	26.8	LOS C	9.9	72.8	0.45	0.97	1.14	36.3

11.7 Infrastructure Scenario 2 PM Peak – Mitigation (Figure 57)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	361	4.8	361	4.8	0.433	11.5	LOS B	1.0	7.6	0.78	0.89	0.97	53.9
5	T1	All MCs	1	0.0	1	0.0	0.433	12.3	LOS B	1.0	7.6	0.78	0.89	0.97	54.3
2	R2	All MCs	234	1.5	234	1.5	0.397	20.0	LOS B	0.8	5.9	0.77	0.96	0.95	39.4
Approach			596	3.5	596	3.5	0.433	14.9	LOS B	1.0	7.6	0.78	0.91	0.96	49.4
East: Great South Rd															
3	T1	All MCs	638	4.1	638	4.1	0.515	3.1	LOS A	0.0	0.0	0.00	0.44	0.00	55.3
4	R2	All MCs	955	8.9	955	8.9	0.515	9.7	LOS A	0.0	0.0	0.00	0.58	0.00	47.9
Approach			1593	7.0	1593	7.0	0.515	7.0	LOS A	0.0	0.0	0.00	0.53	0.00	50.9
West: Great South Rd															
5	L2	All MCs	58	13.3	58	13.3	0.665	15.8	LOS B	2.5	18.2	0.89	1.02	1.39	49.7
6	T1	All MCs	863	5.0	863	5.0	0.665	15.9	LOS B	2.5	18.2	0.88	1.03	1.40	42.7
Approach			921	5.5	921	5.5	0.665	15.9	LOS B	2.5	18.2	0.88	1.03	1.40	43.3
All Vehicles			3109	5.9	3109	5.9	0.665	11.2	LOS B	2.5	18.2	0.41	0.75	0.60	48.3

11.9 Infrastructure Scenario 3 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	Demand Flows HV] %	Arrival Flows [Total veh/h	Arrival Flows HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Aver. Back Of Queue Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	464	5.3	464	5.3	0.451	8.6	LOS A	1.0	7.5	0.66	0.77	0.75	56.7
5	T1	All MCs	1	0.0	1	0.0	0.266	8.9	LOS A	0.5	3.3	0.62	0.81	0.62	51.9
2	R2	All MCs	199	2.3	199	2.3	0.266	15.3	LOS B	0.5	3.3	0.62	0.81	0.62	44.4
Approach			664	4.4	664	4.4	0.451	10.6	LOS B	1.0	7.5	0.65	0.78	0.71	54.0
East: Great South Rd															
3	T1	All MCs	452	9.1	452	9.1	0.289	3.5	LOS A	0.0	0.0	0.00	0.38	0.00	55.8
4	R2	All MCs	371	23.8	371	23.8	0.289	9.5	LOS A	0.0	0.0	0.00	0.59	0.00	45.4
Approach			822	15.7	822	15.7	0.289	6.2	LOS A	0.0	0.0	0.00	0.47	0.00	51.0
West: Great South Rd															
5	L2	All MCs	47	21.1	47	21.1	0.762	14.8	LOS B	5.0	36.3	0.97	0.97	1.44	50.1
6	T1	All MCs	1465	4.2	1465	4.2	0.762	15.3	LOS B	5.0	36.3	0.97	0.99	1.49	43.3
Approach			1513	4.7	1513	4.7	0.762	15.3	LOS B	5.0	36.3	0.97	0.99	1.49	43.6
All Vehicles			2999	7.7	2999	7.7	0.762	11.8	LOS B	5.0	36.3	0.63	0.80	0.91	48.0

11.10 Infrastructure Scenario 3 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	372	4.8	372	4.8	0.465	12.8	LOS B	1.2	8.9	0.82	0.92	1.07	52.8
5	T1	All MCs	1	0.0	1	0.0	0.404	14.6	LOS B	0.9	6.2	0.79	0.96	0.99	47.2
2	R2	All MCs	226	1.5	226	1.5	0.404	21.1	LOS C	0.9	6.2	0.79	0.96	0.99	38.5
Approach			599	3.5	599	3.5	0.465	15.9	LOS B	1.2	8.9	0.81	0.93	1.04	48.5
East: Great South Rd															
3	T1	All MCs	641	4.1	641	4.1	0.433	3.2	LOS A	0.0	0.0	0.00	0.32	0.00	57.2
4	R2	All MCs	976	8.9	976	8.9	0.566	9.4	LOS A	0.0	0.0	0.00	0.64	0.00	46.7
Approach			1617	7.0	1617	7.0	0.566	6.9	LOS A	0.0	0.0	0.00	0.51	0.00	50.7
West: Great South Rd															
5	L2	All MCs	57	13.3	57	13.3	0.902	73.1	LOS F	11.0	80.6	1.00	1.93	3.50	26.7
6	T1	All MCs	869	5.0	869	5.0	0.902	76.3	LOS F	11.0	80.6	1.00	1.87	3.42	18.5
Approach			926	5.5	926	5.5	0.902	76.1	LOS F	11.0	80.6	1.00	1.87	3.43	19.1
All Vehicles			3142	5.9	3142	5.9	0.902	29.0	LOS C	11.0	80.6	0.45	0.99	1.21	35.1

11.11 Infrastructure Scenario 3 PM Peak – Mitigation (Figure 57)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	372	4.8	372	4.8	0.449	11.9	LOS B	1.1	8.1	0.79	0.90	1.01	53.6
5	T1	All MCs	1	0.0	1	0.0	0.449	12.7	LOS B	1.1	8.1	0.79	0.90	1.01	54.0
2	R2	All MCs	226	1.5	226	1.5	0.389	20.1	LOS C	0.8	5.7	0.77	0.96	0.95	39.4
Approach			599	3.5	599	3.5	0.449	15.0	LOS B	1.1	8.1	0.78	0.92	0.98	49.4
East: Great South Rd															
3	T1	All MCs	641	4.1	641	4.1	0.523	3.1	LOS A	0.0	0.0	0.00	0.45	0.00	55.3
4	R2	All MCs	976	8.9	976	8.9	0.523	9.7	LOS A	0.0	0.0	0.00	0.58	0.00	47.9
Approach			1617	7.0	1617	7.0	0.523	7.1	LOS A	0.0	0.0	0.00	0.53	0.00	50.9
West: Great South Rd															
5	L2	All MCs	57	13.3	57	13.3	0.671	16.0	LOS B	2.5	18.5	0.89	1.03	1.41	49.5
6	T1	All MCs	869	5.0	869	5.0	0.671	16.2	LOS B	2.5	18.5	0.89	1.04	1.42	42.5
Approach			926	5.5	926	5.5	0.671	16.2	LOS B	2.5	18.5	0.89	1.04	1.42	43.1
All Vehicles			3142	5.9	3142	5.9	0.671	11.3	LOS B	2.5	18.5	0.41	0.75	0.61	48.2

11.12 Infrastructure Scenario 4 AM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	453	5.3	453	5.3	0.407	8.3	LOS A	0.9	6.1	0.61	0.74	0.63	55.8
5	T1	All MCs	1	0.0	1	0.0	0.407	7.8	LOS A	0.9	6.1	0.62	0.76	0.65	55.5
2	R2	All MCs	205	2.3	205	2.3	0.407	14.2	LOS B	0.9	6.1	0.62	0.76	0.65	49.0
Approach			659	4.3	659	4.3	0.407	10.1	LOS B	0.9	6.1	0.61	0.74	0.63	54.5
East: Great South Rd															
3	T1	All MCs	405	9.1	405	9.1	0.252	3.4	LOS A	0.0	0.0	0.00	0.38	0.00	55.7
4	R2	All MCs	313	23.8	313	23.8	0.252	9.5	LOS A	0.0	0.0	0.00	0.58	0.00	45.5
Approach			718	15.5	718	15.5	0.252	6.1	LOS A	0.0	0.0	0.00	0.47	0.00	51.2
West: Great South Rd															
5	L2	All MCs	48	21.1	48	21.1	0.550	8.9	LOS A	2.1	15.4	0.81	0.69	0.89	53.9
6	T1	All MCs	1088	4.2	1088	4.2	0.550	9.0	LOS A	2.1	15.4	0.82	0.72	0.92	49.4
Approach			1137	4.9	1137	4.9	0.550	9.0	LOS A	2.1	15.4	0.82	0.72	0.92	49.7
All Vehicles			2514	7.8	2514	7.8	0.550	8.4	LOS A	2.1	15.4	0.53	0.65	0.58	51.5

11.13 Infrastructure Scenario 4 PM Peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: SH1C Off-Ramp 2															
1	L2	All MCs	404	4.8	404	4.8	0.420	9.0	LOS A	0.9	6.5	0.65	0.78	0.68	55.1
5	T1	All MCs	1	0.0	1	0.0	0.420	8.5	LOS A	0.9	6.5	0.66	0.80	0.72	54.5
2	R2	All MCs	241	1.5	241	1.5	0.420	14.8	LOS B	0.9	6.5	0.66	0.80	0.72	47.6
Approach			646	3.5	646	3.5	0.420	11.2	LOS B	0.9	6.5	0.65	0.79	0.70	53.3
East: Great South Rd															
3	T1	All MCs	573	4.1	573	4.1	0.305	3.4	LOS A	0.0	0.0	0.00	0.40	0.00	55.7
4	R2	All MCs	338	8.9	338	8.9	0.305	9.4	LOS A	0.0	0.0	0.00	0.56	0.00	48.9
Approach			911	5.9	911	5.9	0.305	5.6	LOS A	0.0	0.0	0.00	0.46	0.00	53.2
West: Great South Rd															
5	L2	All MCs	57	13.3	57	13.3	0.405	7.7	LOS A	1.3	9.3	0.77	0.63	0.77	54.5
6	T1	All MCs	743	5.0	743	5.0	0.405	7.8	LOS A	1.3	9.3	0.77	0.65	0.77	50.1
Approach			800	5.6	800	5.6	0.405	7.8	LOS A	1.3	9.3	0.77	0.65	0.77	50.5
All Vehicles			2357	5.1	2357	5.1	0.420	7.9	LOS A	1.3	9.3	0.44	0.61	0.45	52.4