I hereby give notice that a hearing by commissioners will be held on:

Date:	**Monday 15 May to Thursday 18 May 2023**
Time:	**9:30am**
Meeting Room:	**Uxbridge Theatre**
Venue:	**35 Uxbridge Road, Howick, Auckland 2014**

FURTHER INFORMATION – UPDATED INTEGRATED TRANSPORT ASSESSMENT

5 REEVES ROAD, PAKURANGA HEIGHTS (EB2)

AUCKLAND TRANSPORT IN CONJUNCTION WITH EASTERN BUSWAY ALLIANCE

COMMISSIONERS

Chairperson	**Sarah Shaw**
Commissioners	**Ian Munro**
	Nigel Mark-Brown

Patrice Baillargeon
Kaitohutohu Mataamua Whakawā / Senior Hearings Advisor

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Note: The reports contained within this document are for consideration and should not be construed as a decision of Council. Should Commissioners require further information relating to any reports, please contact the Hearings Advisor.

WHAT HAPPENS AT A HEARING

At the start of the hearing, the Chairperson will introduce the hearing panel and council staff and will briefly outline the procedure. The Chairperson may then call upon the parties present to introduce themselves to the panel. The Chairperson is addressed as Mr Chairman or Madam Chair.

Any party intending to give written or spoken evidence in Māori or speak in sign language should advise the hearings advisor at least five working days before the hearing so that a qualified interpreter can be provided.

Catering is not provided at the hearing. Please note that the hearing may be audio recorded.

Scheduling submitters to be heard

A timetable will be prepared approximately one week before the hearing for all submitters who have returned their hearing attendance form. Please note that during the course of the hearing changing circumstances may mean the proposed timetable is delayed or brought forward. Submitters wishing to be heard are requested to ensure they are available to attend the hearing and present their evidence when required. The hearings advisor will advise submitters of any changes to the timetable at the earliest possible opportunity.

The hearing procedure

The usual hearing procedure is:

- The Requiring Authority (the applicant) will be called upon to present their case. The Requiring Authority may be represented by legal counsel or consultants and may call witnesses in support of the application. After the Requiring Authority has presented their case, members of the hearing panel may ask questions to clarify the information presented
- The relevant local board may wish to present comments. These comments do not constitute a submission however the Local Government Act allows the local board to make the interests and preferences of the people in its area known to the hearing panel. If present, the local board will speak between the applicant and any submitters
- Submitters (for and against the application) are then called upon to speak. Submitters' active participation in the hearing process is completed after the presentation of their evidence so ensure you tell the hearing panel everything you want them to know during your presentation time. Submitters may also be represented by legal counsel or consultants and may call witnesses on their behalf. The hearing panel may then question each speaker. The council officer's report will identify any submissions received outside of the submission period. At the hearing, late submitters may be asked to address the panel on why their submission should be accepted. Late submitters can speak only if the hearing panel accepts the late submission
- Submitters wishing to present written information (evidence) in support of their applications or submissions should provide the number of copies indicated in the notification letter
- Only members of the hearing panel can ask questions about submissions or evidence. Attendees may suggest questions for the panel to ask but it does not have to ask them. No cross-examination - either by the applicant or by those who have lodged submissions – is permitted at the hearing
- After the Requiring Authority and submitters have presented their cases, the chairperson may call upon council officers to comment on any matters of fact or clarification
- When those who have lodged submissions and wish to be heard have completed their presentations, the Requiring Authority or their representative has the right to summarise the application and reply to matters raised by submitters. Hearing panel members may further question the Requiring Authority at this stage

- The chairperson then generally closes the hearing and the Requiring Authority, submitters and their representatives leave the room.
    - The hearing panel will then deliberate "in committee" and make a decision on the resource consent application and a recommendation to the Requiring Authority on the Notice of Requirement. The Requiring Authority then has 30 working days to make a decision and inform council of that decision. You will be informed in writing of both decisions separately, the reasons for the decision and what your appeal rights are
- The decision on the resource consent component is usually available within 15 working days of the hearing closing.

A NOTIFIED DISCRETIONARY ACTIVITY RESOURCE CONSENT APPLICATION BY AUCKLAND TRANSPORT IN CONJUNCTION WITH EASTERN BUSWAY ALLIANCE

AND

A NOTIFIED NOTICE OF REQUIREMENT TO THE AUCKLAND COUNCIL UNITARY PLAN BY AUCKLAND TRANSPORT IN CONJUNCTION WITH EASTERN BUSWAY ALLIANCE

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UPDATED INTEGRATED TRANSPORT ASSESSMENT

(EB2 & EB3R)

Eastern Busway
EB2 and EB3 Residential

Integrated Transport Assessment

Document Number: EB234-1-PL-RP-Z2-0032-A5

Eastern Busway

Quality Information

Document Number: EB234-1-PL-RP-Z2-0032-A5

Document History and Status			
Rev	**Date**	**Author**	**Status**
A1	12 Nov 2021	Josie Ackroyd, Takeshi Nakamura, Christine Lee, Nathan Lowe, XiaoFan Lin, Jacques Van den Heever	Draft for internal review
A2	12 Jul 2022	Josie Ackroyd, Takeshi Nakamura, Christine Lee, Nathan Lowe, XiaoFan Lin, Jacques Van den Heever	Draft for Consent
A3	17 Feb 2023	XiaoFan Lin, Ellen, Chang, Tadios Masrsha, Jacques Van den Heever	For Consent
A4	23 Mar 2023	XiaoFan Lin, Ellen, Chang, Tadios Masrsha, Jacques Van den Heever	For Consent
A5	24 Mar 2023	XiaoFan Lin, Ellen, Chang, Tadios Masrsha, Jacques Van den Heever	For Consent
A6	06 April 2023	Shane Doran	Updated EB3R signalised intersection for Consent

Document Approval				
Action	**Name**	**Position**	**Date**	**Signature**
Prepared by	XiaoFan Lin, Tadios Masrsha, Ellen Chang Jacques Van den Heever	Transport Modeller Transport Modeller Transport Engineer Transport Engineer	24 Mar 2023	On file
Reviewed by	Jack Wan Shane Doran	Transport Engineer Transportation Manager	24 Mar 2023	On file
Approved by	Dean Coutts	Design Lead	24 Mar 2023	On file

Terms and Definitions

Table 1: Terms and definitions

Abbreviation and Definitions	Description
AADT	Average Annual Daily Traffic
ATOC	Auckland Transport Operations Centre
AEE	Assessment of Environmental Effects
AFC	Auckland Forecasting Centre
AMETI	Auckland-Manukau Eastern Transport Initiative
AC	Auckland Council
AT	Auckland Transport
A2B	Airport to Botany
AUP(OP)	Auckland Unitary Plan (Operative in part) 2016
BPO	Best practicable option
CAR	Corridor Access Request
CAS	Crash Analysis System
CEMP	Construction Environmental Management Plan
CMA	Coastal Marine Area
CoPTTM	Code of Practice for Temporary Traffic Management
CTMP	Construction Traffic Management Plan
DOS	Degree of Saturation
EB1	Eastern Busway 1 (Panmure to Pakuranga)
EB2	Eastern Busway 2 (Pakuranga Town Centre)
EB3 Commercial/ EB3C	Eastern Busway 3 (Pakuranga Creek to Botany)
EB3 Residential/ EB3R	Eastern Busway 3 (SEART to Pakuranga Creek)
EB4	Eastern Busway 4 (Botany Town Centre Station)
EBA	Eastern Busway Alliance
HNZPT	Heritage New Zealand Pouhere Taonga
HNZPTA	Heritage New Zealand Pouhere Taonga Act 2014
ITA	Integrated Transport Assessment
km	Kilometre(s)
km/h	Kilometres per hour
KPI	Key Performance Indicator
LILO	Left-in/left-out
LOS	Level of Service
m	Metre(s)
m^2	Square Metre(s)
m^3	Cubic Metre(s)

MCA	Multi Criteria Analysis
MSM	Macro Strategic Model
NES - CS	Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011
NES - FW	Resource Management (National Environmental Standards for Freshwater) Regulations 2020
NPS - FM	National Policy Statement for Freshwater Management 2020
NPS - UD	National Policy Statement for Urban Development 2020
NoR	Notice of Requirement
NSAAT	No Stopping at All Time
NZCPS	New Zealand Coastal Policy Statement 2010
NZGTTM	New Zealand Guide to Temporary Traffic Management
OD and OW	Over-Dimension and Over-Weight
PWA	Public Works Act 1981
RAMM	Road Assessment and Maintenance Management
RASF	Roads and Street Framework
RTN	Rapid Transit Network
RRF	Reeves Road Flyover
RMA	Resource Management Act 1991
SSA	Safe System Assessment
SSTMP	Site Specific Traffic Management Plan
STMS	Site Traffic Management Supervisors
TCQSM	Transit Capacity and Quality Service Manual
tcu	Through car equivalent units or passenger car units
TTM	Temporary Traffic Management
v/c	Volume over capacity ratio
WRRE	William Roberts Road Extension
WTMP	Workforce Travel Management Plan

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Executive Summary

It should be noted that this version of the EB2 and EB3 Residential (EB3R) Integrated Transport Assessment (ITA) has been prepared to reflect an updated proposed design, an updated construction methodology and further technical information to support the Notice of Requirement (NoR) and resource consent applications of EB2 and EB3R.

Changes to the design included the provision of a signalised cross roads intersection at the junction of William Roberts Road, Mattson Street and Ti Rakau Drive. In addition, a signalised all movements intersection at Edgewater Drive (east) joins Ti Rakau Drive has replaced the previously proposed priority controlled left in and left out only intersection.

During the development of the updated construction methodology, based on an updated design, efforts have been made to shorten the overall construction programme where feasible as well as to produce construction staging so as to minimise adverse effects to road traffic. This process has led to a more refined construction staging.

To aid the reader in identifying these amendments, updated text has been highlighted in *yellow*. **Table 2** provides a summary of the key sections within the report that have been updated as well as a short description of the changes.

Table 2: Key updated sections and description of changes

Updated Section	Description
Section 2.4.4.3	SIDRA model adjustments to simulate the effects of raised tables and raised intersections.
Section 3.8.1	Updated assessment of the existing crash environment in response to council's S92 Request for Further Information. Analysis period included data from 2017 - 2022.
Section 4.2	Updated proposed design and construction methodology in EB2 and EB3R. The updates to the proposed design were largely in response to Road Safety Audit comments and changes to further improve transport network operations. This included provision of a signalised intersection between William Roberts Road / Mattson Street / Ti Rakau Drive. Further changes to the design to address issues raised by stakeholders included modification to the previously proposed Edgewater Drive East / Ti Rakau Drive intersection where a priority controlled left in and left out intersection has been replaced with an all movements signalised intersection. The updates to the construction methodology were in response to the updated design as well as an attempt to shorten the overall construction programme.
Section 5.2	Updated assessment of temporary effects to intersection performance and general traffic travel times as a result of the updated construction methodology, including a more refined construction staging.
Section 5.3.5	Updated assessment of temporary effects to bus travel times as a result of the updated construction methodology.
Section 6.3	Updated assessment of permanent effects to intersection performance and general traffic travel times as a result of the updated proposed design.
Section 6.4.7	Updated assessment of permanent effects to bus travel times as a result of the updated proposed design.

Purpose

The purpose of this ITA is to evaluate the temporary and permanent transport effects of the EB2 and EB3R components of the overall Eastern Busway Project (the Project) and to recommend mitigation measures as appropriate. This report will form part of the Assessment of Environmental Effects (AEE) supporting the NoR and resource consent applications of EB2 and EB3R.

The Need for the Project

Auckland's eastern suburbs have one of the highest levels of journey to work trips by car and lowest use of public transport in Auckland[1]. This is due to a combination of lower density land uses and relatively unattractive bus services, lack of cycle facilities and low urban amenity on main roads.

With regard to transport issues in EB2 and EB3R, it has been identified that the area experiences heavy congestion. Recent population growth and a heavy dependence on private vehicles has put significant strain on the existing road network. Furthermore, projected population growth from both established and new suburbs is expected to exacerbate this issue.

Lastly, congestion due to the growth in commercial activity is also anticipated. Ti Rakau Drive and SEART are important for the efficient movement of freight and goods vehicles, connecting the commercial areas of East Tāmaki, Highbrook, Botany, Pakuranga and Highland Park to the wider region.

Without intervention, demand for public transport, walking and cycling will remain low, the heavy reliance on car travel will continue and the road network will experience significantly increased congestion. This will further impede the efficient movement of people and goods within the area, lead to detrimental environmental outcomes and exacerbate the area's limited access to opportunities compared to the rest of the region both in terms of the quality of life for residents and the economic wellbeing of businesses. It will also limit the area's potential to sustainably accommodate further residential and employment growth.

Benefits of the Project

The Eastern Busway programme presents an opportunity to address these problems by extending the rapid transit, high frequency busway between Panmure and Pakuranga, through to Botany Town Centre. The Project will include new walking and cycling connections, placemaking, urban renewal initiatives and improvements for general traffic. The end result will see customers being able to travel between Botany and Britomart by bus and train in less than 40 minutes, which is 20 minutes quicker than the current journey times.

EB2 and EB3R will help alleviate congestion, principally through the diversion of traffic from the Ti Rakau Drive / Pakuranga Road intersection and onto the Reeves Road Flyover (RRF). This diversion will reduce the volumes of through-traffic within the Pakuranga Town Centre and local roads. As such, EB2 and EB3R's contribution to congestion reductions will improve travel times, supporting the rapid movement of freight and people.

The Project will also provide increased transport choices for residents and visitors. The dedicated bus lanes and stations will improve the public transport experience for passengers and make it more attractive to current private vehicle users. Increased uptake of public transport will also ease congestion and reduce greenhouse gas emissions. Similarly, the Project's walking and cycling investments make those transport modes safer and more attractive to users. Lastly, an additional positive effect associated with EB2/EB3R, and the wider Project, is improved accessibility.

[1] SNZ Census 2018

Therefore, reduced congestion, better public transport, safer walking and new cycling infrastructure will improve the ability for both local residents and visitors to access jobs, education, recreation, housing and healthcare. Given the above, EB2 and EB3R will have significant positive effects for Auckland.

Assessment of Effects

Overall, through AIMSUN and SIDRA modelling assessments, EB2 and EB3R are expected to lead to acceptable intersection operations across the network. Importantly, bus movements are predicted to operate at LOS C and with spare capacity. The RRF is expected to relieve congestion around the Pakuranga Town Centre, and significant improvements in travel times are expected overall, especially between Botany in the east and Pakuranga and SEART in the west.

EB2 and EB3R are predicted to significantly increase public transport patronage in the future. As such, bus station platforms and loading areas have been designed to provide appropriate levels of service and capacity to support this uptake. Furthermore, bus service headways will be improved, and travel times are predicted to decrease overall, leading to faster and more reliable public transport trips. The combination of these public transport upgrades and improvements is expected to significantly increase public transport mode share, which in turn will reduce congestion and greenhouse gas emissions.

Dedicated footpaths and cycleways will improve pedestrian and cyclist amenity and safety which will provide users with a more attractive mode of travel and supports the uptake of cycling. Furthermore, the cycleways will improve accessibility to the bus stations, resulting in increased catchment and mode shift to public transport.

Lastly, through a Safe System Assessment (SSA), EB2 and EB3R are expected to provide an overall safer transport system for all modes of transport through the project areas with the aim to reduce fatal and serious injury crashes.

Mitigation

Overall, the temporary effects of construction in the project areas will be mitigated appropriately and are considered to be negligible to low. A Workforce Travel Management Plan (WTMP) will be developed to reduce private vehicle trips and to increase worksite accessibility through more travel options. Construction Traffic Management Plans (CTMPs) will be developed to avoid, remedy or mitigate the adverse effects of construction on transport, parking and property access so far as is reasonably practicable, along with measures to manage travel demand through the provisions of the Site Specific Traffic Management Plans (SSTMPs). The CTMPs will be developed in accordance with the conditions of consent and will include management strategies, controls and reporting protocols to achieve this. Hours of operation will be controlled in part by the Project’s consent conditions and management plans, including the Construction Noise and Vibration Management Plan (CNVMP).

Conclusions

With the proposed mitigation measures in place, the potential adverse effects during construction and upon completion of EB2 and EB3R are considered to be negligible to low overall. Furthermore, the proposed design is predicted to result in significant improvements and a range of benefits overall.

1 Introduction

1.1 Project Background

The Auckland Manukau Eastern Transport Initiative (AMETI) programme was initiated in 2006 and has become the responsibility of Auckland Transport (AT) following the amalgamation of Auckland's previous local authorities in October 2010. The Eastern Busway Project (the Project)[2] is a flagship project for Auckland and will form a key part of the region's Rapid Transport Network (RTN). It will create dedicated bus lanes to connect people from Botany, Pakuranga, and the surrounding suburbs, to the rail network in Panmure. The Project includes cycling and walking paths, roading and safety improvements and a new RRF to ensure better journey reliability for all modes.

The Panmure to Pakuranga section of the busway (EB1) opened in late 2021. The Eastern Busway Alliance (EBA) has been formed to design and consent the Pakuranga to Botany sections of the Project (EB2,3,4), progressing towards construction, which is expected to start in 2022. The Project will provide a busway from Pakuranga Town Centre in the west to Botany Town Centre in the east. The busway will be approximately 5km long and will be running at grade primarily on Ti Rakau Drive. A median busway (Online Busway) is proposed along Ti Rakau Drive from Pakuranga Road to Gossamer Drive, while a separated busway (Offline Busway) is proposed between Gossamer Drive and Botany Station.

There will be one major interchange station at Pakuranga Town Centre, one major interchange station at Botany Town Centre, and three intermediate stations along Ti Rakau Drive. A separate cycleway and pedestrian footpath are also proposed along the length of Ti Rakau Drive. The proposed busway will serve the major employment areas of East Tāmaki, Botany and Panmure, as well as Botany and Pakuranga Town Centres. The proposed busway will also connect with major interchanges at Botany, including local bus services and Airport to Botany (A2B) RTN services, and at Panmure for suburban rail services.

1.1.1 Strategic Context

Auckland's eastern suburbs have one of the highest levels of journey to work trips by car and lowest use of public transport in Auckland[3]. This is due to a combination of lower density land uses and relatively unattractive bus services, lack of cycle facilities and low urban amenity on main roads. Without intervention, demand for public transport, walking and cycling will remain low and the heavy reliance on car travel will continue. This will further impede the efficient movement of people and goods within the area, lead to detrimental environmental outcomes and exacerbate the area's limited access to opportunities compared to the rest of the region. It will also limit the area's potential to sustainably accommodate further residential and employment growth.

The Eastern Busway programme presents an opportunity to address these problems by extending the rapid transit, high frequency busway between Panmure and Pakuranga, through to Botany Town Centre. The Project will include new walking and cycling connections, placemaking, urban renewal initiatives and improvements for general traffic. The end result will see customers being able to travel between Botany and Britomart by bus and train in less than 40 minutes, which is 20 minutes quicker than the current journey times.

[2] Formally known as AMETI.

[3] SNZ Census 2018

1.1.2 Project Objectives

The Project has a set of clear objectives and are outlined below:

1. Provide transport infrastructure that improves linkages, journey time and reliability of the public transport network

2. Provide a multimodal transport corridor that connects Pakuranga and Botany to the wider network and increases choice of transport options

3. Safeguard future transport infrastructure required at (or in vicinity of) Botany Town Centre to support the development of a strategic public transport connection to South Auckland

4. Provide transport infrastructure that integrates with existing land use and supports a quality, compact urban form

5. Contribute to accessibility and place shaping by providing better transport connections between, within and to the town centres

6. Provide transport infrastructure that is safe for everyone

1.1.3 Benefits of the Project as a Whole

With the Panmure to Pakuranga (EB1) section of the Project completed, once delivered the next stage between Pakuranga and Botany (EB2, 3 and 4) will provide:

- Better connections and sustainable travel options for pedestrians, cyclists, motorists, bus and train customers
- A reliable 40-minute bus and train trip between Botany Town Centre and Britomart (saving 20-minutes)
- Increase in public transport trips from 3,700 to 18,000 per day by 2028
- Increase in public transport mode share from 7% to 25% by 2028
- Reduce carbon emissions by 9,292 kg per day by 2028
- 24,000 more people with access to a rapid transit bus station within 1 km from home
- 5 km of busway between Pakuranga and Botany fully separated from other traffic
- 5 new bus stations with quality facilities
- 12 km of safe and separated walking and cycling infrastructure
- Reeves Road flyover to reduce vehicle congestion around Pakuranga Town Centre
- Encourage and support development of a more sustainable urban form and improve urban amenity
- Accommodates electric buses, a key part of AT's low-emission vehicle fleet by 2040

1.1.4 EB2 and EB3R Project Benefits

The Project will deliver significant benefits to the communities of southeast Auckland and the wider Auckland Region. The Project has been developed in response to transport issues within southeast Auckland, to meet projected population growth, reduce regional greenhouse gas emissions and to achieve modal shift goals.

With regard to the Project area's transport issues, it was previously identified that the Howick Local Board area experiences heavy congestion, with 90,000 vpd using the Panmure and Waipuna Bridges. Recent rapid population growth and a heavy dependence on private vehicles has put significant strain on the existing road network. EB2 and EB3R will help alleviate this congestion. This will principally be achieved through the diversion of traffic from the Ti Rakau Drive / Pakuranga Road intersection and onto the RRF. This diversion will reduce the volumes of through-traffic within Pakuranga Town Centre and local roads. As such, EB2 and EB3R's contribution to congestion reductions will improve travel times, supporting the rapid movement of freight and people.

In addition, the development of the Project has been driven by both previous and projected population growth within southeast Auckland. Pakuranga Town Centre is a major transport hub for southeast Auckland, with traffic flows coming from both established and new suburbs. Ti Rakau Drive and SEART are also important for the efficient movement of freight and goods vehicles, connecting the commercial areas of East Tāmaki, Highbrook, Botany, Pakuranga and Highland Park to the wider region.

The established suburbs, such as Howick and Highland Park are experiencing high levels of redevelopment, through both infill housing and wholesale redevelopment of sites. This redevelopment will only grow in intensity through the new medium density residential standards introduced in late 2021 by the New Zealand Government. Traffic flows from the Auckland Isthmus are also expected to increase given population growth from brownfield developments like the Tāmaki regeneration programme[4]. Large growth is also being generated by greenfield developments like Flat Bush, where 1700 ha of land is being urbanised for a population of 40,000 people. Lastly, congestion due to the growth in commercial activity is also anticipated.

Without the construction of the Project and the provision of improved transport choices (i.e., public and active transport modes), southeast Auckland's road network would experience significantly increased congestion. This would in-turn, impact both the quality of life for residents and the economic wellbeing of Auckland's businesses. The Project will alleviate, in part, increases in road congestion.

The Project will also provide increased transport choices for residents and visitors. The dedicated bus lanes and stations will improve the public transport experience for passengers and make it more attractive to current private vehicle users. Increased uptake of public transport will also ease congestion and reduce greenhouse gas emissions. Similarly, the Project's walking and cycling investments make those transport modes safer and more attractive to users. Lastly, an additional positive effect associated with EB2/EB3R, and the wider Project is improved accessibility.

Therefore, reduced congestion, better public transport, safer walking and new cycling infrastructure will improve the ability for both local residents and visitors to access jobs, education, recreation, housing and healthcare. Given the above, EB2 and EB3R will have significant positive effects for Auckland.

[4] Tāmaki regeneration programme will deliver 10,500 new homes over the next 20 years.

1.2 Scope and Purpose of Report

The assessment and consenting phases of the proposed alignment of the Project has been divided into three 'packages'. The rationale is to aid in obtaining relevant RMA approvals for sections of the Project without potential undue delay to the Project as a whole.

This Integrated Transport Assessment (ITA) assesses the traffic and transportation effects during construction and upon completion of the EB2 and EB3 Residential (EB3R) sections of the Project.

Assessment of the William Roberts Road Extension (WRRE), which will precede EB2 and EB3R, has been provided for in the Early Works resource consent package, but has been taken into account in this assessment as part of the existing environment. Assessment of the EB3 Commercial (EB3C) and EB4 sections of the Project, which will follow after this ITA, will be addressed in a separate report.

The full extent and location of the Project is shown in **Figure 1** below.

Figure 1: Full project extent and location[5]

The main elements of EB2 and EB3R include the construction of the RRF, the busway along Ti Rakau Drive from Pakuranga Road to Reeves Road (EB2) and Reeves Road to Gossamer Drive (EB3R) as well as three new bus stations. The general extent and location of these sections of the Project are shown in **Figure 2** below.

[5] https://at.govt.nz/projects-roadworks/eastern-busway/

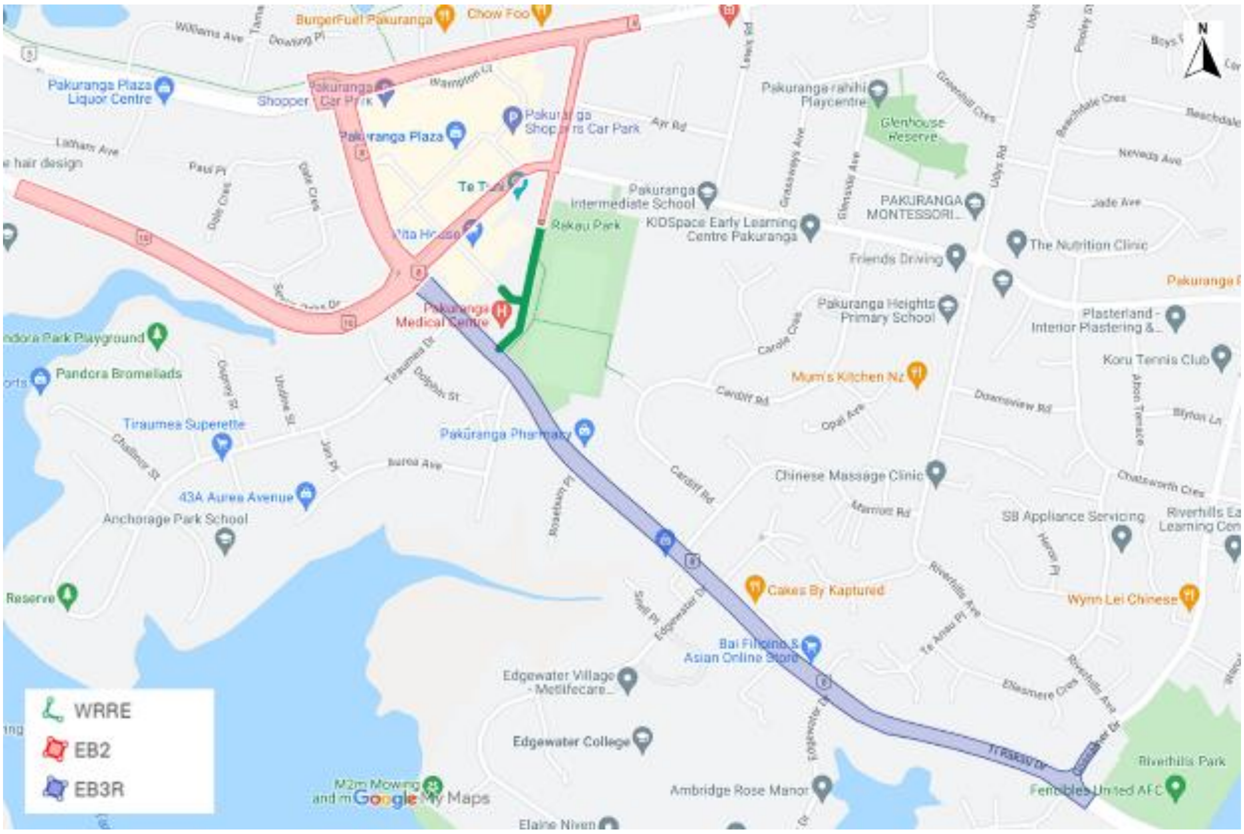


Figure 2: EB2 and EB3R general extent and location

The purpose of this report is to:

1. Identify and describe the existing transport environment, including the key issues that the environment faces
2. Describe the potential positive and adverse transport effects of EB2 and EB3R during its construction, in order to highlight the benefits of the Project and to develop mitigation measures as needed
3. Recommend measures (including any conditions/ management plans required); as appropriate to avoid, remedy or mitigate potential traffic and transportation effects including as these relate to effects from construction traffic
4. Present an overall conclusion of the level of potential transport effects of EB2 and EB3R after the recommended measures are implemented

1.3 Report Structure

This ITA has been structured as follows:

Section 2 describes the methodology used to assess the effects of EB2 and EB3R on the transport environment. This includes EB1, WRRE and other enabling works that will form part of the baseline traffic environment, traffic modelling methodology, public transport, walking and cycling, property access and parking, safety performance and freight traffic.

Section 3 provides a description of the existing transport environment including land use zoning, the transport network, traffic volumes, travel times, road characteristics, bus services and facilities, walking and cycling facilities, parking, crash environment, over-dimension and over-weight (OD and OW) routes, and changes to the baseline traffic environment for modelling.

Section 4 provides an overview of the proposed design and construction of EB2 and EB3R.

Section 5 provides an assessment of the temporary effects of EB2 and EB3R during construction, including construction effects, general traffic, bus services and facilities, pedestrians and cyclists, property access and parking, and safety performance.

Section 6 provides an assessment of the permanent effects of EB2 and EB3R upon completion, including a description of the future transport network, general traffic, bus services and facilities, pedestrians and cyclists, property access and parking, and safety performance.

Section 7 provides a summary of the mitigation measures proposed in this ITA.

Section 8 provides the conclusions from this ITA.

2 Assessment Methodology

2.1 Introduction

This section describes the methodology used to assess the effects of EB2 and EB3R on the transport environment including:

- A description of the transport environment for assessment (which includes EB1 (Panmure to Pakuranga), WRRE works, and other enabling works)
- Traffic modelling methodology
- Public transport
- Walking and cycling
- Property access and parking
- Safety performance
- Freight traffic

2.2 Guidance and Scope

The preparation of this ITA has taken into account the guidance set out in the Auckland Transport (AT) document "*Integrated Transport Assessment Guidelines*" (January 2015) and the Waka Kotahi NZ Transport Agency (Waka Kotahi) document "*Integrated Transport Assessment Guidelines*" (November 2010). This assessment has considered the operational effects of the following areas in the system:

- Road network – general traffic flows and travel time
- Public transport network
- Walking and cycling network
- Property access
- Parking
- Safety performance
- Heavy vehicle routes

2.3 Transport Environment for Traffic Modelling Assessment

Auckland's transport networks are constantly changing, undergoing improvements from new initiatives and being optimised. Furthermore, the global COVID-19 pandemic dramatically effected travel patterns and behaviours, and uncertainty remains that these effects would continue into the future. Assessment of the Project against the existing environment was therefore not considered appropriate.

Instead, a more conservative approach was followed whereby a future year scenario was used to compare a '<u>without</u> Project' and a '<u>with</u> Project' scenario. Throughout this assessment, the '<u>without</u> Project' scenario is also referred to as the '<u>Do-Minimum</u>' scenario, whilst the '<u>with</u> Project' scenario is also referred to as the '<u>EB2/EB3R</u>' scenario. The transport models used to simulate the effects of the future year scenarios are listed below:

- Do-Minimum – 2028
- EB2 and EB3R – 2028

Notable major changes to the existing transport network, that were included in the modelling assessments, are detailed below.

2.3.1 Eastern Busway 1 (EB1)

EB1 is a key component of the overall Project. It is the segregated busway connection from Panmure train station to Pakuranga Town Centre. EB1 was completed near the end of 2021 and was included in all 'future year' scenarios.

2.3.2 WRRE Works

This assessment has considered the effects of the WRRE to be undertaken prior to EB2 and EB3R construction. The WRRE includes the extension of William Roberts Road south to Ti Rakau Drive and the completion of the Cortina Place link between William Roberts Road and Reeves Road. WRRE was included in all future year scenarios.

2.3.3 Other EB2 and EB3R Enabling Works

This assessment has also considered the effects of other enabling works to be undertaken during the initial phases of the EB2 and EB3R construction programme, to enable the temporary closure of Reeves Road. The enabling works include geometric and traffic signal timing plan amendments at the Ti Rakau Drive / Reeves Road and Ti Rakau Drive / Gossamer Drive intersections. These enabling works will form part of the EB2 and EB3R consent packages.

2.4 Traffic Modelling Methodology

Traffic modelling undertaken of the proposed design of the Project used data cascaded from a number of higher-order, more strategic models provided by the Auckland Forecasting Centre (AFC).

Macro Strategic Model (MSM) Auckland Regional Transport Models (EMME) – These models forecast demands based on Auckland Council's Scenario I Modified Version 11.5 demographic and land use data. The outputs of these models include general traffic demand and public transport demand.

AMETI Regional Traffic Models (EMME) – The outputs of the MSM models were used as inputs into the Regional Traffic Models to generate traffic demands across the region. The outputs of the regional models were then fed into project specific AIMSUN models to allow for a more detailed assessment of traffic effects.

Operational Microsimulation Models (AIMSUN) – These models provide information regarding travel times along different routes within the project area as well as turn movements and traffic demand along roads within the project area. The turning movement outputs from these models were used as inputs into the SIDRA models.

Intersection Models (SIDRA) – These models were used to determine the performance of intersections using traffic movement data from the AIMSUN models. The key outputs include Degree of Saturation (DOS or v/c ratio), delay in seconds, Level of Service (LOS) and queue lengths in metres.

2.4.1 Supplied Models

The AIMSUN 2018 Base Model was subjected to various calibration and validation checks to assess the accuracy and suitability of the model. These checks were undertaken with reference to criteria for Category C: Urban Area NZTA Model Development Guidelines (Criteria) on individual link flows, turn flows and travel time for each hour between 07:00 – 09:00 and 16:00-18:00 and is considered acceptably calibrated and validated for the purposes of Eastern Busway design work[6] (see **Appendix J**).

Turning movement volumes from the AIMSUN models were used in the SIDRA models to assess intersection performance.

2.4.2 Model Outputs

As above, traffic flow outputs (in vehicles per hour) from the AIMSUN models were used as inputs in the SIDRA models to assess intersection performance. AIMSUN models simulate several hours of the network operation during the AM and PM peak periods. However, in order to account for residual demand and queues within the network and to maintain consistency across the various model runs, the AM peak hour adopted was 08:00 – 09:00 while the PM peak hour was 17:00 – 18:00. Traffic flows from these peak hours, produced by AIMSUN, were used to assess intersection performance in SIDRA.

Another key AIMSUN model output considered during this ITA was travel time. Route travel times were determined along various routes through the Project areas for the Do-Minimum and EB2/EB3R scenarios. The effects of EB2 and EB3R were determined by comparing these scenarios in each direction, for the AM and PM peak periods.

Key SIDRA outputs considered during this ITA included Level of Service (LOS), Degree of Saturation (DOS) or v/c ratio, and delay in seconds.

2.4.3 Traffic Demand

The traffic demand data, cascaded down from the various models as detailed above and used in the SIDRA models, represent an average weekday's traffic demand in the AM and PM peak hours. Interpeak periods and weekends were determined to generally have lower traffic activity and congestion compared to weekdays, so explicitly modelling these periods was not considered necessary to understand the effects and outcomes of the Project.

[6] Eastern Busway – Base 2018 Model Update Report, BECA, February 2019

2.4.4 Assumptions

Below are the key assumptions used in the modelled transport environments.

2.4.4.1 MSM Assumptions

- Auckland Council's Scenario I Modified Version 11.5
- All relevant projects that have been identified in the ATAP plan delivery 2021 – 2031 were included in the MSM version 11.5. Notable projects that may influence the demand of the movement of people around the Project include:
    - Airport to Botany interim bus improvements
    - Sylvia Park bus improvements
    - Connected Communities (Pakuranga Road)
    - City Rail Link
- Eastern Busway 1 Panmure to Pakuranga was included in the future Do-Minimum, 2028 and 2048 scenarios

2.4.4.2 AIMSUN Assumptions

- Similarly, relevant and notable projects were included in the AIMSUN models

2.4.4.3 SIDRA Assumptions

- Where turning movement volumes were <10 veh/h, a minimum of 10 veh/h was adopted
- Rather than being random, bus arrivals at intersections were set to Arrival Type 6 on all busway lanes. This means a high percentage of arrivals occur during the green phases, which was used to simulate Traffic Signal Priority for buses
- Free flow speeds along Ti Rakau Drive were assumed from the free-flow speeds provided by the MSM modelling. The following speeds were assumed for the various other streets:
    - Side streets – 50 km/h
    - William Roberts Road - 30km/h
    - Entrances (i.e., to the mall) – 20 km/h
    - Along busways – 50 km/h
- Saturation flow rate was left at the SIDRA default Basic Saturation Flow of 1950 tcu/h per lane
- Where the approach/ intersection was modified, lanes widths for general vehicle lanes and bus lanes were taken as 3.2 m and 3.5 m, respectively

The following model adjustments were added to simulate the effects of a raised table or raised intersection as per the updated proposed design (see **Appendix B** and **Appendix C**):

- Saturation flow rate of 1860tcu/h per lane, calculated from a jam spacing assumption of 6.5m which is between 6m (standard queue space value) and 7m (default SIDRA light vehicle jam spacing value)
- Saturation speed of 25km/h (MOTSAM guidelines for raised tables/humps)
- Negotiation speed of 25km/h

2.5 Public Transport, Walking and Cycling

2.5.1 Public Transport

The effects on the public transport network focused on the following aspects:

- Direct effects on bus routes and bus stops
- Effects on travel times of buses through the Project area

2.5.2 Walking and Cycling

The assessment considered the potential effects of EB2 and EB3R on pedestrians and cyclists. This was primarily via a qualitative assessment of changes in the type and quality of connections and facilities provided.

2.6 Property Access and Parking

2.6.1 Property Access

The assessment considered the potential effects of changes in property access. Local access effects were assessed in terms of extra travel time and distance as well as safety.

2.6.2 Parking

This included assessment of the potential physical effect of reducing properties' on-site parking spaces, as well as any on-street parking that may be affected by the proposed design.

2.7 Safety Performance

A Safe System Assessment (SSA) was undertaken for the Project, which provides a comprehensive assessment of the existing crash environment and the potential future environment.

The safety performance assessment considered the effects of the proposed design on existing roads, new roads and vulnerable users.

2.8 Freight Traffic

It is recognised that cars and trucks generally have the same travel times in congested urban networks and therefore the same methodology described in **Section 2.4.2** was used to assess the effect of the Project on freight traffic and direct effects to heavy vehicle routes.

3 Existing Transport Environment

This section provides a description of the existing transport environment, including the following:

- A description of the existing problems and challenges
- Land use zoning
- Existing transport network
- Traffic volumes
- Travel times
- Road characteristics
- Bus services and facilities
- Walking and cycling facilities
- Parking
- Crash environment
- Over-dimension and over-weight (OD and OW) routes
- Changes to the baseline traffic environment

3.1 Description of the Existing Problems and Challenges

In 2016, AT, Waka Kotahi and Auckland Council agreed the following key problems in the AMETI Project area for the AMETI programme, including the Eastern Busway, to address:

- **Problem 1** – Lack of connections in the transport network creates congestion and unreliable travel times for people accessing employment and other destinations

- **Problem 2** – Lack of travel choices and reliance on private cars is resulting in congestion, lack of access to opportunities and poor environmental outcomes

- **Problem 3** – Provision of transport capacity and options has not kept pace with land use development resulting in congestion and inefficient use of transport corridors

- **Problem 4** – Poorly integrated land use and transport design is limiting accessibility, creating poor places and discouraging economic development

- **Problem 5** – Development and operation of the road network has prioritised the efficient movement of vehicles ahead of safety resulting in too many people dying or being seriously injures, especially vulnerable users

The Project will seek to address these problems through a range of improvements to existing infrastructure as well as new infrastructure.

3.2 Land Use Zoning

The Project area is located in East Auckland and bordered by Pakuranga Town Centre in the northwest and Botany Town Centre in the southeast. Major industrial and commercial areas in East Tāmaki are situated to the west and south which play an important role in providing employment opportunities to the residents in the vicinity of the Project. These employment zones include Panmure, Mt Wellington, Penrose/ Onehunga and Highbrook/ East Tāmaki.

The local land uses comprise of medium density/ single dwelling residential lots with retail-based town centres, local shops, commercial activities and industrial blocks. These areas are currently connected to the Project area by either direct property access or near-direct access via side roads. The Project will also have a through-function and will serve movements between and beyond the fringes of the project area, including links to Panmure, Mt Wellington, Flat Bush and Manukau.

Notable features of the existing land use and environment include:

Business Land Uses of Interest:

- Pakuranga Plaza
- GAS Pakuranga Road service station
- Gull Reeves Road service station
- Tai Ping Supermarket
- Eastside Pups Dog Grooming and Daycare
- Edgewater Shops

Residential and Community Land Uses of Interest:

- Pakuranga Library and Citizens Advice Bureau
- Te Tuhi Art Gallery
- Pakuranga Mosque
- Ti Rakau Park
- Pakuranga Leisure Centre
- Dementia Auckland
- Pakuranga Medical Centre
- Pakuranga Counselling Centre
- Pakuranga Baptist Church
- River Hills Park (Fencibles United Football Club)

Schools and Education Land Uses of Interest:

- Saint Kentigern College
- Barnardos Early Learning Centre
- Pakuranga Intermediate School
- KIDSpace Early Learning Centre Pakuranga
- Pakuranga Kindergarten
- Edgewater College
- Pakuranga Baptist Church and Kindergarten

Figure 3 shows the surrounding area zoning of EB2 and EB3R in the Auckland Unitary Plan (Operative in Part) (AUP(OP)), in the existing environment.

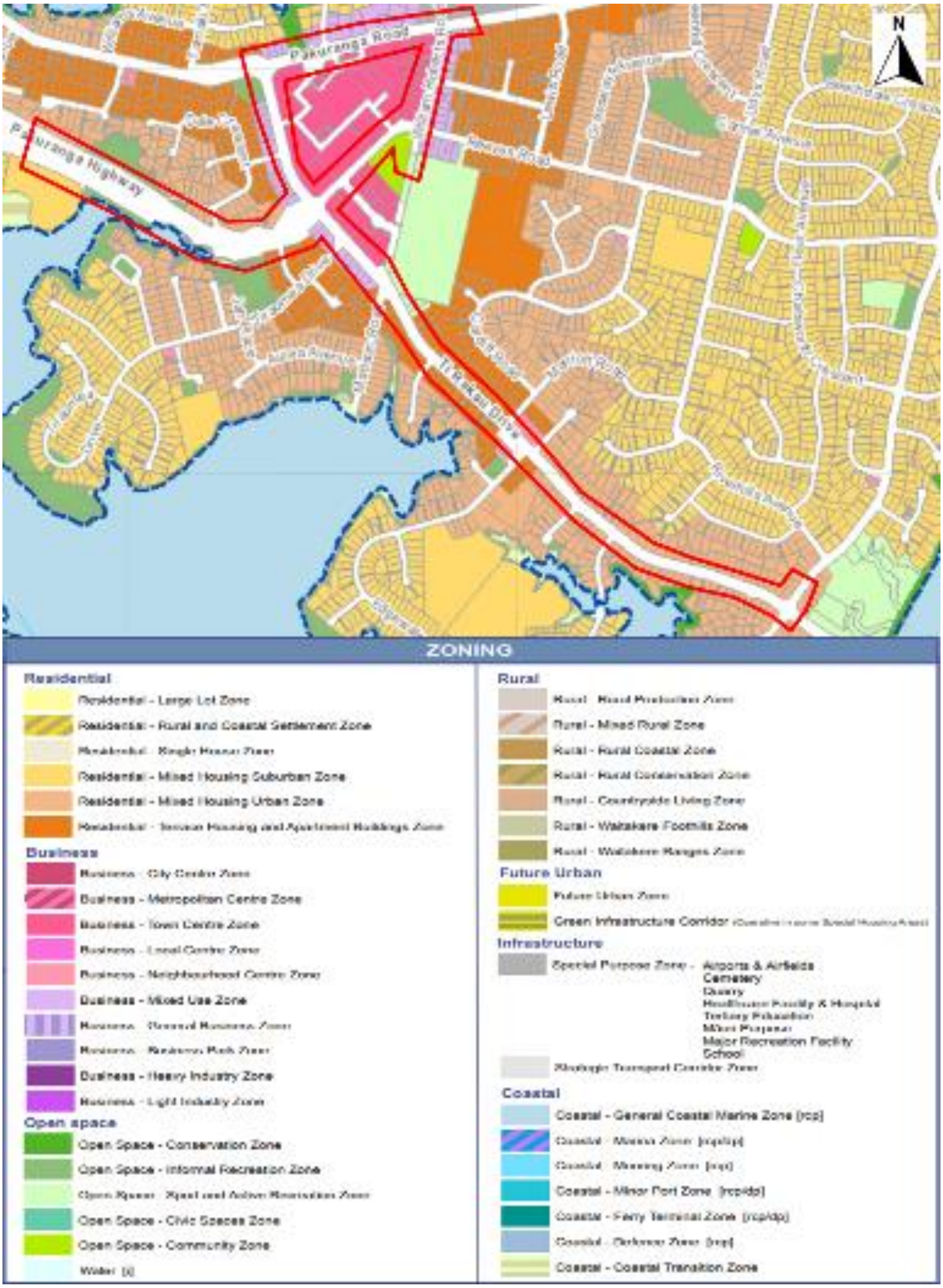


Figure 3: Existing EB2 and EB3R zoning (source: Auckland Council GIS)

3.3 Existing Transport Network

In order to align with AT's and Auckland Council's desire to consistently identify the different functions of roads and streets in Auckland, the EBA has adopted the Roads and Streets Framework (RASF) by using concepts of 'Place' and 'Movement' to reflect the strategic role of streets.

The RASF provides a systematic and consistent methodology for identifying the Place and Movement functions of roads and streets. In doing this, it reflects the needs and catchment of the adjoining land use as well as the movement of people, goods and services. A full RASF assessment was completed for the Project[7] and the section below summarises the key aspects of the existing transport network and modal priority in the EB2 and EB3R project areas.

Figure 4 shows the RASF typology matrix as a function of Movement and Place significance.

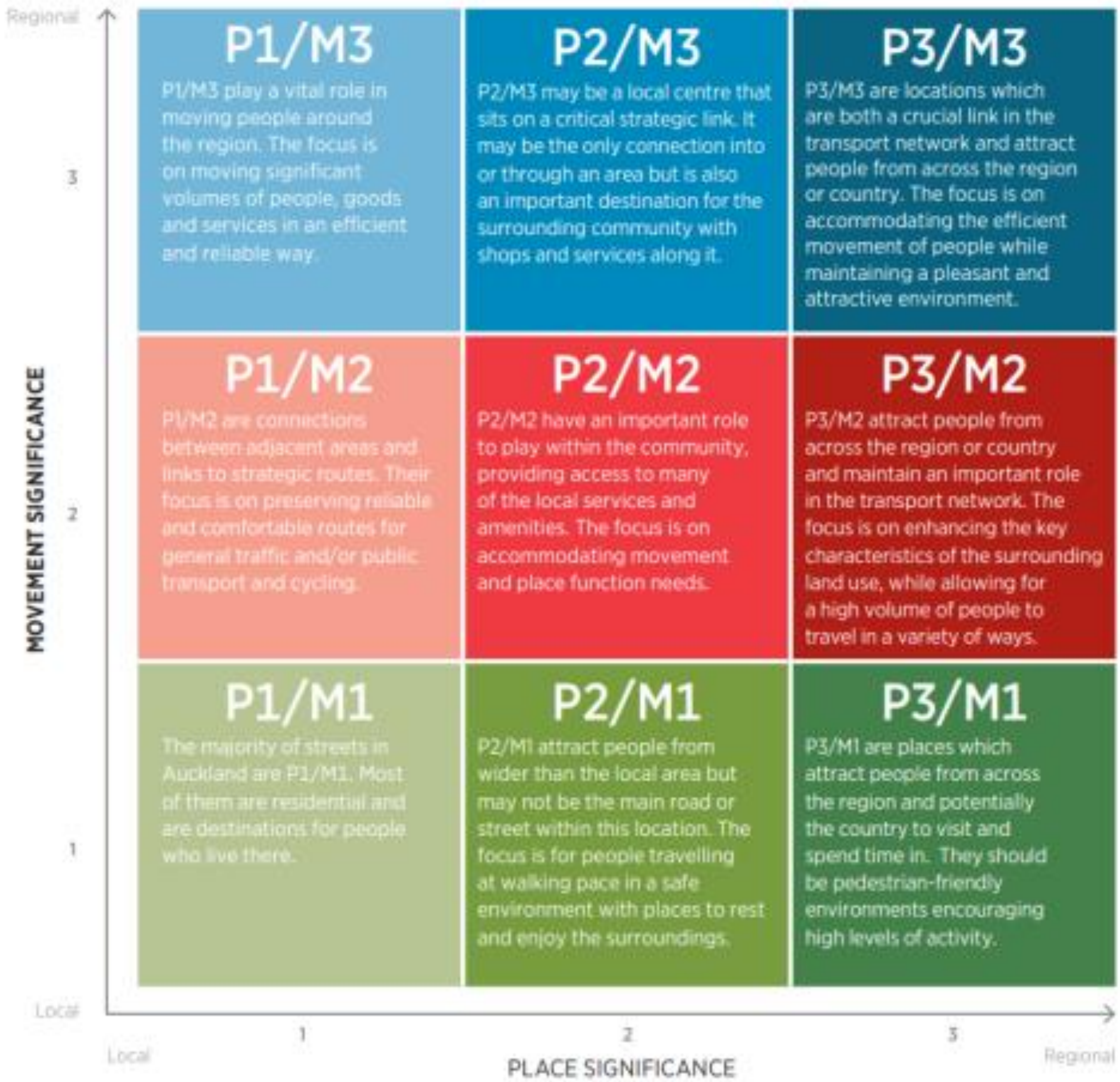


Figure 4: RASF typology matrix

[7] EB234-1-TE-RP-Z0-A2-Roads and Street Framework

Figure 5 outlines the current typology of the EB2 and EB3R project areas.

Figure 5: Existing EB2 and EB3R typology

Pakuranga Road is an east-west primary/ regional arterial, which connects Howick/Highland Park with Panmure via Pakuranga. It also intersects with Ti Rakau Drive, providing an arterial route towards Botany Town Centre and East Tāmaki. Pakuranga Road carries approximately 40,000 vehicles a day, as well as frequent bus services. The objective of this corridor is to move significant volumes of people, goods and services and as such, it has a typology of 'M3' classification.

The majority of land use along Pakuranga Road, west of the town centre, is residential. East of the town centre there are some retail properties along Pakuranga Road. However, these properties generally have a large setback between the footpath and the properties due to car parking spaces. As a result, the primary function of this corridor is Movement.

Ti Rakau Drive is a regionally significant corridor connecting Pakuranga with Botany. Along Ti Rakau Drive there are major employment sites such as Pakuranga Town Centre, Botany Town Centre, and East Tāmaki industrial zones. The section of Ti Rakau Drive east of SEART is a level 1B freight route. Frequent bus services also operate along this section. Given these factors, the primary function of this corridor is also Movement, and it also has a typology of 'M3' classification.

A trend is observed whereby Movement is largely prioritised over Place, especially along Ti Rakau Drive. The Project seeks to improve this, particularly at the proposed locations of the new bus stations.

3.4 Traffic Volumes, Travel Time and Road Characteristics

3.4.1 Traffic Volumes

The existing environment traffic volumes were determined predominantly using traffic data from 2017. In 2020/2021, COVID-19 dramatically affected the way people travelled and so these years would not accurately reflect the volumes of traffic expected on the road network. It was anticipated that data from 2019 would be the most accurate, however, it was determined that this data set was incomplete and would likely produce inaccurate results.

Data from 2017 was the most complete data set available from the previous life cycle of the AMETI EB2&3 specimen design. Although traffic volumes are expected to have grown marginally between 2017 and 2019, it is not expected that this growth would be significant, and the 2017 data is still considered relevant.

Table 3 shows the Average Annual Daily Traffic (AADT) volumes in the existing environment in the EB2 and EB3R project areas as well as the anticipated daily volumes for the 2028 and 2048 future years, without the Project. A conservative approach was followed to produce the 2028 and 2048 future year AADTs, by not including the effects of COVID-19. The purpose of this table is to provide context for a more detailed comparison of the future years.

Table 3: Existing[8] and future[9] AADT (without project)

Road Section	Direction	Existing AADT	2028 without project	2048 without project
Ti Rakau Drive				
Pakuranga Rd – Reeves Rd	Westbound	19,400	20,700	20,700
	Eastbound	14,800	17,400	17,400
Reeves Rd – Tiraumea Dr	Westbound	19,500	18,000	18,700
	Eastbound	17,300	16,600	18,200
Tiraumea Dr – Mattson Rd	Westbound	21,300	17,300	18,000
	Eastbound	18,800	16,600	18,200
Mattson Rd – Marriot Rd	Westbound	21,100	17,400	18,100
	Eastbound	17,900	16,100	17,700
Marriot Rd – Edgewater Dr West	Westbound	20,000	17,800	18,400
	Eastbound	17,900	16,400	17,800
Edgewater Dr West – Edgewater Dr East	Westbound	19,800	16,900	17,600
	Eastbound	17,500	15,600	17,200
	Westbound	19,700	16,600	17,400

[8] The majority of the existing volumes were sourced from 2017 SCATS data, however where this data was not available a mixture of RAMM, ONRC, and the most recent AT traffic counts have been reported.

[9] 2028 and 2048 future year demand was determined from the EMME models

Road Section	Direction	Existing AADT	2028 without project	2048 without project
Edgewater Dr East – Gossamer Dr	Eastbound	18,000	15,300	17,200
Side Roads				
Pakuranga Rd	Westbound	17,900	18,500	17,600
	Eastbound	16,000	20,000	19,400
SEART	Off-Ramp	27,400	26,200	27,900
	On-Ramp	27,000	29,900	30,600
Tiraumea Dr[10]	Exit	1,230	2,800	2,830
	Enter	410	2,600	2,620
William Roberts Rd[11]	Northbound	380	550	540
	Southbound	2,410	5,700	5,700
Reeves Rd	Exit	6,700	9,500	10,000
	Enter	6,600	4,100	4,400
Mattson Rd[12]	Exit	1,000	1,700	1,600
	Enter	1,600	2,300	2,300
Marriot Rd[13]	Exit	1,160	840	840
	Enter	1,090	950	1,000
Edgewater Dr West	Exit	1,500	1,800	1,900
	Enter	1,200	1,900	2,000
Fremantle Pl	Exit	400	520	530
	Enter	400	480	480
Gossamer Dr	Exit	7,200	1,2200	12,800
	Enter	5,800	8,800	10,000

It should be noted that no data was available for Cortina Place. This table provides useful context, however a more detailed comparison of future years ‘without and with the Project’ is discussed in **Section 5** and **Section 6** of this report.

[10] 2018 RAMM data used.
[11] Assumed 50/50 Split of volumes enter and exit.
[12] 2018 RAMM data used.
[13] 2028 design volume ratios used to determine volumes in each direction.

Large increases in traffic demand are predicted on Ti Rakau Drive between Pakuranga Road and Reeves Road in the 2028 future year, with no increases by 2048. With this section of the corridor near or at full capacity, especially at the Ti Rakau Drive / Reeves Road / SEART intersection, a trend is observed where traffic demand on Ti Rakau Drive to the east of the intersection is expected to remain roughly unchanged or in some cases decrease. This is likely due to large increases in queues and delays, acting as a bottle neck for the rest of the corridor, forcing vehicles to reroute to less congested links.

This trend is also observed on Pakuranga Road. An increase in traffic demand is predicted by 2028, with a decrease by 2048. In the existing environment, motorists travel along Pakuranga Road and turn left onto Ti Rakau Drive to head towards SEART. With this section of Ti Rakau Drive at capacity, large increases in queues and delays are likely. This in turn is expected to lead to rerouting to occur to less congested links.

Figure 6 shows the AADT volumes in the existing environment in a network context.

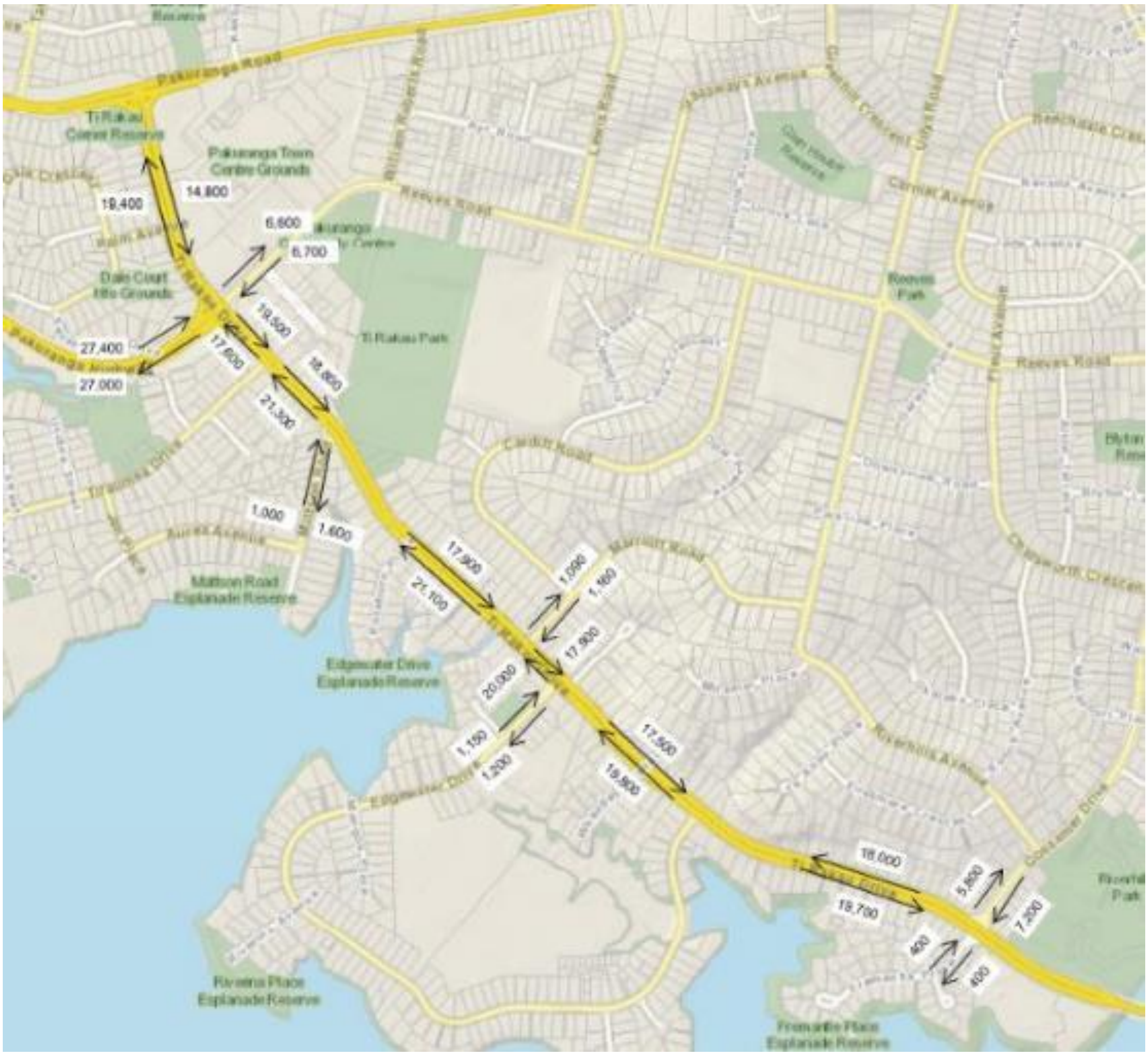


Figure 6: Existing environment AADT

3.4.2 Travel Time and Variability

Route travel times and variability in the existing environment were determined from the AIMSUN 2018 Base Model. The AM peak hour was recorded between 07:30-08:30 and the PM peak hour between 16:30-17:30. To maintain consistency across the different assessments already conducted and future ITAs, four routes were selected to determine the travel time of general traffic in the existing environment. These routes are outlined below, and the results are shown in **Table 4**:

- Botany to Pakuranga (Ti Rakau Drive / Chapel Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Botany to SEART (Ti Rakau Drive / Te Irirangi Drive intersection to the western abutment on Waipuna Bridge) – both directions
- Howick to Pakuranga (Pakuranga Road / Glenmore Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Howick to SEART (Pakuranga Road / Glenmore Road intersection to the western abutment on Waipuna Bridge) – both directions

Table 4: Base model (2018) general traffic travel times

AM Peak						
	Westbound			Eastbound		
Route	Base Model 2018 [min]	Variability + [min]	Variability – [min]	Base Model 2018 [min]	Variability + [min]	Variability – [min]
Botany - Pakuranga	17.4	2.0	-1.7	11.7	0.3	-0.4
Botany - SEART	10.7	1.6	-0.9	9.4	0.9	-0.7
Howick - Pakuranga	3.1	0.1	-0.1	3.3	0.2	-0.1
Howick - SEART	12.0	0.4	-0.5	6.9	0.5	-0.4
PM Peak						
	Westbound			Eastbound		
Route	Base Model 2018 [min]	Variability + [min]	Variability – [min]	Base Model 2018 [min]	Variability + [min]	Variability – [min]
Botany – Pakuranga	26.1	0.8	-1.1	16.0	0.8	-1.2
Botany - SEART	18.5	0.6	-0.9	9.3	0.6	-0.6
Howick - Pakuranga	2.9	0.1	-0.1	5.6	0.6	-0.5
Howick - SEART	4.5	0.1	-0.2	9.2	0.2	-0.1

In the AIMSUN model, the routes from Botany to Pakuranga and Botany to SEART travel along the same section of Ti Rakau Drive, up to Reeves Road. Therefore, these routes have the same travel time along this section of the corridor.

However, from the Ti Rakau Drive / Reeves Road / SEART intersection, the Botany to Pakuranga route heads towards the Williams Avenue intersection, a distance of roughly 780 m. Meanwhile, the Botany to SEART route extends up to the western abutment of the Waipuna Bridge, a distance of roughly 1.4km.

Although the Botany to Pakuranga Road route passes through three more intersections compared to the Botany to SEART route, its travel time is significantly longer. This is particular evident in the peak directions, westbound in the AM peak period and eastbound in the PM peak period. This is likely due to congestion on Ti Rakau Drive between Pakuranga Road and Reeves Road, leading to large queues and delays.

This trend is also observed in the Howick to Pakuranga and Howick to SEART routes. The two routes from Howick travel along the same section of Pakuranga Road, from Glenmore Road up to Ti Rakau Drive and will have the same travel times along this section. However, a significant increase in travel time is expected in the Howick to SEART route. Although the distance from the Pakuranga Road / Ti Rakau Drive intersection to the Waipuna Bridge is further than the distance to the Williams Avenue intersection, it is likely that congestion on Ti Rakau Drive is contributing to the large travel times.

3.4.3 Road Characteristics

The traffic data for Ti Rakau Drive demonstrated a tidal flow characteristic where westbound traffic movements (citybound) are dominant in the morning period and eastbound traffic volumes (outbound) are dominant in the evening period.

Figure 7 shows the existing directional signage on Ti Rakau Drive, upstream of Reeves Road / SEART intersection, westbound and eastbound, respectively.

Figure 7: Existing directional signage on Ti Rakau Dr westbound and eastbound, respectively

A raised median on Ti Rakau Drive between Pakuranga Road and Reeves Road prevents right-turn movements, except at Palm Avenue. Aylesbury Street has two accesses points onto Ti Rakau Drive with varying movement restrictions. A U-turn facility is provided on Ti Rakau Drive approximately 50 m south of the intersection with Pakuranga Road. This section of Ti Rakau Drive consists of three lanes in each direction.

A similar restriction currently exists on Ti Rakau Drive between Reeves Road and Mattson Road, preventing right-turn movements out of Tiraumea Drive and all properties fronting this section of Ti Rakau Drive. Three lanes westbound and two lanes eastbound are provided for the majority of this section.

The raised median continues from Mattson Road to Gossamer Drive, preventing right-turns out of properties fronting Ti Rakau Drive. However, full turning movements are provided at all intersections along this section of the corridor. Ti Rakau Drive has a 60 km/h posted speed limit in the existing environment.

3.5 Bus Services and Facilities

In December 2017, AT launched a new bus network for East Auckland. This launch included a new bus network, bus routes, route numbers, timetables and buses. The new East Auckland Bus Network philosophy was improved integration with other public transport networks for Auckland, such as buses connecting with trains at the Panmure and Otahuhu interchanges, as well as at the Middlemore, Papatoetoe and Manukau train stations. **Figure 8** outlines the existing bus routes operating in the EB2 and EB3R project areas.

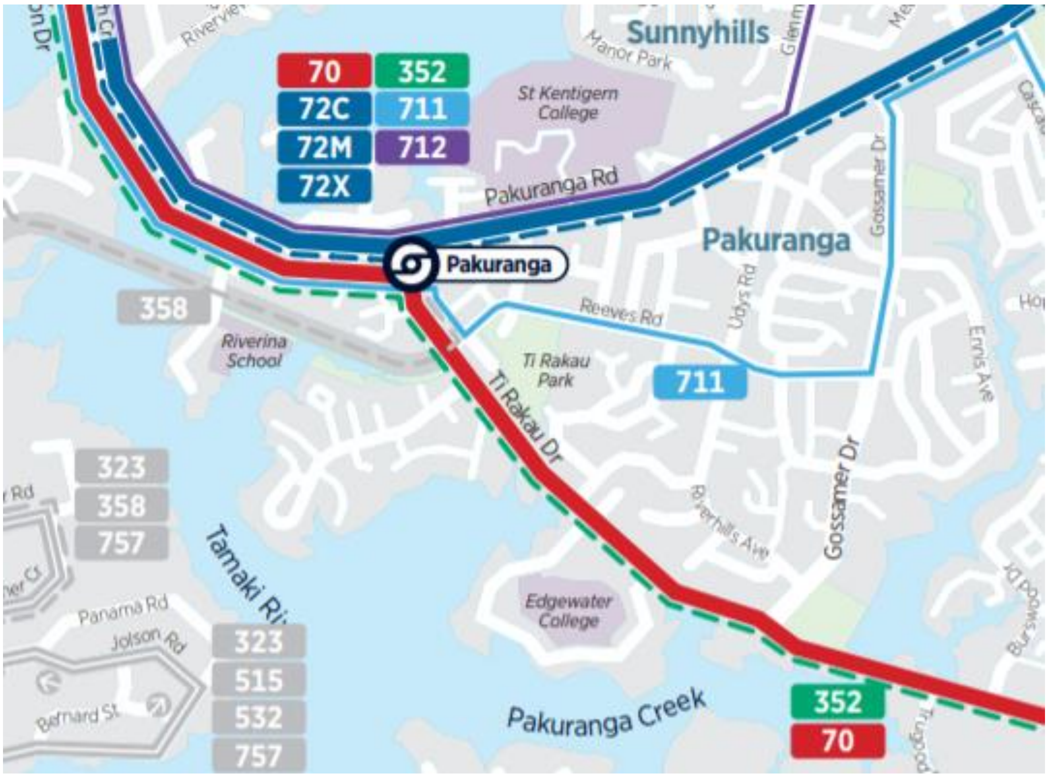


Figure 8: Existing bus network through EB2 and EB3R project areas[14]

[14] https://at.govt.nz/media/1974487/east-new-network-get-ready-poster-aug17-v30.pdf

There are a number of routes within the EB2 and EB3R project areas that currently operate on the proposed Eastern Busway corridor. These routes are the 70, 72C, 72M, 72X, 352, 711, 712. School bus services operating in the EB2 and EB3R project areas include the following:

- S415 – Pakuranga to Sacred Heart College
- S416 – Botany Downs to Sacred Heart College
- S440 – Bucklands Beach to Sancta Maria College
- S013 – Otara to Edgewater College
- S073 – Otahuhu to Edgewater College

Details of the general routes are outlined in **Table 5** below.

Table 5: Existing bus services through EB2 and EB3R project areas

Route Type	Route No	Frequency	Description
Frequent Services	70	Every 15 minutes	Botany, Pakuranga, Panmure, Ellerslie, Newmarket, City
	72C/M	Every 15 minutes	Howick, Pakuranga Rd, Pakuranga, Panmure
Connector Services	711	Varying	Howick, Cook St, Union Rd, Bradbury Rd, Cascades Rd, Reeves Rd, Panmure
	712	Varying	Bucklands Beach, Casuarina Rd, Glenmore Rd, Panmure
Peak Period Services	72X	Services operate weekdays only, during morning and afternoon peaks	Botany, Howick, Pakuranga, Panmure, Southern Motorway, City
	352	Services operate weekdays only, during morning and afternoon peaks	Panmure, Highbrook, East Tāmaki, Manukau

In the existing environment, the 70, 352 and 711 services travel along Ti Rakau Drive and the 72C, 72M, 72X and 712 services travel along Pakuranga Road in the kerbside lanes with general traffic. As such, buses have roughly the same travel times as general vehicles along these sections (excluding dwelling time at bus stops) and experience the same delays at intersections. Furthermore, without the Project, buses are expected to experience the same increases in delays in the future as a result of congestion and queueing on Ti Rakau Drive and Pakuranga Road.

There are approximately 18 bus stops within the EB2 and EB3R project areas, which include 10 on Ti Rakau Drive. **Figure 9** below shows the existing bus stop locations, the stops are mainly for public bus services.

Figure 9: Existing bus stops within the EB2 and EB3R project areas

The spacing between bus stops varies between 200m and 1.5km with the average distance between stops being 500m. The walking catchments for these bus stops show that there are some significant gaps in the walking network over large areas, particularly along Ti Rakau Drive, based on a nominal 400m radius isochrone walking catchment.

There are also locations of considerable overlap in the bus stop catchments suggesting that stop locations may not be optimised. All existing bus stops are on-street, with the exception of off-street stops at Pakuranga Town Centre. The majority of the existing bus stops on Ti Rakau Drive and Pakuranga Road do not provide seating and sheltered cover. No bicycle parking is provided in the existing environment.

3.6 Walking and Cycling Facilities

3.6.1 Walking Facilities

Overall, pedestrian footpaths are provided along both sides of the majority of roads within the Project area in the existing environment. However, there is an absence of pedestrian facilities particularly along William Roberts Road south, and some slip lanes do not provide signalised pedestrian crossings. Various side roads intersecting Ti Rakau Drive do not have crossings facilities currently.

3.6.1.1 EB2 – Ti Rakau Drive (Pakuranga Road to Reeves Road)

- A pedestrian footpath is available on both sides of the road, approximately 1.5 m wide and separated from the live lane by a 1.0 m grass berm
- The only crossing facilities are at the two signalised intersections of Pakuranga Road / Ti Rakau Drive and Ti Rakau Drive / Reeves Road
- No mid-block crossing is available between the two intersections. The road is also separated by a median grass berm. From observation, pedestrians are finding gaps in traffic and utilise the median as a refuge area, waiting for a gap to cross to Pakuranga Plaza

3.6.1.2 EB2 – Pakuranga Road (Ti Rakau Drive to William Roberts Road)

- A pedestrian footpath is provided on both sides of the corridor, approximately 1.2 m wide on the northern side with a 1.5 m grass berm (no grass berm to the east of the Brampton Court access to the Pakuranga Plaza). The footpath is approximately 1.7 m wide on the southern side with a 0.6 m grass berm
- Crossing facilities are only provided at the Pakuranga Road / Ti Rakau Drive intersection and the signalised mid-block crossing near the Pepler Street exit at the Pakuranga Plaza. The westbound and eastbound carriageways are separated by a 3.0 m flush median
- A pedestrian refuge island is provided across William Roberts Road at its intersection with Pakuranga Road, however, no crossing facility is provided across Pakuranga Road at this location

3.6.1.3 EB2 – Reeves Road

- Footpaths are currently provided along both sides of Reeves Road, approximately 1.5m in width and separated from the live lanes by a 1.2 m grass berm
- Crossing facilities are provided at the Ti Rakau Drive / Reeves Road / SEART intersection and at the mid-block pedestrian crossing. A pedestrian refuge island is provided across William Roberts Road north at its intersection with Reeves Road, however, no crossing facility across Reeves Road is provided at this intersection

3.6.1.4 EB2 – William Roberts Road

- Currently, footpaths are available on both sides of William Roberts Road north (approximately 1.5 m wide), however, a grass berm of approximately 1.2 m width is only provided on the eastern side
- Pedestrian refuge islands are provided at the north end at Pakuranga Road and at the southern end at Reeves Road
- William Roberts Road south currently has no pedestrian footpaths on either side of the carriageway, except for a short section on the western side near the Pakuranga Community Centre
- No pedestrian facilities are currently provided to cross William Roberts Road south

3.6.1.5 Cortina Place

- Footpaths are currently provided on both sides of Cortina Place, approximately 1.7 m wide and no grass berm
- A pedestrian refuge island is provided near the intersection with Reeves Road, and 2.9 m grass median is provided along the majority of the road

3.6.1.6 EB3R – Ti Rakau Drive (Reeves Road to Gossamer Drive)

- On average, the footpath width is 1.5 m and is separated from the road carriageway and high volumes of fast-moving traffic by a 1.0 m grass berm
- Patches of the pedestrian path is encroached with tree branches, leaves and shrubs from the property side of the footpath reducing the width of the footpath, but generally the path itself is in good physical condition
- The Ti Rakau Drive residential area supports low to medium density housing with a number of cul-de-sacs, as well as local schools and parks. Footpath facilities enable pedestrian movements along Ti Rakau Drive, but there are no additional links between cul-de-sacs
- There is one access into Ti Rakau Park from Ti Rakau Drive itself, near the intersection with Mattson Road. Limited links and connections indicate poor pedestrian connectivity and access to the parks and schools in the surrounding area
- There are four crossing facilities to accommodate crossing the corridor in the residential section, located at the four signalised intersections:
  - Ti Rakau Drive / Reeves Road
  - Ti Rakau Drive / Mattson Road
  - Ti Rakau Drive / Edgewater Drive
  - Ti Rakau Drive / Gossamer Drive
- The intersections are of similar design along the route, which consist of left-turn slip lanes for vehicle efficiency and crossing facilities provided across the side street and one leg of the corridor. Pedestrians must cross the slip lanes, unprotected, to the refuge island before arriving at the push button to cross the road. Additionally, pedestrians can only cross at one side of the intersections on Ti Rakau Drive, reducing the pedestrian amenity and efficiency

3.6.2 Cycling Facilities

There is an absence of cycle facilities along the vast majority of Ti Rakau Drive. Neither on-road nor off-road cycle facilities are provided to encourage movement along Ti Rakau Drive, except at the Ti Rakau Drive / Gossamer Drive intersection.

Cyclists within the EB2 and EB3R project areas must currently share an on-road lane with high-volume, high-speed traffic, as well as with heavy vehicles (e.g., buses). Crossing facilities are limited to those at signalised intersections. More experienced and confident cyclists who mix with general traffic have the choice to cross at intersections from right turning bays, but must still cross multiple lanes of traffic to do so. Furthermore, cyclists must navigate numerous driveways along the corridor.

In the wider Pakuranga area, there are sections of short cycle routes, outlined in **Figure 10**. Reeves Road is suggested as a road with space for cyclists, albeit with high traffic demand. AT recently developed recreational cycle facilities in the eastern cycle network, such as the Cascades shared path that connects Pakuranga College, Burswood Drive and Meadowlands. AT has also developed the Pakuranga Rotary shared path that tracks the coastline of the Tāmaki River. Additional recreational cycle routes provide connection to and from Half Moon Bay Ferry Terminal, Farm Cove, Sunny Hills, and Pakuranga Plaza. With the completion of EB1, a bi-directional cycleway and shared path is located on the northern side of Pakuranga Road from Ireland Road to Ti Rakau Drive.

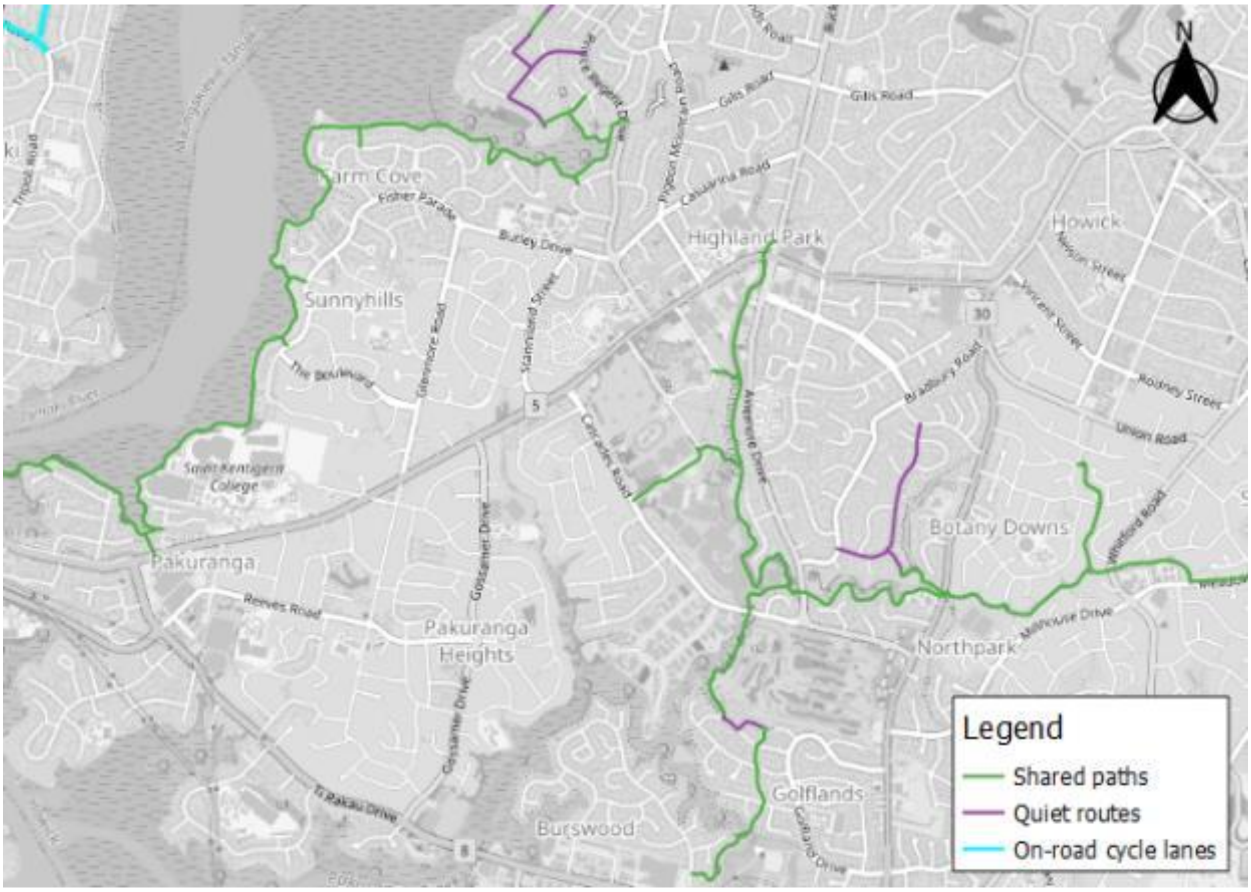


Figure 10: Existing cycle routes and facilities in the wider Pakuranga area

3.7 Parking

Within the EB2 and EB3R project areas there are a number of locations that offer parking, both on-street and off-street. The key locations in the EB2 and EB3R project areas are:

- Pakuranga Plaza
- Te Tuhi
- Ti Rakau Park
- Cortina Place
- William Roberts Road
- Ti Rakau Drive
- Edgewater shops
- Side roads

Currently, Pakuranga Plaza is classified as a Business Town Centre Zone. Under the AUP(OP), there are generally no upper limits on the amount of parking retail, office, education facilities, hospitals and commercial services can provide.

Parking surveys were conducted to determine the utilisation of the existing on-street and off-street parking demand and utilisation in the EB2 and EB3R project areas. **Figure 11** shows the surveyed areas, which were surveyed on Thursday 5 July 2018 and Saturday 7 July 2018. At the time of data collection, these survey dates were selected to represent typical weekday and weekend periods of parking utilisation at the selected sites. These data sets exclude the effects of COVID-19 on travel behaviour and are considered to represent the existing environment before EB2 and EB3R construction.

Figure 11: Parking survey locations

3.7.1 Pakuranga Plaza

Pakuranga Plaza currently supports 1,355 parking spaces on site. The utilisation of 840 of these parks was captured in the parking survey in the areas outlined in **Figure 12**.

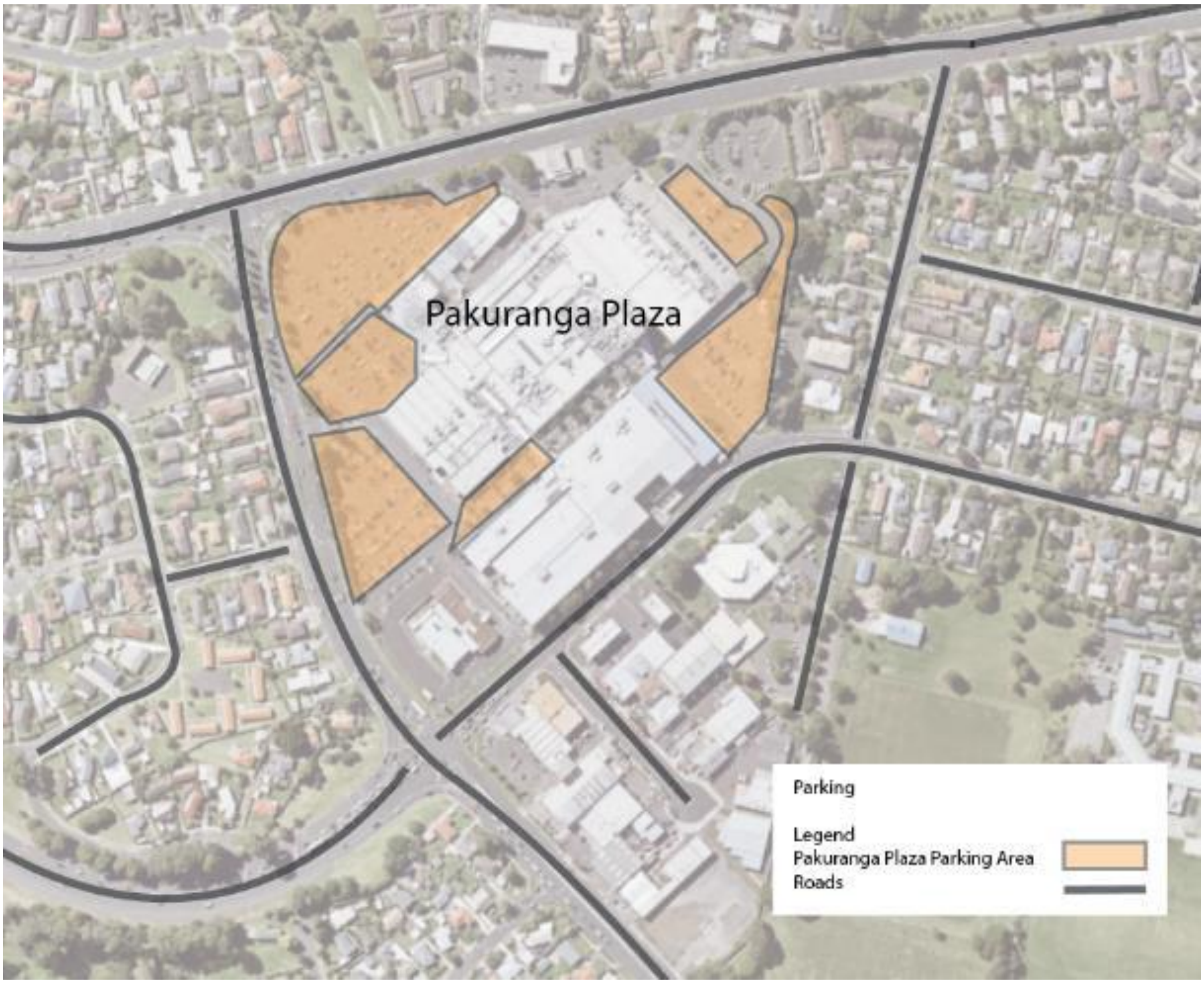


Figure 12: Surveyed parking areas of Pakuranga Plaza

Table 6 outlines the findings of the surveys and **Figure 13** below illustrates the daily utilisation profile. The table and the graph indicate the Pakuranga Plaza parking is underutilized and does not exceed 60% capacity on a typical weekday or weekend.

Table 6: Pakuranga Plaza parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	13	9
Minimum Stay [hours]	1	1
Average Stay [hours]	2.4	1.5
Maximum Parking (Utilisation)	418 (51%)	471 (57%)
Minimum Parking (Utilisation)	52 (6%)	306 (37%)
Average Parking (Utilisation)	301 (37%)	392 (48%)

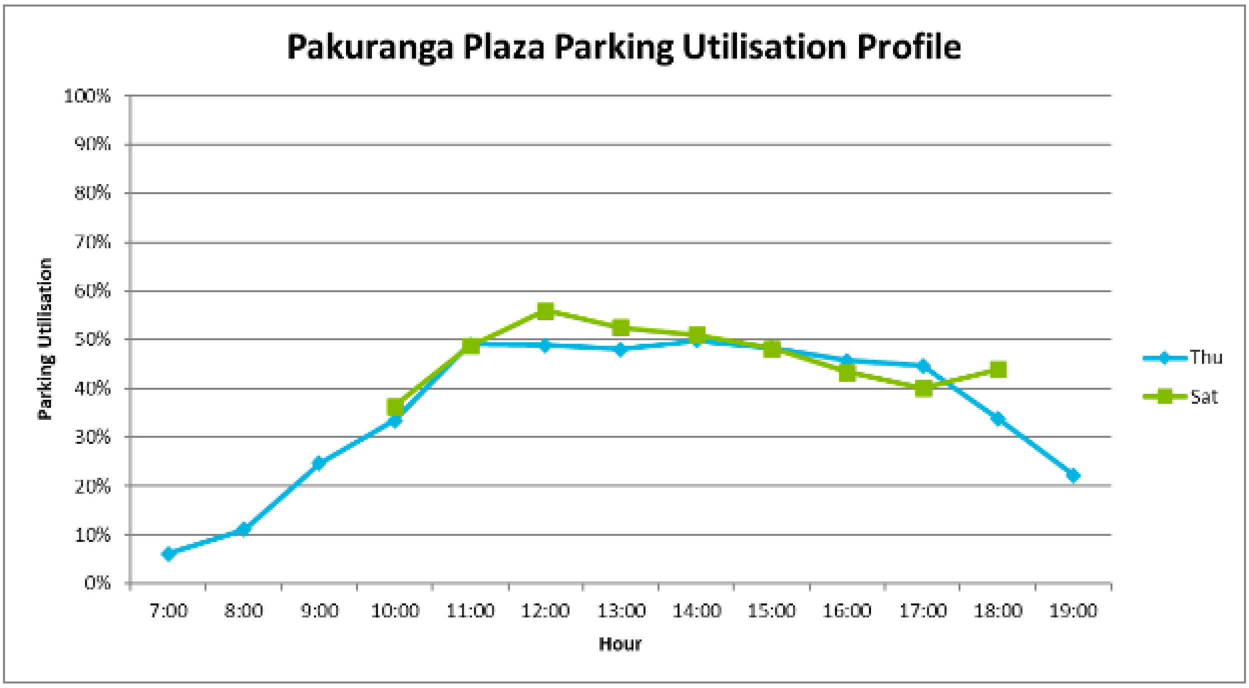


Figure 13: Pakuranga Plaza parking utilisation profile

3.7.2 Cortina Place

Cortina Place is a local cul-de-sac intersecting Reeves Road and provides access to a small commercial area. Overall, there are 25 on-street spaces available, with an average utilisation of 64% during weekdays and 71% during weekends. Full utilisation of the parking spaces occurs on weekend mornings for a short duration. The long duration of the average stay indicate that shop-owners and staff are likely using the spaces. **Table 7** outlines the findings of the survey and **Figure 14** below illustrates the parking utilisation profile across the days.

Table 7: Cortina Pl parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	13	9
Minimum Stay [hours]	1	2
Average Stay [hours]	5.7	5.5
Maximum Parking (Utilisation)	21 (84%)	25 (100%)
Minimum Parking (Utilisation)	8 (32%)	15 (60%)
Average Parking (Utilisation)	16 (64%)	18 (71%)

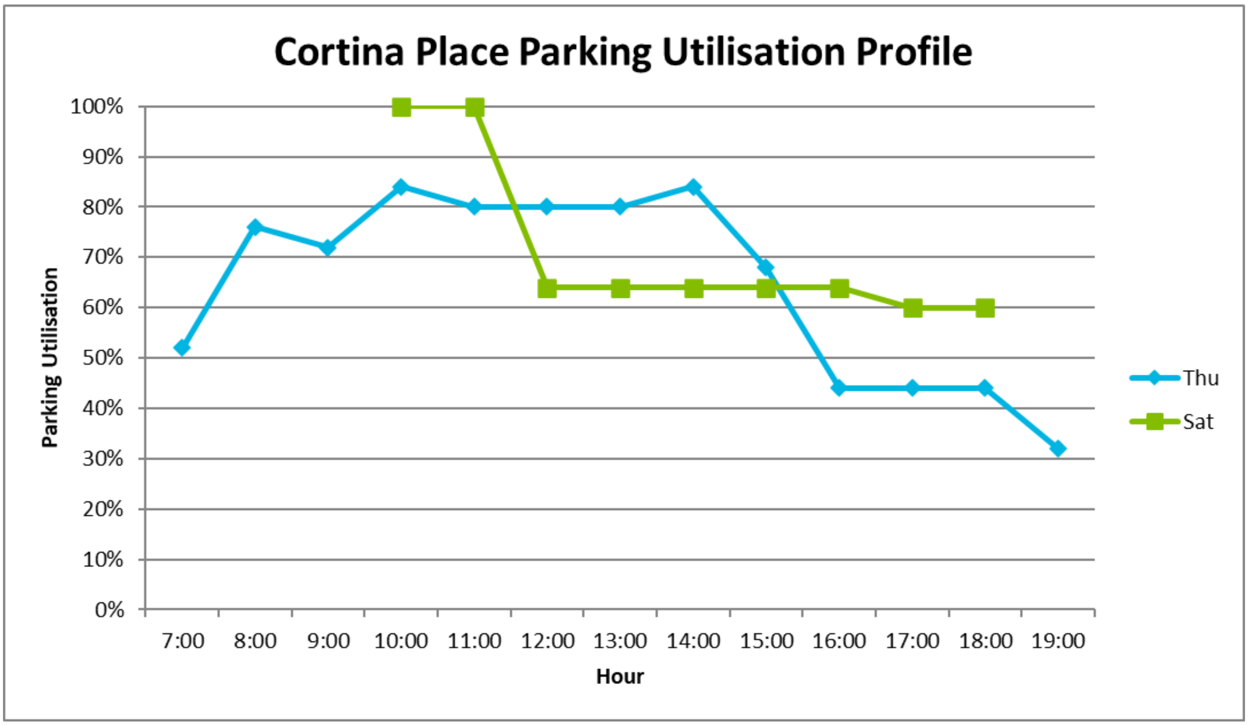


Figure 14: Cortina Pl parking utilisation profile

3.7.3 William Roberts Road

William Roberts Road connects Pakuranga Road to Reeves Road at its northern end and provides access to the Pakuranga Leisure Centre and Ti Rakau Park at its southern end. Overall, there are 127 parking spaces available, with an average utilisation of 49% on weekdays and 33% on weekends. There are 40 additional parks for the Ti Rakau Park which were considered off-street parking and were not surveyed. **Figure 15** outlines the area included in the parking survey of William Roberts Road.

Figure 15: Surveyed area of William Roberts Rd

Table 8 outlines the findings of the survey and **Figure 16** illustrates the parking utilisation profile across the days.

Table 8: William Roberts Rd parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay (hours)	13	9
Minimum Stay (hours)	1	1
Average Stay (hours)	3.7	2.8
Maximum Parking (Utilisation)	105 (83%)	113 (89%)
Minimum Parking (Utilisation)	25 (20%)	35 (28%)
Average Parking (Utilisation)	62 (49%)	42 (33%)

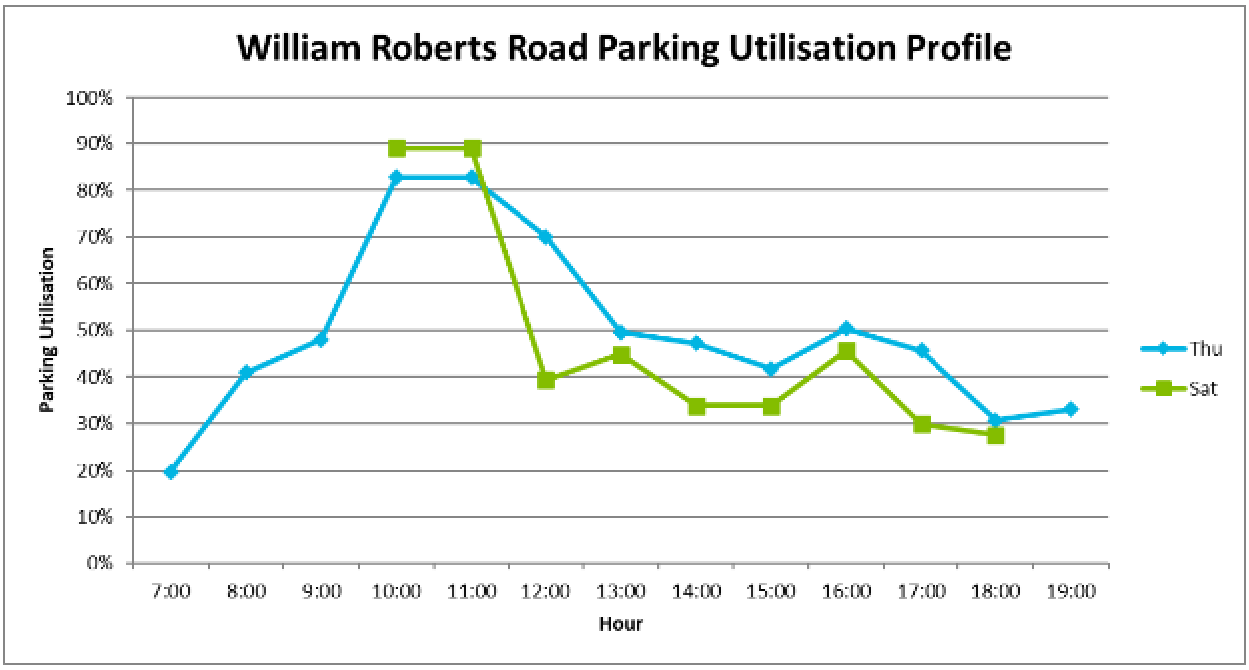


Figure 16: William Roberts Rd parking utilisation profile

Where the utilisation is around 90% for William Roberts Road and Cortina Place it is likely due to activities at the Pakuranga Leisure Centre or the Ti Rakau Park, such as Saturday morning sports. Additionally, the maximum stay for both Cortina Place and William Roberts Road was 13 hours, which is equivalent to the length of the parking survey. This indicates that a number of these parks are likely to be occupied by owners/ staff of the surrounding properties.

3.7.4 Ti Rakau Drive

Ti Rakau Drive is a major corridor connecting Pakuranga to East Tāmaki and Botany Town Centre in the southeast. The survey was conducted from the Roseburn Place intersection down to the Gossamer Drive intersection. Overall, there are 180 on-street parking spaces provided along Ti Rakau Drive, which are currently poorly utilised. **Table 9** below outlines the findings of the survey and **Figure 17** below illustrates the parking utilisation profile across the days.

Table 9: Ti Rakau Dr parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	13	9
Minimum Stay [hours]	1	1
Average Stay [hours]	3.0	2.7
Maximum Parking (Utilisation)	10 (5%)	28 (15%)
Minimum Parking (Utilisation)	3 (2%)	9 (5%)
Average Parking (Utilisation)	5 (3%)	15 (8%)

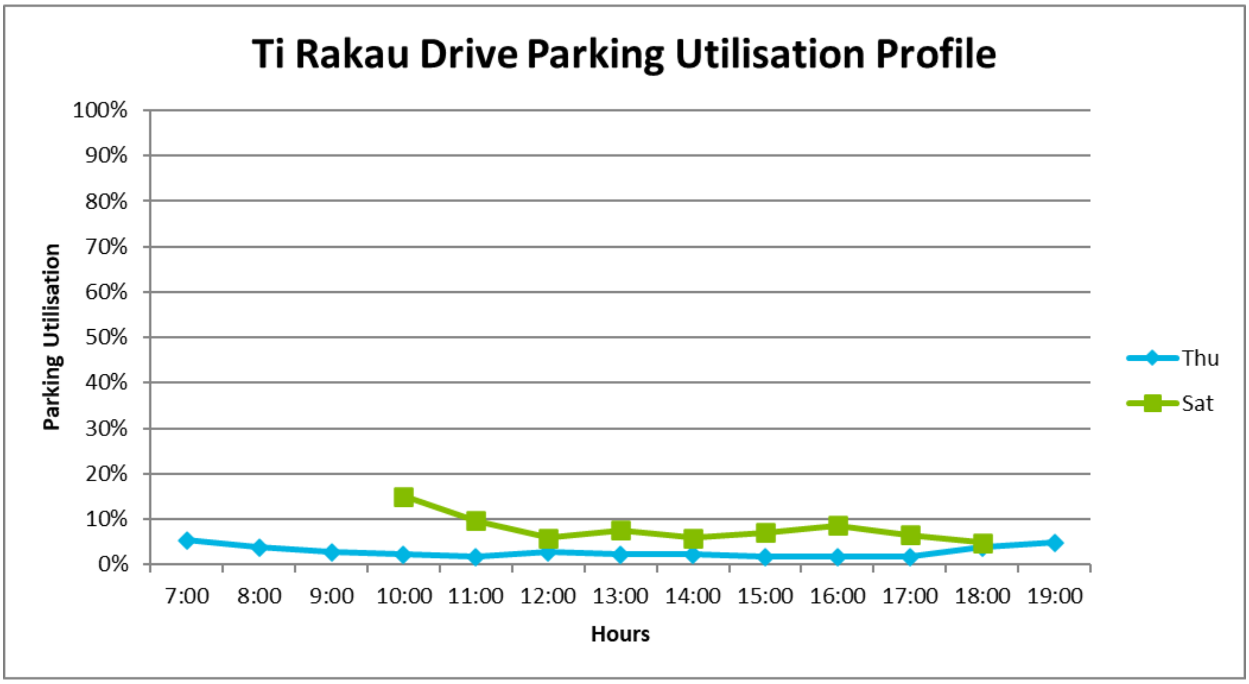


Figure 17: Ti Rakau Dr parking utilisation profile

The results shown are not unexpected. It is likely that the high traffic volume environment on Ti Rakau Drive does not create an appealing location to park vehicles given a perceived risk of accidents. Furthermore, this section of Ti Rakau Drive is surrounded by residential properties, and it would not be unreasonable to assume that properties have ample individual off-street parking due to the general size of these free-standing properties.

3.7.5 Edgewater Shops

The Edgewater Shops is a block of local shops located at the Ti Rakau Drive / Edgewater Drive intersection. Currently there are 30 parking spaces provided within an off-street parking area that serves the various commercial properties. The survey determined that the carpark is not fully utilised. **Table 10** outlines the findings of the survey and **Figure 18** illustrates the parking utilisation profile across the days.

Table 10: Edgewater Shops parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	11	9
Minimum Stay [hours]	1	1
Average Stay [hours]	2.5	1.8
Maximum Parking (Utilisation)	18 (60%)	12 (40%)
Minimum Parking (Utilisation)	1 (4%)	3 (10%)
Average Parking (Utilisation)	11 (37%)	8 (27%)

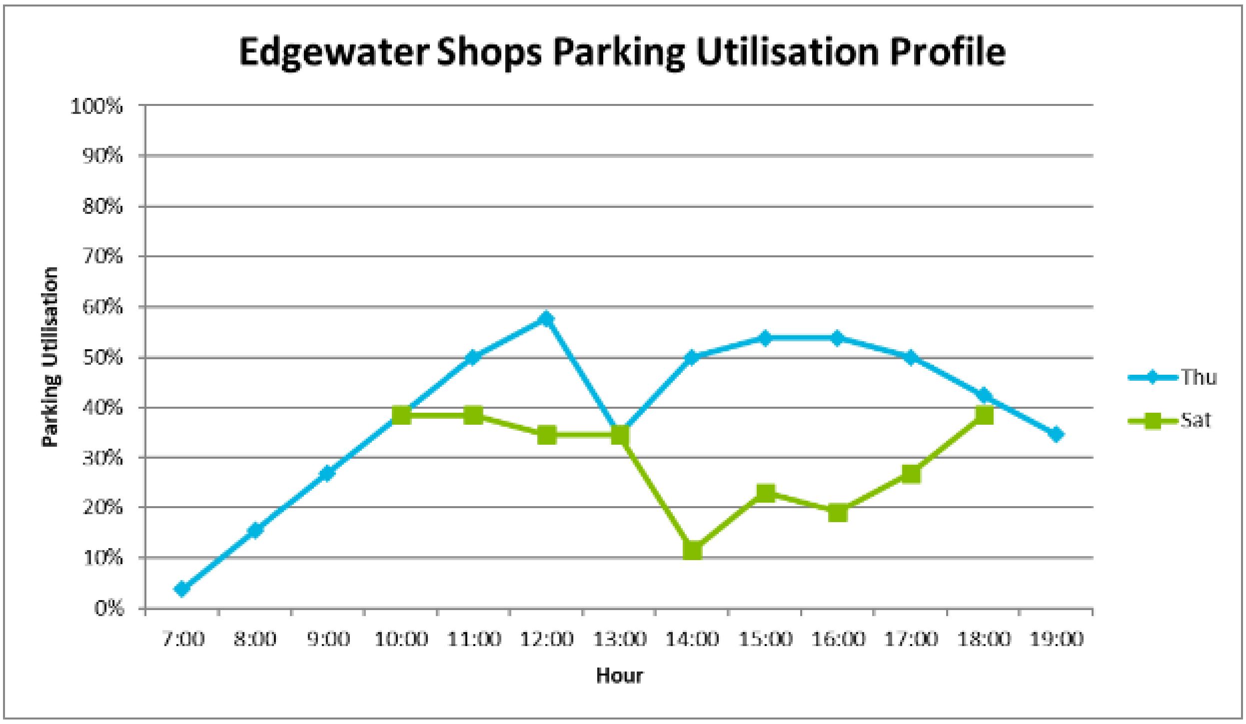


Figure 18: Edgewater Shops parking utilisation profile

Further analysis of the parking survey data shows that generally most vehicles are parked for short periods (one-hour survey intervals), with a minority of vehicles parked for longer periods (likely staff and shop owners). This is in line with what would be expected at these commercial properties. Parking utilisation is not expected to exceed 60% on a typical weekday or weekend.

3.7.6 Side roads

Due to the low utilisation of on-street parking along the side roads of Ti Rakau Drive, no further detailed analysis is presented. **Table 11** provides a summary of the parking surveys conducted on the side roads in EB2 and EB3R project areas.

Table 11: EB2 and EB3R side roads parking utilisation summary

Side Road	Parking Utilisation Comments
Ayr Rd	Ayr Road is a local road providing access to residential houses with 70 on-street spaces available. However, it is a poorly utilised road, with the maximum utilisation on Thursday being 12% and 6% on Saturday.
Roseburn Pl	Roseburn Place is a cul-de-sac joining to Ti Rakau Drive, providing access to residential properties. There are 45 on-street spaces available. However, it is poorly utilised with the maximum utilisation on Thursday being 9% and 10% on Saturday. The low utilisation could be attributed to residents having ample parking within their properties and visitors parking on the street.
Mattson Rd	Similar to Roseburn Place, Mattson Road is a cul-de-sac off Ti Rakau Drive with 80 on-street spaces. Again, it is poorly utilised with the maximum utilisation on Thursday being 4% and 8% on Saturday.
Marriott Rd	Marriott Road connects Ti Rakau Drive to Udys Road with 175 on-street parking spaces available. It is a poorly utilised road with a maximum of six parked vehicles.
Chevis Pl	Chevis Place is a cul-de-sac off Ti Rakau Drive providing access to residential properties to the east. There are 45 on-street parking spaces available. However, these spaces are poorly utilised with a maximum utilisation of 4% on Thursday and 16% on Saturday. The low utilisation could be attributed to most residents having ample parking within their properties.
Edgewater Dr	Edgewater Drive is a collector with a crescent shape that connects to Ti Rakau Drive at two locations. It provides access to residential properties, Edgewater College and Pakuranga Retirement Village. There are 500 on-street parking spaces available along the length of the road. It would be expected to see high utilisation of on-street parking during school peak periods; however, this is not the case, with a maximum weekday utilisation of five parked vehicles. A similar trend was observed on Saturday with a maximum of six vehicles parked within an hour.
Wheatley Ave	Wheatley Avenue is a small cul-de-sac off Ti Rakau Drive between the two sections of Edgewater Drive. It serves a small residential community and provides 30 on-street parking spaces. It is poorly utilised during weekdays with the maximum utilisation being 10%. This was observed to increase to 20% during the weekend.

3.8 Crash Environment

3.8.1 Crash Analysis System Data

All reported crashes within the EB2 and EB3R project area were extracted from the Crash Analysis System (CAS) for a five-year period from 2017 to 2022. For this assessment, the focus on the extracted data was in the area shown in **Figure 19**.

Figure 19: Extent of extracted CAS data for EB2 and EB3R project areas

There were 2 fatal crashes and 17 serious injury crashes in the 2017 – 2022 time period as described and analysed below:

- **Fatal crash 1 (2021/02/14)**: An eastbound vehicle on Pakuranga Road travelling in a through lane had turned right at the Pakuranga Road / Ti Rakau Drive intersection. A motorcycle travelling westbound on Pakuranga Road attempted to stop, lost control and collided with the right turning vehicle.
    - There were road works in the area at the time of the crash. A combination of traffic signals and road signage for all motorists in the eastbound lanes may have been confusing if they were unfamiliar with the road changes or area. Various road changes, layout changes, traffic cones, and signage were in effect (see **Figure 20**).

Figure 20: Pakuranga Rd / Ti Rakau Dr intersection, looking eastbound on Pakuranga Rd (source: Google Street View, Feb 2021)

- **Fatal crash 2 (2021/06/10)**: A vehicle was traveling in the south-west direction on Reeves Road while a pedestrian was crossing Reeves Road in the south-east direction. The pedestrian was hit by the vehicle while crossing the road.
  - There are two controlled pedestrian crossings within 90m of the crash scene.
  - A number of environmental factors were identified, but not limited to;
    - The change in speed zone from 60-50km/hr for eastbound traffic just before the driveway access to Pakuranga Plaza.
    - The merging of two lanes to one lane for eastbound traffic just before the driveway access to Pakuranga Plaza.
    - The amount of vehicle and pedestrian usage for the driveway to Pakuranga Plaza.
    - The width of Cortina Place and the amount of foot/vehicle traffic.
    - The increase in speed from 50-60km/hr just west of Cortina Place.
    - The widening of the westbound lane from one lane to three lanes just west of Cortina Place.
    - When Reeves Road traffic queues at the intersection with Ti Rakau Drive the tail can extend past Cortina Place obscuring visibility to pedestrians that cross from Cortina Place.
    - The average street lighting from nearby overhead lamp posts (if it was fully dark).

The majority of the serious injury crashes have occurred along Ti Rakau Drive. The data does not suggest commonality between the location and type of crashes. In total, of the 17 serious injuries, 47% was a result of vehicle collision with pedestrians, and 30% were attributed to loss of control from drivers. A further 18% of crashes were as a result of right turning collision between two motor vehicles, predominantly at intersections and a total of one serious injury attributed to a rear end crash were observed. The major factors influencing crashes are poor observation (42%), pedestrian factors (42%), alcohol (26%) and travel speed (16%). A further 11% were due to road factors. Time of day did not appear to be a significant factor in the crashes with 68% of crashes occurring during light/overcast conditions.

3.8.2 Safe System Assessment

A Safe System Assessment (SSA) was undertaken for the entire Project area[15]. The SSA was conducted in accordance with the Auckland Transport Safe System Assessment Guidelines which are based on the Austroads 2016, Research Report AP-R509-16, Safe System Assessment Framework. A summary of the SSA is provided below.

The SSA assessed a total of ten crash types as described below:

1. Run-off-road (R-O-R): Involving one or more vehicle(s) losing control on a curve or straight
2. Head-on (H-O): Crashes involving two or more vehicles travelling in opposite directions
3. Intersection (INT): Crashes involving two or more vehicles travelling in adjacent directions
4. Other: Includes manoeuvring, overtaking, parking and miscellaneous crashes
5. Motorcycle (M/C): Any crash type above involving a motorcycle
6. P1: Any crash involving a pedestrian and a vehicle turning at an intersection
7. P2: Any crash involving a pedestrian and vehicle travelling straight (midblock crossing)
8. P3: Any crash involving a pedestrian and vehicle travelling straight through an intersection
9. C1: Any crash involving a cyclist being struck by a vehicle travelling in the same direction
10. C2: Any Crash involving a cyclist being struck by a vehicle at an intersection (turning or straight)

Each crash type is scored based on exposure, likelihood and severity with a value between 0 and 4. A lower score corresponds with a safer system. A score of 0 for exposure, likelihood or severity means that a particular crash type is not applicable to the location being considered and will result in a product score of 0. **Table 12** and **Table 13** outline the safe system score of the existing environment in the EB2 and EB3R project areas. Location C in EB2 and locations F and H in EB3R indicate station locations on completion of the full Eastern Busway Project.

Table 12: EB2 existing environment safe systems assessment

ZONE EB2 ASSESSMENT SUMMARY											
EXISTING LAYOUT	R-O-R	H-O	INT	OTHER	M/C	P1	P2	P3	C1	C2	TOTAL
A) TI RAKAU DR - MB	16	16	32	16	64	24	48	0	36	36	288
B) TI RAKAU DR - INT	16	16	32	16	48	24	0	48	36	36	272
C) TI RAKAU DR - MB	16	16	32	16	64	24	48	0	36	36	288
D) TI RAKAU DR - INT	16	16	24	16	48	18	0	24	36	27	225
E) TI RAKAU DR - MB	8	16	16	24	48	24	48	0	31.5	27	243
F) TI RAKAU DR - INT	16	16	24	24	48	18	48	36	31.5	27	289
G) TI RAKAU DR - MB	16	16	0	24	48	0	48	0	36	0	188
H) PAKURANGA RD - INT	16	16	24	16	48	12	0	24	36	36	228
I) PAKURANGA RD - MB	16	24	24	24	48	18	36	0	36	36	262
J) PAKURANGA RD - INT	16	24	32	16	64	18	0	48	36	36	290
K) REEVES RD - MB	9	13.5	15.75	13.5	36	18	36	0	31.5	36	209
L) REEVES RD - INT	15.75	13.5	18	13.5	36	21	0	48	36	36	238
M) WILLIAM ROBERTS RD - MB	NOT APPLICABLE										
N) CORTINA PL - MB	3	3	0	5.25	28	0	24	0	24	0	87
O) CORTINA PL - INT	9	13.5	18	15.75	42	21	0	48	27	36	230
P) PAKURANGA HWY - MB	24	0	0	24	32	0	0	0	0	0	80

[15] EB234-1-TE-RP-Z0_000003

Table 13: EB3R existing environment safe systems assessment

ZONE EB3R ASSESSMENT SUMMARY											
EXISTING LAYOUT	R-O-R	H-O	INT	OTHER	M/C	P1	P2	P3	C1	C2	TOTAL
A) ROSEBURN PL	8	16	32	24	64	24	48	0	27	36	279
B) MARRIOTT RD	8	16	32	24	64	24	48	0	27	36	279
C) EDGEWATER DR / CHEVIS PL	8	16	16	24	48	24	48	24	27	27	262
D) WHEATLY AVE	8	16	32	24	64	24	36	0	27	36	267
E) EDGEWATER DR	8	0	32	24	64	24	0	0	27	36	215
F) GOSSAMER STATION WB	8	0	0	24	32	0	0	0	27	18	109
G) GOSSAMER DR INTERSECTION	24	24	24	24	48	18	0	36	36	18	252
H) GOSSAMER STASTION EB	8	16	0	8	16	0	32	0	36	0	116

Motorcycle crashes were identified as the highest risk in the existing layout due to a maximum score of 4 for both exposure and severity.

3.9 Over-Dimension and Over-Weight (OD and OW) Routes

Within the Project area there are a number of roads that have been defined by Waka Kotahi as strategic Over-Dimensional (OD) routes[16]. These support the large commercial and industrial areas in and around Burswood and East Tāmaki which are the key generators of freight and OD loads. The OD routes relevant to the EB2 and EB3R project areas are listed below and shown in **Figure 21**:

- Pakuranga Road – Ti Rakau Drive to Howick
- Pakuranga Highway – Ti Rakau Drive to Waipuna Road
- Ti Rakau Drive – Pakuranga Road to Te Irirangi Drive

[16] http://nzta1.cwp.govt.nz/assets/resources/overdimen-veh-route-maps/4-auckland/docs/OD_4-35%20Auckland

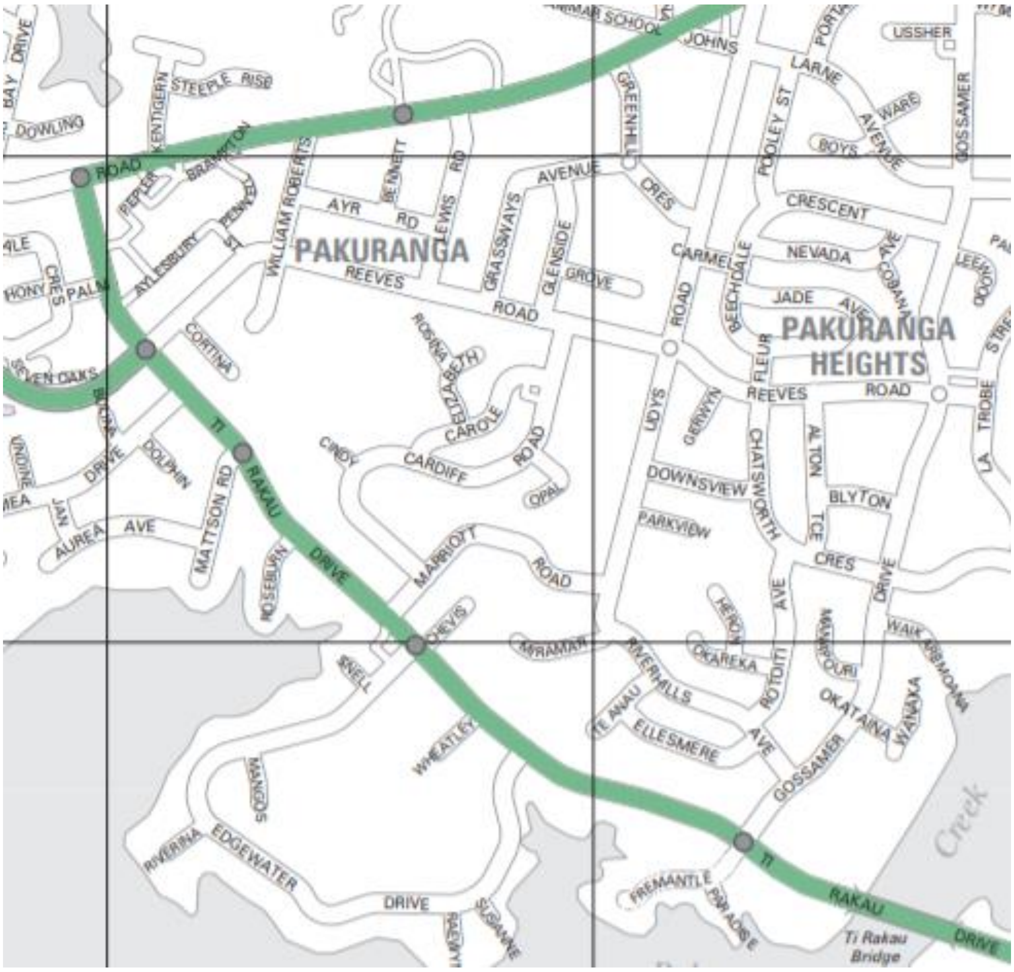


Figure 21: Over-dimensional vehicle routes

It is worth noting that no roads within the EB2 and EB3R project areas are designated as Over-Weight (OW) routes. The nearest OW route is Te Irirangi Drive further southeast, from State Highway 1 up to Botany Town Centre.

Table 14 below shows the current heavy commercial vehicle (HCV) percentage of traffic that travel through the EB2 and EB3R project areas. HCV data were sourced through a combination of AT traffic counts and RAMM data.

Table 14: Existing HCV percentage

Roads	HCV Percentage
Pakuranga Rd (east of Ti Rakau Dr)	6%
Pakuranga Rd (west of Ti Rakau Dr)	7%
Ti Rakau Dr (Pakuranga Rd – SEART)	7% westbound, 8% eastbound
Ti Rakau Dr (SEART – Edgewater Dr (west))	8%
Ti Rakau Dr (Edgewater Dr, west to east)	9% westbound, 8% eastbound
SEART	3%
William Roberts Rd	4%
Edgewater Dr	3%

3.10 Changes to the Baseline Traffic Environment

This section provides an overview of the changes to the baseline traffic environment that were included in the traffic modelling assessments conducted in this ITA.

3.10.1 EB1

Included in the modelling scenarios was EB1, which is a key component of the overall Project. It is the segregated busway connection from Panmure train station to Pakuranga Town Centre. The eastern terminus of EB1 is located beside the western boundary of the EB2 project area, at the Pakuranga Road / Ti Rakau Drive intersection and is shown in **Figure 22**.

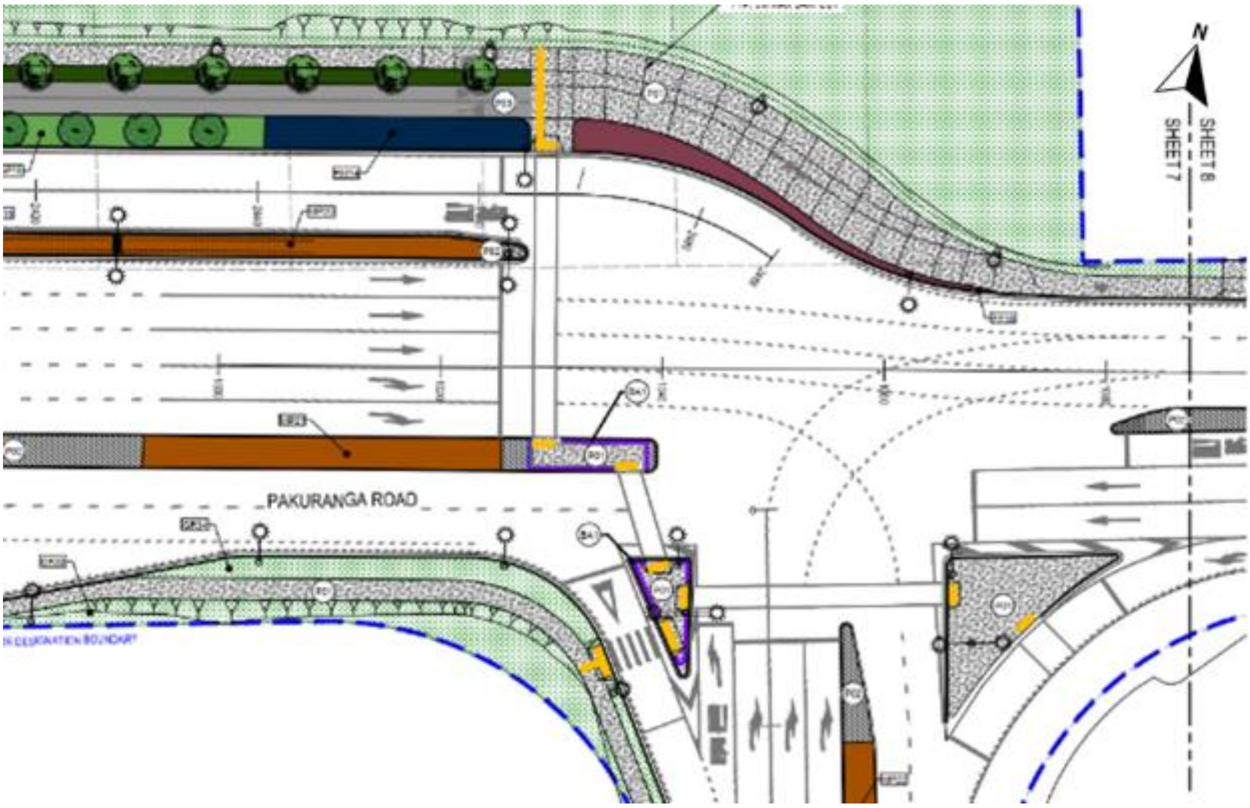


Figure 22: EB1 tie-in at Pakuranga Rd / Ti Rakau Dr intersection

3.10.2 WRRE Works

The WRRE construction will precede EB2 and EB3R, and is anticipated to have a duration of approximately eight months, from November 2022 to June 2023. The WRRE[17] will consist of:

- The extension of William Roberts Road further south to Ti Rakau Drive
- A new priority-controlled, left-in left-out (LILO) only intersection with Ti Rakau Drive at the southern end of William Roberts Road. The kerbside lane of Ti Rakau Drive eastbound will be a shared through and left-turn lane. It should be noted that a second lane at the northern approach will also be constructed during the WRRE but will not be operational until later stages of the overall construction of the Project (EB2)
- The extension of Cortina Place further east to connect to William Roberts Road. A new raised priority-controlled intersection with William Roberts Road at the eastern end of Cortina Place. All approaches to the intersection will provide one approach lane and one exit lane
- Five parallel on-street parking spaces will be provided on the eastern side of William Roberts Road and 11 angled parking spaces on the western side. A new raised pedestrian crossing will also be provided on William Roberts Road at Ti Rakau Park. The posted speed limit of this section of William Roberts Road will be 30 km/h

Figure 23 shows the layout of the William Roberts Road and Cortina Place extensions upon completion.

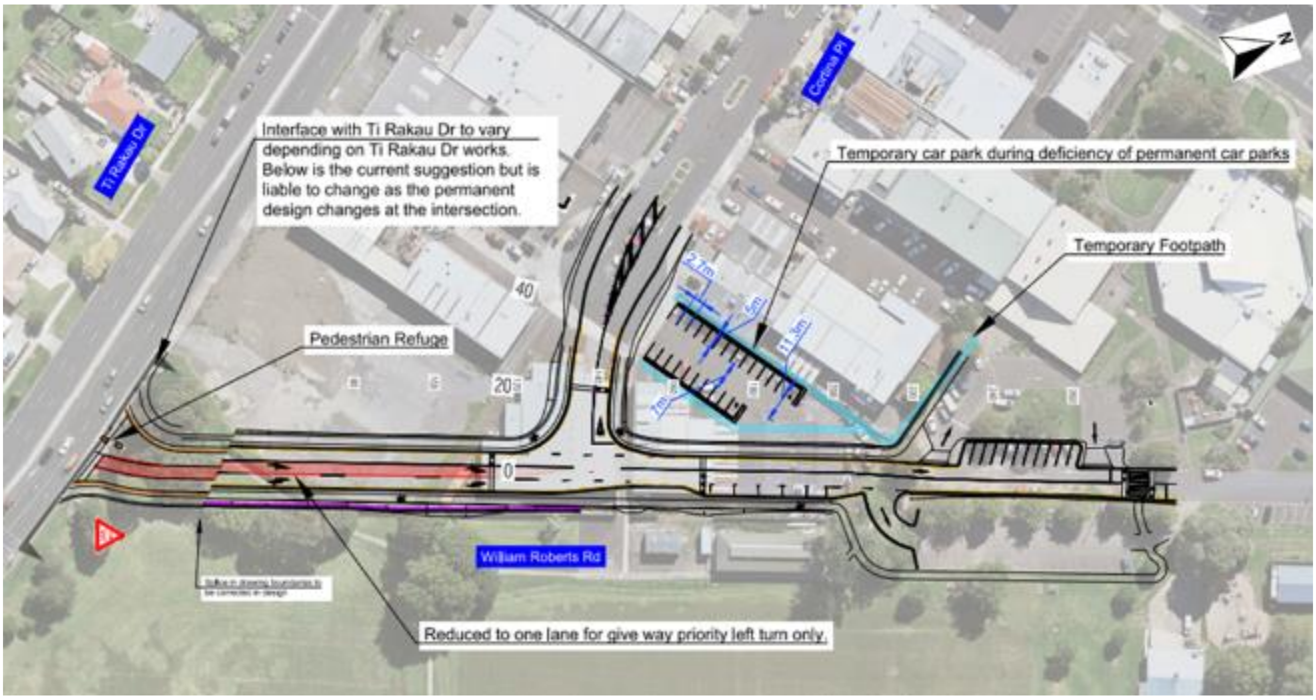


Figure 23: WRRE layout

[17] EB234-1-TE-RP-Z2-0001-A1-William Roberts Rd Extension ITA

3.10.3 Other EB2 and EB3R Enabling Works

An assessment was undertaken to understand the potential traffic redistribution that could occur on the network due to the closure of Reeves Road, which is required for the construction of the RRF during EB2. Furthermore, the assessment was aimed at identifying other potential enabling works that may be required to mitigate the effects of the resulting traffic redistribution. These enabling works will form part of the EB2 and EB3R consent package. Considering the construction programme, these enabling works will follow the WRRE and will precede the closure of Reeves Road during EB2 and EB3R construction.

The full results of the assessment are presented in the Technical Advice Memorandum provided in **Appendix A**, hereafter referred to as the 'Reeves Road Detour Assessment'. A summary of the results, and the enabling works required before the closure of Reeves Road, is presented below. **Figure 24** shows the proposed detour route during the Reeves Road closure.

Figure 24: Proposed detour route during Reeves Rd closure

The detour route along William Roberts Road north, westbound along Pakuranga Road and eastbound along Ti Rakau Drive towards SEART was determined to be less attractive than expected. Overall, only a small percentage of traffic could be expected to route along the proposed detour, likely due to the already congested nature of the Pakuranga Road / William Roberts Road intersection.

It was determined that inbound (citybound) traffic, during the AM peak, could be expected to detour via Gossamer Road to Ti Rakau Drive. Traffic in the outbound direction, during the PM peak, could be expected to return via Pakuranga Road and via SEART turning right onto Ti Rakau Drive.

It should be noted that the Reeves Road Detour Assessment followed a similar methodology as the WRRE ITA of assessing a 'future Do-Minimum' scenario in comparison to a 'future with detour' scenario. This approach allowed for the inclusion of known changes to the network that are expected to be completed before the Reeves Road closure and the associated traffic distribution on the network, such as the WRRE.

This assessment indicated that mitigation works would be required at the Ti Rakau Drive / Reeves Road and Ti Rakau Drive/ Gossamer Drive intersections.

3.10.3.1 Ti Rakau Drive / Reeves Road Intersection

Intersection performance is expected to be poor (LOS F) during both the AM and PM peaks in the Do-Minimum scenario. The Reeves Road Detour AM peak intersection performance could be expected to be slightly improved (LOS E), however the PM peak would still be LOS F.

The SEART off-ramp right-turn lanes into Ti Rakau Drive are expected to operate at LOS F during the PM peak. The increase in traffic volumes, due to Reeves Road closure, would result in delay increasing from around 50 sec to 215 sec (3.6 min), which would require mitigation.

Various mitigation measures were tested, however only the preferred option (Mitigation 2) is presented below. Mitigation 2 consists of the temporary removal of the pedestrian crossing on the eastern arm of the intersection, reducing the number of signal phases to three and redistributing the green time. **Table 15** provides a summary of the Ti Rakau Drive / Reeves Road intersection performance.

Table 15: Reeves Rd Detour Assessment – Ti Rakau Dr / Reeves Rd intersection performance summary[18]

Scenario	Level-of-Service (LOS)		Degree of Saturation (DOS)		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	F	F	0.90	1.13	178	83
Reeves Rd Detour	E	E	0.91	1.02	60	75
Mitigation 2	D	D	0.87	0.90	41	38

Mitigation 2 is expected to lead to improved intersection performance during both the AM and PM peaks compared to the Do-Minimum and the Reeves Road Detour scenarios.

[18] SIDRA analysis carried out based on traffic volumes for a 2028 horizon year.

3.10.3.2 Ti Rakau Drive / Gossamer Drive Intersection

The right-turn traffic volume from Gossamer Drive into Ti Rakau Drive is expected to increase by 160 veh/h in the AM peak during the Reeves Road closure. The resultant intersection performance is expected to be poor (LOS F), compared to the LOS E of the Do-Minimum scenario. This would require mitigation. The intersection is expected to experience little change during the Reeves Road closure in the PM peak and will remain at LOS D.

Again, various mitigation measures were tested, however only the preferred option (Mitigation 2) is presented below. Mitigation 2 consists of the following changes to the northern Gossamer Drive approach to the intersection; converting the short left-turn slip lane to pass through the intersection, converting the centre lane to a full length left-turn lane, providing an additional short lane for the shared through and right-turn movements, and increasing the length of the short kerbside exit lane (see **Figure 25**).

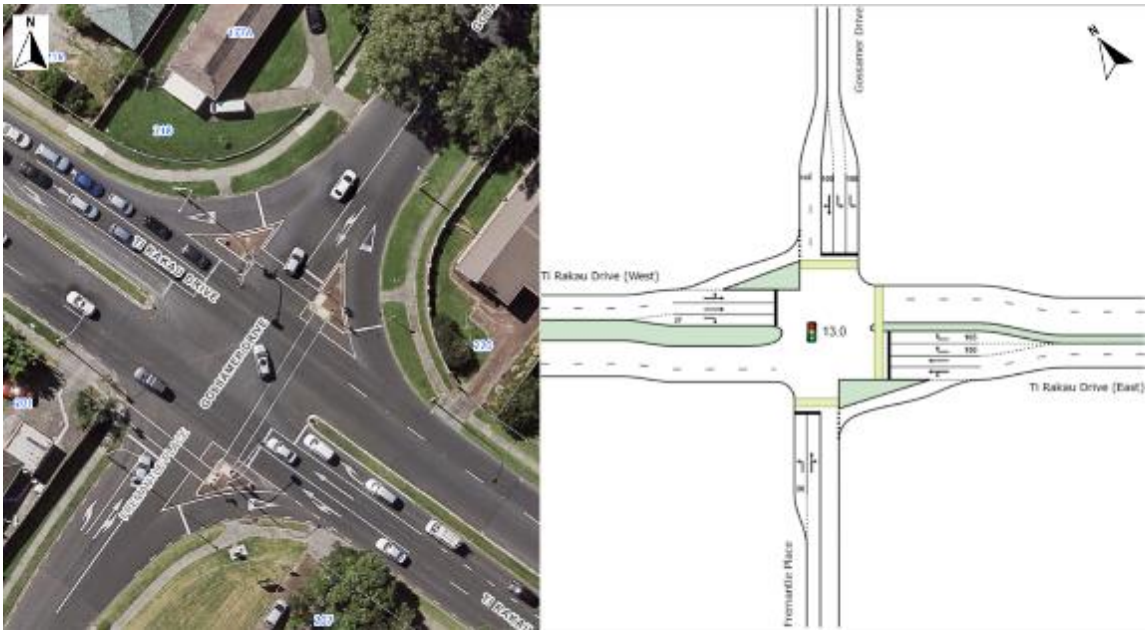


Figure 25: Ti Rakau Dr / Gossamer Dr intersection layout (left = current, right = enabling works)

Table 16 provides a summary of the Ti Rakau Drive / Gossamer Drive intersection performance.

Table 16: Reeves Rd Detour Assessment – Ti Rakau Dr / Gossamer Dr intersection performance summary[19]

Scenario	Level-of-Service (LOS)		Degree of Saturation (DOS)		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	D	D	1.02	0.90	48	45
Reeves Rd Detour	F	D	1.25	0.88	168	43
Mitigation 2	D	D	0.89	0.86	37	37

Mitigation 2 is expected to lead to improved intersection performance during both the AM and PM peaks compared to the Do-Minimum and the Reeves Road Detour scenarios.

[19] SIDRA analysis carried out based on traffic volumes for a 2028 horizon year.

4 EB2 and EB3R Design and Construction

4.1 EB2 and EB3R Overview

As stated in **Section 3.4.1**, without the Project, traffic volumes are predicted to increase on Pakuranga Road and Ti Rakau Drive (between Pakuranga Road and Reeves Road), reaching the capacity of the corridors by 2028. It is likely that large queues and delays on these sections will act as a bottle neck for the rest of the network. This issue is also highlighted in **Section 3.4.2**, with large travel times on these specific sections of the network in the existing environment.

The Project seeks to improve congestion and travel times across the transport network, and particularly in the area around the Pakuranga Town Centre. This will be achieved through the construction of the RRF, which will provide a direct and faster link between Pakuranga Road and SEART, as well as dedicated bus lanes for bus services.

Bus travel times will be improved primarily through the construction of dedicated bus lanes. Buses will also have priority at intersections by way of 'call-ahead' features and advance loops to extend the traffic signal green time when a bus is within approach distance of an intersection. Furthermore, the buses will in future laydown at new bus stations with improved efficiency and merge back into dedicated bus lanes, instead of general traffic lanes, further improving travel times as well as safety.

The Project will also seek to improve the catchment areas of public transport via improved bus stations and improved walking and cycling infrastructure. In the future, all bus stations in the EB2 and EB3R project area will provide seating and sheltered cover as well as bicycle and scooter parking for passengers. Separated walkways and cycleways will improve safety, amenity and travel time for an all-around improved trip to/from the bus stations.

Pedestrian and cyclist safety and amenity will be improved through the construction of separated footpaths and cycleways. Raised tables will be provided across all approaches on the southern side of Ti Rakau Drive as well as both intersections along Cortina Place. Additional signalised pedestrian crossings will be provided across Pakuranga Road, Ti Rakau Drive, Reeves Road, Aylesbury Street and William Roberts Road. A raised pedestrian crossing will also be provided on William Roberts Road near the Ti Rakau Park.

Lastly, the Project will seek an all-around improvement in safety to all users through the use of relevant TDM design standards. Improved pedestrian crossing facilities will be provided to discourage jaywalking and to improve amenity.

4.2 EB2 and EB3R Design and Construction Works

The sections below provide details, split between the EB2 and EB3R project areas, of the proposed design and construction works. Details are also provided to highlight when in the construction programme these works will occur as this is important to understand the development of the modelling scenarios presented in **Section 5.2.2**.

During the development of the updated construction methodology, based on an updated design, efforts have been made to shorten the overall construction programme where feasible as well as to produce construction staging with less adverse effects to road traffic. This process has led to a more refined construction staging.

4.2.1 EB2 – Design and Construction Works

The general extent of the EB2 project area encompasses the following roads (see **Figure 26**, dark purple):

- Ti Rakau Drive from Pakuranga Road to Reeves Road
- SEART from the eastern Waipuna Bridge abutment to Ti Rakau Drive
- Reeves Road from Ti Rakau Drive to William Roberts Road
- Pakuranga Road from Ti Rakau Drive to William Roberts Road
- Specific sections of Palm Avenue, Aylesbury Street, Seven Oaks Drive, Cortina Place, and William Roberts Road

Figure 26: EB2 general extent (dark purple)

EB2 will be a complex area with multiple work zones occurring simultaneously against different time scales. Below are sections of geographical works roughly in sequential order, however significant overlap will occur between some of these sections of work. A full set of EB2 layout drawings is provided in **Appendix B**. The EB2 construction works are anticipated to occur over a period of approximately four years.

4.2.1.1 Reeves Road and the Flyover

Reeves Road between Ti Rakau Drive and William Roberts Road will consist of one lane per direction, similar to the existing environment. However, unlike the existing environment, Reeves Road will not serve as a through route from SEART to Pakuranga Heights. In the future, it will serve buses between Ti Rakau Drive and Pakuranga Road, and will provide access to the Pakuranga Plaza and businesses on Cortina Place.

The lower section of Reeves Road between Ti Rakau Drive and Cortina Place as well the new Reeves Road 'ramps' connecting to the RRF tie-in at Pakuranga Road will be bus only lanes to improve bus travel times between Ti Rakau Drive and Pakuranga Road. Reeves Road between Cortina Place and William Roberts Road will be mixed traffic with access to Pakuranga Plaza at Aylesbury Street and the private access road. The intersections with Aylesbury Street and William Roberts Road will be signalised upon completion of the RRF to avoid midblock queues blocking the bus lane ramps.

The RRF will in future provide a direct and faster link between Pakuranga Road and SEART, by eliminating the need to travel along Ti Rakau Drive. The RRF will consist of four lanes, two lanes per direction. Adjacent to the Pakuranga Plaza, the alignment of the RRF will be directly above Reeves Road.

A raised intersection will be provided at the Reeves Road / Cortina Place intersection, with uncontrolled courtesy crossings on the western, northern and eastern approaches. Signalised crossings will be provided across the southern and western approaches at the Reeves Road / Aylesbury Street intersection and all approaches at the William Roberts Road / Reeves Road intersection. The southern crossing at the Reeves Road / Aylesbury Street intersection and the western crossing at the William Roberts Road / Reeves Road intersection will be shared crossings. The existing midblock pedestrian crossing on Reeves Road will be removed to avoid potential sightline issues. As the columns of the RRF will be located along the centre of Reeves Road, the view of pedestrians may be obstructed to vehicles.

Unidirectional cycleways will be provided on both sides of Reeves from Ti Rakau Drive to Aylesbury Street, with a bidirectional cycleway on the eastern side between Aylesbury Street and William Roberts Road.

Figure 27 shows the proposed layout of Reeves Road underneath the RRF.

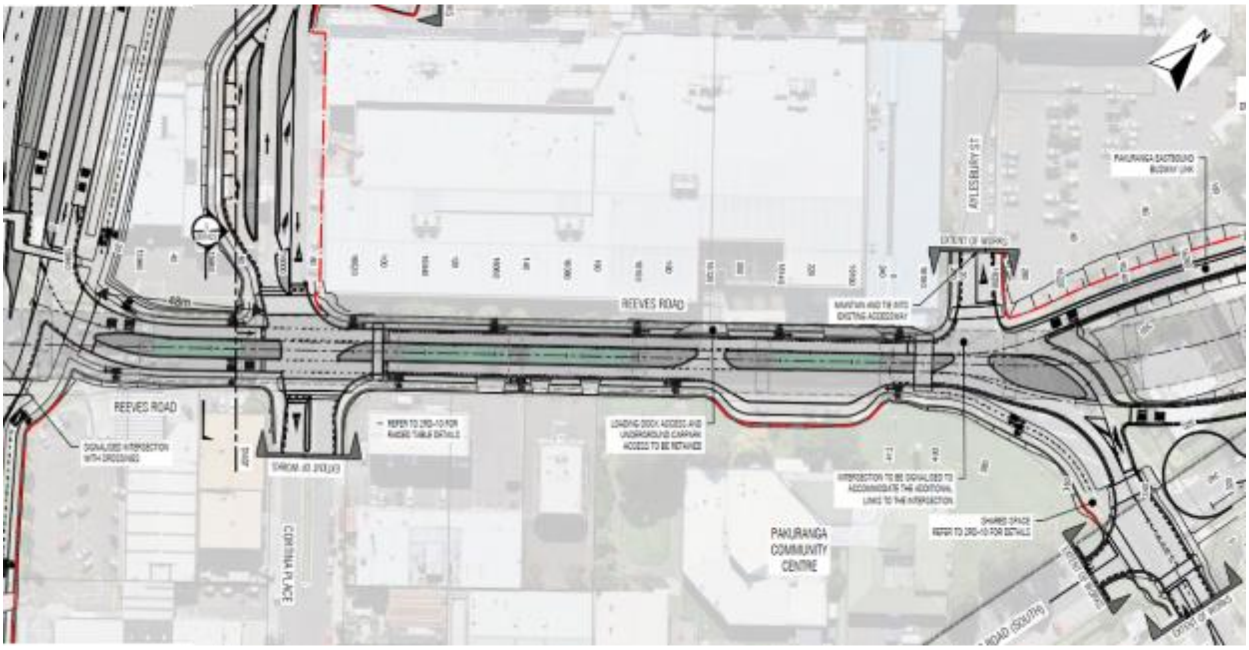


Figure 27: Reeves Rd (underneath RRF)

Figure 28 shows the proposed layout of the RRF itself.

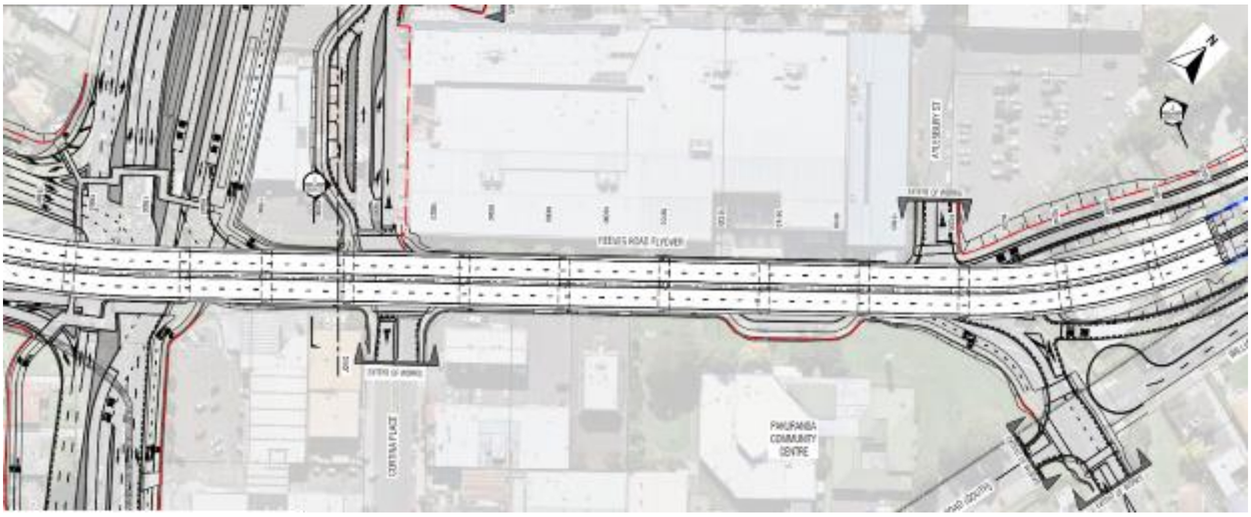


Figure 28: RRF

The works on Reeves Road will be extensive and will encompass offline works heading north along William Roberts Road. Reeves Road will be closed to enable these works and will not fully reopen until all works associated with the RRF and the remaining environment below the RRF have been completed.

Figure 29 shows the indicative work zones associated with Reeves Road and the RRF. The works associated with the RRF, and Reeves Road underneath are anticipated to have a duration of approximately three years.

Figure 29: Indicative work zones – Reeves Rd and RRF

The existing alternate routes, during the Reeves Road closure, are at capacity and additional traffic loading will result in increased delays. This means that to enable the closure of Reeves Road without significant effects, three works must be completed prior to the closure to accommodate the displaced traffic volumes:

1. William Roberts Road extension. Effects of these works have been assessed in the WRRE ITA, see **Section 3.10.2**.
2. Ti Rakau Drive enabling works. To close Reeves Road will require the temporary removal of the pedestrian crossing on the eastern arm of the Ti Rakau Drive / Reeves Road intersection, reducing the required signal phases to three and redistributing the green time. The pedestrian crossing on the western approach will be maintained.
3. Gossamer Drive enabling works. During the Reeves Road closure, citybound traffic is expected to find an alternate route, via Gossamer Drive then proceeding along Ti Rakau Drive. As stated in **Section 3.10.3.2**, the enabling works at Gossamer Drive will include converting the short left-turn slip lane to pass through the intersection, converting the centre lane to a full left-turn lane, providing an additional short lane for the shared through and right-turn movements, and increasing the length of the kerbside exit lane.

The traffic modelling undertaken for EB2 and EB3R assumes that these three works have been completed and so form part of the baseline traffic environment discussed in **Section 3.10**.

4.2.1.2 William Roberts Road North

In the future, William Roberts Road north will no longer function as a through route between Reeves Road and Pakuranga Road, but rather as a local road to the surrounding residential properties. William Roberts Road north will be closed off once works are completed at the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection further south.

During this phase of construction, each end of William Roberts Road will be converted to a cul-de-sac with access off Ayr Road only. This in turn will remove the southern approach at the Pakuranga Road / William Roberts Road intersection, resulting in a no stop intersection until the RRF is built. The northern approach at the William Roberts Road / Reeves Road intersection will also be removed, resulting in a T-junction arrangement.

The majority of the existing footpath on the eastern side of William Roberts Road will be retained. **Figure 30** below shows the proposed layout of William Roberts Road north.

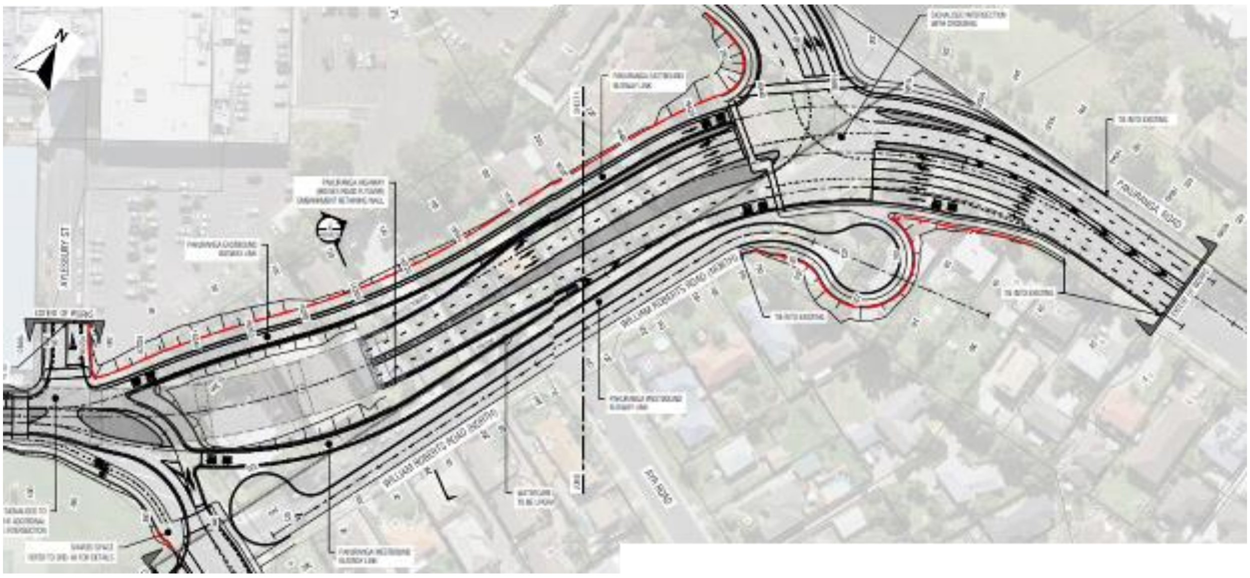


Figure 30: William Roberts Rd north

Figure 31 shows the indicative work zone of William Roberts Road north. The construction of William Roberts Road north is anticipated to have a duration of approximately six months.

Figure 31: Indicative work zones – William Roberts Rd north

4.2.1.3 Pakuranga Road Tie-In

The RRF will tie into Pakuranga Road with two through lanes per direction in addition to the dedicated bus lanes from Reeves Road. The Pakuranga Road western approach will tie into the intersection in a T-arrangement, providing two full length left-turn lanes for this minor approach and one short right-turn lane onto the RRF.

The eastern approach will consist of a short bus lane, two full length through lanes, one full length right-turn lane and an additional short right-turn lane. The southern RRF approach will consist of a bus lane from Reeves Road, a short left-turn lane, and two full length through lanes. Signalised pedestrian crossings will be provided across the southern and western approaches. **Figure 32** shows the proposed layout of the Pakuranga Road / RRF tie-in.

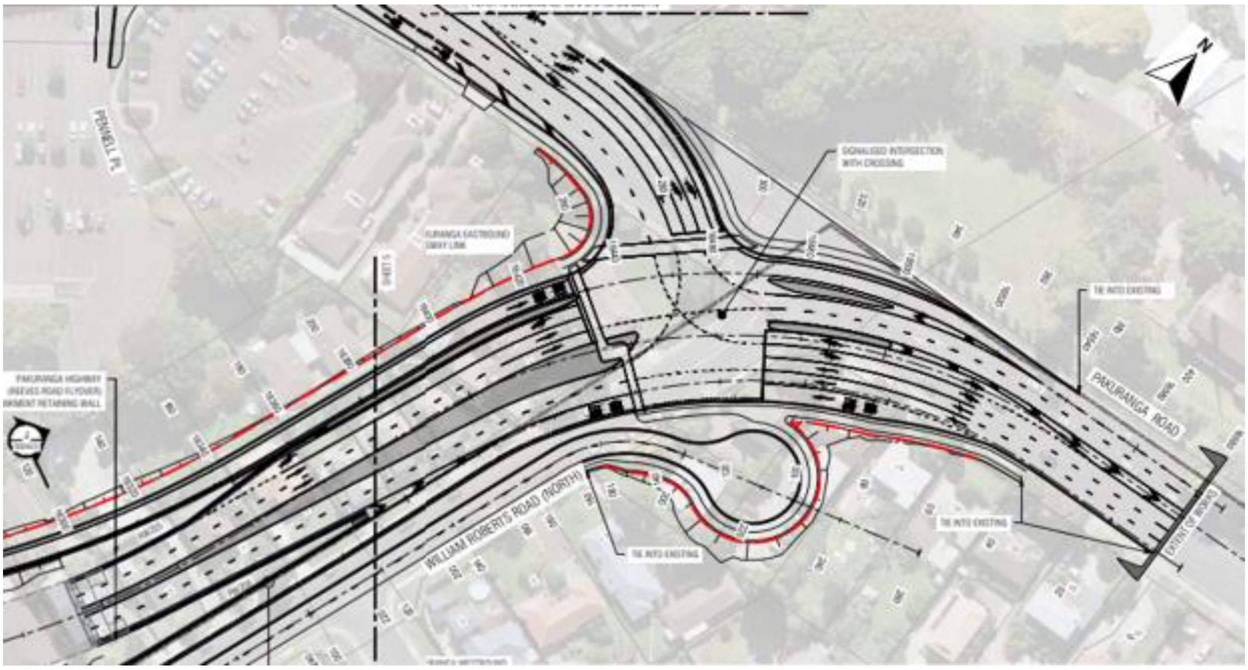


Figure 32: Pakuranga Rd / RRF tie-in

The tie-in of the RRF with Pakuranga Road will occur over four phases, generally maintaining five lanes of the Pakuranga Road carriageway. Three lanes will be provided for the westbound traffic and two lanes for the eastbound traffic. These works will be undertaken as soon as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection has been constructed.

Figure 33 shows the indicative work zone of the Pakuranga Road tie-in works. The construction of the tie-in is anticipated to have a duration of approximately six months.

Figure 33: Indicative work zone – Pakuranga Rd tie-in

4.2.1.4 SEART

In the future, the SEART off-ramp will consist of one short left-turn lane onto Ti Rakau Drive westbound, one short right-turn lane and two full length right-turn lanes onto Ti Rakau Drive eastbound. The SEART on-ramp will consist of two lanes to cater for the single left-turn from Ti Rakau Drive westbound and the single right-turn from Ti Rakau Drive eastbound.

Figure 34 below shows the proposed layout of the SEART on-ramp and off-ramp at Ti Rakau Drive. The works along SEART will be divided into three phases.

Figure 34: SEART on-ramp and off-ramp at Ti Rakau Dr

Phase 1 – Eastbound Carriageway:

The work associated with the eastbound carriageway will be offline between Ti Rakau Drive and Dale Crescent, on the northern side of SEART. Barrier protection will be installed along the existing shoulder up to the intersection with Ti Rakau Drive. To maintain the two left-turn lanes on the off-ramp, removal of the traffic island and temporary pavement will be required. Seven Oaks Drive will be reinstated further north of its current alignment.

Phase 2 – Westbound Carriageway:

During this phase the eastbound traffic will be moved to the new off-ramp. Westbound traffic will be transitioned to the existing eastbound lanes at the Ti Rakau Drive / Reeves Road intersection. This will allow for drainage works, permanent barrier removal and pavement construction on the existing westbound lanes. This phase of works will also consist of drainage works further west on SEART, which will be completed over night works with discrete closures.

Phase 3 – Centre of Carriageway:

Eastbound traffic will remain on the new off-ramp lanes from the preceding phases. Westbound traffic will be pushed to the southern edge of seal, maintaining the number of lanes as per the existing environment. A mixture of permanent and temporary barriers will protect the workspace.

A key component of this phase is construction of the falsework for the pier head above the Ti Rakau Drive right-turn lanes into SEART. Removal of the existing traffic island, including a streetlight and traffic signal pole, and construction of temporary pavement will be required to maintain the number of lanes as per the existing environment.

Figure 35 below shows the indicative work zones for SEART. The works along SEART are anticipated to have a duration of approximately three years.

Figure 35: Indicative work zones – SEART

4.2.1.5 Ti Rakau Drive

The works along Ti Rakau Drive in the EB2 project area have been divided into two sections to provide a clear and concise description of the proposed design and construction methodology.

Pakuranga Road to Reeves Road Section:

Ti Rakau Drive between Pakuranga Road and Reeves Road will in future consist of two through lanes per direction and offline bus lanes on the northern side of the carriageway. The eastern approach of Ti Rakau Drive at the intersection with Pakuranga Road will consist of one full length left-turn slip lane and one full length right-turn lane.

The two intersections with Aylesbury Street will be combined into one crossroads intersection with Palm Avenue, providing for all movements in and out of the side roads and will be signalised. The western approach on Ti Rakau Drive will consist of a short left-turn lane, two full length through lanes and a short right-turn lane, while the eastern approach will consist of full length shared through and left-turn lane, a full length through lane and a short right-turn lane. The northern approach on Aylesbury Street will consist of left-turn lane and a shared through and right-turn lane. The southern Palm Avenue approach will remain as per the existing environment.

A bus station will be provided between Aylesbury Street and Reeves Road, while a 'Kiss-and-Ride' facility will be provided on the private access road off Aylesbury Street that will consist of five parking spaces. A bidirectional cycleway will also be provided on the northern side of Ti Rakau Drive which will tie into the existing bidirectional cycleway on Pakuranga Road west (part of EB1) and the new unidirectional cycleways on Pakuranga Road east.

A signalised shared crossing will be provided across the northern approach at the Pakuranga Road / Ti Rakau Drive intersection, with a raised zebra crossing on the left-turn slip lane and signalised pedestrian crossings on all other approaches.

A raised intersection will be provided at the Ti Rakau Drive / Aylesbury Street / Palm Avenue intersection, a signalised shared crossing on the Aylesbury Street approach and signalised pedestrian crossings on all other approaches.

At the Ti Rakau Drive / Reeves Road / SEART intersection, a signalised shared crossing will be provided on the northern and eastern approaches, and signalised pedestrian crossings on the southern and western approaches. **Figure 36** below shows the proposed layout of Ti Rakau Drive between Pakuranga Road and Reeves Road.

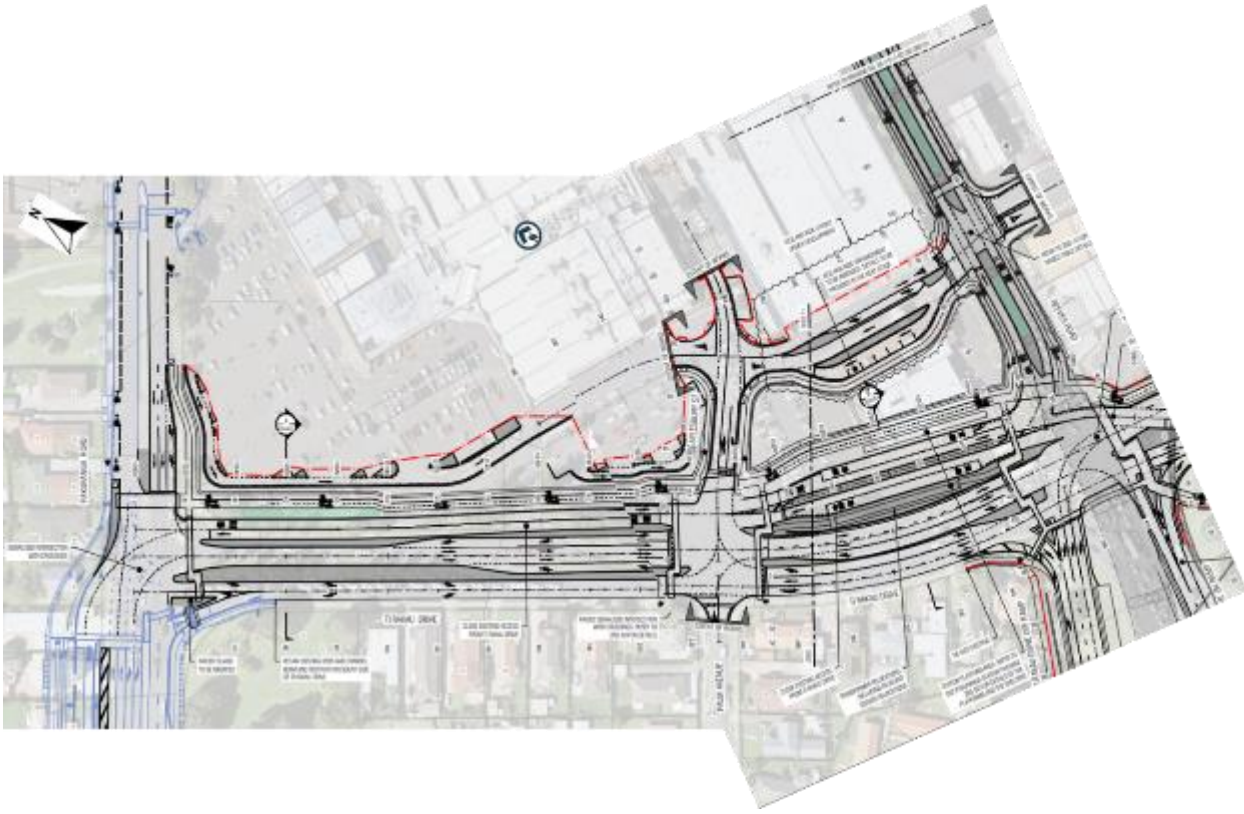


Figure 36: Ti Rakau Dr from Pakuranga Rd to Reeves Rd

The construction of Ti Rakau Drive between Pakuranga Road and Reeves Road will be divided into three sub-phases.

In Phase 1, the new bus lanes are to be built largely offline concurrent with the RRF abutment construction, and will include removal of the median island and shifting vehicle lanes. Construction of the new Ti Rakau Drive / Palm Avenue / Aylesbury Street crossroads intersection will be brought forward, and will be undertaken during this phase and is expected to have a duration of approximately eight months. The early completion of this intersection will provide improved access to the Pakuranga Plaza during the subsequent construction phases. It is anticipated that the intersection will be completed before the closure of Reeves Road.

Phase 2, which will consist of works in the centre of Ti Rakau Drive to construct the new eastbound lanes, will be undertaken after the completion of the RRF to maintain the capacity of this section of Ti Rakau Drive. In Phase 2, the eastbound traffic will be temporarily transferred to the new bus lanes, reducing the available eastbound lanes to two lanes.

Once the centre lane work is completed, Phase 3 will be able to commence and will consist of less extensive works in the westbound kerbside lane. The westbound carriageway will also be reduced to two lanes in this phase.

Figure 37 below shows the indicative work zones for Ti Rakau Drive from Pakuranga Road to Reeves Road. Construction of this section of Ti Rakau Drive is anticipated to have a duration of approximately three years.

Figure 37: Indicative work zones – Ti Rakau Dr from Pakuranga Rd to Reeves Rd

Ti Rakau Drive / Reeves Road Intersection:

The Ti Rakau Drive / Reeves Road intersection will provide for the transition of offline bus lanes from the west to online or central running bus lanes to the east. The northern Reeves Road approach to the intersection will serve bus movements only up to Cortina Place, and will connect to the bus lanes to the west of the intersection. The western approach will provide two full length through lanes and one short right-turn lane. The eastern approach will provide one full length left-turn lane and two full length through lanes.

As stated in **Section 4.2.1.4**, the SEART off-ramp will consist of one left-turn lane and three right-turn lanes. The intersection will also provide for the transition of the bidirectional cycleway to unidirectional cycleways on both sides of Ti Rakau Drive to the east of the intersection. Again, a signalised shared crossing will be provided on the northern and eastern approaches, and signalised pedestrian crossings on the remaining approaches. **Figure 38** below shows the proposed layout of the Ti Rakau Drive / Reeves Road intersection underneath the RRF.

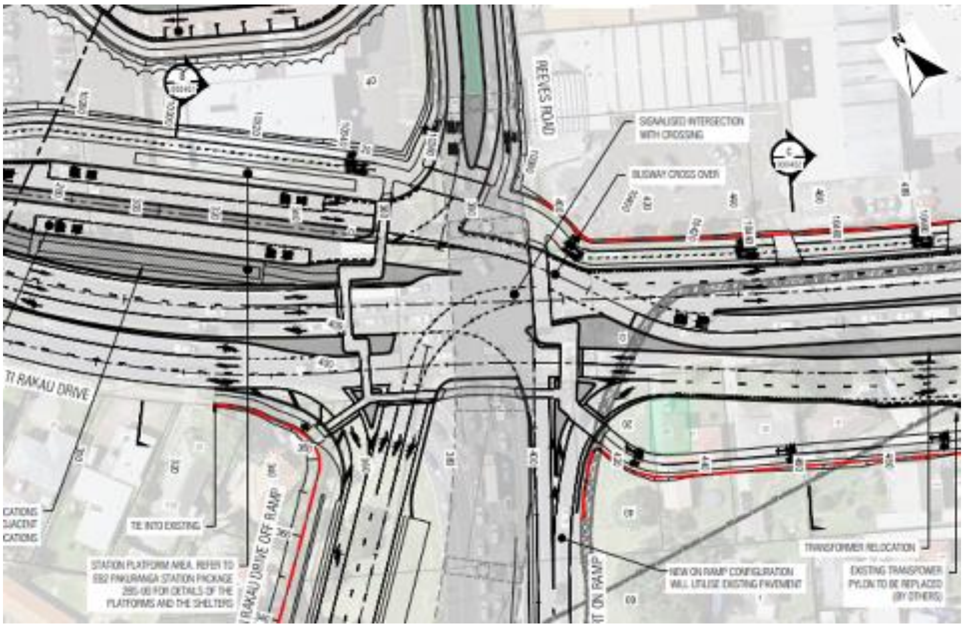


Figure 38: Ti Rakau Dr / Reeves Rd intersection

To minimise the adverse effects to traffic, temporary pavement will be constructed on the southern side of the intersection as part of the enabling works for the closure of Reeves Road. This will allow lanes to be shifted over while works are undertaken within the intersection footprint, as well as maintaining the majority of the existing number of lanes. The temporary realignment will be constructed and ready for use upon completion of the new Ti Rakau Drive / Palm Avenue / Aylesbury Street crossroads intersection further west, early in the construction programme.

Figure 39 shows the indicative work zone of the Ti Rakau Drive / Reeves Road intersection.

Figure 39: Indicative work zone – Ti Rakau Dr / Reeves Rd intersection

4.2.1.6 Pakuranga Road

Pakuranga Road between Ti Rakau Drive and the RRF will consist of four lanes (two lanes per direction) with unidirectional cycleways on each side. The eastern approach of Pakuranga Road at the intersection with Ti Rakau Drive will consist of a short left-turn lane and two full length through lanes. As stated in **Section 4.2.1.3**, the western Pakuranga Road approach at the intersection with the RRF will consist of two full length left-turn lanes and one short right-turn lane.

The works associated with Pakuranga Road will involve converting the existing kerbside lanes to cycleways while retaining the existing footpaths along both sides. The existing signalised midblock pedestrian crossing on Pakuranga Road, constructed as part of EB1, will remain. The Pakuranga Road / Brampton Court priority-controlled access to the Pakuranga Plaza will be realigned to improve access safety for right turners. **Figure 40** below shows the proposed layout of Pakuranga Road from Ti Rakau Drive to the RRF tie-in.

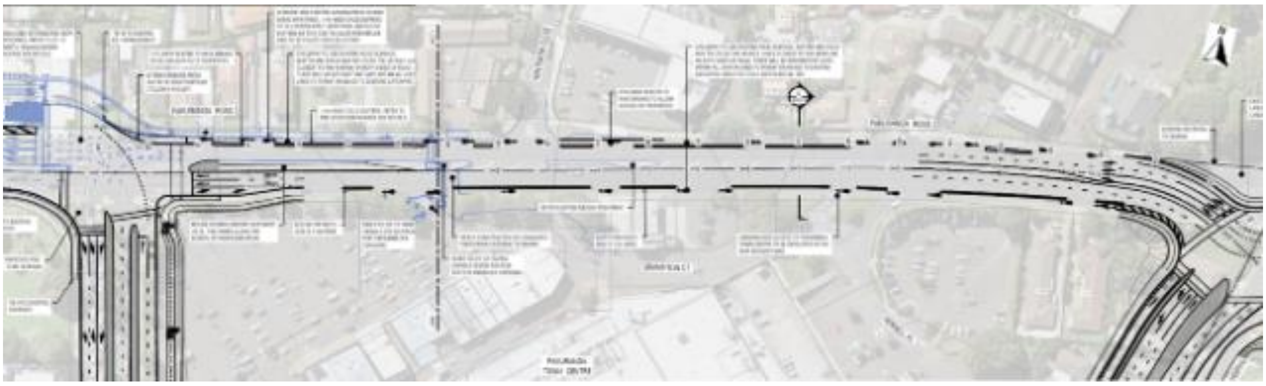


Figure 40: Pakuranga Rd from Ti Rakau Dr to the RRF

The initial stages of the Pakuranga Road construction will also include longitudinal drainage works between Kentigern Close and St Kentigern College, and will be undertaken concurrently with the enabling works, early in the construction programme. The new longitudinal drainage will tie into the existing drainage infrastructure crossing Pakuranga Road. Works to complete the tie-in of the drainage works between Kentigern Close and the signalised pedestrian crossing will be undertaken after the RRF is completed. **Figure 41** shows the indicative work zone for Pakuranga Road. Construction works along Pakuranga Road are anticipated to have a duration of approximately six months.

Figure 41: Indicative work zone – Pakuranga Rd

4.2.2 EB3R – Design and Construction Works

The general extent of the EB3R project area encompasses the following roads (see **Figure 42**, yellow):

- Ti Rakau Drive from Reeves Road to the western Ti Rakau Bridge abutment
- Short sections of Tiraumea Drive, Mattson Road, Roseburn Place, Edgewater Drive west, Wheatley Avenue, Edgewater Drive east, Gossamer Drive and Freemantle Place

Figure 42: EB3R general extent (yellow)

Ti Rakau Drive in the EB3R section of the Project will largely consist of two lanes per direction, similar to the existing environment. Online bus lanes will be provided along the entire length of the corridor from Reeves Road to Gossamer Drive. For the purposes of this ITA the online bus lanes will terminate at the western approach of the Ti Rakau Drive / Gossamer Drive intersection. An intermediate bus station will be provided in the centre of the carriageway between Roseburn Place and Wheatley Avenue, and another intermediate bus station near the intersection with Gossamer Drive. A full set of EB3R layout drawings is provided in **Appendix C**.

4.2.2.1 Ti Rakau Drive – Reeves Road to Mattson Road

This section of Ti Rakau Drive, between Reeves Road and Mattson Road, will consist of three lanes per direction. Bus lanes will also be provided along the centre of the carriageway.

The Tiraumea Drive intersection will remain left-in left-out only, as per the existing environment.

The intersections with William Roberts Road and Mattson Road will be combined into one signalised crossroads intersection. Both the William Roberts Road and Mattson Road approaches will consist of two lanes, a short left-turn lane and a full length shared through and right-turn lane. The Ti Rakau Drive eastern approach will consist of one full length shared through and left-turn lane, two full length through lanes and one short shared right-turn and U-turn lane. The western approach will consist of one full length left-turn lane, two full length through lanes and one short right-turn lane.

A bidirectional cycleway will be provided on the northern side of Ti Rakau Drive between Reeves Road and William Roberts Road, while a unidirectional cycleway (westbound) will be provided on the southern side as well.

Signalised shared crossings will be provided on all approaches at the Ti Rakau Drive / William Roberts Road / Mattson Road intersection. -A raised table will be provided across Tiraumea Drive. **Figure 43** shows the proposed layout of Ti Rakau Drive from Reeves Road to Mattson Road.

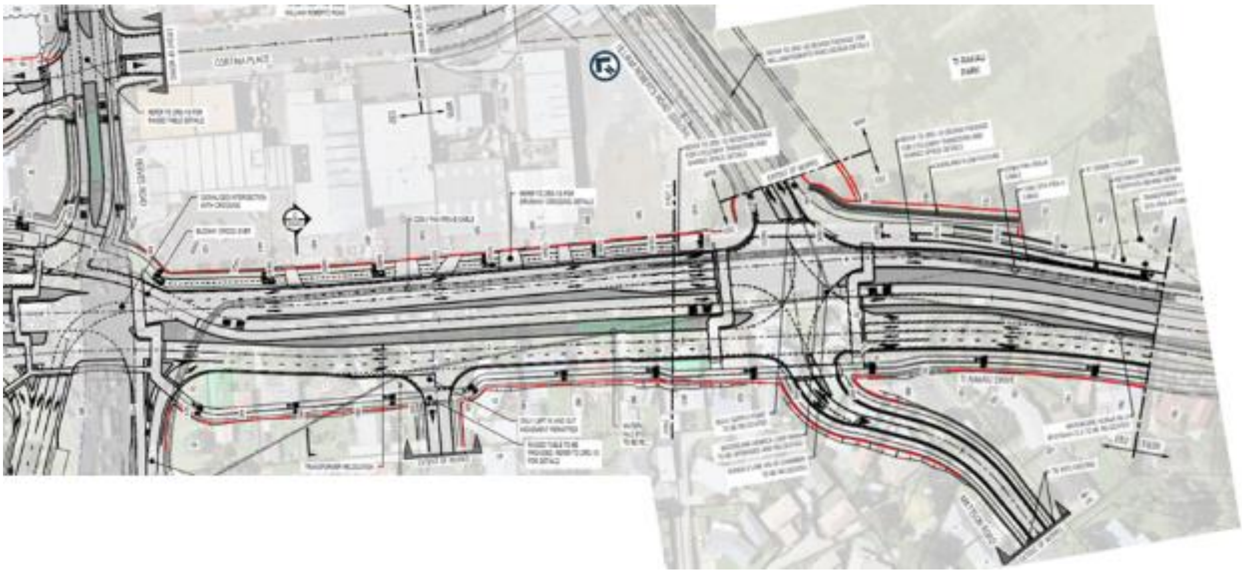


Figure 43: Ti Rakau Dr from Reeves Rd to Mattson Rd

The construction of this section of Ti Rakau Drive will be divided into six phases and will for the majority of its duration occur during the Reeves Road closure.

The first four phases will largely consist of offline works to construct the new westbound lanes on the acquired properties on the southern side of the carriageway. In addition, these phases will include the construction of the Mattson Road approach to the new crossroads intersection and will also include the construction of the Tiraumea Drive intersection.

The next phase will consist of works in the centre of the carriageway to construct the new bus lanes, after the completion of the RRF. During Phase 5, the new signalised Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection will be operational as well as all lanes on the William Roberts Road approach.

Finally, Phase 6 will include works in the existing eastbound lanes while traffic is diverted onto the newly constructed bus lanes. **Figure 44** shows the indicative works zones for Ti Rakau Drive from Reeves Road to Mattson Road. Construction of this section of Ti Rakau Drive is anticipated to have a duration of approximately one and a half years.

Figure 44: Indicative work zones – Ti Rakau Dr from Reeves Rd to Mattson Rd

4.2.2.2 Ti Rakau Drive – Mattson Road to Gossamer Drive

The intersections with Roseburn Place, Marriott Road, Edgewater Drive west and Chevis Place, and Wheatley Avenue which currently provide for all movements in/out of the side roads, will be converted to LILO intersections. A U-turn facility will be provided along Ti Rakau Drive, between Roseburn Place and Marriott Road for the westbound traffic (see **Figure 45**). The Ti Rakau Drive / Edgewater Drive east intersection will be signalised, and a separate turn lane will be provided to allow eastbound motorists to turn right from Ti Rakau Drive into Edgewater Drive east or make a U-turn to return along Ti Rakau Drive in a westbound direction. This will provide access for eastbound traffic into Wheatley Avenue and the properties on the southern side of Ti Rakau Drive, between Edgewater Drive east and west.

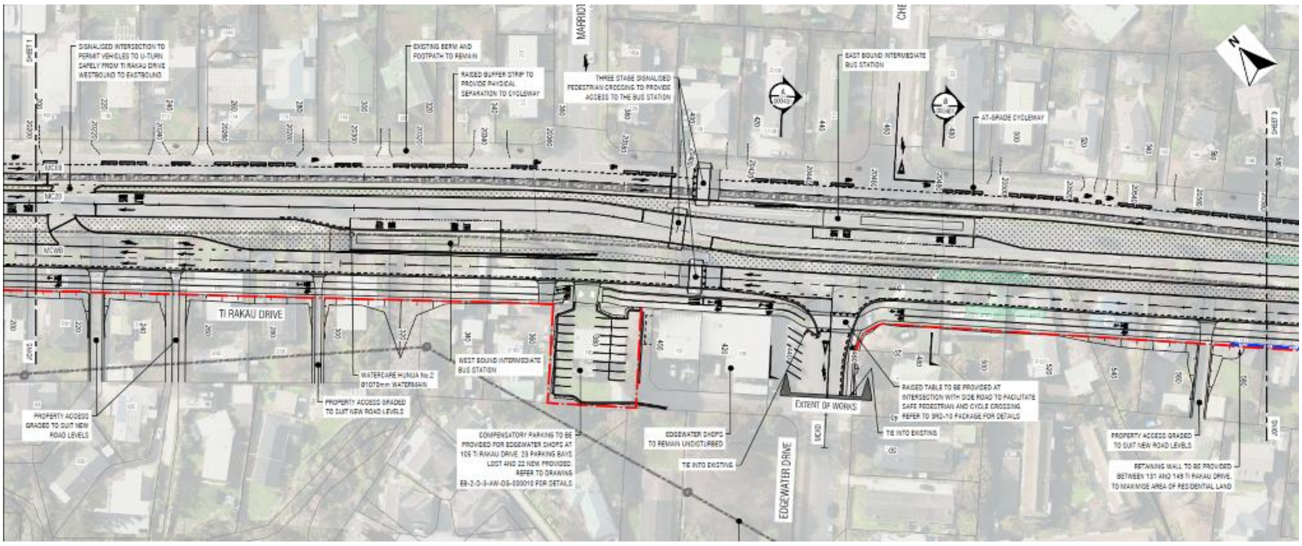


Figure 45: Ti Rakau Dr between Roseburn Pl and Wheatley Ave

Additionally, a U-turn manoeuvre will also be provided on the western approach at the Ti Rakau Drive / Gossamer Drive intersection. This is to provide access from Ti Rakau Drive eastbound into the properties on the southern side of Ti Rakau Drive between Edgewater Drive east and Freemantle Place. A U-turn manoeuvre will also be provided on the eastern approach of the Ti Rakau Drive / William Roberts Road / Mattson Road intersection to provide access onto Ti Rakau Drive eastbound from Roseburn Place.

A three-stage raised signalised crossing will be provided, between Marriot Road and Edgewater Drive, to facilitate pedestrian access to the bus station from both sides of Ti Rakau Drive. A two-stage signalised crossing will also be provided on the eastern approach of the Edgewater Drive east intersection. Raised tables will be provided across Roseburn Place, Edgewater Drive west and Wheatley Avenue.

Figure 46 below shows the proposed layout of the Ti Rakau Drive / Gossamer Drive intersection. The western approach will consist of a short left-turn lane, two full length through lanes and one shared right-turn and U-turn short lane. The eastern approach will consist of one full length shared through and left-turn lane, one full length through lane, one short bus queue-jump lane and two short right-turn lanes.

The eastbound bus lane will transition to the northern side of Ti Rakau Drive to the proposed bus stop, and taper back into Ti Rakau Drive before the Ti Rakau Bridge. The southern Freemantle Place approach will consist of a short left-turn lane and a full length shared through and right-turn lane. The northern Gossamer Drive approach will consist of one short and one full length left-turn lane, and a shared through and right-turn short lane.

Signalised shared pedestrian and cyclist crossings will be provided on the northern and western approaches at the Ti Rakau Drive / Gossamer Drive intersection, with signalised pedestrian crossings on all other approaches. The Ti Rakau Drive / Gossamer Drive intersection will also be a raised intersection.

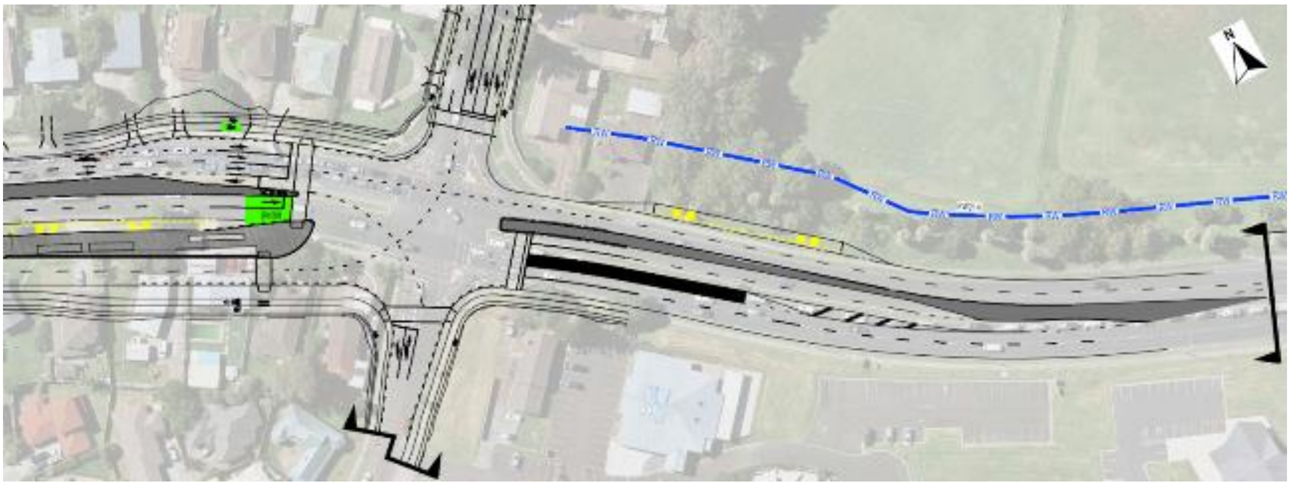


Figure 46: Ti Rakau Dr at Gossamer Dr

Throughout the construction of EB3R, the preferred methodology is to complete works offline to allow space to be provided for future lateral shifts of running lanes. The EB3R construction works between Mattson Road and Gossamer Drive are anticipated to occur over a period of approximately three years, and will be split into three main phases.

4.2.2.3 Ti Rakau Drive – Mattson Road to Gossamer Drive (Phase 1)

Phase 1 will involve constructing the new westbound lanes offline in the acquired properties along the southern side of Ti Rakau Drive and rebuilding pavement at intersections where the new busway intersects. This phase will be divided into six sub-phases, a summary of which is provided in **Table 17** and will occur during the closure of Reeves Road.

Table 17: EB3R Phase 1 construction summary

Sub-Phase	Summary of Activities
1a-b	Construction of Roseburn Place in two sub-phases.
1c	Edgewater Drive west in one sub-phase.
1d-e	Wheatley Avenue in two sub-phases.
1f	Edgewater Drive east in one sub-phase.

The new westbound carriageway will consist of two lanes, similar to the existing environment. Establishing works will also be able to commence on the north-east quadrant of the Ti Rakau Drive / Gossamer Drive intersection to enable construction of the eastbound Gossamer Drive bus station to commence at any time.

Figure 47 below shows the indicative work zones for Phase 1 of EB3R, and is anticipated to have a duration of approximately one year and three months.

Figure 47: Indicative work zones – EB3R Phase 1

The pavement type specified for design requires closures of specific roadway sections for periods of at least one week before being opened to general traffic. These roadway sections have been divided into two categories with varying Temporary Traffic Management (TTM) approaches.

Category 1 (Detour Loops) – Edgewater Drive west and east:

The preferred approach to construct pavement through these intersections is to close one intersection at a time. As Edgewater Drive is a loop with two accesses to Ti Rakau Drive, traffic will be detoured to one end of the loop enabling the other end to be closed and rebuilt. The full closures are anticipated to reduce the overall time TTM will be required.

As above, Phase 1c will consist of the construction of the Edgewater Drive west intersection. All traffic along Edgewater Drive will be diverted to the Ti Rakau Drive / Edgewater Drive east intersection. A temporary traffic signal will be provided at this intersection to aid vehicles turning right into and out of Edgewater Drive. Phase 1f will include the construction of the Edgewater Drive east intersection, and all traffic along this side road will be diverted to the existing traffic signal at Edgewater Drive west.

Category 2 (Cul-de-sac Roads) – Wheatley Avenue and Roseburn Place:

Two cul-de-sac roads are located along Ti Rakau Drive that enable residential property access. To maintain access through Wheatley Avenue and Roseburn Place intersections, the approaches will be constructed in halves with temporary traffic signals installed and set back from the works, creating a one-way system on the side roads. As above, these intersections will be constructed during sub-phases 1a-b and 1d-e, respectively.

To minimise disruption to the main road, vehicles entering the cul-de-sac will have right-of-way. Green phases for vehicles leaving the cul-de-sac roads will only be triggered on the basis of demand. Traffic volumes on the side roads are predicted to be low during both peak periods (see **Table 18**).

Table 18: Ti Rakau Dr side road traffic volumes (2028)[20]

Side Road	Movement Out	AM Peak	PM Peak
Roseburn Pl	Left	20	7
	Right	10	8
	Total	**30**	**15**
Wheatley Ave	Left	31	22
	Right	0	0
	Total	**31**	**22**

Approximately one vehicle every two minutes would require access onto Ti Rakau Drive from Roseburn Place and Wheatley Avenue during the peak periods. Improved performance is expected on the side roads as the temporary traffic signal control would improve the delay currently being experienced at the priority-controlled intersections.

An alternative approach is also being considered whereby traffic to/from these side roads will be diverted to Edgewater Drive west and east, respectively, via temporary access tracks along the back of the acquired properties. This approach would support a more efficient construction programme. As above, the traffic volumes on these side roads are expected to be low during the peak periods, and the effects of this additional traffic at the Edgewater Drive intersections is expected to be low.

Freemantle Place:

The construction of the Freemantle Place approach will be brought forward in the programme, and will be undertaken during Phase 1 in EB3R (Mattson Road to Gossamer Drive). This will involve temporarily closing the kerbside left-turn short lane to construct the new kerbline.

Ti Rakau Drive / Gossamer Drive Intersection:

The Gossamer Drive approach enabling works will also be undertaken during Phase 1 of EB3R (Mattson Road to Gossamer Drive), see **Section 3.10.3.2** for a detailed description. These works will be undertaken before the closure of Reeves Road.

[20] Traffic volumes sourced from the WRRE AIMSUN model, with a 2028 horizon year.

Lastly, during Phase 1 of EB3R (Mattson Road to Gossamer Drive), the Ti Rakau Drive eastbound and westbound left-turn slip lanes at this intersection will be converted to a signalised left-turn once the necessary stacking space has been constructed.

4.2.2.4 Ti Rakau Drive – Mattson Road to Gossamer Drive (Phase 2)

Phase 2 will consist of the construction of the bus lanes in the centre of Ti Rakau Drive and is expected to be undertaken during the closure of Reeves Road. The new bus lanes will tie into the EB2 bus lanes to the west and will terminate at Gossamer Drive to the east. The new Edgewater Drive bus station, the new westbound Gossamer Drive bus station and the new U-turn facility will also be constructed during this phase.

During Phase 2 of EB3R (Mattson Road to Gossamer Drive), the right-turn movements from all side roads will require removal, resulting in the intersections supporting LILO movements only. To mitigate these adverse effects to traffic, two new U-turn facilities will be constructed near Roseburn Place and Wheatley Avenue, respectively. The works in the median along Ti Rakau Drive, to enable the operation of the U-turn facilities, will be minimal and will be undertaken during night works. In the interim, while the bus lanes along the centre of Ti Rakau Drive are under construction, these U-turn facilities are expected to be unsignalised.

To provide access into Wheatley Avenue and Edgewater Drive east, while travelling eastbound on Ti Rakau Drive, a U-turn movement will also be provided on the western approach of the Ti Rakau Drive / Gossamer Drive intersection. Efforts will be made to complete this piece of work as early as possible during Phase 2 of EB3R (Mattson Road to Gossamer Drive).

Figure 48 below shows the indicative work zone for Phase 2 of EB3R (dark grey), and is expected to have a duration of approximately 11 months.

Figure 48: Indicative work zone – EB3R Phase 2

4.2.2.5 Ti Rakau Drive – Mattson Road to Gossamer Drive (Phase 3)

Phase 3 will consist of works in the existing eastbound lanes and will have some temporal overlap with Phase 2 as some sections are completed. This is due to some Phase 3 works being completed under night works with discrete closures. However, the majority of the works under Phase 3 are expected to be completed after the completion of the RRF.

There is a large number of properties with driveways on the northern side of Ti Rakau Drive, meaning long term access will be required to allow vehicles to traverse through the site. As the pavement only requires resurfacing and not major reconstruction, this work will be completed in sections, with the road being trafficable during the daytime.

Figure 49 shows the indicative work zones for Phase 3 of EB3R, and is anticipated to have a duration of approximately six months.

Figure 49: Indicative work zones – EB3R Phase 3

During Phase 3 of EB3R (Mattson Road to Gossamer Drive), eastbound traffic along Ti Rakau Drive will be diverted onto the new bus lanes. Furthermore, all side roads on the southern side of Ti Rakau Drive will be temporarily converted back to full movement priority-controlled intersections during this phase. This will be enabled by not fully constructing the entire median under the previous phase of work, and by providing short right-turn pockets at Roseburn Place, Edgewater Drive west, Wheatley Avenue and Edgewater Drive east.

Phase 3 construction will also consist of works at the Ti Rakau Drive / Gossamer Drive intersection. Works during Phase 3 of EB3R (Mattson Road to Gossamer Drive) on the western and eastern approaches of the intersection have been brought forward in the construction programme and will occur during the Reeves Road closure, but after the RRF is open. These works will consist of the construction of the approach lanes of the western arm and the departure lanes as well as the medians on the eastern arm. This construction methodology, coupled with the updated construction methodology of Phases 1 and 2 above, will allow for more general traffic lanes to remain open during construction.

5 Assessment of Temporary Effects during Construction

The sections below provide an assessment of the temporary effects during construction of EB2 and EB3R including:

- Construction effects
- General traffic effects
- Effects to bus services and facilities
- Effects to pedestrians and cyclists
- Effects to property access and parking
- Effects to safety performance

5.1 Construction Effects

5.1.1 Construction Support Areas and Site Access Points

Construction Support Areas (CSAs) and Site Access Points (SAPs) are anticipated to vary throughout the construction phases, shifting as sections of the roadway are completed. The sections below provide details of notable CSAs and SAPs within the EB2 and EB3R project areas as advised by the construction team as well as an assessment of their temporary effects.

5.1.1.1 EB2 – 2 Cortina Place and 5 Reeves Road Site Offices

The properties at 2 Cortina Place and 5 Reeves Road have been acquired by AT and will serve as site offices for the EB2 project area. Therefore, the current use of these properties will no longer exist in the future. It is envisaged that Site Office 1 at 5 Reeves Road will accommodate approximately 120 workstations and Site Office 2 at 2 Cortina Place will accommodate approximately 30 workstations at the peak of construction. Office hours for the site offices will be from 07:00 to 19:00. **Figure 50** shows the location of Site Office 1 and 2 in the EB2 project area.

Figure 50: Site Office 1 and 2 locations

During the closure of Reeves Road, vehicle access to Site Office 1 from Reeves Road will not be maintained, although the property will still be accessible via Cortina Place. Pedestrian access to the property will be maintained at all times. Approximately 11 off-street parking spaces will be maintained on the eastern side of the property for visitors and deliveries.

The closure of Reeves Road will result in the loss of the access to Site Office 2 from the western frontage, however the property will still be accessible from Cortina Place. Pedestrian access to the property will be maintained at all times. The building in the centre of the property will be used as site office space, while the building along the eastern frontage of the property (red outline) will be demolished. Approximately five off-street parking spaces will be maintained on site and accessed from Cortina Place for material deliveries.

It is envisaged that, at least for the initial year of construction, site office staff will use public transport for commuter trips and will access the site offices on foot. A WTMP will be developed to achieve this. The aim of the WTMP will be to reduce the number of private vehicles travelling to the worksites and to increase the accessibility of the worksites through more travel options. Therefore, the temporary traffic effects from the site offices in the first year are expected to be very low. Following the initial year and as construction activities ramp up, a staff carpark will be provided at 26 Ti Rakau Drive.

5.1.1.2 EB2 – 26 Ti Rakau Drive Staff Carpark

It is envisaged that the property at 26 Ti Rakau Drive will be acquired by AT and will serve partially as a site office staff parking area and partially as a work zone for the new Pakuranga Town Centre bus station during construction. The existing building and parking area on the property are not in use and therefore the Project will have no effects on the property from a transport perspective.

Once the existing infrastructure has been demolished and the work zone has been established, a temporary staff carpark will be established until the construction of the Kiss-and-Ride facility. For the purposes of this ITA it was assumed the staff carpark will provide 150 parking spaces, one parking space per workstation in Site Office 1 and 2. The property currently has no direct access from Ti Rakau Drive, and is accessed via Reeves Road and the internal road network inside the Pakuranga Plaza.

Figure 51 below shows the location of the CSA to be located at 26 Ti Rakau Drive.

Figure 51: 26 Ti Rakau Dr CSA location

In the existing environment, the Pakuranga Plaza has six access points allowing for both in and out movements, with a seventh at Pepler Street allowing for movements out onto Pakuranga Road only. Throughout the construction programme of EB2, the accesses to Pakuranga Plaza will undergo several changes, some of which will be closed temporarily. Further details of effects to property access at the Pakuranga Plaza are provided in **Section 5.5.5.3**.

For the purposes of assessing the effects of the staff carpark, the 'worst-case' has been considered here, which will be during the Reeves Road closure. During this closure, access to this carpark will be gained via the three remaining accesses at Aylesbury Street north and south and at Brampton Court. It should be noted that the Pepler Street exit will also be open during this time.

As stated in **Section 5.1.1.1**, office hours for the site offices will be from 07:00 to 19:00, meaning a large proportion of site office staff is expected to travel on the road network outside of the AM and PM peaks. For the purpose of this ITA, assumptions were made to consider the staff carpark fully utilised and 50% of staff would be arriving/departing during the AM and PM peak hours, respectively.

Therefore, 150 parked vehicles, which would translate to 75 veh/h added to the traffic network and these vehicles would be accessing the Pakuranga Plaza from three access points during the peak hours. **Figure 52** below shows the background traffic volumes for both the AM and PM peak hours at these access points (PM traffic volumes in brackets).

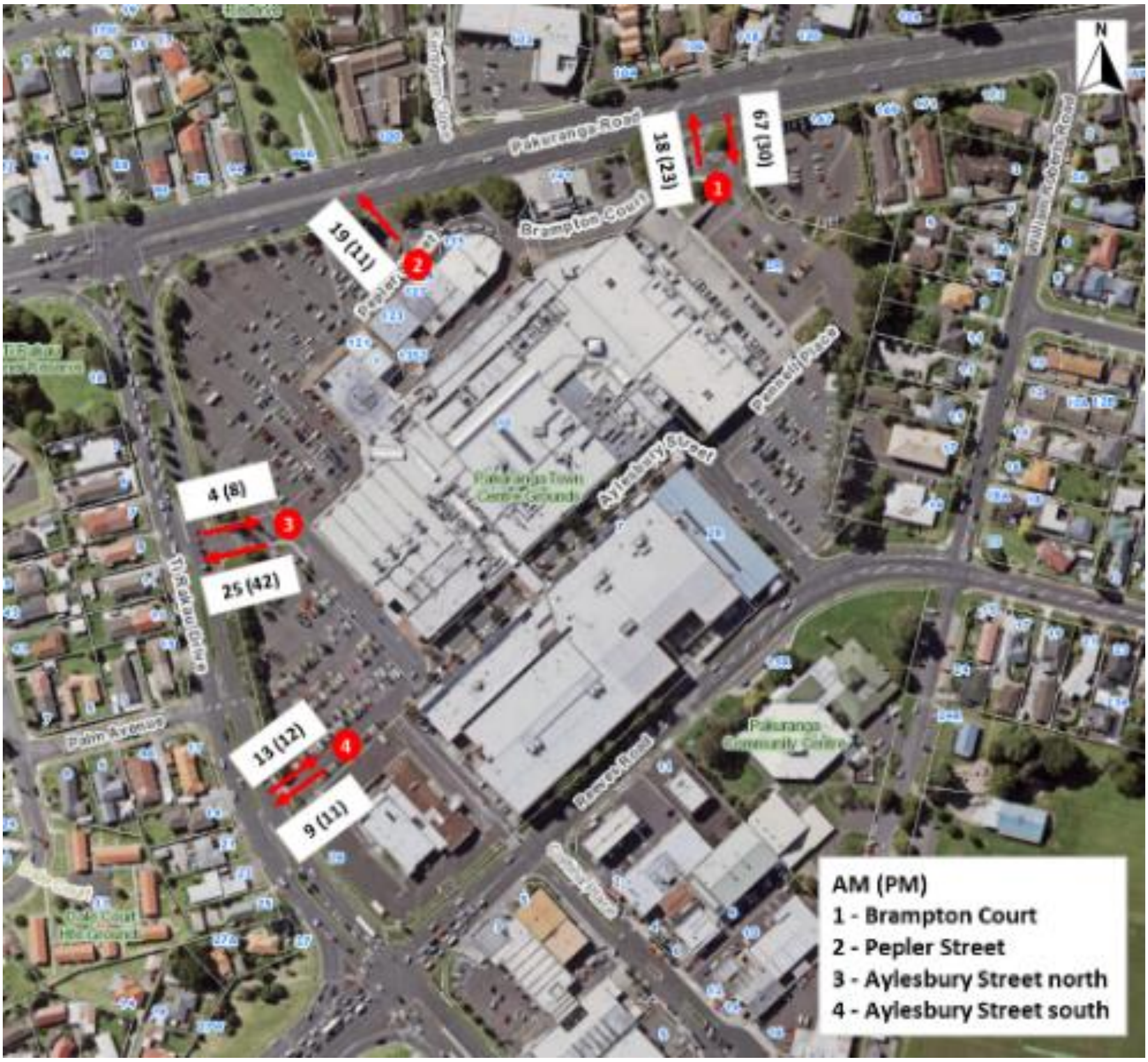


Figure 52: Pakuranga Plaza background traffic volumes[21]

[21] Traffic volumes sourced from the Do-Minimum AIMSUN model, with a 2028 horizon year.

The background traffic volumes on these access points are expected to be low during both the AM and PM peak hours. Furthermore, it would not be unreasonable to assume that the additional 75 veh/h would be distributed roughly evenly across these access points or to where the highest capacity is available. Therefore, the temporary effects of the staff carpark are expected to be very low.

5.1.1.3 EB2 – 2R Ti Rakau Drive Pennell Place CSA

During construction, the parking area off Pennell Place in the Pakuranga Plaza will be temporarily occupied and established as a CSA. **Figure 53** shows the location of the CSA.

Figure 53: Pennell Pl CSA location

The CSA will be used to support the construction of the RRF. In particular, it will be used to receive and pre-assemble the special Gantry (bespoke crane) to be used to lift and position the 'Super-T' beams. The CSA will also provide parking on site for specialist personnel and deliveries. The Pennell Place parking area will be occupied for approximately two years and two months.

Given the nature and operation of the CSA, general vehicle traffic volumes entering/exiting from the site are considered negligible. The operation and movement of the Gantry will be under strict construction traffic management control. Advance notice and appropriate public communication of such infrequent activities will be undertaken prior to these being initiated. This will be achieved through the Construction Traffic Management Plan (CTMP).

Therefore, the effects of the CSA on the transport network are expected to be very low. Effects to property access and parking at the Pakuranga Plaza due to the occupation are discussed in further detail in **Section 5.5.5.3**.

5.1.1.4 EB2 – William Roberts Road North Construction Yard

A CSA will be located on the south-western quadrant of the Pakuranga Road / William Roberts Road intersection and will serve as a laydown area of materials and aggregates. This construction yard is subject to a separate resource consent application[22], but is mentioned here for completeness.

It is proposed that the Pakuranga Road / William Roberts Road intersection will be signalised temporarily. This will improve the capacity of the right-turn movements into and out of William Roberts Road and improve safety of turning across three lanes of through traffic. Further details on intersection performance are provided in **Section 5.2.2.3** to **Section 5.2.2.5**.

5.1.1.5 EB2 – 14 Seven Oaks Drive Site Office / Laydown Area

A site office / laydown area will be established at 14 Seven Oaks Drive for the construction of EB2. The property has been acquired by AT. As such, the current residential use of this property will no longer exist during construction or at completion, therefore the CSA will have no effects on this property.

Figure 54 shows the location of the CSA to be located at 14 Seven Oaks Drive.

Figure 54: 14 Seven Oaks Dr CSA location

Access will be maintained off Seven Oaks Drive, utilizing the existing driveway. The existing house will be utilised as the office until de-construction of the structure is required. The site will be relatively small, and all parking requirements will be accommodated on site. The temporary effects of this contained site on the road network are expected to be negligible.

[22] LUC60403744

5.1.1.6 EB3R – 12 Bolina Cr, 143 Ti Rakau Dr and 178 Gossamer Dr Site Offices / Laydown Areas

Site offices / laydown areas will be established at 12 Bolina Crescent, 143 Ti Rakau Drive and 178 Gossamer Drive for the construction of EB3R. The properties have been acquired by AT. As such, the use of these properties will no longer exist during construction or at completion, therefore the CSAs will have no effects on these properties.

Figure 55 shows the location of the CSA to be located at 12 Bolina Crescent.

Figure 55: 12 Bolina Cr CSA location

Figure 56 shows the location of the CSA to be located at 143 Ti Rakau Drive.

Figure 56: 143 Ti Rakau Dr CSA location

Figure 57 shows the location of the CSA to be located at 220-222 Ti Rakau Drive and 178 Gossamer Drive.

Figure 57: 178 Gossamer Dr CSA location

Access will be maintained off Bolina Crescent, Ti Rakau Drive and Gossamer Drive, utilizing the existing driveways. The existing houses will be utilised as offices until de-construction of the structures is required. The sites will be relatively small, and all parking requirements will be accommodated on site. The temporary effects of these contained sites on the road network are expected to be negligible.

5.1.2 Construction Vehicle Effects

The sections below provide details on the construction routes, construction traffic volumes, hours of operation and vehicle types as advised by the construction team. Thereafter, an assessment of construction vehicle effects is provided, split into sections of the EB2 and EB3R project areas.

5.1.2.1 Construction Routes and Construction Traffic

The construction routes in and around the EB2 and EB3R project areas are shown in **Figure 58.** At the time of writing, suppliers of construction materials had not been confirmed. Therefore, the most likely routes for construction vehicle movements to the project area from plant and material sites not in the immediate vicinity will be the main corridors of Ti Rakau Drive, Pakuranga Road and SEART (main external routes below). The figure also shows the construction yard at 169-173 Pakuranga Road and the 'internal material transfer routes' to be used by construction vehicles.

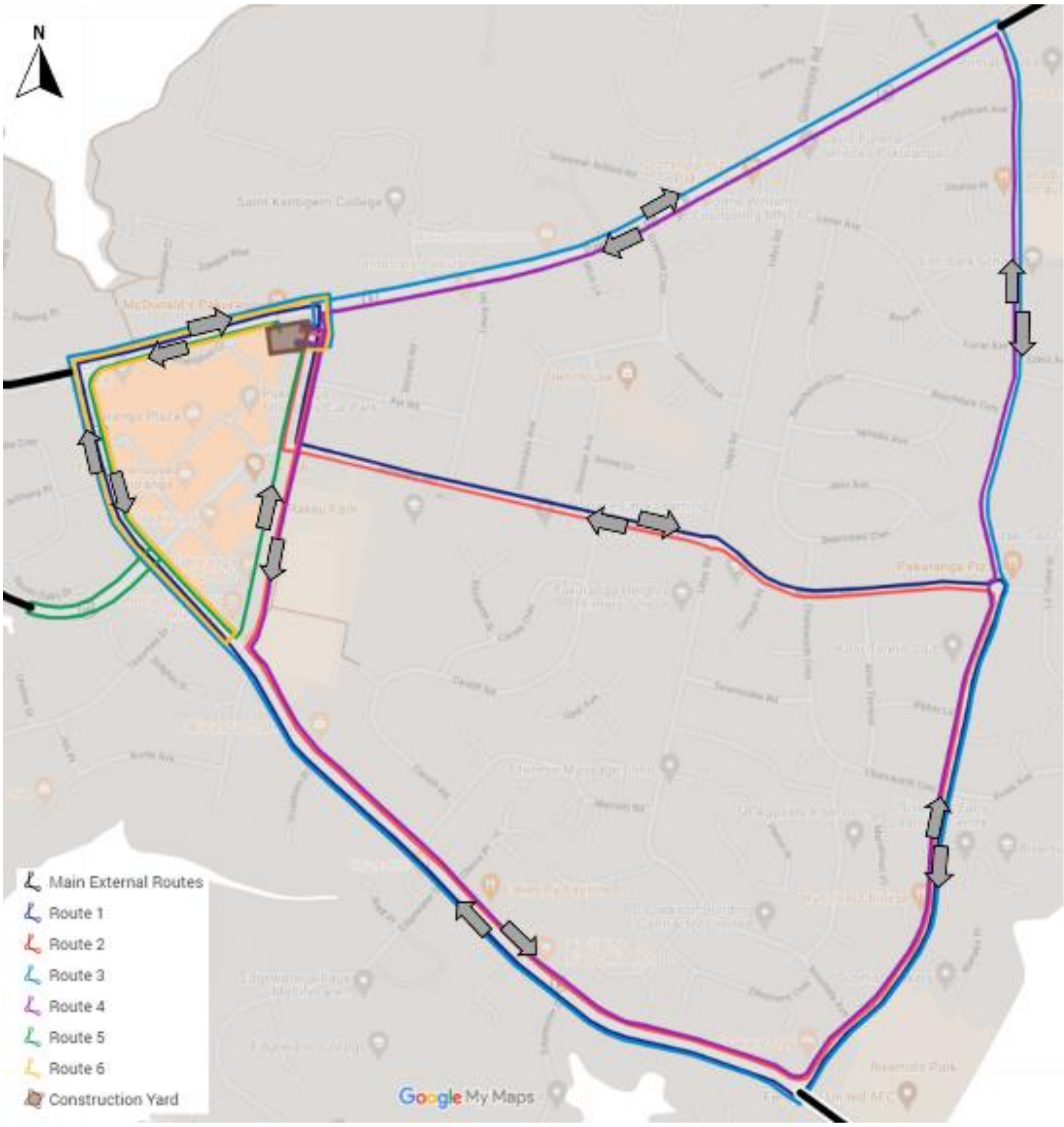


Figure 58: Construction vehicle routes

During EB2 and EB3R construction, roughly 50% of materials will be transported directly to the work zones from external supply yards as needed. The remaining 50% will be transported to the construction yard for storage until required. Construction material will be transported from the construction yard to the various work zones via six routes. **Table 19** below provides a description of each route as well as the anticipated number of vehicle movements. The number of vehicle movements also include the carting of demolition materials and excess spoil.

Table 19: Construction route description and movements

Route	Construction Activity	Description	Vehicle Movements [veh/h]
Route 1	EB3R Ti Rakau Dr westbound lanes (primary route)	Egress from the construction yard onto William Roberts Rd southbound, then Reeves Rd eastbound, Gossamer Dr southbound, Ti Rakau Drive westbound, Pakuranga Rd eastbound, William Roberts Rd southbound, return to construction yard.	9
Route 2	EB3R Ti Rakau Dr eastbound lanes (primary route)	Egress from construction yard onto William Roberts Rd southbound, then Ti Rakau Dr eastbound, Gossamer Drive northbound, Reeves Rd westbound, William Roberts Road northbound, return to construction yard.	10
Route 3	EB3R Ti Rakau Dr westbound lanes (secondary route)	Egress from construction yard onto William Roberts Rd northbound, then Pakuranga Rd eastbound, Gossamer Dr southbound, Ti Rakau Dr westbound, Pakuranga Rd eastbound, William Roberts Rd southbound, return to construction yard.	8
Route 4	EB3R Ti Rakau Dr eastbound lanes (secondary route)	Egress from construction yard onto William Roberts Rd southbound, then Ti Rakau Dr eastbound, Gossamer Dr northbound, Pakuranga Rd westbound, William Roberts Road southbound, return to construction yard.	9
Route 5	EB2 SEART	Egress from construction yard onto Pakuranga Rd westbound, then Ti Rakau Dr eastbound, SEART southbound, U-turn within work zone, SEART northbound, Ti Rakau Dr eastbound, William Roberts Rd northbound, return to construction yard.	10
Route 6	EB2 Ti Rakau Dr	Egress from construction yard onto Pakuranga Rd westbound, then Ti Rakau Dr eastbound, U-turn within work zone, Ti Rakau Drive westbound, Pakuranga Road eastbound, William Roberts Rd southbound, return to construction yard.	8

Route 1 will be the primary route for the construction of the Ti Rakau Drive westbound lanes with Route 3 as a secondary route in case of congestion or emergencies on Reeves Road. Similarly, Route 2 will be the primary route during the construction of the Ti Rakau Drive eastbound lanes, with Route 4 as a secondary route.

It should be noted that Route 1 and Route 3 will not be operating simultaneously with Route 2 and Route 4. This is due to the construction staging of Ti Rakau Drive in the EB3R project area. The new westbound lanes will be constructed first followed by the bus lanes in the centre and lastly the eastbound lanes.

5.1.2.2 Vehicle Types

It is anticipated that a range of vehicle sizes and types will be used for the construction activities within the EB2 and EB3R project areas. As stated above, roughly 50% of materials will be transported directly to the work zones as needed along the main external routes of Ti Rakau Drive, Pakuranga Road and SEART. The remaining 50% will be transported to the construction yard for storage until required. It is anticipated that 19m truck and trailers will be used for these activities. Materials from the construction yard will be transported to the various work zones via the six internal routes with smaller vehicles units such as 6-wheeler trucks.

Over-dimensional and over-weight deliveries are also expected; however, these will be infrequent, during low traffic periods such as night deliveries and will travel along appropriate routes such as arterial roads. The Ti Rakau Drive, Pakuranga Road and SEART corridors are well-suited to larger vehicles. Overall, the effects of these types of construction vehicles to the road network are expected to be negligible.

5.1.2.3 Hours of Operation

The vast majority of construction activities will be undertaken during 'typical weekdays' throughout the construction programme, as well as some weekends. Some construction activities will also be undertaken during lower traffic periods such as Easter and December holiday periods.

The general hours of operation for the construction activities and the construction routes will be from 07:00 to 18:00 on weekdays and 07:00 to 15:00 on Saturdays[23]. As such, construction vehicle movements will be balanced throughout the day, avoiding concentrations of construction traffic during the AM and PM peak hours. Therefore, the effects are expected to be very low.

It is anticipated that some night works will be undertaken to minimise the disruption to the public, businesses and traffic. Night works will be intermittent, and will not be continuous in a single location or activity for more than one month. These works will be controlled in part by the Project's consent conditions and management plans[24].

The sections below provide an assessment of construction vehicle effects on specific sections of the road network within the EB2 and EB3R project areas.

[23] It should be noted that staff will begin arriving at site prior to construction start times and leave after construction end times.

[24] These management plans include the Construction Noise and Vibration Management Plan (CNVMP).

5.1.2.4 EB2 – William Roberts Road North

This section provides an assessment of construction vehicle effects on William Roberts Road north, from Pakuranga Road to Reeves Road (see **Figure 59**).

Figure 59: William Roberts Rd north construction vehicle effects

The construction yard will be located on this section of roadway and will support the highest concentration of construction vehicles in the EB2 and EB3R project areas. At the peak of construction, William Roberts Road north is expected to carry an additional 20 veh/h northbound and 19 veh/h southbound. It should be noted that if Reeves Road is experiencing congestion or in case of an emergency, construction vehicles would be rerouted through Pakuranga Road, thereby reducing the construction vehicle traffic volumes on William Roberts Road.

In addition to the properties used by AT for the construction yard, all of the remaining properties on the western side of William Roberts Road north as well as 2 and 2A William Roberts Road on the eastern side have also been acquired and are flagged for demolition. Therefore, the demand for on-street parking along this section of road will be significantly reduced.

Pedestrian refuge islands are currently provided at both ends of William Roberts Road north to provide pedestrians with safe crossing opportunities.

Overall, the addition of the construction vehicles to William Roberts Road north will be roughly one vehicle every three minutes in each direction, on-street parking demand will be significantly reduced, and safe pedestrian crossing points are provided. Therefore, the effects are considered to be very low.

5.1.2.5 EB2 – William Roberts Road South

This section includes William Roberts Road south, from Reeves Road to Ti Rakau Drive, once the WRRE is completed (see **Figure 60**).

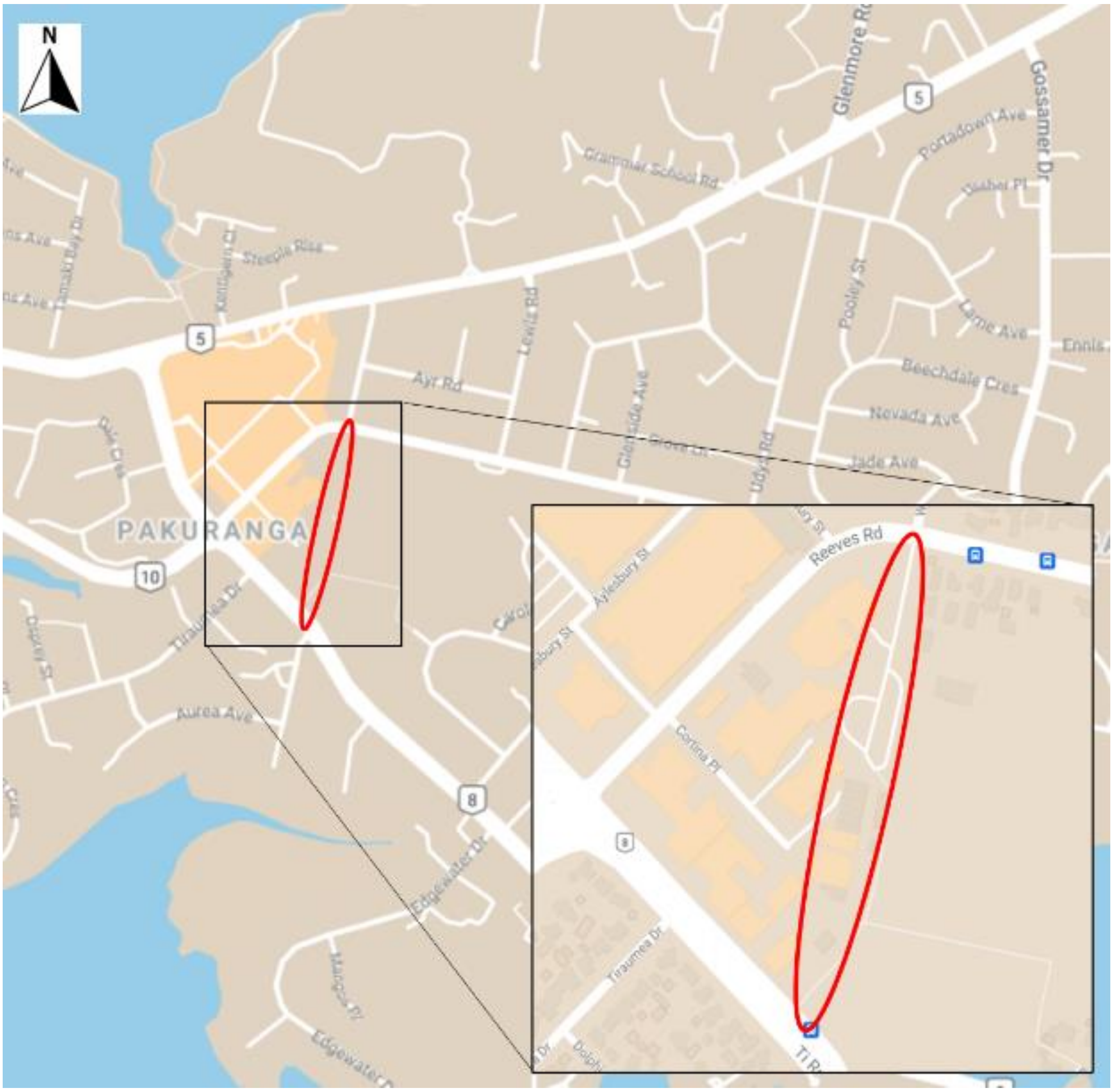


Figure 60: William Roberts Rd south construction vehicle effects

At the peak of construction, William Roberts Road south is expected to carry an additional 10 veh/h northbound and 10 veh/h southbound.

Some properties with vulnerable users such as the Pakuranga Leisure Centre, Barnardo's Early Learning Centre, Ti Rakau Park, and Dementia Auckland are located along this section of road. **Figure 61** below shows the location of these community and educational facilities.

Figure 61: William Roberts Rd south community and education facilities

However, once the William Roberts Road extension is completed, a low-speed environment will be created through a combination of the raised tables at the William Roberts Road / Cortina Place intersection, the raised pedestrian crossing near Ti Rakau Park and a 30 km/h posted speed limit. Furthermore, pedestrians will also be provided with safe crossing points at the Ti Rakau Drive / William Roberts Road and the William Roberts Road / Cortina Place intersections.

Nevertheless, appropriate community engagement will be undertaken to raise awareness of the increase in construction vehicles that will pass through the area. Construction vehicle drivers will also be briefed on these properties so that additional caution is employed when driving through the area. This will be achieved through the CTMP.

Overall, William Roberts Road is expected to carry roughly one construction vehicle every six minutes northbound and southbound, and a combination of speed calming features will create a low-speed environment. Therefore, the effects are considered to be very low.

5.1.2.6 EB2 – Reeves Road

This section includes Reeves Road from William Roberts Road in the west to Gossamer Drive in the east (see **Figure 62**).

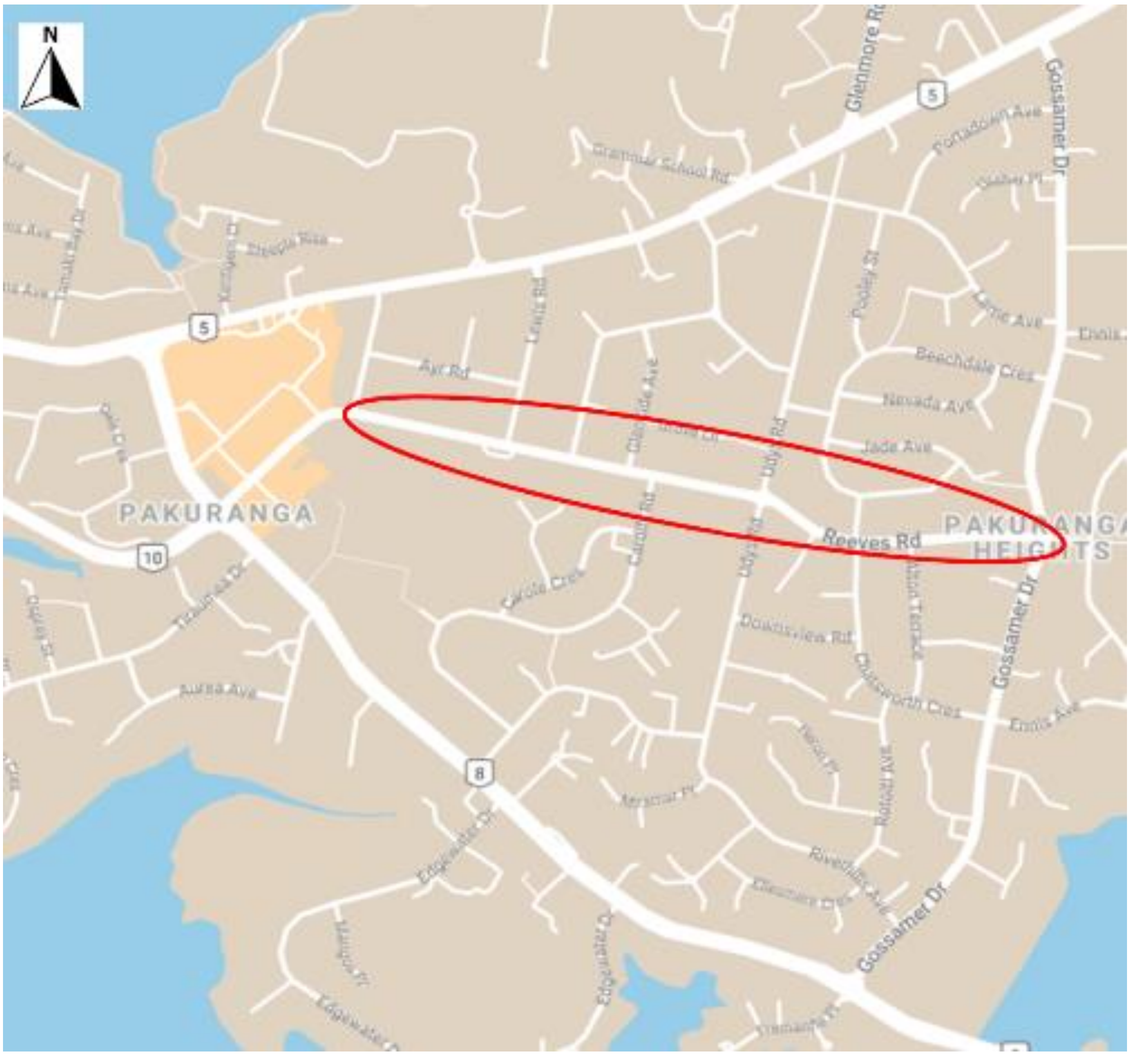


Figure 62: Reeves Rd construction vehicle effects

During construction of the Ti Rakau Drive westbound and eastbound lanes, Reeves Road will support an additional 9 veh/h in the eastbound direction and 10 veh/h in the westbound direction, respectively. It should be noted that these two construction phases will not occur simultaneously.

Reeves Road, in the existing environment, serves as a through route between Pakuranga Town Centre and Pakuranga Heights. As such, the carriageway consists of 4.4 m wide lanes and a 1.8 m flush median along the entire length. It also serves as a bus route for the 711 service.

In the existing environment there are three educational facilities that front Reeves Road, which will experience an increase in heavy vehicle traffic volumes. The Pakuranga Intermediate School, KIDSpace Early Learning Centre Pakuranga, and the Pakuranga Kindergarten are educational facilities with vulnerable users, and all have direct access off Reeves Road in the existing environment. The locations of these facilities are shown in **Figure 63** below.

Figure 63: Reeves Rd education facilities

The users of the facilities are, however, currently provided with ample and safe crossing facilities. Pedestrians are provided with a signalised pedestrian crossing outside the Pakuranga Intermediate School, and a pedestrian crossing near Cardiff Road for users of the KIDSpace Early Learning Centre. An uncontrolled pedestrian crossing is located near Gerwyn Place outside the Pakuranga Kindergarten; however, a pedestrian refuge island is provided here to facilitate a staged crossing if required.

Nevertheless, appropriate community engagement will be undertaken to raise awareness of the increase in construction vehicles that will pass through the area. Construction vehicle drivers will also be briefed on these properties so that additional caution is employed when driving through the area. This will be achieved through the CTMP.

Overall, Reeves Road will carry roughly one construction vehicle every six minutes either in the westbound or eastbound directions at the peak of construction. Furthermore, Reeves Road consists of a wide carriageway which supports larger sized vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be very low.

5.1.2.7 EB2 – Pakuranga Road

This section includes Pakuranga Road from Ti Rakau Drive in the west to William Roberts Road in the east (see **Figure 64**).

Figure 64: Pakuranga Rd construction vehicle effects

At the peak of construction Pakuranga Road is expected to carry an additional 17 veh/h eastbound and 18 veh/h westbound.

Pakuranga Road is an arterial road, and will for the majority of the construction period consist of three lanes per direction. Multiple bus services run along this road and as such Pakuranga Road is well-suited to larger sized vehicles. Signalised pedestrian crossings are also provided at the Ti Rakau Drive / Pakuranga Road intersection and the Pepler Street exit from Pakuranga Plaza.

Overall, Pakuranga Road will carry roughly one construction vehicle every three minutes eastbound and westbound at the peak of construction. Furthermore, Pakuranga Road is an arterial route supporting large vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be negligible.

5.1.2.8 EB2 – SEART

This section includes SEART from Ti Rakau Drive to the southern abutment of the RRF, see **Figure 65**.

Figure 65: SEART construction vehicle effects

During construction of the RRF southern abutment, construction vehicles will enter onto SEART turning right from the western Ti Rakau Drive approach and will gain access to the work zone from the on-ramp. A 180˚ turn will be executed within the work zone, allowing construction vehicles to exit back onto the SEART off-ramp. Construction vehicles will head back to the construction yard by turning right onto Ti Rakau Drive.

At the peak of construction, the SEART on-ramp and off-ramp are expected to carry an additional 10 veh/h each, which translates to one construction vehicle every six minutes. Therefore, the effects are considered to be negligible.

5.1.2.9 EB2 and EB3R – Ti Rakau Drive

This section includes Ti Rakau Drive between Pakuranga Road to SEART (Section 1) and SEART to Gossamer Drive (Section 2), see **Figure 66**.

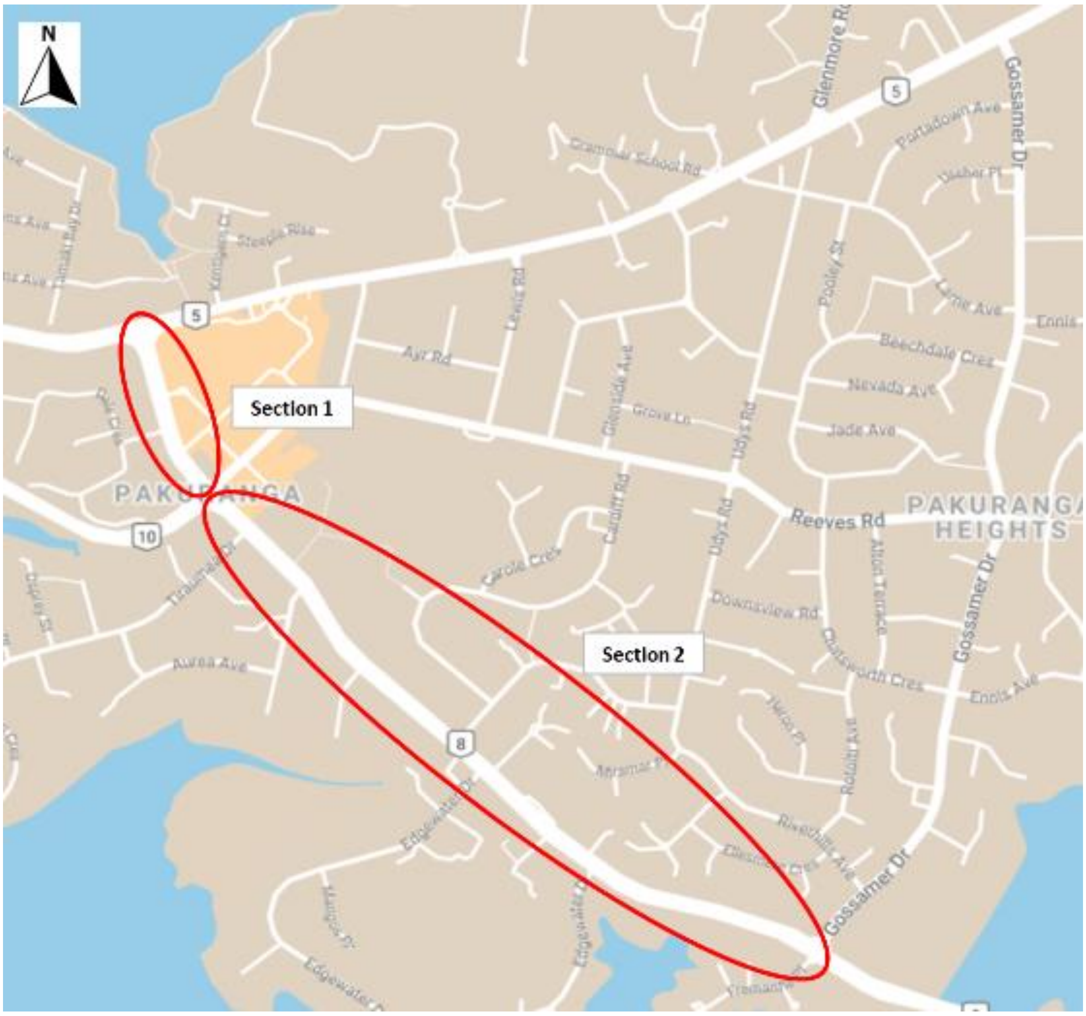


Figure 66: Ti Rakau Dr construction vehicle effects

Section 1 is expected to carry an additional 17 veh/h westbound and 18 veh/h eastbound at the peak of construction, while Section 2 is expected to carry an additional 9 veh/h westbound and 10 veh/h eastbound, respectively. It should be noted that the westbound and eastbound directions of Section 2 will not be loaded simultaneously as described above.

Ti Rakau Drive is an arterial road, and will for the majority of the construction period consist of two lanes per direction. Multiple bus services currently run along this road and as such is well-suited to larger sized vehicles. Signalised pedestrian crossings are provided at Pakuranga Road, Reeves Road, Mattson Road, Edgewater Drive west and Gossamer Drive.

Overall, Ti Rakau Drive will carry roughly one construction vehicle every three minutes westbound and eastbound at the peak of construction. Furthermore, Ti Rakau Drive is an arterial route supporting large vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be negligible.

5.1.2.10 EB3R – Gossamer Drive

This section includes Gossamer Drive from Ti Rakau Drive in the south to Reeves Road in the north (see **Figure 67**).

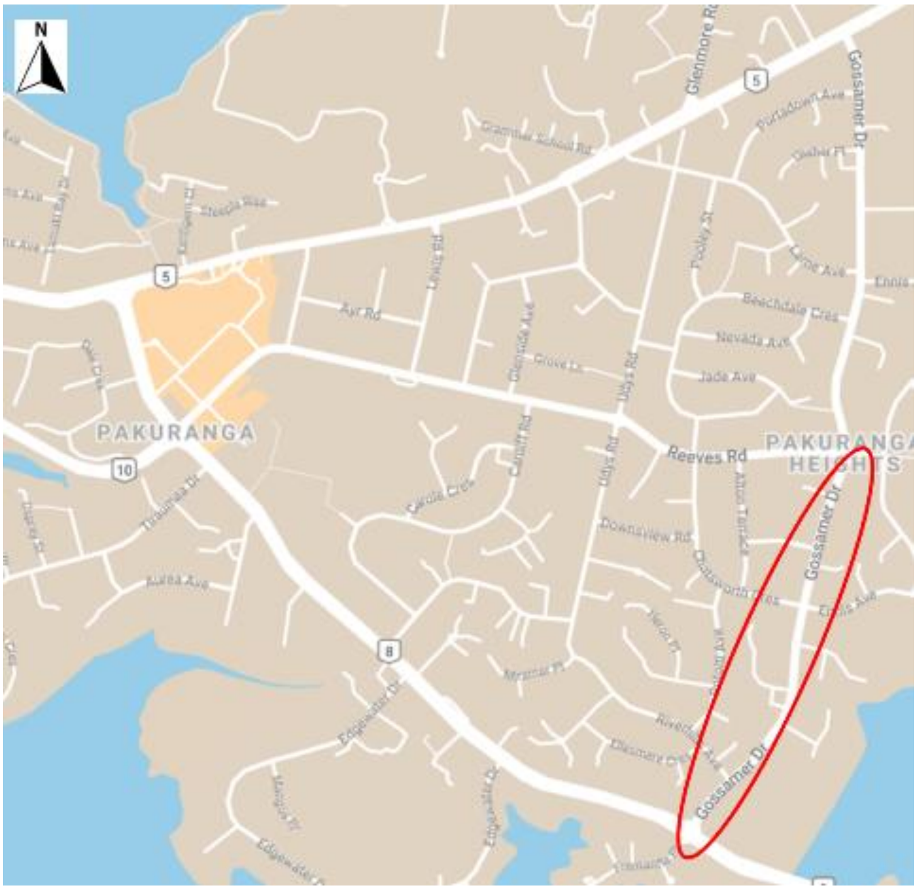


Figure 67: Gossamer Dr construction vehicle effects

During the construction of the Ti Rakau Drive westbound and eastbound lanes, Gossamer Drive will support an additional 9 veh/h southbound and 10 veh/h northbound, respectively. It should be noted that these two construction phases will not occur simultaneously.

Gossamer Drive, in the existing environment, serves as a through route between Ti Rakau Drive and Pakuranga Road. As such, the carriageway consists of 4.0 m wide lanes. Gossamer Drive is also a school bus route.

In the current environment, pedestrians are provided with a signalised pedestrian crossing at the Ti Rakau Drive / Gossamer Drive intersection and a pedestrian crossing near Chatsworth Crescent. In addition, all approaches to the Gossamer Drive / Reeves Road roundabout are provided with pedestrian refuge islands to facilitate a staged crossing if required.

Overall, Gossamer Drive will carry roughly one construction vehicle every six minutes either in the northbound or southbound directions at the peak of construction. Furthermore, Gossamer Drive consists of a wide carriageway which supports larger sized vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be negligible.

5.1.3 Summary of Temporary Construction Effects

Overall, the temporary effects of the various CSAs that will be established as well as the construction traffic in the EB2 and EB3R project areas will be mitigated appropriately and are considered to be negligible or very low.

A WTMP will be developed to reduce the number of private vehicles travelling to the worksites and to increase accessibility of the worksites through more travel options.

CTMPs will be developed for the Project to avoid, remedy or mitigate the adverse effects of construction on transport, parking and property access so far as is reasonably practicable. The CTMPs will be developed in accordance with the conditions of consent and will include management strategies, controls and reporting protocols to achieve this.

Hours of operation, especially night works, will be controlled in part by the Project's consent conditions and management plans, including the CNVMP.

5.2 General Traffic Effects

The sections below provide an assessment of effects to general traffic during construction. General traffic effects refer to the movement of traffic across the road network as a whole. An assessment at a network-wide level, provides a better understanding as to the wider traffic effects of the Project and is based on the results from various AIMSUN and SIDRA traffic modelling assessments[25].

As stated in **Section 2.3**, Auckland's transport networks are constantly changing, undergoing improvements from new initiatives and being optimised. Furthermore, the global COVID-19 pandemic dramatically affected travel patterns and behaviours, and uncertainty remains that these effects would continue into the future. Given these factors, careful consideration was given to determine what formed the "existing environment".

For the purposes of the scenarios employed by the traffic modelling and this assessment, the existing environment was based on pre COVID-19 travel behaviours and a number of committed transport projects (including EB1 and WRRE Works) as well as the EB2/EB3R enabling works. Furthermore, a conservative approach was followed, whereby a 2028 future year was used to compare a Do-Minimum (without project) scenario and the EB2/EB3R scenarios. This approach allowed for the direct comparison between scenarios.

5.2.1 Construction Traffic

As stated in **Section 5.1.2**, the effects of the estimated construction traffic volumes are expected to be negligible or very low and will be catered for within the existing road network. Therefore, a separate modelling assessment of the 'Do-Minimum' and 'Do-Minimum + Construction Traffic' scenarios on the entire network was not considered necessary.

5.2.2 Intersection Performance during Construction

5.2.2.1 Overview of Performance Criteria and Modelling Scenario Development

Intersection performance analyses were undertaken, using SIDRA, of the transport network comprised of selected intersections in the EB2 and EB3R project areas. The analyses consisted of a comparison between the Do-Minimum and EB2/EB3R scenarios for both the AM and PM peak hours. The performance criteria for the assessment were based on the Level of Service (LOS), degree of Saturation (DOS) or v/c ratio and delay in seconds. The LOS is a measure of the average delay at an intersection and is a function of the intersection control (see **Table 20** below).

Table 20: Level of Service for intersections

Level of Service	Control Delay (d) for Buses, Freight and General Traffic
	Signalised intersections
A	d < 10 sec
B	10 < d <= 20 sec
C	20 < d <= 35 sec
D	35 < d <= 55 sec
E	55 < d <= 80 sec
F	d > 80 sec

[25] These assessments were undertaken in accordance with the methodology set out in **Section 2.4**.

It should be noted that SIDRA cannot produce an overall intersection performance LOS for priority-controlled intersections. This is due to some approaches at priority-controlled intersections being uncontrolled, i.e., free flow, hence no control delay. As per the Transport Minimum Requirements guiding the design of the Project, overall intersection performance of LOS E or better for signalised intersections, with regards to general traffic, was considered acceptable throughout this ITA.

The DOS is a measure of utilisation of the capacity of the intersection between 0 and 1, based on the traffic load forecast for the intersection. In SIDRA, the DOS is reported by turn movements based on the traffic load divided by the calculated capacity. At signalised intersections, the calculated capacity considers the signal phase times and the effective green time for any particular turn movement. The overall intersection DOS metric is based on the maximum reported DOS for any movement within the intersection.

The traffic modelling undertaken in this ITA considered the 'worst-case' scenarios to determine the temporary effects during construction. During the development of the updated construction methodology, based on an updated design, efforts have been made to shorten the overall construction programme where feasible as well as to produce construction staging with less adverse effects to road traffic. This process has led to a more refined construction staging. The temporary effects were modelled in five separate construction scenarios to simulate the expected traffic distribution that could occur due to changes in the road network.

Figure 68 provides a simplified schematic of the construction activities that informed the development of the construction scenarios assessed in this ITA. It should be noted that activity duration should not be interpreted from this schematic.

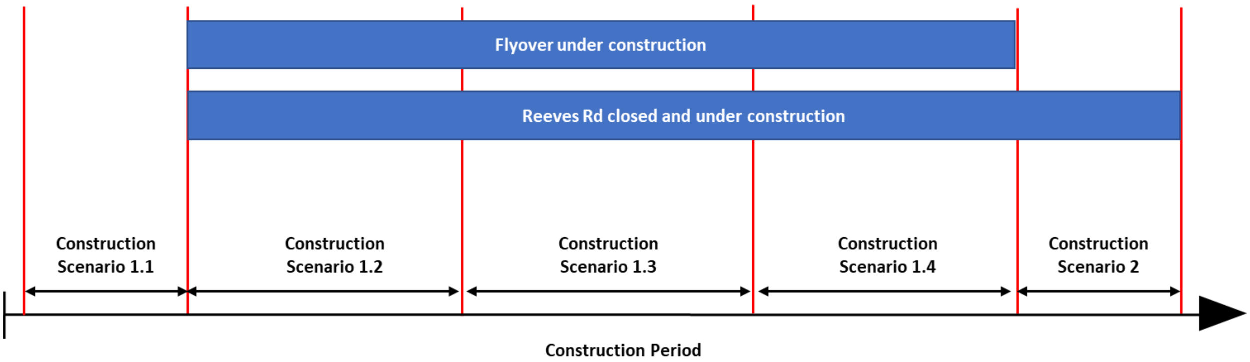


Figure 68: Construction modelling scenarios

Considering the construction programme from a transport perspective, the closure of Reeves Road and the ongoing construction of the RRF are considered as major changes to the transport network in the EB2 and EB3R project areas. Construction Scenario 1.1 to 1.4 simulate these activities.

The next major change to the transport network is the completion of the RRF, while Reeves Road underneath the RRF remains closed. These changes are simulated in Construction Scenario 2.

The sections below provide a description of each individual scenario, analysis of the scenario, followed by an assessment.

5.2.2.2 Construction Scenario 1.1

Construction Scenario 1.1 simulates various enabling works being undertaken, drainage works and offline works with some resultant lane closures as safety barriers are installed (see **Appendix K** for indicative construction staging diagrams in EB2 and **Appendix L** for EB3R). These include:

- WRRE works are not expected to be completed by this stage and therefore Reeves Road in EB2 will remain open.
- Construction of the new bus lanes in EB2 on the northern side of Ti Rakau Drive, between Pakuranga Road and Reeves Road, as well as the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection, see **Section 4.2.1.5** (Phase 1). This will reduce the eastbound carriageway to two lanes.
- Longitudinal drainage works in the kerbside lane of the westbound carriageway along Pakuranga Road in EB2, between Kentigern Close and St Kentigern College, see **Section 4.2.1.6**. The flush median will be utilised to maintain three traffic lanes in the westbound direction, while temporarily reducing the eastbound direction to two lanes and removing the right-turn into William Roberts Road.
- Construction of the new westbound lanes in EB3R on the southern side of Ti Rakau Drive, between Reeves Road and Gossamer Drive, as well as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection, see **Section 4.2.2.1** (Phases 1-4) and **Section 4.2.2.3** (Phase 1). This will reduce one through lane on the eastern approach at the Ti Rakau Drive / Reeves Road / SEART intersection to a short lane and the westbound carriageway to two lanes between Tiraumea Drive and Mattson Road.
- Temporary closure of the kerbside left-turn lane at Freemantle Place in EB3R, see **Section 4.2.2.3** (Phase 1).

Intersection Performance:

Demand flows from the 2028 AIMSUN Do-Minimum Scenario were used to test Construction Scenario 1.1. Traffic signal phasing diagrams per intersection are provided in **Appendix D** and lane performance summaries per intersection are provided in **Appendix E**.

Table 21 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1 during the AM peak, with a 2028 horizon year.

Table 21: Intersection performance – Do-Minimum vs Construction Scenario 1.1 (AM peak)

Intersection	Do-Minimum			Construction Scenario *1.1*		
	LOS	DOS (v/c)	Delay [s]	LOS	DOS (v/c)	Delay [s]
Pakuranga Rd / Ti Rakau Dr	C	0.89	32	C	0.89	32
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	1.69	7
Pakuranga Rd / William Roberts Rd	N/A	7.23	265	N/A	7.23	228
Pakuranga Rd / St Kentigern College	C	0.86	22	C	0.87	27
Reeves Rd / Aylesbury St	N/A	0.24	1	N/A	0.26	1
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.89	14
Ti Rakau Dr / Aylesbury St north	N/A	1.46	5	N/A	1.12	4
Ti Rakau Dr / Aylesbury St south	N/A	0.24	1	N/A	0.34	1
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	D	0.89	50
Ti Rakau Dr / Mattson Rd	B	0.78	15	C	0.89	21
Ti Rakau Dr / Edgewater Drive west	C	0.85	27	C	0.86	28
Ti Rakau Dr / Gossamer Dr	F	1.07	91	F	1.06	84

SIDRA analysis indicates that in the AM peak, overall Construction Scenario 1.1 is expected to result in minimal adverse effects to intersection performance along the network. Compared to the Do-Minimum scenario, similar intersection performance is expected at all intersections, except the William Roberts Road / Reeves Road and Ti Rakau Drive / Mattson Road intersections. However, these intersections are still expected to operate with spare capacity.

Table 22 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1 during the PM peak, with a 2028 horizon year.

Table 22: Intersection performance – Do-Minimum vs Construction Scenario 1.1 (PM Peak)

Intersection	Do-Minimum			Construction Scenario *1.1*		
	LOS	DOS (v/c)	Delay [s]	LOS	DOS (v/c)	Delay [s]
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	D	0.89	46
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.86	10
Pakuranga Rd / William Roberts Rd	N/A	53.18	3474	N/A	48.04	3108
Pakuranga Rd / St Kentigern College	C	0.89	27	B	0.72	14
Reeves Rd / Aylesbury St	N/A	1.03	42	N/A	0.37	1
William Roberts Rd / Reeves Rd	N/A	1.05	26	N/A	1.00	22
Ti Rakau Dr / Aylesbury St north	N/A	5.50	49	N/A	4.67	35
Ti Rakau Dr / Aylesbury St south	N/A	0.38	1	N/A	0.38	1
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	E	1.02	69
Ti Rakau Dr / Mattson Rd	B	0.68	13	B	0.88	20
Ti Rakau Dr / Edgewater Drive west	C	0.89	31	C	0.85	26
Ti Rakau Dr / Gossamer Dr	D	0.91	45	D	0.89	44

SIDRA analysis indicates that in the PM peak, Construction Scenario 1.1 is expected to result in acceptable intersection performance along the network overall, with minor mitigation measures in place.

In order to manage the heavy demand on Pakuranga Road eastbound during the drainage works, it is recommended that Signal Phase D, at the Pakuranga Road / St Kentigern College intersection, be modified to a variable phase in the PM peak, only to be called when necessary. Through SIDRA analysis, it is expected that overall, more green time would be available to the major eastbound movement and queues would be manageable (see **Appendix D**). Consultation with the Auckland Transport Operations Centre (ATOC) will be undertaken to with regards to this mitigation measure.

Compared to the Do-Minimum scenario, similar or better intersection performance is expected at all intersections, except the Ti Rakau Drive / Reeves Road / SEART intersection. However, this intersection is still expected to operate at an acceptable LOS E.

5.2.2.3 Construction Scenario 1.2

Construction Scenario 1.2 simulates various completed enabling works, the initial closure of Reeves Road and ongoing offline works (see **Appendix K** and **Appendix L**). These include:

- Closure of Reeves Road between Ti Rakau Drive and Cortina Place in EB2.
- Ongoing construction of the new bus lanes in EB2 on the northern side of Ti Rakau Drive and the completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection. Safety barriers will be installed on the existing kerbline of the eastbound carriageway to maintain three lanes.
- Completion of the temporary pavement on the southern side of the Ti Rakau Drive / Reeves Road / SEART intersection in EB2 (see **Section 4.2.1.5**), undertaken as part of the previous stage. In addition, a 3rd right-turn lane will be provided on the SEART offramp for vehicles turning onto Ti Rakau Drive eastbound. All slip lanes will be temporarily converted to pass through the intersection during this stage. As such, a double left-turn onto SEART will be provided. The pedestrian crossing on the eastern approach will be removed temporarily.
- Completion of the WRRE (see **Section 3.10.2**).
- Temporary signalisation of the Pakuranga Road / William Roberts Road intersection in EB2, see **Section 5.1.1.4.**
- Ongoing construction of the new westbound lanes in EB3R on the southern side of Ti Rakau Drive as well as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection. This will reduce the westbound carriageway to two lanes between Tiraumea Drive and Mattson Road.
- Temporary closure and construction of the Ti Rakau Drive / Edgewater Drive west intersection in EB3R, see **Section 4.2.2.3** (Phase 1c). During this closure, all traffic along Edgewater Drive will be diverted to the eastern intersection, which will be signalised temporarily.
- Completion of the enabling works at the Ti Rakau Drive / Gossamer Drive intersection in EB3R (see **Section 3.10.3.2**) as well as converting the left-turn slip lane on the western and eastern approaches to pass through the intersection, see **Section 4.2.2.3** (Phase 1). These works will be undertaken in the preceding stage, will be offline works, and will partly be undertaken during night works if necessary.
- Ongoing temporary closure of the kerbside left-turn lane at Freemantle Place in EB3R.

Intersection Performance:

Traffic signal phasing diagrams per intersection are provided in **Appendix M** and lane performance summaries per intersection are provided in **Appendix N**. Demand flows from the 2028 AIMSUN Construction Scenario 1.3 were used to test Construction Scenario 1.2 as Construction Scenario 1.3 was determined to be the most critical.

Table 23 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.2 during the AM peak, with a 2028 horizon year.

Table 23: Intersection performance – Do-Minimum vs Construction Scenario 1.2 (AM Peak)

Intersection	Do-Minimum			Construction Scenario 1.2		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	35	C	0.89	29
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	4.75	52
Pakuranga Rd / William Roberts Rd	N/A	7.23	265	C	0.89	22
Pakuranga Rd / St Kentigern College	C	0.86	22	C	0.85	22
Reeves Rd / Aylesbury St	N/A	0.24	1	N/A	0.02	2
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.25	5
William Roberts Road / Cortina Pl	Built during WRRE			N/A	0.17	3
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			D	0.84	38
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	C	0.92	33
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.50	1
Ti Rakau Dr / Mattson Rd	B	0.78	15	C	0.89	22
Ti Rakau Dr / Edgewater Dr west	C	0.85	27	C	0.86	21
Ti Rakau Dr / Edgewater Dr east	N/A	1.99	17	C	0.89	23
Ti Rakau Dr / Gossamer Dr	F	1.07	91	F	1.21	113

The analysis indicates that overall in the AM peak, Construction Scenario 1.2 is expected to result in minimal adverse effects at the majority of intersections.

Average delay at the Pakuranga Road / Brampton Court intersection is expected to increase due to the increased demand on Pakuranga Road as a section of Reeves Road will be closed during this stage. However, all other access points to the Plaza are expected to have spare capacity should these vehicles wish to divert elsewhere.

The temporary signalisation of the Pakuranga Road / William Roberts Road intersection is expected to significantly reduce the average delay, particularly for vehicles turning right into/out of William Roberts Road.

The Ti Rakau Drive / Gossamer Drive intersection is also expected to experience an increase in delay. However, the intersection is already at capacity in the Do-Minimum Scenario and average delay is still expected to be less than the traffic signal cycle length.

Table 24 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.2 during the PM peak, with a 2028 horizon year.

Table 24: Intersection performance – Do-Minimum vs Construction Scenario 1.2 (PM Peak)

Intersection	Do-Minimum			Construction Scenario 1.2		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	C	0.92	34
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.88	26
Pakuranga Rd / William Roberts Rd	N/A	53.18	3474	E	1.91	67
Pakuranga Rd / St Kentigern College	C	0.89	27	B	0.85	16
Reeves Rd / Aylesbury St	N/A	1.03	42	N/A	0.04	2
William Roberts Rd / Reeves Rd	N/A	1.05	26	N/A	0.14	4
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.20	3
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			C	0.85	24
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	E	0.99	72
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.44	1
Ti Rakau Dr / Mattson Rd	B	0.68	13	B	0.88	19
Ti Rakau Dr / Edgewater Dr west	C	0.89	31	C	0.88	22
Ti Rakau Dr / Edgewater Drive east	N/A	3.41	28	C	0.89	23
Ti Rakau Dr / Gossamer Dr	D	0.91	45	E	1.08	76

Construction Scenario 1.2 is expected to have acceptable intersection performance overall during the PM peak with some mitigation measures in place.

In order to manage the heavy demand on Pakuranga Road eastbound, it is recommended that fixed time cycles and offsets be implemented at the following intersections:

- Pakuranga Road / William Roberts Road (temporary traffic signal)
- Pakuranga Road / St Kentigern College

Through SIDRA analysis, a cycle length of 150 seconds and an offset of 13 seconds to St Kentigern College using the William Roberts Road intersection as reference, is expected to lead to manageable queues and delays (see **Appendix M**). Consultation with ATOC will be undertaken with regards to this mitigation measure.

Similar to the AM peak, average delay at the Pakuranga Road / Brampton Court intersection is expected to increase. However, all other access points to the Plaza are expected to have spare capacity should some diversions occur.

Although moderate increases in average delay are expected at the Ti Rakau Drive / Reeves Road / SEART and Ti Rakau Drive / Gossamer Drive intersections, these intersections are still expected to operate an acceptable LOS E.

5.2.2.4 Construction Scenario 1.3

Construction Scenario 1.3 simulates the full closure of Reeves Road, completion of the new SEART offramp and ongoing offline works (see **Appendix K** and **Appendix L**). These include:

- Closure of Reeves Road from Ti Rakau Drive to William Roberts Road in EB2.
- Ongoing construction of the new bus lanes in EB2 on the northern side of Ti Rakau Drive and the completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection. Three lanes on the eastbound carriageway will be maintained.
- Completion of the new SEART offramp in EB2, providing two left-turn lanes (one of which will be temporary) and two right-turn lanes, see **Section 4.2.1.4** (Phase 1). The 3rd right-turn lane will have been constructed by this stage, but will not be operational until the Ti Rakau Drive eastbound carriageway has been widened.
- Ongoing construction of the new SEART onramp in EB2 by shifting traffic over to the existing offramp pavement, see **Section 4.2.1.4** (Phase 2). These works are not expected to lead to a reduction in general traffic lanes.
- Completion of the WRRE.
- Temporary signalisation of the Pakuranga Road / William Roberts Road intersection in EB2.
- Ongoing construction of the new westbound lanes in EB3R on the southern side of Ti Rakau Drive as well as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection. The left-turn onto SEART will be converted back to a slip lane and the westbound carriageway to two lanes between Tiraumea Drive and Mattson Road. The pedestrian crossing on the eastern approach will be removed temporarily.
- Completion of the enabling works at the Ti Rakau Drive / Gossamer Drive intersection in EB3R, including converting the left-turn slip lane on the western and eastern approaches to pass through the intersection.
- Ongoing temporary closure of the kerbside left-turn lane at Freemantle Place in EB3R.

Intersection Performance:

Traffic signal phasing diagrams per intersection are provided in **Appendix O** and lane performance summaries per intersection are provided in **Appendix P**.

Table 25 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.3 during the AM peak, with a 2028 horizon year.

Table 25: Intersection performance – Do-Minimum vs Construction Scenario 1.3 (AM Peak)

Intersection	Do-Minimum			Construction Scenario 1.3		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	35	C	0.91	34
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	4.12	45
Pakuranga Rd / William Roberts Rd	N/A	7.23	265	B	0.89	22
Pakuranga Rd / St Kentigern College	C	0.86	22	C	0.85	22
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.26	5
William Roberts Road / Cortina Pl	Built during WRRE			N/A	0.17	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			E	1.01	69
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	D	0.89	54
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.50	1
Ti Rakau Dr / Mattson Rd	B	0.78	15	C	0.89	21
Ti Rakau Dr / Edgewater Dr west	C	0.85	27	C	0.89	30
Ti Rakau Dr / Gossamer Dr	F	1.07	91	F	1.27	83

The analysis indicates that in the AM peak, Construction Scenario 1.3 is expected to result in minimal adverse effects at the majority of intersections.

Again, average delay at the Pakuranga Road / Brampton Court intersection is expected to increase due to the full closure of Reeves Road and resultant increased demand on Pakuranga Road. However, all other access points to the Plaza are expected to have spare capacity should these vehicles wish to divert elsewhere.

As above, the temporary signalisation of the Pakuranga Road / William Roberts Road intersection is expected to improve the average delay significantly.

Table 26 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.3 during the PM peak, with a 2028 horizon year.

Table 26: Intersection performance – Do-Minimum vs Construction Scenario 1.3 (PM Peak)

Intersection	Do-Minimum			Construction Scenario 1.3		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	C	0.93	35
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.93	27
Pakuranga Rd / William Roberts Rd	N/A	53.18	3474	B	0.92	28
Pakuranga Rd / St Kentigern College	C	0.89	27	B	0.86	13
William Roberts Rd / Reeves Rd	N/A	1.05	26	N/A	0.28	4
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.15	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			B	0.85	20
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	E	0.96	64
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.43	1
Ti Rakau Dr / Mattson Rd	B	0.68	13	B	0.88	20
Ti Rakau Dr / Edgewater Drive west	C	0.89	31	C	0.89	30
Ti Rakau Dr / Gossamer Dr	D	0.91	45	E	1.08	72

Construction Scenario 1.3 is expected to have acceptable intersection performance during the PM peak with some mitigation measures in place, similar to Construction Scenario 1.2.

The heavy demand on Pakuranga Road eastbound is expected to be manageable through implementing fixed time cycles and offsets at the following intersections:

- Pakuranga Road / William Roberts Road (temporary traffic signal)
- Pakuranga Road / St Kentigern College

A cycle length of 150 seconds and an offset of 13 seconds to St Kentigern College using the William Roberts Road intersection as reference, is expected to lead to manageable queues and delays (see **Appendix O**). Consultation with ATOC will be undertaken with regards to this mitigation measure.

Similar to Construction Scenario 1.2, moderate increases in average delay are expected at the Ti Rakau Drive / Reeves Road /SEART and Ti Rakau Drive / Gossamer Drive intersections. However, these intersections are still expected to operate at an acceptable LOS E.

5.2.2.5 Construction Scenario 1.4

Construction Scenario 1.4 simulates the full closure of Reeves Road, completion of the new SEART onramp and ongoing offline works (see **Appendix K** and **Appendix L**). These include:

- Closure of Reeves Road from Ti Rakau Drive to William Roberts Road in EB2.
- Completion of the new SEART offramp in EB2, providing two left-turn lanes and two right-turn lanes.
- Completion of the new SEART onramp in EB2, see **Section 4.2.1.4**. Offline construction of the southern RRF abutment will then commence (Phase 3).
- Ongoing construction of the new bus lanes in EB2 on the northern side of Ti Rakau Drive and the completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection. Three lanes on the eastbound carriageway will be maintained.
- Completion of the WRRE.
- Temporary signalisation of the Pakuranga Road / William Roberts Road intersection in EB2**.**
- Ongoing construction of the new westbound lanes in EB3R on the southern side of Ti Rakau Drive as well as the new Ti Rakau Drive / William Roberts Road / Mattson Road crossroads intersection. The left-turn slip lane onto SEART will be maintained while the westbound carriageway is reduced to two lanes between Tiraumea Drive and Mattson Road. The pedestrian crossing on the eastern approach will be removed temporarily.
- Temporary closure and construction of the Ti Rakau Drive / Edgewater Drive east intersection in EB3R, see **Section 4.2.2.3** (Phase 1f). During this closure, all traffic along Edgewater Drive will be diverted to the western intersection.
- Completion of the enabling works at the Ti Rakau Drive / Gossamer Drive intersection in EB3R, including converting the left-turn slip lane on the western and eastern approaches to pass through the intersection.
- Ongoing temporary closure of the kerbside left-turn lane at Freemantle Place in EB3R.

Intersection Performance:

Traffic signal phasing diagrams per intersection are provided in **Appendix Q** and lane performance summaries per intersection are provided in **Appendix R**. Demand flows from the 2028 AIMSUN Construction Scenario 1.3 were used to test Construction Scenario 1.4 as Construction Scenario 1.3 was determined to be the most critical.

Table 27 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.4 during the AM peak, with a 2028 horizon year.

Table 27: Intersection performance – Do-Minimum vs Construction Scenario 1.4 (AM Peak)

Intersection	Do-Minimum			Construction Scenario 1.4		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	35	C	0.92	30
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	4.75	52
Pakuranga Rd / William Roberts Rd	N/A	7.23	265	C	0.89	22
Pakuranga Rd / St Kentigern College	C	0.86	22	C	0.85	23
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.27	5
William Roberts Road / Cortina Pl	Built during WRRE			N/A	0.17	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			C	0.86	35
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	E	0.90	60
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.50	1
Ti Rakau Dr / Mattson Rd	B	0.78	15	C	0.88	21
Ti Rakau Dr / Edgewater Dr west	C	0.85	27	C	0.89	28
Ti Rakau Dr / Gossamer Dr	F	1.07	91	F	1.27	83

The analysis indicates that in the AM peak, Construction Scenario 1.4 is expected to result in minimal adverse effects overall.

Similar to Construction Scenario 1.3, average delay at the Pakuranga Road / Brampton Court intersection is expected to increase due to the full closure of Reeves Road. However, all other access points to the Plaza are expected to have spare capacity should these vehicles wish to divert elsewhere.

Also similar to the previous scenarios, average delay at the Pakuranga Road / William Roberts Road intersection is expected to improve significantly.

Table 28 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1.4 during the PM peak, with a 2028 horizon year.

Table 28: Intersection performance – Do-Minimum vs Construction Scenario 1.4 (PM Peak)

Intersection	Do-Minimum			Construction Scenario 1.4		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	C	0.91	35
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.12	8
Pakuranga Rd / William Roberts Rd	N/A	53.18	3474	C	0.89	27
Pakuranga Rd / St Kentigern College	C	0.89	27	B	0.86	12
William Roberts Rd / Reeves Rd	N/A	1.05	26	N/A	0.27	4
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.15	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			B	0.85	20
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	E	0.99	68
Ti Rakau Dr / William Roberts Rd	Built during WRRE			N/A	0.43	1
Ti Rakau Dr / Mattson Rd	B	0.68	13	B	0.89	20
Ti Rakau Dr / Edgewater Drive west	C	0.89	31	C	0.89	31
Ti Rakau Dr / Gossamer Dr	D	0.91	45	E	1.08	72

Construction Scenario 1.4 is also expected to have acceptable intersection performance during the PM peak with some mitigation measures in place.

Similar to Construction Scenario 1.3, the heavy demand on Pakuranga Road eastbound is expected to be manageable through implementing fixed time cycles and offsets at the following intersections:

- Pakuranga Road / William Roberts Road (temporary traffic signal)
- Pakuranga Road / St Kentigern College

A cycle length of 150 seconds and an offset of 13 seconds to St Kentigern College using the William Roberts Road intersection as reference, is expected to lead to manageable queues and delays (see **Appendix Q**). Consultation with ATOC will be undertaken with regards to this mitigation measure.

Low to moderate increases in average delay are expected at the Ti Rakau Drive / Reeves Road /SEART and Ti Rakau Drive / Gossamer Drive intersections. However, these intersections are still expected to operate at an acceptable LOS E.

Following Construction Scenario 1.4, before the RRF is operational, Phase 2 works are expected to commence in the centre of Ti Rakau Drive in EB3R between Mattson Road and Gossamer Drive (see **Section 4.2.2.4**). During these works the existing number of lanes on Ti Rakau Drive will be maintained in addition to the two new U-turn facilities and the U-turn manoeuvres as Mattson Road and Gossamer Drive. As such, the temporary effects are expected to similar to Construction Scenario 1.4.

5.2.2.6 Construction Scenario 2

Construction Scenario 2 simulates the completion of the RRF, while Reeves Road underneath remains closed. Various other ongoing construction activities, with lesser expected effects, as well as sections of work already completed were also included under Construction Scenario 2. These include:

- Completion of the William Roberts Road north closure works, see **Section 4.2.1.2**.
- Completion of the Pakuranga Road / RRF tie-in works, see **Section 4.2.1.3**.
- Completion of the SEART off-ramp and on-ramp works, during which the off-ramp left-turn lanes will be reduced to one lane, see **Section 4.2.1.4**.
- Completion of the new bus lanes on Ti Rakau Drive between Pakuranga Road and Reeves Road as well as the crossroads intersection with Palm Avenue and Aylesbury Street. This will allow for construction to commence in the centre of Ti Rakau Drive, between Pakuranga Road and Reeves Road, requiring eastbound traffic to be temporarily diverted onto the new bus lanes, see **Section 4.2.1.5** (Phase 2). This will reduce both the eastbound and westbound carriageways to two lanes.
- The western approach to the Ti Rakau Drive / Reeves Road intersection will provide two through lanes and a right-turn lane. The eastern approach will provide one left-turn lane onto SEART and two through lanes. The pedestrian crossing on the eastern approach of the Ti Rakau Drive / Reeves Road / SEART will not be operational yet.
- Completion of the Pakuranga Road works between Ti Rakau Drive and the RRF, see **Section 4.2.1.6**.
- Completion of the Ti Rakau Drive / William Roberts Road / Mattson Road intersection works, see **Section 4.2.2.1**.
- Completion of Phases 1 and 2 of the Ti Rakau Drive works between Mattson Road and Gossamer Drive, see **Section 4.2.2.3** and **Section 4.2.2.4**. This will allow for Phase 3 works to commence in EB3R (see **Section 4.2.2.5**). All side roads on the southern side of Ti Rakau Drive in EB3R will be temporarily converted back to full movement intersections. The western U-turn facility and the U-turn manoeuvres at the Ti Rakau Drive / William Roberts Road / Mattson Road and Ti Rakau Drive / Gossamer Drive intersections will be operational.
- Ongoing construction on the western and eastern approaches of the Ti Rakau Drive / Gossamer Drive intersection.

Intersection Performance:

Traffic signal phasing diagrams per intersection are provided in **Appendix F** and lane performance summaries per intersection are provided in **Appendix G**.

Table 29 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 2 during the AM peak, with a 2028 horizon year.

Table 29: Intersection performance – Do-Minimum vs Construction Scenario 2 (AM peak)

Intersection	Do-Minimum			Construction Scenario 2		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.89	35	D	0.90	50
Pakuranga Rd / Brampton Ct	N/A	2.31	10	N/A	0.34	1
Pakuranga Rd / RRF	Built during EB2			C	0.90	35
Reeves Rd / Aylesbury St	N/A	0.24	1	N/A	0.03	3
William Roberts Rd / Reeves Rd	N/A	0.69	8	N/A	0.19	5
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.15	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			D	0.88	37
Ti Rakau Dr/ Reeves Rd / SEART	D	0.91	54	C	0.89	24
Ti Rakau Dr / William Roberts Rd	Built during WRRE			C	0.87	27
Ti Rakau Dr / Mattson Rd	B	0.78	15			
Ti Rakau Dr western U-turn facility	Built during EB3R			N/A	0.53	2
Ti Rakau Dr / Edgewater Drive west	C	0.85	27	N/A	2.00	66
Ti Rakau Dr / Gossamer Dr	F	1.07	91	D	0.97	50

SIDRA analysis indicates that overall, in the AM peak, Construction Scenario 2 is expected to result in minimal adverse effects to intersection performance along the network. Compared to the Do-Minimum scenario, similar intersection performance is expected at the following intersections:

- Reeves Road / Aylesbury Street
- William Roberts Road / Reeves Road

Once constructed, the following new intersections are expected to operate with spare capacity during the AM peak under Construction Scenario 2, all with acceptable LOS and DOS:

- Pakuranga Road / RRF
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue
- Ti Rakau Drive / William Roberts Road
- Ti Rakau Drive western U-turn facility

Increases in delay are expected at the Pakuranga Road / Ti Rakau Drive intersection during the AM peak hour, however the intersection is expected to operate at an acceptable LOS D.

Significant improvements in DOS and delay are predicted at the Ti Rakau Drive / Reeves Road / SEART intersection, and is expected to operate with spare capacity (LOS C). Improvements in performance are also expected at the Pakuranga Road / Brampton Court and Ti Rakau Drive / Gossamer Drive intersections.

Table 30 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 2 during the PM peak, with a 2028 horizon year.

Table 30: Intersection performance – Do-Minimum vs Construction Scenario 2 (PM Peak)

Intersection	Do-Minimum			Construction Scenario 2		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	D	0.94	53
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	0.38	1
Pakuranga Rd / RRF	Built during EB2			E	0.94	57
Reeves Rd / Aylesbury St	N/A	1.03	42	N/A	0.04	4
William Roberts Rd / Reeves Rd	N/A	1.05	26	N/A	0.41	6
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.14	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			C	0.86	21
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	E	1.00	77
Ti Rakau Dr / William Roberts Rd	Built during WRRE			D	0.95	50
Ti Rakau Dr / Mattson Rd	B	0.68	13			
Ti Rakau Dr western U-turn facility	Built during EB3R			N/A	0.56	2
Ti Rakau Dr / Edgewater Drive west	C	0.89	31	N/A	1.93	63
Ti Rakau Dr / Gossamer Dr	D	0.91	45	E	1.02	74

SIDRA analysis indicates that in the PM peak, Construction Scenario 2 is also expected to result in acceptable intersection performance along the network overall, with some mitigation measures in place.

The demand on Ti Rakau Drive westbound, between Pakuranga Road and SEART, is expected to be manageable through implementing fixed time cycles and offsets at the following intersections:

- Pakuranga Road / Ti Rakau Drive
- Ti Rakau Drive / Aylesbury Street / Palm Avenue
- Ti Rakau Drive / Reeves Road / SEART

A cycle length of 150 seconds, offsets of 11 seconds to Palm Avenue and 28 seconds to Pakuranga Road using the SEART intersection as reference, is expected to lead to manageable queues and delays (see **Appendix F**). Consultation with ATOC will be undertaken with regards to this mitigation measure.

Compared to the Do-Minimum scenario, similar intersection performance is expected at the following intersections:

- Pakuranga Road / Brampton Court
- Reeves Road/ Aylesbury Street

SIDRA analysis indicates that the following new intersections are expected to operate with spare capacity during the PM peak under Construction Scenario 2, all with acceptable LOS and DOS:

- Pakuranga Road / RRF
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue
- Ti Rakau Drive / William Roberts Road / Mattson Road
- Ti Rakau Drive western U-turn facility

Improvements in DOS and delay are predicted at the William Roberts Road / Reeves Road intersection during the PM peak hour under Construction Scenario 2.

An increase in DOS and delay is predicted at the Ti Rakau Drive / Gossamer Drive intersection under Construction Scenario 2. Regardless, the intersection is expected to operate at an acceptable LOS E.

5.2.2.7 Construction Scenario 3

The various pieces of work originally proposed under Construction Scenario 3 will now be undertaken earlier in the construction programme. Therefore, this modelling scenario is no longer relevant to this assessment.

5.2.2.8 EB2 – Pakuranga Road / William Roberts Road Temporary Signalisation

The assessment of the temporary signalisation of the Pakuranga Road / William Roberts Road intersection is now incorporated into Construction Scenario 1.2 to 1.4, see **Section 5.2.2.3** to **Section 5.2.2.5**.

5.2.2.9 EB2 – Pakuranga Road Drainage Works

As stated in **Section 4.2.1.6**, the Pakuranga Road drainage works will be undertaken concurrently with the enabling works, early in the construction programme. Therefore, these works are now incorporated into Construction Scenario 1.1, see **Section 5.2.2.2**.

5.2.2.10 EB3R – Ti Rakau Drive / Edgewater Drive East Temporary Signalisation

The assessment of the temporary closures of the Edgewater Drive intersections is now incorporated into Construction Scenario 1.2 and 1.4, see **Section 5.2.2.3** and **Section 5.2.2.5**, respectively.

5.2.3 General Traffic Travel Times

Route travel times were determined using the AIMSUN model, with a 2028 horizon year. Four routes were selected to compare route travel times between the Do-Minimum and EB2/EB3R scenarios for general traffic. This is similar to the assessment of travel times in the existing environment (see **Section 3.4.2**) and to maintain consistency across the different assessments already conducted as well as future ITAs. These routes are outlined below:

- Botany to Pakuranga (Ti Rakau Drive / Chapel Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Botany to SEART (Ti Rakau Drive / Te Irirangi Drive intersection to the western abutment on Waipuna Bridge) – both directions
- Howick to Pakuranga (Pakuranga Road / Glenmore Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Howick to SEART (Pakuranga Road / Glenmore Road intersection to the western abutment on Waipuna Bridge) – both directions

The sections below assess the temporary effects to travel times during the construction scenarios.

5.2.3.1 Construction Scenario 1.1

As the vast majority of the proposed works under Construction Scenario 1.1 are offline (see **Section 5.2.2.2**), a limited impact on general traffic travel time is expected. Therefore, route travel times under Construction Scenario 1.1 have not been remodelled in AIMSUN and are expected to be comparable to the travel times in the Do-Minimum scenario.

5.2.3.2 Construction Scenario 1.2 to 1.4

The transport network under Construction Scenario 1.2, 1.3 and 1.4 is roughly similar in terms of route options, ongoing works and lane configuration. As such, route travel times have only been remodelled in AIMSUN for Construction Scenario 1.3, which is expected to be the most conservative. Route travel times under Construction Scenario 1.2 and 1.4 are expected to perform similar or better.

Table 31 provides a comparison of the route travel times between the Do-Minimum and Construction Scenario 1.3, with a 2028 horizon year.

Table 31: General traffic travel times – Do-Minimum vs Construction Scenario 1.3

AM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	CS 1.3 [min]	Difference [min]	Do Minimum [min]	CS 1.3 [min]]	Difference [min]
Botany - Pakuranga	24.7	32.2	7.5	13.9	20.9	7.0
Botany - SEART	20.9	29.3	8.4	13.7	12.3	-1.4
Howick - Pakuranga	5.3	5.7	0.4	4.7	4.3	-0.3
Howick - SEART	11.6	26.9	15.3	8.0	6.6	-1.4

PM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	CS 1.3 [min]	Difference [min]	Do Minimum [min]	CS 1.3 [min]	Difference [min]
Botany - Pakuranga	18.4	15.2	-3.2	24.6	27.0	2.4
Botany - SEART	11.6	10.0	-1.6	24.5	32.7	8.2
Howick - Pakuranga	4.7	4.4	-0.4	3.4	3.3	-0.1
Howick - SEART	5.0	5.5	0.5	7.5	11.7	4.2

Travels times from Botany towards SEART (westbound) and Botany to Pakuranga (both directions) as well as from Howick to SEART (westbound) are predicted to experience moderate to relatively large increases during the AM peak period compared to the Do-Minimum. This is not unexpected given the following factors:

- The addition of the new Ti Rakau Drive / William Roberts Road and Ti Rakau Drive / Aylesbury Street / Palm Avenue intersections to the network
- The closure of Reeves Road, whereby more vehicles are likely to divert to Ti Rakau Drive and Pakuranga Road
- Ongoing construction on the northern side Ti Rakau Drive, between Pakuranga Road and Reeves Road as well as on the southern side between Reeves Road and Gossamer Drive.

Ti Rakau Drive is a congested corridor in the existing environment; therefore, it is likely that a redistribution of traffic or reduction in capacity due to road works will lead to increased queues and delays. It should also be noted that these increases in travel times are temporary, and are inherent in the majority of transport projects of this scale.

Consequently, changes in travel behaviour are also inherent in the majority of transport projects which the AIMSUN models do not account for. These include:

- The AIMSUN models do not account for peak spreading, i.e., motorists choosing to travel earlier or later on the network for their daily commute. 'As the capacity of the corridors is reached, especially during the peak period, travel behaviour changes. One of these changes may involve travelling to work earlier or later to avoid congestion'[26]. This change in behaviour is expected to occur at least to some degree with sufficient community engagement and on-road messaging such as Variable Message Signs (VMS).

- Another change in travel behaviour not included in the modelling assessment is flexible working options, i.e., to work from home. During and following the Covid-19 pandemic, many motorists with the option to do so changed their travel patterns in this manner. During construction it is expected that some motorists may choose to not travel on the network in order to avoid the temporary disruption.

[26] Research into Traffic Peak Spreading, Transfund New Zealand Research Report No. 241, 2003

- Multiple route choices are also an inherent limitation of the AIMSUN model being assessed. East-West route options within the model are limited to Ti Rakau Drive and Pakuranga Road. **Figure 69** shows the route options for motorists in Howick (red outline) and Botany (blue outline) to/from Panmure and the CBD.

Figure 69: Howick (red outline) and Botany (blue outline) route options

- Route options for motorists in the Howick area are geographically limited to Pakuranga Road and Ti Rakau Drive. As such, it is expected that no significant diversion of traffic will occur during construction from this area. However, Highbrook Drive, which is not within the extent of the model, may be an alternative route option over Ti Rakau Drive for some motorists in the Botany area for east-west movement to avoid the temporary disruption.

Therefore, a combination of the above factors could be expected to lead to a reduction in traffic volumes during construction, leading to more manageable queues and delays overall.

Mode shift is another travel behaviour change that the AIMSUN model does not take into account. However, realistically it is not expected that significant mode shift to public transport will occur during construction in the EB2 and EB3R areas with the existing public transport provision. Therefore, this travel behaviour change was excluded.

Various mitigation options were tested, ranging from traffic signal phasing amendments to delaying specific pieces of the proposed works, in an attempt improve travel times. However, this testing indicated that the only alternative to improve general traffic travel times would be to temporarily add more lanes, which would add significant construction cost and potentially delay the construction programme even further.

Once constructed the RRF will, in part, alleviate the congestion around the Pakuranga Town Centre and improve travel times for general traffic (see **Section 5.2.3.3**). Also, the completion of EB2 and EB3R is expected to further improve travel times, by means of the new RRF and dedicated bus lanes (see **Section 6.3.3**).

Nevertheless, to mitigate these effects, appropriate public communication and advance warning of the planned works will be undertaken prior to the works being initiated. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which would lead to changes in travel behaviour such as travelling outside the peak periods or using alternative routes. This will be achieved through the CTMP.

During the AM peak period, travel times of the majority of eastbound routes are predicted to experience small improvements.

The majority of route travel times during the PM peak, in all directions, are expected to experience small improvements, or is some cases manageable increases under Construction Scenario 1.3.

Based on the above, the potential adverse effects are considered to mitigated as far as is reasonably practicable.

5.2.3.3 *Construction Scenario 2*

Table 32 provides a comparison of the route travel times between the Do-Minimum and Construction Scenario 2, with a 2028 horizon year.

Table 32: General traffic travel times – Do-Minimum vs Construction Scenario 2

AM Peak						
Route	**Westbound**			**Eastbound**		
	Do Minimum [min]	**Construction 2 [min]**	**Difference [min]**	**Do Minimum [min]**	**Construction 2 [min]**	**Difference [min]**
Botany - Pakuranga	24.7	33.5	8.8	13.9	15.2	1.3
Botany - SEART	20.9	30.5	9.6	13.7	12.7	-1.0
Howick - Pakuranga	5.3	9.6	4.3	4.7	4.5	-0.2
Howick - SEART	11.6	7.3	-4.3	8.0	5.3	-2.7
PM Peak						
Route	**Westbound**			**Eastbound**		
	Do Minimum [min]	**Construction 2 [min]**	**Difference [min]**	**Do Minimum [min]**	**Construction 2 [min]**	**Difference [min]**
Botany - Pakuranga	18.4	13.4	-5.0	24.6	26.8	2.2
Botany - SEART	11.6	8.6	-3.0	24.5	26.1	1.6
Howick - Pakuranga	4.7	6.6	1.9	3.4	3.8	0.4
Howick - SEART	5.0	3.0	-2.0	7.5	9.6	2.1

Similar to Construction Scenario 1.3 during the AM peak, the westbound routes from Botany towards Pakuranga and SEART are predicted to experience moderate increases in travel times under Construction Scenario 2. This is likely due to the addition of a new intersection, additional traffic as a result of the Reeves Road and William Roberts Road north closures and capacity reduction due to the construction in the centre of Ti Rakau Drive.

The westbound route from Howick to Pakuranga is predicted to experience an increase in travel time during the AM peak period. This is likely due to the operation of the newly completed Pakuranga Road / RRF intersection. The right turn from Pakuranga Road east towards Pakuranga Road west is treated as the minor movement, and the majority of the traffic signal green time is allocated to the through movements between Pakuranga Road east and the RRF.

As the operation of this intersection as well as the wider network is a balance of not only the various movements of traffic flows, but also the competing modes of transport, the trade-off is the improvement of travel times of the other routes. Particularly the improvement in travel times for the major route from Howick towards SEART. It should also be noted that this increase in travel time is temporary. Upon completion of EB2 and EB3R, travel time for this route is expected to be improved (see **Section 6.3.3**), compared to Construction Scenario 2. As above, travel time increases are generally inherent in construction projects of this scale, and in context of the improvements that will be experienced once completed, this level of delay is considered to be acceptable.

The eastbound routes are predicted to experience small improvements or in some cases negligible increases in travel time during the AM peak period.

During the PM peak period, route travel times under Construction Scenario 2 are predicted to experience negligible increases or small improvements, in all directions.

Again, public communication and advance warning of the planned works will be undertaken prior to the works as well as during construction, along with appropriate signage of expected travel times and possible alternative routes. This will be achieved through the CTMP.

5.2.3.4 Construction Scenario 3

As stated in **Section 5.2.2.7**, the various pieces of work originally proposed under Construction Scenario 3 will now be undertaken earlier in the construction programme. Therefore, this modelling scenario is no longer relevant to this assessment.

5.2.4 Summary of Temporary General Traffic Effects

During the development of the updated construction methodology, based on an updated design, efforts have been made to create efficiencies in construction delivery and produce construction staging that would minimise adverse transport effects. Overall, the temporary effects on intersection performance during most construction scenarios across the EB2 and EB3R network are considered to be negligible or low as indicated by the SIDRA analysis, with some mitigation measures in place.

It is expected that the effects of the Pakuranga Road drainage works and the RRF tie-in works can be managed by utilising the flush median as a running lane in order to maintain three lanes westbound and two lanes eastbound during these works. Mitigation measures in the form of phasing adjustments and fixed-time cycles to facilitate better coordination between closely spaced intersection have been recommended in the PM peak during the majority of the construction scenarios. Consultation with ATOC will be undertaken to implement these measures.

The pedestrian crossing on the eastern arm of the Ti Rakau Drive / Reeves Road / SEART intersection will require removal for the majority of the construction programme to allow for more efficient traffic signal phasing, which will assist in managing the increased demand on Ti Rakau Drive. The pedestrian crossing on the western arm will be maintained.

Analysis indicated that the temporary signalisation of the Pakuranga Road / William Roberts Road intersection, to support the operation of the construction yard, is expected to lead to improved intersection performance. A temporary traffic signal will be provided at the Ti Rakau Drive / Edgewater Drive east intersection during the construction of the Ti Rakau Drive / Edgewater Drive west intersection. This will ensure that signalised movements for vehicles turning into and out of Edgewater Drive are maintained.

Although the temporary effects to intersection performance during construction are predicted to be negligible to low overall, some adverse effects to general traffic travel times are expected, particularly during Construction Scenario 1.3. These effects are not unexpected due to the additional intersections along the network and the number of ongoing construction activities.

A number of mitigation options were tested; however, it is expected that the only alternative to maintain existing travel times would be to add more lanes. This was not considered practicable as it would be expected to have significant implications on construction cost and programme.

Increases in travel times through the project area are inherent in the majority of transport projects of this scale as are changes in travel behaviour that could be reasonably expected to reduce traffic volumes on the network, such as peak spreading, flexible working options and alternative route selection. With appropriate public engagement and on-road messaging, it is expected that these travel behaviour changes could occur. This in turn could lead to more manageable queues, reduced delays and improved travel times on the network. These will be managed through the CTMP.

It should be noted that these effects are temporary, and once constructed, the RRF and EB2/EB3R as a whole will alleviate congestion, particularly around the Pakuranga Town Centre. In light of the improvements that will be experienced once completed, this level of delay is considered to be acceptable. Based on the above, the potential adverse effects are considered to be mitigated as far as is reasonably practicable.

5.3 Effects to Bus Services and Facilities

The sections below provide details and assessment of the temporary effects during construction to bus services and facilities in the EB2 and EB3R project areas. **Figure 70** shows the existing bus services operating through the project areas. These include the 70, 72C, 72M, 72X, 352, 711 and 712 services.

School bus service operating in the EB2 and EB3R project areas include the following:

- S415 – Pakuranga to Sacred Heart College
- S416 – Botany Downs to Sacred Heart College
- S440 – Bucklands Beach to Sancta Maria College
- S013 – Otara to Edgewater College
- S073 – Otahuhu to Edgewater College

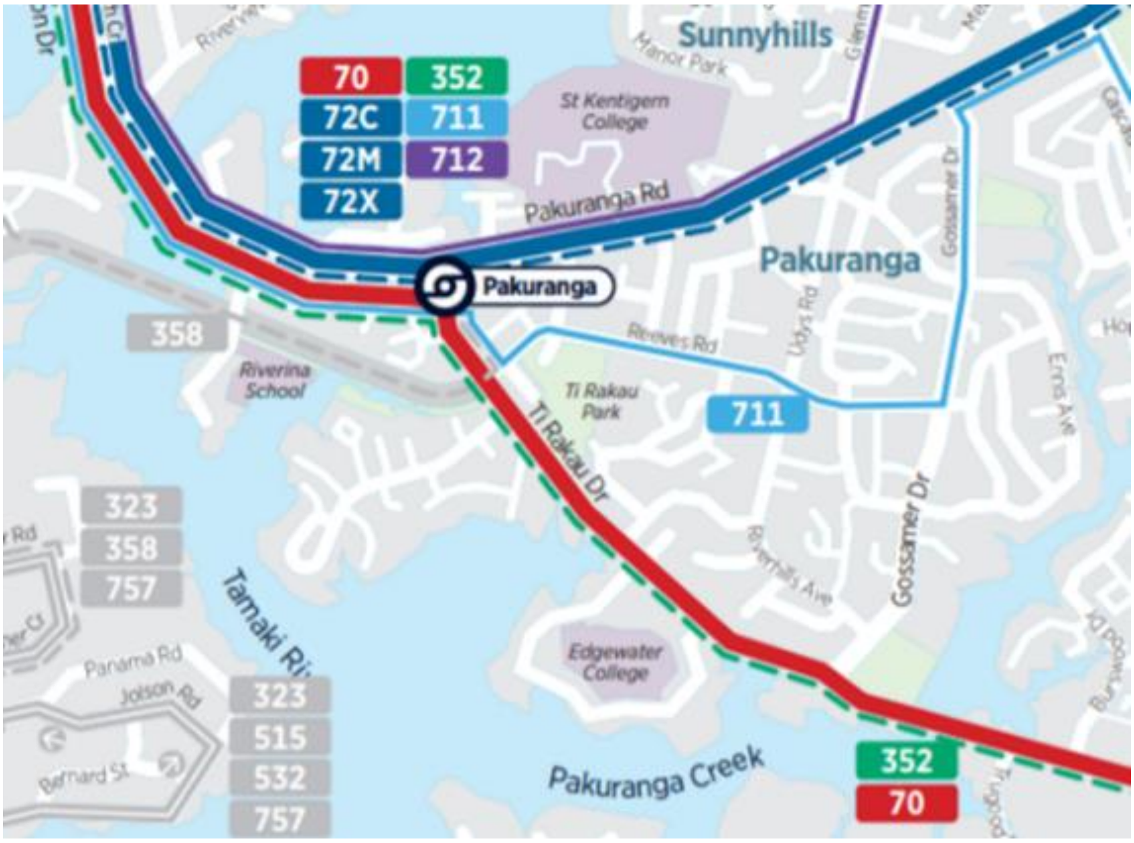


Figure 70: Existing bus services in the EB2 and EB3R project areas

5.3.1 EB2 – Reeves Road

At present, the 711 service travels partly along Reeves Road as a connector service between Howick and Panmure. During the Reeves Road closure, the 711 outbound (eastbound) service will be diverted temporarily to the newly completed WRRE (see **Figure 71**).

Figure 71: 711 outbound service, existing and proposed routes

The increase in distance of approximately 270 m and the resultant increase in travel time (20s) are considered negligible. It is noted that currently there are no bus stops located along Reeves Road between Ti Rakau Drive and William Roberts Road utilised by the 711 outbound service.

5.3.2 EB2 – William Roberts Road North

Currently, the 711 inbound (westbound) service travels partly along William Roberts Road north. Once William Roberts Road north is closed, the 711 inbound service will be diverted temporarily to William Roberts Road south and along Ti Rakau Drive (see **Figure 72**).

Figure 72: 711 inbound service, existing and proposed routes

The increase in distance of approximately 290 m and the resultant increase in travel time (21s) are considered to be negligible.

At present, the 711 inbound service utilises bus stop (ID 6060) to pick-up / drop-off passengers at the Pakuranga Plaza. Once William Roberts Road north is closed and until Reeves Road reopens, the 711 inbound service will utilise bus stop (ID 6127) instead.

The Pakuranga Road / Ti Rakau Drive intersection is located approximately 160 m north and the Ti Rakau Drive / Reeves Road intersection is located approximately 188 m south from the bus stop (ID 6127). Therefore, the increase in pedestrian walking distance to the Pakuranga Plaza is considered to be negligible.

Lewis Road was an alternative route considered during this assessment. However, Lewis Road is not well suited to buses given its narrow carriageway and on-street parking on both sides. Therefore, this alternative was discounted.

5.3.3 EB2 – Ti Rakau Drive and Pakuranga Road

Figure 73 shows the existing bus stops near the Pakuranga Town Centre, located on Ti Rakau Drive and Pakuranga Road in the EB2 project area.

Figure 73: Pakuranga Plaza bus stops

During construction of the new bus lanes on the northern side of Ti Rakau Drive, as well as the new bus station (Phase 1 of Ti Rakau Drive in EB2, see **Section 4.2.1.5**), it is anticipated that bus stop (ID 6132) will be maintained as existing. Once this phase of work has been completed, the bus stop will be removed permanently, and the new bus station will be utilised.

Currently, this bus stop is located in-lane on Ti Rakau Drive eastbound, whereas in the future the bus station will provide indented bus bays for improved operation and safety. The remaining bus stops will remain at their current locations following this phase of work. This is due to the ongoing Reeves Road works at this stage. Bus services that will benefit from this initial improvement include the 70 outbound, 352 outbound and the 711 outbound.

Following the completion of the RRF and Reeves Road modifications, it is anticipated that the bus stops (ID 6062, 6060 and 6127) will also be removed with bus services utilising the new bus station. The bus services that will benefit from the new bus station include the 70, 72C, 72M, 72X, 352, 711 and 712.

5.3.4 EB3R – Ti Rakau Drive

Figure 74 shows the existing bus stops on Ti Rakau Drive in the EB3R project area.

Figure 74: EB3R Ti Rakau Dr bus stops

During construction of Phase 1 of Ti Rakau Drive (between Mattson Road and Gossamer Drive) in EB3R (see **Section 4.2.2.3**), which will consist of the new westbound lanes on Ti Rakau Drive, bus stops (ID 6129, 6131 and 6133) will largely be kept in accordance with the current arrangement. It is expected that the bus stops will need to shift longitudinally as the works progress. However, the effects to bus services and passengers are expected to be negligible. The eastbound bus station at Gossamer Drive will also be constructed during Phase 1, however, it will not be operational until the completion of Phase 3 of EB3R.

Once Phase 1 is completed, these bus stops will be temporarily relocated to the new westbound lanes, in close proximity to their current locations and will operate until the completion of Phase 2 of EB3R.

Phase 2 of Ti Rakau Drive in EB3R (see **Section 4.2.2.4**) will consist of the central running bus lanes, as well as the new bus station at Edgewater Drive and the westbound bus station at Gossamer Drive. As above, the Gossamer Drive bus station will not be operational until completion of Phase 3 of EB3R.

Upon completion of Phase 2, it is anticipated that the bus stops (ID 6134, 6129, 6131, 6136, 6138 and 6133) will be removed permanently. The new Edgewater Drive bus station will provide improved bus services and facilities, as well as greater pedestrian safety and amenity.

In Phase 3 of Ti Rakau Drive in EB3R (see **Section 4.2.2.5**), the Ti Rakau Drive / Gossamer Drive intersection will be constructed, which will provide a link between the western and eastern bus stations at Gossamer Drive. It is expected that following Phase 3, bus stops (ID 6140 and 6135) will be removed permanently. The new bus station will provide improved bus services and facilities, as well as greater pedestrian safety and amenity.

5.3.5 Bus Travel Times

Bus route travel times were determined using the AIMSUN model, with a 2028 horizon year. Travel times were determined in both directions during AM and PM peak periods for the following routes:

- 70 – Botany Town Centre bus station to Ellerslie Panmure Highway / Clare Place intersection
- 72C – Pakuranga Road / Stanniland Street intersection to Ellerslie Panmure Highway / Clare Place intersection
- 72M – Panmure Pakuranga Road / Stanniland Street intersection to Ellerslie Panmure Highway / Clare Place intersection
- 72X – Pakuranga Road / Stanniland Street intersection to Ellerslie Panmure Highway / Clare Place intersection
- 352 – Cryers Road / Neales Road intersection to Panmure bus station
- 711 – Pakuranga Road / Stanniland Street intersection to Panmure bus station
- 712 – Glenmore Road / Meadway intersection to Panmure bus station

Note: The route descriptions refer to the extent of the routes in the AIMSUN model, not the total extent of the services from start to end on the wider network.

The sections below assess the temporary effects on bus travel times during the construction scenarios.

5.3.5.1 Construction Scenario 1.1

As stated in **Section 5.2.3.1**, the vast majority of the proposed works under Construction Scenario 1.1 are offline and as such a limited impact on bus travel time is expected. Therefore, bus travel times under Construction Scenario 1.1 have not been remodelled in AIMSUN and are expected to be comparable to the travel times in the Do-Minimum scenario.

5.3.5.2 Construction Scenario 1.2 to 1.4

Similar to the general traffic travel time assessment in **Section 5.2.3.2**, the transport network under Construction Scenario 1.2, 1.3 and 1.4 is roughly similar in terms of route options, ongoing works and lane configuration. As such, bus travel times have only been remodelled in AIMSUN for Construction Scenario 1.3, which is expected to be the most conservative. Bus travel times under Construction Scenario 1.2 and 1.4 are expected to perform similar or better.

Table 33 below provides a comparison of the bus route travel times between the Do-Minimum and Construction Scenario 1, with a 2028 horizon year.

Table 33: Bus travel times – Do-Minimum vs Construction Scenario 1.3

AM Peak						
Route Description	Westbound			Eastbound		
	Do-Minimum [min]	CS 1.3 [min]	Difference [min]	Do-Minimum [min]	CS 1.3 [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	42.3	49.5	7.2	26.9	33.0	6.1
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	20.6	41.0	20.4	16.0	15.9	-0.1
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	15.8	17.2	1.4
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	24.6	47.8	23.2	-	-	-
352 – Cryers Rd / Neales Rd to Panmure bus station	36.8	41.8	5.0	29.1	32.3	3.1
711 – Pakuranga Rd / Stanniland St to Panmure bus station	29.1	39.3	10.2	22.7	27.2	4.5
712 – Glenmore Rd / Meadway to Panmure bus station	22.6	34.9	12.3	16.6	15.8	-0.8

PM Peak						
Route Description	Westbound			Eastbound		
	Do-Minimum [min]	CS 1.3 [min]	Difference [min]	Do-Minimum [min]	CS 1.3 [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	35.7	33.8	-1.9	38.1	41.4	3.3
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	14.6	14.4	-0.2	14.8	14.7	-0.1
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	15.0	14.4	-0.6	-	-	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	16.8	20.3	3.5
352 – Cryers Rd / Neales Rd to Panmure bus station	33.4	30.2	-3.2	27.9	32.7	4.8
711 – Pakuranga Rd / Stanniland St to Panmure bus station	23.8	25.6	1.8	24.5	24.3	-0.2
712 – Glenmore Rd / Meadway to Panmure bus station	19.7	19.6	-0.1	18.1	19.5	1.4

Bus travel times of the 72C, 72X, 711 and 712 services westbound along Pakuranga Road, as well as the 70 and 352 services (westbound) along Ti Rakau Drive, are predicted to experience moderate to relatively large increases during the AM peak period under Construction Scenario 1.3. This is not unexpected given the following factors:

- The addition of the new Ti Rakau Drive / William Roberts Road and Ti Rakau Drive / Aylesbury Street / Palm Avenue intersections to the network
- The closure of Reeves Road, whereby more vehicles are likely to divert to Ti Rakau Drive and Pakuranga Road
- Ongoing construction on the northern side of Ti Rakau Drive, between Pakuranga Road and Reeves Road as well as on the southern side between Reeves Road and Gossamer Drive.

With the closure of Reeves Road and with the RRF not completed at this stage, large queues are predicted in the westbound kerbside lane on Ti Rakau Drive as vehicles attempt to turn onto SEART. As the existing bus stops along Ti Rakau Drive are located along the kerbside lane, buses are likely to travel in this congested lane, resulting in increased travel times.

As stated in **Section 5.2.3.2**, a number of mitigation options were tested. However, it is expected that the only alternative to improve bus travel times would be to add temporary bus lanes. For example, converting a westbound general traffic lane on Pakuranga Road into a bus lane. This would be expected to have significant impacts on general traffic travel times.

However, Ti Rakau Drive is a congested corridor in the existing environment; therefore, it is expected that a redistribution of traffic or reduction in capacity due to road works will lead to increased queues and delays. Furthermore, increases in travel times through the project area are inherent in the majority of transport projects of this scale as are changes in travel behaviour that could be reasonably expected to reduce traffic volumes on the network, such as peak spreading, flexible working options and alternative route selection. With appropriate public engagement and on-road messaging, it is expected that these travel behaviour changes could occur. This in turn could lead to more manageable queues, reduced delays and improved travel times on the network. This will be managed through the CTMP.

It should also be noted that these increases in travel times are temporary. Once constructed the RRF will, in part, alleviate the congestion around the Pakuranga Town and improve travel times (see **Section 5.3.5.3**). Furthermore, the completion of EB2 and EB3R is expected to further improve travel times, by means of the new dedicated bus lanes (see **Section 6.4.7**).

Opportunities to improve bus travel times will be explored in the development of the CTMPs, such as the provision of temporary bus priority where feasible, along with measures to manage travel demand through the provisions of the SSTMPs. Appropriate public communication and advance warning of the planned works will be undertaken prior to the works being initiated. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which could lead to changes in travel behaviour.

It should be noted that the 72M (westbound) and 72X (eastbound) services do not operate during the AM peak period.

All services in both directions are predicted to experience manageable increases, or in some cases small improvements, in travel time during the PM peak period under Construction Scenario 1.3.

Based on the above, the potential adverse effects are considered to mitigated as far as is reasonably practicable.

5.3.5.3 Construction Scenario 2

Table 34 provides a comparison of the bus route travel times between the Do-Minimum and Construction Scenario 2, with a 2028 horizon year.

Table 34: Bus travel times – Do-Minimum vs Construction Scenario 2

AM Peak						
Route Description	Westbound			Eastbound		
	Do Minimum [min]	Construction 2 [min]	Difference [min]	Do Minimum [min]	Construction 2 [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	42.3	47.3	5.0	26.9	26.6	-0.3
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	20.6	23.5	2.9	16.0	15.0	-1.0
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	15.8	16.0	0.2
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	24.6	28.4	3.8	-	-	-
352 – Cryers Rd / Neales Rd to Panmure bus station	36.8	39.1	2.3	29.1	27.0	-2.1
711 – Pakuranga Rd / Stanniland St to Panmure bus station	29.1	32.7	3.6	22.7	26.9	4.2
712 – Glenmore Rd / Meadway to Panmure bus station	22.6	27.3	4.7	16.6	15.5	-1.1

Route Description	PM Peak					
	Westbound			Eastbound		
	Do Minimum [min]	Construction 2 [min]	Difference [min]	Do Minimum [min]	Construction 2 [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	35.7	29.8	-5.9	38.1	36.7	-1.4
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	14.6	17.8	3.2	14.8	14.8	0.0
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	15.0	20.9	5.9	-	-	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	16.8	17.2	0.4
352 – Cryers Rd / Neales Rd to Panmure bus station	33.4	28.2	-5.2	27.9	26.7	-1.2
711 – Pakuranga Rd / Stanniland St to Panmure bus station	23.8	26.4	2.6	24.5	24.1	-0.4
712 – Glenmore Rd / Meadway to Panmure bus station	19.7	25.2	5.5	18.1	19.8	1.7

The completion of the RRF is predicted to result in improved travel times of bus routes under Construction Scenario 2, compared to Construction Scenario 1.3. This is due to a significant redistribution of general traffic from Pakuranga Road and Ti Rakau Drive to the RRF.

Acceptable increases in bus travel times of the 70 and 352 (westbound) services are predicted during the AM peak. The 70 and 352 (eastbound) services are predicted to experience small travel time improvements.

The remaining westbound and eastbound services are predicted to experience manageable increases, or in some cases small improvements, in travel times during the AM peak under Construction Scenario 2.

Similar to the AM peak, travel times of the 70 and 352 services along Ti Rakau Drive are expected to experience improvements, in both directions, during the PM peak.

Again, travel times of the remaining westbound and eastbound services are expected to experience manageable increases or small improvements during the PM peak under Construction Scenario 2.

5.3.5.4 Construction Scenario 3

The various pieces of work originally proposed under Construction Scenario 3 will now be undertaken earlier in the construction programme. Therefore, this modelling scenario is no longer relevant to this assessment.

5.3.6 School Bus Services

The S415 school bus service between Pakuranga and Sacred Heart College will continue to depart from bus stop (ID 6060) outside Farmers in the AM peak and will continue to terminate at bus stop (ID 6062) on the return journey in the afternoon during construction. Furthermore, the service will also continue to travel in the general traffic lanes on Pakuranga Road during construction. As stated in **Section 5.3.3**, it is anticipated that the bus stops (ID 6062 and 6060) will only be removed following the completion of the RRF and Reeves Road underneath.

The S416 school bus service between Botany and Sacred Heart College will continue to use the general traffic lanes along Ti Rakau Drive as well as the existing bus stops in the EB2 and EB3R projects areas during construction. As stated in **Section 5.3.3**, it is anticipated that the bus stop (ID 6127) in the Pakuranga Town Centre will only be removed after the RRF, and Reeves Road have been completed. Also, as stated in **Section 5.3.4**, it is anticipated that bus stops (ID 6134, 6129, 6131, 6136, 6138 and 6133) along Ti Rakau Drive will only be removed following Phase 2 of Ti Rakau Drive in EB3R (Mattson Road to Gossamer Drive) and bus stops (ID 6140 and 6135) following Phase 3 of EB3R.

During construction, the S440 school bus services between Bucklands Beach and Sancta Maria College and Primary will remain on its current route and students will board and alight at the existing bus stops.

Edgewater College is located near the Ti Rakau Drive / Edgewater Drive west intersection. In the existing environment, the S013 school bus service proceeds down Edgewater Drive east and the S073 proceeds down Edgewater Drive west. Currently, both of these school bus services enter through the western access to pick-up/drop-off students at the off-street bus stop inside the parking area (see **Figure 75**).

Figure 75: Edgewater College existing school bus services and bus stop

As stated in **Section 4.2.2.3**, Phase 1 of Ti Rakau Drive in EB3R (Mattson Road to Gossamer Drive) will include the construction of the Edgewater Drive east and west intersections. This will require the closure of one intersection while diverting all traffic along Edgewater Drive to the other in an alternating fashion. As such, during each of these closures, both services will access the bus stop from the same direction along Edgewater Drive. During the Edgewater Drive west closure, the S073 is expected to experience an increased travel time of approximately 1.5min, while the S013 is expected to experience a decreased travel time of approximately 40sec during the Edgewater Drive east closure. Therefore, the temporary effects to these school bus services are considered to be very low.

5.3.7 Summary of Temporary Effects to Bus Services and Facilities

Overall, the temporary effects during construction to bus services and facilities in the EB2 and EB3R project areas are considered to be negligible during Construction Scenario 1.1, moderate to relatively large during Construction Scenario 1.3, and low during Construction Scenario 2. Again, these effects are not unexpected due to the additional intersections along the network and the number of ongoing construction activities.

A number of mitigation options were tested. However, it is expected that the only alternative to improve bus travel times would be to add temporary bus lanes. This is expected to have additional impacts on general traffic travel times.

Ti Rakau Drive is a congested corridor in the existing environment; therefore, it is expected that a redistribution of traffic or reduction in capacity due to road works will lead to increased queues and delays. Furthermore, increases in travel times through the project area are inherent in the majority of transport projects of this scale as are changes in travel behaviour that could be reasonably expected to reduce traffic volumes on the network, such as peak spreading, flexible working options and alternative route selection. With appropriate public engagement and on-road messaging, it is expected that these travel behaviour changes could occur This in turn could lead to more manageable queues, lower delays and improved travel times on the network. These will be managed through the CTMP.

It should also be noted that these increases in travel times are temporary. Once constructed the RRF will, in part, alleviate the congestion around the Pakuranga Town and improve travel times. Furthermore, the completion of EB2 and EB3R is expected to further improve travel times, by means of the new dedicated bus lanes.

Opportunities to improve bus travel times will be explored in the development of the CTMPs, such as the provision of temporary bus priority or temporary bus lanes where feasible, along with measures to manage travel demand through the provisions of the SSTMPs. Appropriate public communication and advance warning of the planned works will be undertaken prior to the works being initiated. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which could lead to changes in travel behaviour.

Lastly, the 711 service will undergo minor route changes as construction progresses through the closure of Reeves Road and William Roberts Road north. Existing bus stops along Pakuranga Road and Ti Rakau Drive will also experience minor changes during construction, undergoing minor relocation as the works progress. Based on the above, the potential adverse effects are considered to be mitigated as far as is reasonably practicable.

5.4 Effects to Pedestrians and Cyclists

Currently, pedestrian footpaths are provided along both sides of Ti Rakau Drive, between Pakuranga Road and Gossamer Drive. Signalised pedestrian facilities for crossing Ti Rakau Drive are provided at the following intersections:

- Ti Rakau Drive / Pakuranga Road southern and eastern approaches
- Ti Rakau Drive / Reeves Road all approaches
- Ti Rakau Drive / Mattson Road Western and southern approaches
- Ti Rakau Drive / Edgewater Drive west / Chevis Place western and southern approaches
- Ti Rakau Drive / Gossamer Drive northern, eastern and southern approaches

Pedestrian footpaths are also provided along both sides of Pakuranga Road, between Ti Rakau Drive and William Roberts Road. A midblock signalised pedestrian crossing is provided near the Pepler Street exit.

In the residential area to the north of SEART, pedestrian footpaths are provided along both sides of Dale Crescent. At the southern end of the street, the footpath continues along the northern side of Seven Oaks Drive.

In the commercial area south of the Pakuranga Plaza, pedestrian footpaths are provided along both sides of Reeves Road and Cortina Place. A midblock pedestrian crossing is also provided on Reeves Road. Footpaths are provided along both sides of William Roberts Road north, to the east of the Pakuranga Plaza. Once the WRRE is completed, footpaths will be provided along both sides of William Roberts Road south, from Ti Rakau Drive up to Ti Rakau Park.

Footpaths with the same width as existing footpaths will be provided during construction.

As stated in **Section 3.6.2**, no cycle facilities are provided in the existing environment, except at the Ti Rakau Drive / Gossamer Drive intersection.

Pedestrian crossings and footpaths will be maintained at all times during construction. Should this be unachievable, temporary facilities will be provided to ensure pedestrian connectivity. This will be ensured through the CTMPs.

5.4.1 EB2 – Reeves Road

Footpaths along both sides of Reeves Road as well as the midblock pedestrian crossing will be maintained during construction. When beam-landing activities are required for construction of the RRF, pedestrians may need to be diverted around these areas for safety purposes. CTMPs will be employed to achieve this.

5.4.2 EB2 – William Roberts Road North

Although construction is required to form the cul-de-sacs at each end, the existing footpaths along both sides of William Roberts Road north will be maintained. Once the RRF northern abutment is under construction, it is anticipated that the pedestrian footpath on the western side of William Roberts Road north will be closed. The effects of this closure are considered to be negligible as the footpath on the opposite side of the road will be maintained.

5.4.3 EB2 – Pakuranga Road Tie-In

The footpath along the northern side of the Pakuranga Road / RRF intersection will be maintained at all times. While the Pakuranga Road tie-in is under construction, pedestrians will be unable to utilise the existing refuge island on the southern side of the intersection. A temporary pedestrian crossing will be provided in a similar location to limit the effects to pedestrian walking time and distance.

5.4.4 EB2 – SEART

There are no footpaths along SEART provided at present.

Once the new SEART off-ramp has been completed and Seven Oaks Drive has been reinstated further north, it is anticipated that the footpath along the northern side of the Seven Oaks Drive will also be reinstated, similar to the existing environment.

5.4.5 EB2 – Ti Rakau Drive from Pakuranga Road to Reeves Road

Footpaths along both sides of the carriageway will be maintained. During the construction of the bus lanes on this section of Ti Rakau Drive as well as the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection, pedestrians may need to be diverted around these areas for safety purposes. CTMPs will be employed to achieve this.

During construction of the Ti Rakau Drive / Reeves Road intersection, pedestrian crossings will be maintained, except for the crossing on the eastern arm of the intersection. Temporary crossings will be provided as necessary to avoid the construction areas.

5.4.6 EB2 – Pakuranga Road

The existing footpaths along both sides of Pakuranga Road will be maintained during construction. The existing signalised midblock pedestrian crossing on Pakuranga Road, constructed as part of EB1, is also expected to be maintained.

5.4.7 EB2 – Side Roads

The existing footpaths along both sides of Palm Avenue, Aylesbury Street north, Cortina Place and William Roberts Road will be maintained. In the case of Aylesbury Street, the footpaths will be maintained until the completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection. Following which the existing footpaths will be removed. CTMPs will be employed to divert pedestrians around work zones as necessary.

5.4.8 EB3R – Ti Rakau Drive from Reeves Road to Mattson Road

Footpaths along both sides of the carriageway will be maintained. During construction of the Ti Rakau Drive / William Roberts Road / Mattson Road intersection, temporary crossing facilities will be provided as per the CTMPs to avoid the work zones.

5.4.9 EB3R – Ti Rakau Drive from Mattson Road to Gossamer Drive (Phase 1)

Pedestrian footpaths on both sides of Ti Rakau Drive will be maintained. A new raised three-stage pedestrian crossing will be constructed, between Marriot Road and Edgewater Drive west, during the construction of the new westbound lanes. However, this crossing will not be in use until the completion of the bus lanes and the Edgewater bus station in the centre of Ti Rakau Drive. Pedestrians will continue to use the existing pedestrian crossing at the Ti Rakau Drive / Edgewater Drive west intersection.

5.4.10 EB3R – Ti Rakau Drive from Mattson Road to Gossamer Drive (Phase 2)

The footpath along the northern side of Ti Rakau Drive will be maintained, and pedestrians will be able to utilise the new footpath along the southern side during Phase 2. As above, the new staged pedestrian crossing towards the Edgewater bus station will not be in use until completion of the bus lanes and the bus station. A temporary signalised pedestrian crossing will be provided at the Ti Rakau Drive / Edgewater Drive west intersection.

5.4.11 EB3R – Ti Rakau Drive from Mattson Road to Gossamer Drive (Phase 3)

During Phase 3, the staged pedestrian crossing at the Edgewater Drive bus station will be completed and will be opened for use. During construction of Ti Rakau Drive / Gossamer Drive intersection, pedestrian crossings will be maintained. Temporary crossings will be provided as necessary to avoid the construction areas, and will form part of the CTMP.

5.4.12 EB3R – Side Roads

The existing footpaths along both sides of Tiraumea Drive, Mattson Road, Roseburn Place, Edgewater Drive west, Chevis Place, Wheatley Avenue, Edgewater Drive east, Freemantle Place and Gossamer Drive will be maintained during construction. CTMPs will be employed to divert pedestrians around work zones as necessary.

5.4.13 Summary of Temporary Effects to Pedestrians and Cyclists

Temporary effects to pedestrians and cyclists during construction are considered to be negligible overall. Pedestrian crossings and footpaths will be maintained at all times during construction. Should this be unachievable, temporary facilities and diversions will be provided to ensure pedestrian connectivity. Furthermore, pedestrian access to properties will be maintained at all times. This will be ensured through the CTMPs.

5.5 Effects to Property Access and Parking

The sections below provide assessment of the temporary effects of EB2 and EB3R on property access, as well as on-street and off-street parking during construction, split between the EB2 and EB3R project areas.

5.5.1 EB2 – Reeves Road

The construction of Reeves Road will have no effect on on-street parking along this section of road as none is provided currently.

An assessment of temporary effects to property access and off-street parking at specific properties along Reeves Road in the EB2 project area is provided below.

5.5.1.1 3 Reeves Road – Gull Service Station

Figure 76 shows the location and property boundary of 3 Reeves Road, as well as the Gull service station (red outline) developed on the site. Access to the property from Reeves Road will not be maintained during the Reeves Road closure. Discussions are ongoing with the owner regarding loss of direct road access onto Reeves Road.

Figure 76: 3 Reeves Rd and Gull service station (red outline)

5.5.1.2 11 Reeves Road – Eastside Pups Dog Grooming and Daycare

Access to the property at 11 Reeves Road will not be maintained during the closure of Reeves Road. A temporary two-way access will be provided from Cortina Place via the property at 2 Cortina Place (see **Figure 77**), which is owned by AT. The manoeuvring width between parking spaces to the rear of the property is approximately 8.4m and will be sufficient to accommodate a two-way temporary access, while having no effect on on-site parking. Therefore, the temporary effects to property access and parking are considered to be negligible.

Figure 77: 11 Reeves Rd temporary access during construction

5.5.1.3 7 Aylesbury Street and 2R Ti Rakau Drive – The Warehouse and Pakuranga Library

Currently, access from Reeves Road is provided to The Warehouse's goods access and the associated undercover carpark at 7 Aylesbury Street (orange outline). Similarly, the service entrance of the Pakuranga Library and Citizens Advice Bureau at 2R Ti Rakau Drive (blue outline) is also accessed from Reeves Road.

During the initial stages of the Reeves Road closure, from approximately mid-2023 to mid-2024[27], access will be maintained through the work site to the goods access. Access to the undercover carpark from Reeves Road as well as the library service entrance from Reeves Road will not be maintained during this period. However, the existing secondary access to the undercover carpark off the private access road in the Pakuranga Plaza will remain open (see **Figure 78**). The main access to the Library on Aylesbury Street east will also remain open. Therefore, effects to property access during this period at these properties, as well as during events such as the Pakuranga Night Market, are expected to be very low.

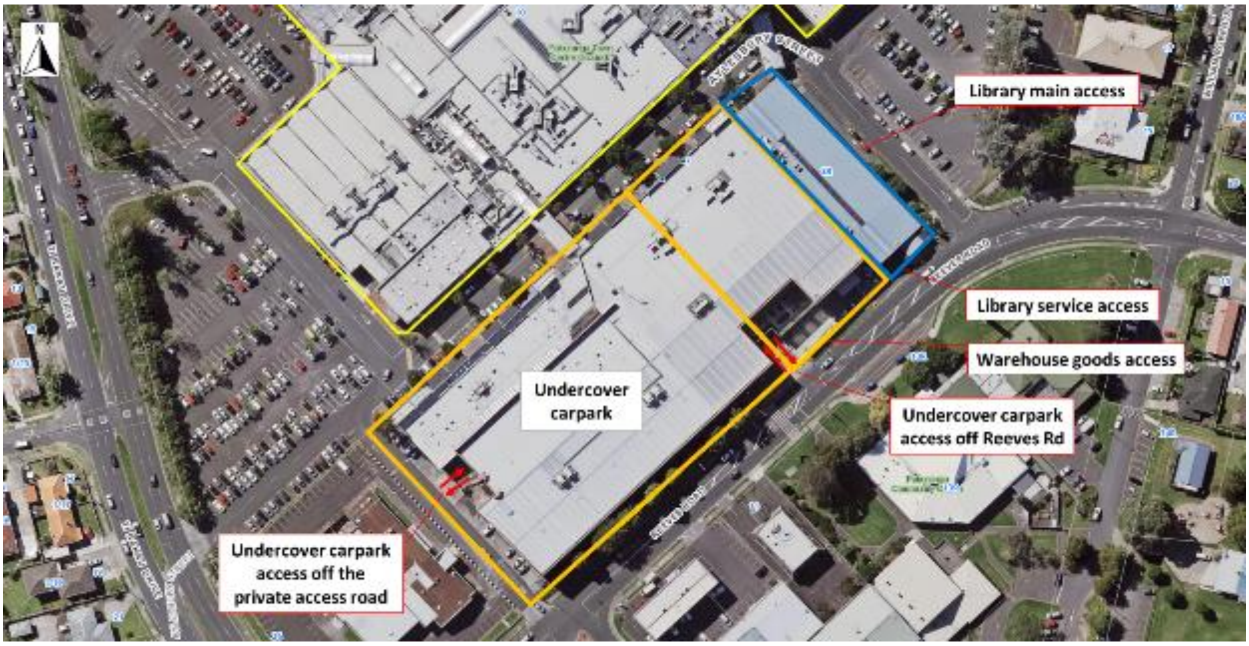


Figure 78: Pakuranga Plaza undercover carpark accesses

It should be noted that during this period, access to the Pakuranga Plaza at the Reeves Road / Aylesbury Street east intersection will also not be maintained. A full assessment of effects to property access at the Pakuranga Plaza is presented in **Section 5.5.5.3**.

Following this initial period, and in addition to the access being maintained to The Warehouse, access will also be reinstated to the undercover carpark and the Library service access. These access arrangements are shown in **Figure 79** below.

[27] These periods are indicative, and the EBA is reviewing the design and construction methodology to accelerate construction.

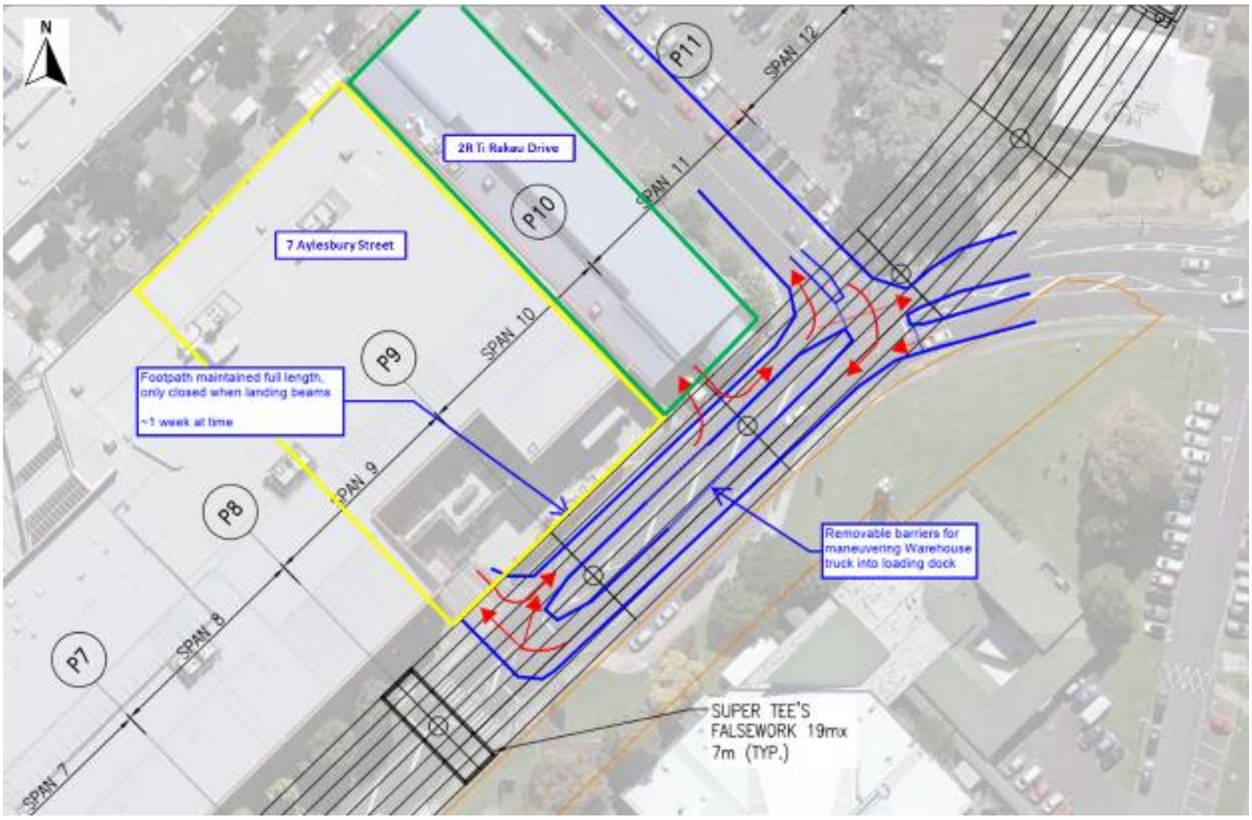


Figure 79: 7 Aylesbury St and 2R Ti Rakau Dr temporary access during construction

At present, The Warehouse's goods access is left-in left-out only, with trucks accessing the site via Reeves Road from the south and exiting to the north. Trucks will access the site from the north on Reeves Road, execute a U-turn and return northbound on Reeves Road towards William Roberts Road during construction.

Removeable barriers will be installed in the median and the existing masonry wall on the property boundary will be removed, if required, to accommodate this manoeuvre. The wall will be reinstated after construction of Reeves Road. Deliveries to the property are currently limited to one semi-trailer per day (as per the terms of the existing resource consent for the property) and background traffic volumes on Reeves Road will be significantly reduced.

Access to the undercover carpark will also be from the north on Reeves Road, turning right into the carpark. Left-out only movements will be provided at this access for vehicles exiting from the carpark.

Access to the service entrance of the Library will be from the north on Reeves Road, executing a U-turn manoeuvre at the undercover carpark access. During construction, this access will provide for left-in left-out movements only. Given the nature of the service access and its size, it is expected that a low number of vehicles would require access to this entrance during construction. Effects to property access are expected to be negligible as the existing background traffic on the road will be redistributed elsewhere during the Reeves Road closure.

5.5.1.4 13R Reeves Road – Te Tuhi

The main access to the property off Reeves Road will not be maintained during the Reeves Road closure. A temporary indented drop-off area will be provided on the western side of William Roberts Road, with a temporary walkway leading around the property to the main entrance (see **Figure 80**).

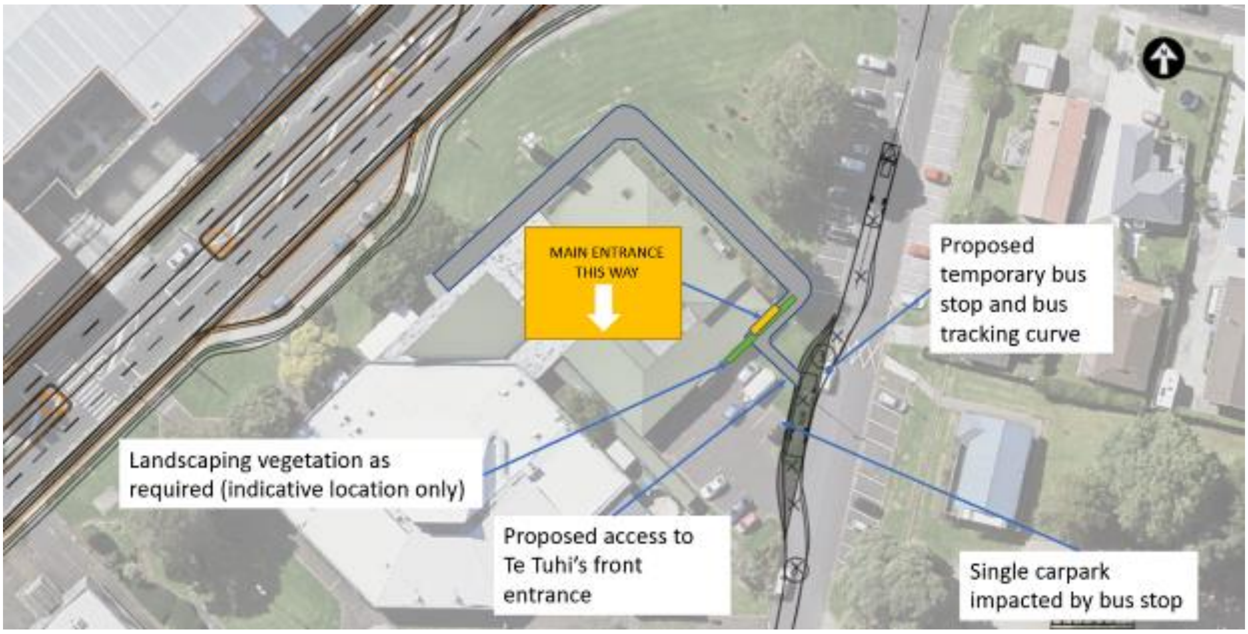


Figure 80: 13R Reeves Rd temporary access during construction

The drop-off will result in the temporary loss of one off-street parking space to the rear of the property. It is expected that the remaining 12 off-street parking spaces on the property would be sufficient during construction. Temporary effects on property access and off-street parking during construction are expected to be very low.

Once the WRRE is completed, on-street parking fronting this property will be removed via No Stopping at All Time (NSAAT) line markings. Therefore, the proposed temporary drop-off will have no additional effects on on-street parking along William Roberts Road.

5.5.2 EB2 – William Roberts Road North

As stated in **Section 5.1.1.4**, the construction yard will be located on the south-western quadrant of the Pakuranga Road / William Roberts Road intersection. The properties at 169, 171, 173 Pakuranga Road and 3 William Roberts Road have been acquired by AT and will provide the necessary space for this CSA. Again, it should be noted that this CSA is subject to a separate resource consent application and associated transport assessment. As such, no further comment on the construction yard is provided in this ITA.

AT have also acquired the remaining properties on the western side of William Roberts Road north, including 5, 7, 9,11, 13, 15, 17 and 19 William Roberts Road. These properties will provide the necessary space for the northern RRF abutment. The removal of these residential properties will further reduce the need for on-street parking along William Roberts Road north.

Lastly, AT have also acquired the properties at 177, 179, 181, 187 Pakuranga Road and 2 William Roberts Road on the southern side of the carriageway to allow for the Pakuranga Road / RRF tie-in.

Accesses to the remaining properties on the eastern side of the road will be maintained as per the existing environment.

Overall, the need for on-street parking along William Roberts Road north will be significantly reduced during construction. Therefore, the temporary effects to property access and parking are considered to be negligible.

5.5.3 EB2 – SEART

To enable the proposed design of the new SEART off-ramp and the southern RRF abutment, AT have acquired the following properties on the northern side of SEART:

- 25 and 27 Ti Rakau Drive
- 2, 4, 6, 8, 10, 12, 14, and 18 Seven Oaks Drive
- 1R and 19 Dale Crescent

The properties have been earmarked for demolition, thereby removing the current use of these properties.

5.5.4 EB2 – Pakuranga Road

In the existing environment, clearways are provided in the kerbside lanes on Pakuranga Road in the EB2 project area. The westbound clearway is enforced during the AM peak period (07:00 – 09:00) and the eastbound clearway during the PM peak period (16:00 – 18:00). In the off-peak periods, on-street parking is permitted along these sections of Pakuranga Road. **Figure 81** shows the location and extent of the clearways (blue outline) along Pakuranga Road in the EB2 project area.

Figure 81: Pakuranga Rd clearways and on-street parking (blue outline)

During construction of the Pakuranga Road / RRF tie-in, these clearways and on-street parking sections will be removed to provide the necessary workspace. As Pakuranga Road is largely similar to Ti Rakau Drive in the EB3R project area, in terms of traffic volumes and operating speeds, it is not unreasonable to assume that Pakuranga Road experiences the same low level of parking utilisation in the existing environment during weekdays and weekends. Based on this assumption, the temporary effects on on-street parking are expected to be negligible.

As per the existing environment, left-in/left-out access to the residential and commercial properties on the frontage of Pakuranga Road in EB2 will be maintained throughout the construction programme. This will be achieved through the CTMP. During the Reeves Road closure and before the RRF is open, vehicles exiting properties fronting this arterial road are expected to experience a minor increase in delay and queueing, and will still rely on driver behaviour for gaps within the opposing traffic streams. Once the RRF is completed, this section of Pakuranga Road is expected to experience a significant decrease in traffic volumes. The result is expected to be significantly less delay for vehicles attempting to enter the corridor. Therefore, the effects to these properties are considered to be very low.

As stated in **Section 4.2.1.6**, the initial stages of the Pakuranga Road construction will also include longitudinal drainage works and will be undertaken concurrently with the enabling works, early in the construction programme. A full assessment of effects to general traffic is presented in **Section 5.2.2.2**.

5.5.4.1 141 Pakuranga Road – GAS Service Station

Figure 82 shows the general location of the proposed longitudinal drainage works along Pakuranga Road and the property boundary of the GAS service station located at 141 Pakuranga Road.

Figure 82: Pakuranga Rd longitudinal drainage works and GAS service station (blue outline)

Longitudinal drainage construction will consist of the temporary closure of a section of the westbound kerbside lane on Pakuranga Road between William Roberts Road and Ti Rakau Drive. During this phase of work, access to the Pakuranga Plaza via Brampton Court, access to the GAS service station and the Pepler Street exit will be maintained.

The drainage works will be completed in sections to ensure this. It is envisaged that lateral shifts of the access points may be required. The construction team will also liaise with the operators of the GAS service station to ensure sufficient access widths are provided, as and when required, for fuel delivery tankers. Therefore, the effects to property access are expected to be negligible.

5.5.5 EB2 – Ti Rakau Drive, Side Roads and Pakuranga Plaza

5.5.5.1 Ti Rakau Drive

Ti Rakau Drive in the EB2 project area, between Pakuranga Road and Reeves Road, provides no on-street parking in the existing environment. Therefore, the construction phase will have no effects on on-street parking.

As per the existing environment, left-in/left-out access to the residential and commercial properties on the western side of the carriageway will be maintained throughout the construction programme. These properties include 3-27 Ti Rakau Drive. This will be achieved through the CTMP. Similar to **Section 5.5.4**, during the Reeves Road closure and before the RRF is open, vehicles exiting from these properties are expected to experience a minor increase in delay, and will still rely on driver behaviour for gaps within the opposing traffic stream. Once the RRF is completed, this section of Ti Rakau Drive is expected to experience a significant decrease in traffic volumes and delay. Therefore, the effects to these properties are considered to be very low.

Effects on property access with regards to the Pakuranga Plaza are discussed below.

5.5.5.2 Side Roads

Construction works on Palm Avenue will be limited to the approach of the intersection with Ti Rakau Drive. Works on Aylesbury Street will be more extensive; however, no on-street parking is provided in the existing environment and property access will be maintained during these works. Therefore, the construction phase will have no effects on on-street parking or property access along these side roads.

5.5.5.3 Pakuranga Plaza

The works in the EB2 project area around Pakuranga Plaza will be constantly evolving as works transition from one phase to the next. This in turn will require multiple changes to the accesses and parking currently serving the Pakuranga Plaza until the completion of the Project. The sections below provide an assessment of the temporary effects, in chronological order, to property access and parking.

It should be noted that for the purposes of this ITA, the term 'Pakuranga Plaza' is used here to refer to the entire area encompassed in the yellow outline in **Figure 83** below and includes the following properties:

- 7 and 10 Aylesbury Street
- 2R Ti Rakau Drive
- 1 Pepler Street
- 121, 123, 125, 127, 129, 131, 135, 141 and 167 Pakuranga Road

The assessment presented here excludes the property located at 26 Ti Rakau Drive (red outline).

Figure 83: Pakuranga Plaza

Property Access:

The Pakuranga Plaza currently has six access points allowing for both in and out movements, with a seventh allowing for movements out onto Pakuranga Road only. All accesses are currently priority-controlled. **Figure 84** below shows the traffic volumes for both the AM and PM peak hours at these access points (PM traffic volumes in brackets).

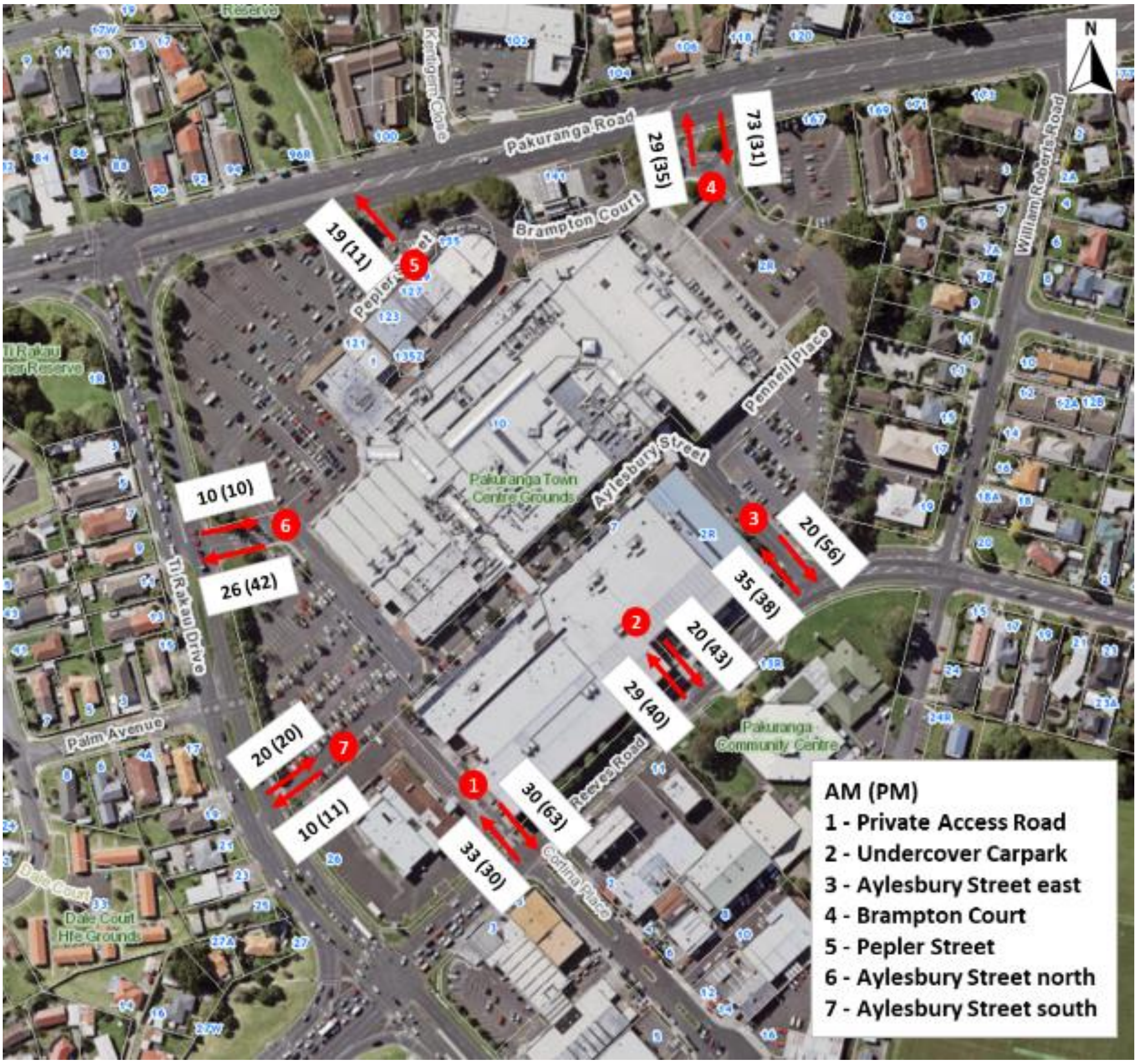


Figure 84: Pakuranga Plaza access volumes[28]

The initial stages of the Pakuranga Road construction will also include longitudinal drainage works and will be undertaken concurrently with the enabling works, early in the construction programme. However, as stated in **Section 5.5.4.1**, access to the Plaza via Brampton Court (Access 4) and the Pepler Street exit (Access 5) will be maintained. The drainage works will be completed in sections to ensure this. It is envisaged that lateral shifts of the access points may be required. The temporary effects to property access are expected to be negligible.

Construction of the new Ti Rakau Drive / Palm Avenue / Aylesbury Street crossroads intersection will be brought forward, and will be undertaken during Phase 1 of Ti Rakau Drive in EB2. The early completion of this intersection will provide improved access to the Pakuranga Plaza, with increased capacity and will allow for all movements. It is anticipated that the intersection will be completed before the closure of Reeves Road. During this phase of work, the existing priority-controlled Aylesbury Street accesses

[28] Traffic volumes sourced from the AIMSUN Do-Minimum model, with a 2028 horizon year.

(Access 6 and 7) will be maintained until completion of the new signalised crossroads intersection. Once completed, the accesses will be removed.

As stated in **Section 5.5.1.3**, Reeves Road will be closed during the initial stages of the construction programme, from approximately mid-2023 to mid-2024[29]. Access to the Plaza via the private access road (Access 1), the undercover carpark (Access 2), and Aylesbury Street east (Access 3) will not be maintained.

However, access will be maintained through the work site to The Warehouse's goods access. Furthermore, the existing secondary access to the undercover carpark off the private access road in the Pakuranga Plaza will remain open. The main access to the Library on Aylesbury Street east will also remain open.

It is expected that vehicles would divert to the three remaining accesses on Ti Rakau Drive and Pakuranga Road, which would have sufficient spare capacity due to the low background traffic volumes at those accesses. Therefore, the effects of the temporary closure of these accesses are expected to be very low.

Lastly, the Pakuranga Road / Brampton Court priority-controlled access to the Pakuranga Plaza will be realigned to allow for easier access for right turners.

Parking:

As stated in **Section 3.7.1**, the Pakuranga Plaza currently supports 1,355 parking spaces on site. The utilisation of 840 of these parks was captured during the parking survey, shown in **Figure 85**. The utilisation of the surveyed parking spaces was determined to not exceed 60% capacity on a typical weekday or weekend.

It is not unreasonable to assume that the remaining 495 un-surveyed parking spaces experience a similar utilisation profile. Therefore, based on this assumption, it is expected that the Pakuranga Plaza has at least 542 unoccupied parking spaces on an average weekday and weekend. It should be noted that AT owns all of parking areas shown in **Figure 85**, except for those parking spaces located on Aylesbury Street.

[29] These periods are indicative, and the Alliance is reviewing the design and construction methodology to accelerate construction.

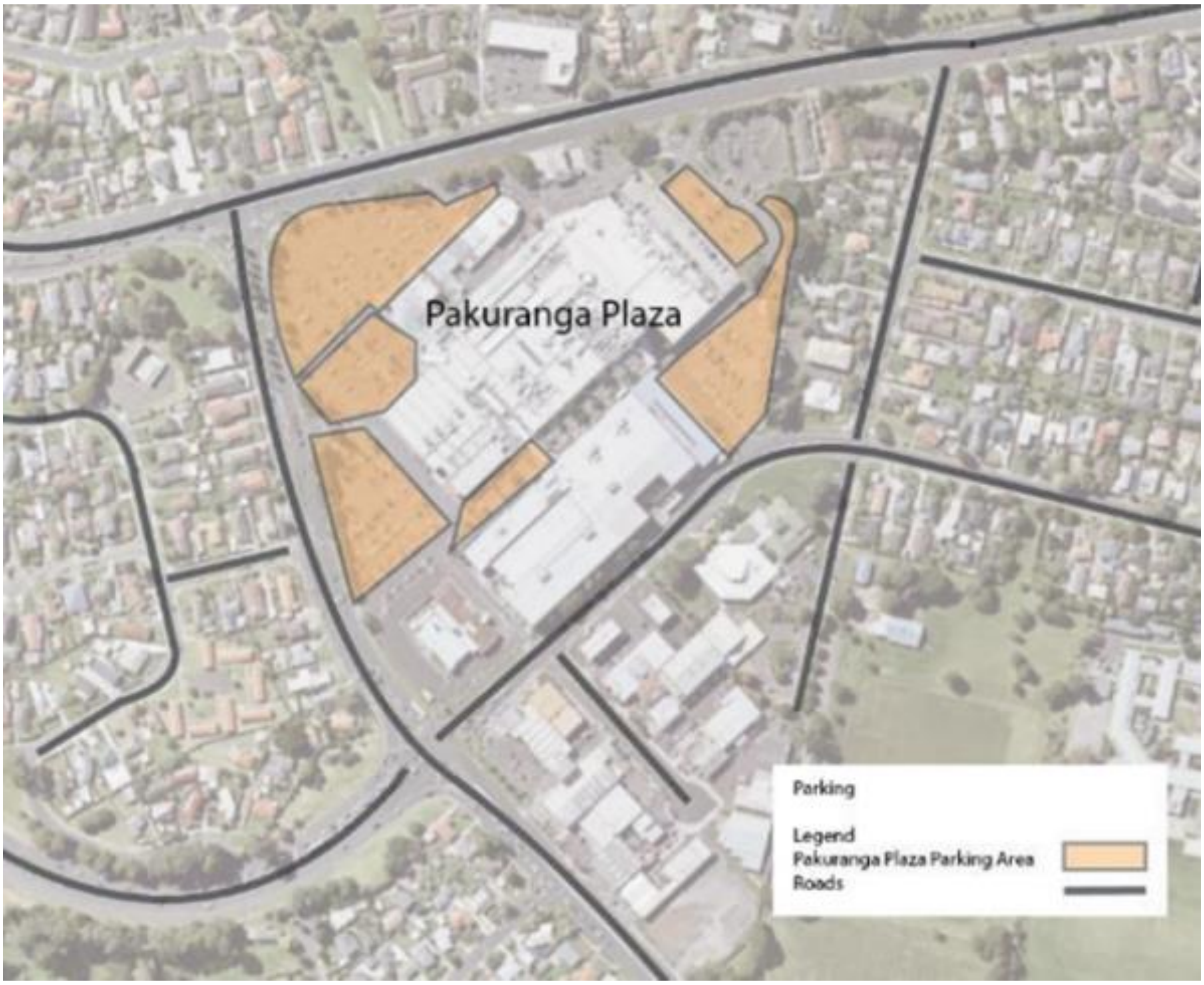


Figure 85: Pakuranga Plaza surveyed parking areas

As stated in **Section 5.1.1.3**, the parking area off Pennell Place in the Pakuranga Plaza will be temporarily occupied and established as a CSA. This carpark in its current form provides 108 parking spaces and will be occupied for approximately two years and two months. Taking the spare capacity of parking spaces at the Plaza into account, it is expected that there would still be 434 unoccupied parking spaces on site during the period where this parking area is occupied by the CSA. Therefore, in light of the existing spare capacity, the temporary effects of the use of the carpark as a CSA on parking at the Plaza are expected to be negligible.

During the Reeves Road closure and the RRF construction, works will commence on the new offline bus lanes on the northern side of Ti Rakau Drive between Pakuranga Road and Reeves Road. These works will also include the new bus station, the Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection and the 'Kiss-and-Ride' facility (see **Section 4.2.1.5**). **Figure 86** shows the layout of the proposed works and the effects on parking at the Plaza.

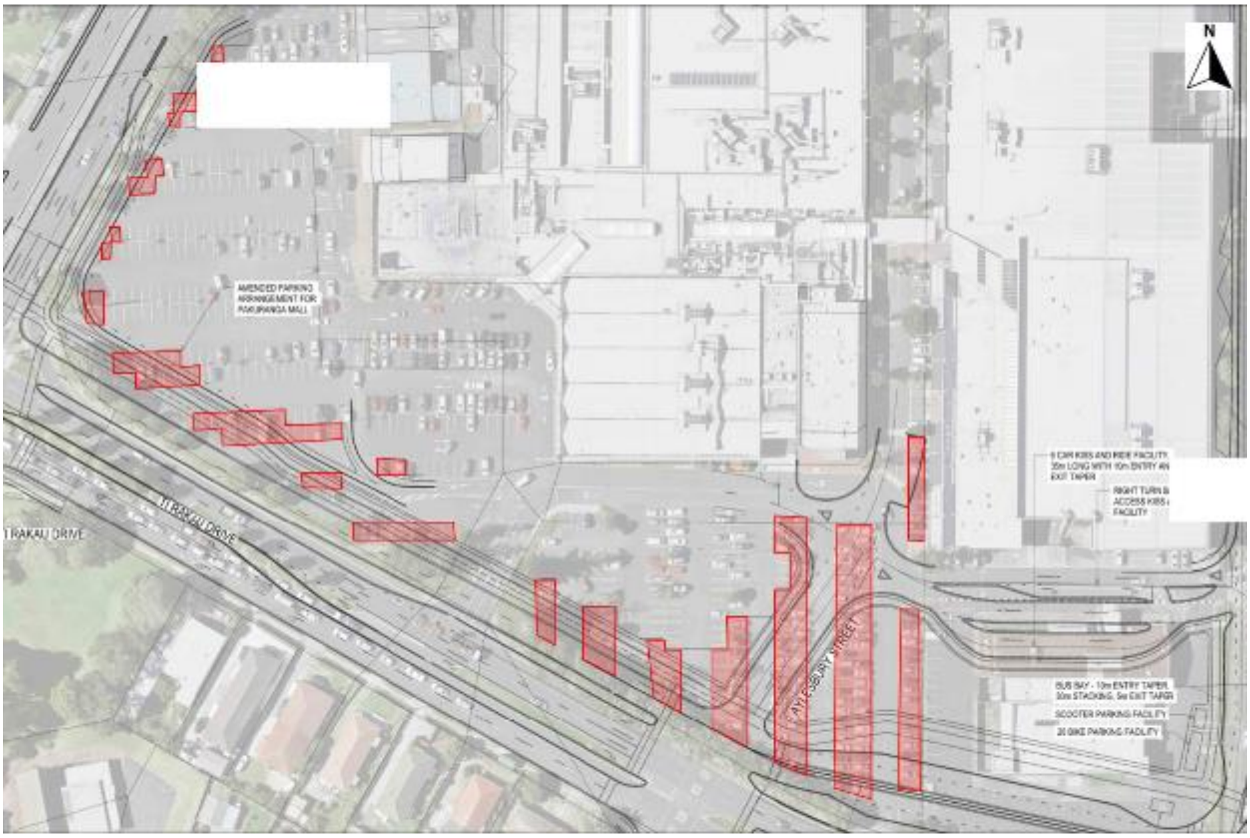


Figure 86: EB2 Ti Rakau Drive effects on parking at Pakuranga Plaza

For the purposes of this ITA it was assumed that all of the required land area will be under construction simultaneously, in other words the full effects of the proposed works on parking. Based on this assumption, the works will result in the permanent loss of 245 parking spaces at Pakuranga Plaza. Taking the spare capacity of parking at the Plaza into account, it is expected that there would still be 189 unoccupied parking spaces on site. Therefore, the effects of these works on parking at the Plaza are expected to be negligible.

Following construction of the RRF, late in the construction programme, the Reeves Road / Aylesbury Street and the Reeves Road / William Roberts Road intersections will be signalised. This will include the realignment of Reeves Road and Aylesbury Street east. **Figure 87** shows the proposed alignment of Reeves Road and Aylesbury Street east, as well as the effects on parking at the Plaza.

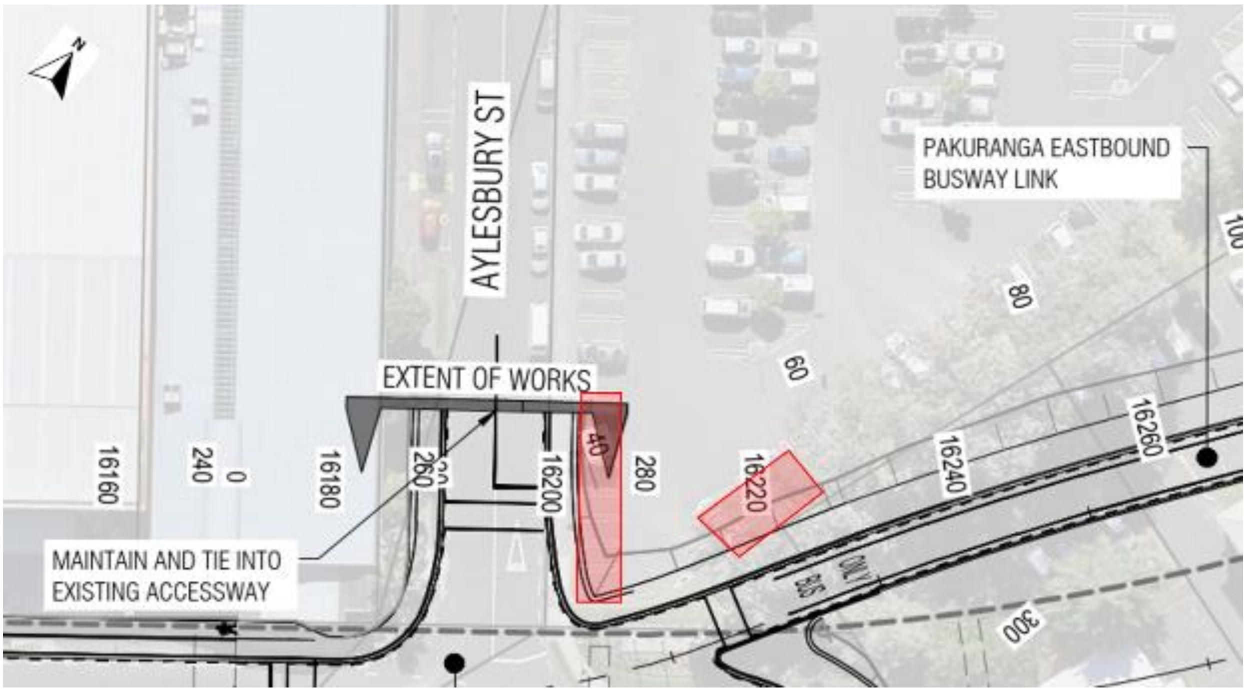


Figure 87: Reeves Rd / Aylesbury St signalisation effects on parking at Pakuranga Plaza

The proposed works will result in an additional and permanent loss of 12 parking spaces at the Pakuranga Plaza. However, these proposed works will occur after the CSA at Pennell Place has been disestablished and the parking area re-established. Taking the spare capacity of the remaining 297 parking spaces into account, it is expected that there would still be 285 unoccupied parking spaces on site. Therefore, the effects of this signalisation on parking at the Plaza are expected to be negligible.

5.5.6 EB3R – Ti Rakau Drive, Side Roads and Properties

The sections below provide assessment of the temporary effects during construction on property access and parking in the EB3R project area.

To enable the EB3R construction, AT have acquired the vast majority of properties along the southern frontage of Ti Rakau Drive including:

- 37 – 69, 73-105, 121-143, 147-207 Ti Rakau Drive
- 3 Tiraumea Drive
- 1, 3, 4 and 5 Mattson Road as well as small parcels of 7 and 9 Mattson Road
- 1 Roseburn Place
- 1 Snell Place
- 2 and 167 Edgewater Drive
- 1-2 Wheatley Avenue

Properties acquired on the northern side of the carriageway include:

- 216-222 Ti Rakau Drive
- 170, 174 and 178 Gossamer Drive
- A parcel of 168R Gossamer Drive

The majority of these properties are scheduled for demolition to facilitate the busway, thereby removing the current use of these properties.

5.5.6.1 Ti Rakau Drive

Ti Rakau Drive in the EB3R project area, between Reeves Road and Gossamer Drive, provides on-street parking along both sides for the majority of the corridor in the existing environment. The on-street parking will be removed during construction to provide the necessary space for the work zones. However, as stated in **Section 3.7.4**, the average utilization is poor with only 3% occupancy on weekdays and 8% on Saturdays. This is not unexpected as this high-volume road does not create an appealing location to park vehicles and is likely leading to a high perceived risk of crashes. It is also not unreasonable to assume that the surrounding residential properties have sufficient off-street parking.

Furthermore, the acquisition of the majority of the residential properties on the southern frontage of Ti Rakau Drive will remove the need for on-street parking along this section. Lastly, the current left-in/left-out access arrangements to the properties on the northern side of Ti Rakau Drive will be maintained during construction. Therefore, the temporary effects on on-street parking and property access along Ti Rakau Drive are considered to be negligible.

5.5.6.2 Side Roads

Tiraumea Drive, Roseburn Place, Edgewater Drive and Wheatley Avenue:

Construction works along the side roads of Tiraumea Drive, Roseburn Place, Edgewater Drive west, Wheatley Avenue and Edgewater Drive east will be limited to the approaches of the intersections with Ti Rakau Drive. Therefore, the construction phase will have negligible effects on on-street parking and property access along these side roads.

Marriot Road and Chevis Place:

No works are planned along Marriott Road and Chevis Place. Therefore, construction will have no temporary effects on on-street parking and property access along these side roads.

Mattson Road:

Construction works along Mattson Road will be relatively more extensive. The Mattson Road approach will be set back approximately 27m south and 36m west of its current location where it intersects Ti Rakau Drive. This will provide space for the new westbound lanes on Ti Rakau Drive.

However, the properties on the southern side of Ti Rakau Drive have been acquired, removing the need for on-street parking. Accesses to properties along Mattson Road not acquired by AT will be maintained and will interface with the new alignment of Mattson Road similar to the existing environment. Therefore, the temporary effects on on-street parking and property access along Mattson Road are considered to be negligible.

Gossamer Drive:

The Gossamer Drive approach limit line will be set back approximately 15 m from its current location and the kerbside exit lane will be extended to 100 m. NSAAT line markings are currently provided on the eastern side of the road up to the bus stop near the intersection with Riverhills Avenue. These markings will be replicated on the western side of the road. This will result in the loss of on-street parking in front of 169, 171, 173 and 175 Gossamer Drive. It is likely that these properties have sufficient off-street parking, and that on-street parking is not occupied on a regular basis. Accesses to properties along Gossamer Drive not acquired by AT will be maintained and will interface with the roadway similar to the existing environment. Therefore, the effects on on-street parking and property access along Gossamer Drive are considered to be negligible.

Freemantle Place:

The Freemantle Place approach will be set back approximately 11 m. NSAAT line markings are provided on the western side of the road for approximately 31 m from the limit line. The line markings will be reinstated upon completion and will result in the loss of one parking space in front of 3 Freemantle Place. It is expected that the remaining on-street parking space in front of the property will be sufficient. The existing line markings on the eastern side of the road will be retained. Property access along Freemantle Place will be maintained as per the existing environment. Therefore, the effects on on-street parking and property access along Freemantle Place are considered to be negligible.

5.5.6.3 Residential Properties on Southern Frontage of Ti Rakau Drive

During Phase 1 of EB3R, there will be 10 long driveways or 'strip accessways' to residential properties not being acquired by AT on the southern side of Ti Rakau Drive. As the new westbound lanes are constructed, access via Ti Rakau Drive will not be possible. Access to these properties will be provided via temporary residential access tracks along the back of the acquired properties as mitigation.

The temporary access tracks will run alongside a haul road to be used by site traffic, meaning construction and residential traffic will be separated. The tracks will be constructed with Chip Seal as the surface and in cases where the access tracks are greater than 50 m in length, these tracks will be wide enough for two-way traffic flow. The effect on each individual property is assessed below, however, overall the effects to property access are considered to be very low or negligible. As stated in **Section 4.2.2.3**, Phase 1 of EB3R is anticipated to have a duration of approximately one year and three months.

75A Ti Rakau Drive:

A temporary access point will be provided for 75A Ti Rakau Drive on the eastern side of Roseburn Place. The driveway will effectively line up with the existing access of 73 Ti Rakau Drive and will be separated from the haul road. Therefore, the effects to property access are considered to be negligible. **Figure 88** shows the location of the proposed temporary access.

Figure 88: 75A Ti Rakau Dr temporary access

83, 83A-C, 87, 89, 91, 97 and 103A Ti Rakau Drive:

A temporary access road will be provided for 83, 83A-C, 87, 89, 91 and 97 Ti Rakau Drive at the back of the acquired properties. The temporary access road will head east towards Edgewater Drive. **Figure 89** shows the location of the proposed temporary access road.

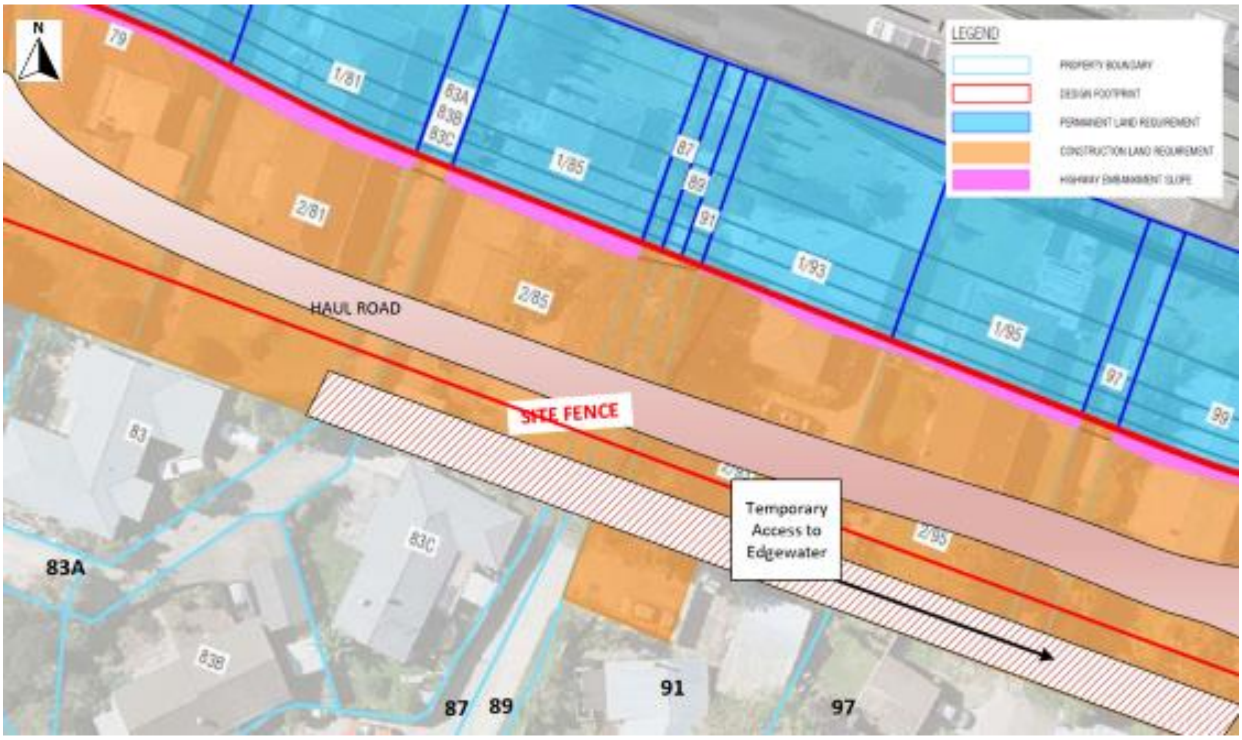


Figure 89: 83, 83A-C, 87, 89, 91 and 97 Ti Rakau Dr temporary access road

At the eastern end, the proposed temporary access road will terminate in the temporary parking area to be provided for the Edgewater Shops, located at 105 Ti Rakau Drive. A temporary access point for 103A Ti Rakau will also be provided here. **Figure 90** below shows the location of the proposed temporary accesses.

Figure 90: 103A Ti Rakau Dr temporary access

Residents will access the temporary access roads via Edgewater Drive west and the access road to the rear of the Edgewater Shops. The site haul road will also intersect the temporary parking area, but will be accessed by site traffic via Ti Rakau Drive. Therefore, the temporary effects to property access are considered to be very low.

129 Ti Rakau Drive:

A temporary access point will be provided for 129 Ti Rakau Drive on the western side of Wheatley Avenue. The driveway will intersect with Wheatley Avenue close to the existing access of 1 Wheatley Avenue and will be separated from the haul road. Therefore, the effects to property access are considered to be negligible. **Figure 91** shows the location of the proposed temporary access.

Figure 91: 129 Ti Rakau Dr temporary access

145 Ti Rakau Drive:

A temporary access point will be provided for 145 Ti Rakau Drive on the western side of Edgewater Drive east. The access road will intersect with Edgewater Drive at the existing access of 149 Ti Rakau Drive. A haul road is not proposed between Wheatley Avenue and Edgewater Drive east. Therefore, the effects to property access are considered to be negligible. **Figure 92** below shows the location of the proposed temporary access.

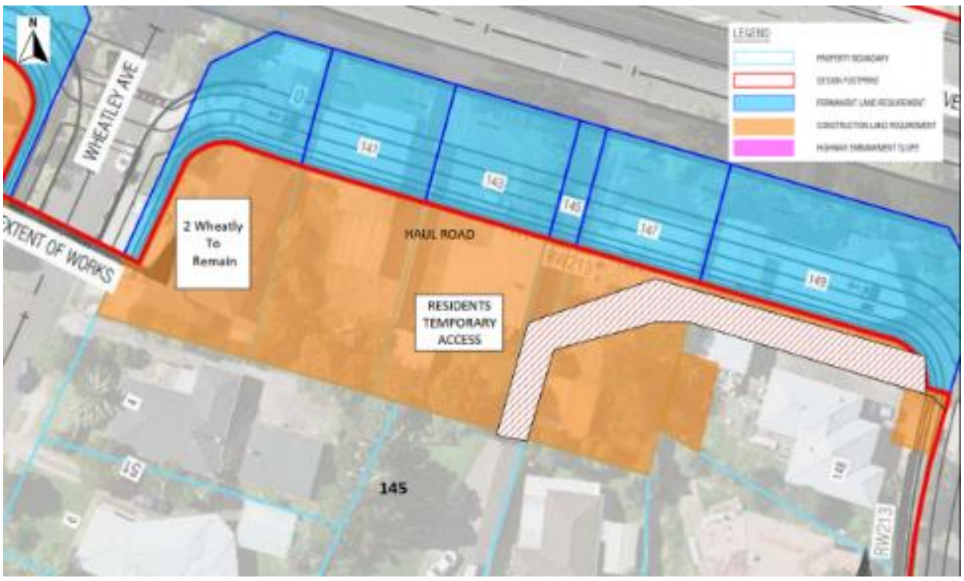


Figure 92: 145 Ti Rakau Dr temporary access

175A, 177, 183, 185 and 191 Ti Rakau Drive:

A temporary access road will be provided for 175A, 177, 183 and 185 Ti Rakau Drive at the back of the acquired properties. The temporary access road will head east towards Freemantle Place. **Figure 93** shows the location of the proposed temporary access road.

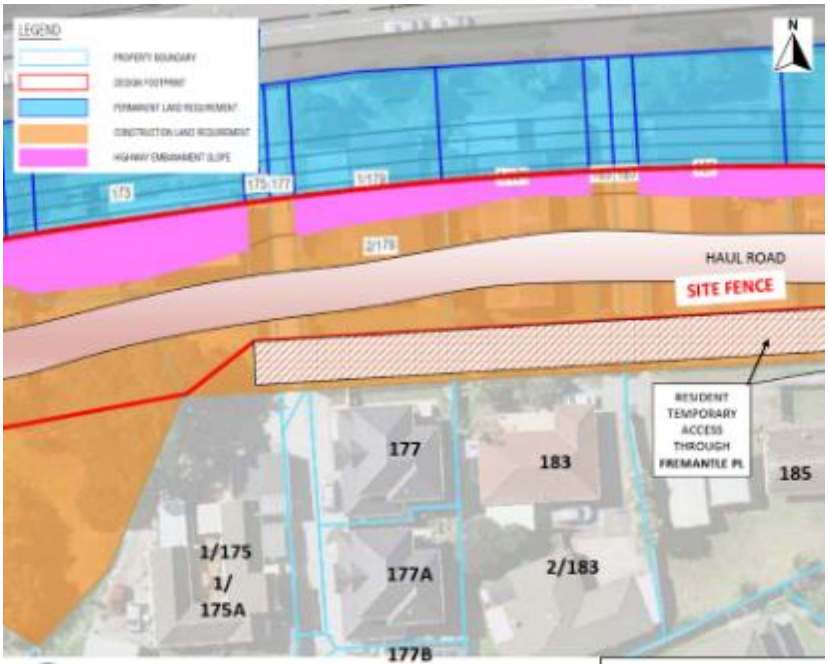


Figure 93: 175, 177, 183 and 185 Ti Rakau Dr temporary access

Near the eastern edge of 185 Ti Rakau Drive, the proposed haul road and temporary access road will curve northward, which will allow for access to also be provided to 191 Ti Rakau Drive. The temporary access road will continue eastwards and intersect Freemantle Place at the existing access to 201 Freemantle Place. Therefore, the effects to property access are considered to be negligible. **Figure 94** shows the location of the proposed temporary access road.

Figure 94: 191 Ti Rakau Dr temporary access

5.5.6.4 107 and 109 Ti Rakau Drive – Edgewater Shops

The Edgewater Shops, located at 107 and 109 Ti Rakau Drive, is a block of local shops. The parking area currently provides 26 parking spaces on the northern side of the property and an additional four parking spaces on the eastern side, for a total of 30 parking spaces (see **Figure 95**). It should be noted that these parking spaces are within the road reserve.

Figure 95: Edgewater Shops parking area

During construction, the new westbound lanes on Ti Rakau Drive as well as the redesigned Edgewater Drive west approach will result in the loss of all of the parking spaces at the shops.

As stated in **Section 5.5.6.3** above, the property at 105 Ti Rakau Drive (immediately west of the Edgewater Shops) has been acquired by AT and will provide a temporary parking area for customers of the shops (see **Figure 96**).

Figure 96: Edgewater Shops temporary parking area during construction

As stated in **Section 3.7.5**, utilization of the existing carpark is not expected to exceed 60% or 18 occupied spaces during a typical weekday or weekend. The temporary carpark will provide 18 parking spaces and access to the parking area will be from Edgewater Drive west via the access road at the back of the commercial properties. Access to the refuse collection area to the rear of the property will be maintained. Temporary signage will be provided to direct customers to the temporary parking area during construction. Therefore, temporary effects to property access and parking at the Edgewater Shops are considered to be very low.

As stated in **Section 5.5.6.3**, the temporary site haul road (blue polygon) will intersect the temporary carpark, but will be accessed by site traffic from Ti Rakau Drive. The proposed temporary access roads to 83, 83A-C, 87, 89, 91, 97 Ti Rakau Drive (green polygon) and 103A Ti Rakau Drive (yellow polygon) will also intersect the temporary carpark and will be accessed via Edgewater Drive west.

5.5.6.5 32 Edgewater Drive – Edgewater College

As stated in **Section 5.3.6**, the existing school bus services operating to and from the school will experience small route changes during the proposed Edgewater Drive intersection closures (Phase 1 of EB3R between Mattson Road and Gossamer Drive). However, these school bus services will still be able to access the existing off-street bus stop similar to the existing environment. Therefore, the temporary effects to property access and parking are considered to be negligible.

5.5.6.6 207, 219 and 229 Ti Rakau Drive – Pakuranga Baptist Church

Figure 97 shows the location of the Pakuranga Counselling Centre located at 207 Ti Rakau Drive (blue outline. The figure also shows the location of the Pakuranga Chinese Baptist Church, Pakuranga Baptist Kindergarten and the Pakuranga Baptist Church located at 219 Ti Rakau Drive (yellow outline) and the Congregational Church of Samoa located at 229 Ti Rakau Drive (purple outline). Lastly, the figure also shows the areas that will be occupied temporarily for drainage works (orange polygons), and the indicative drainage works segments (red outline).

It should be noted there is no intention to occupy the building at 207 Ti Rakau Drive and no demolition is planned.

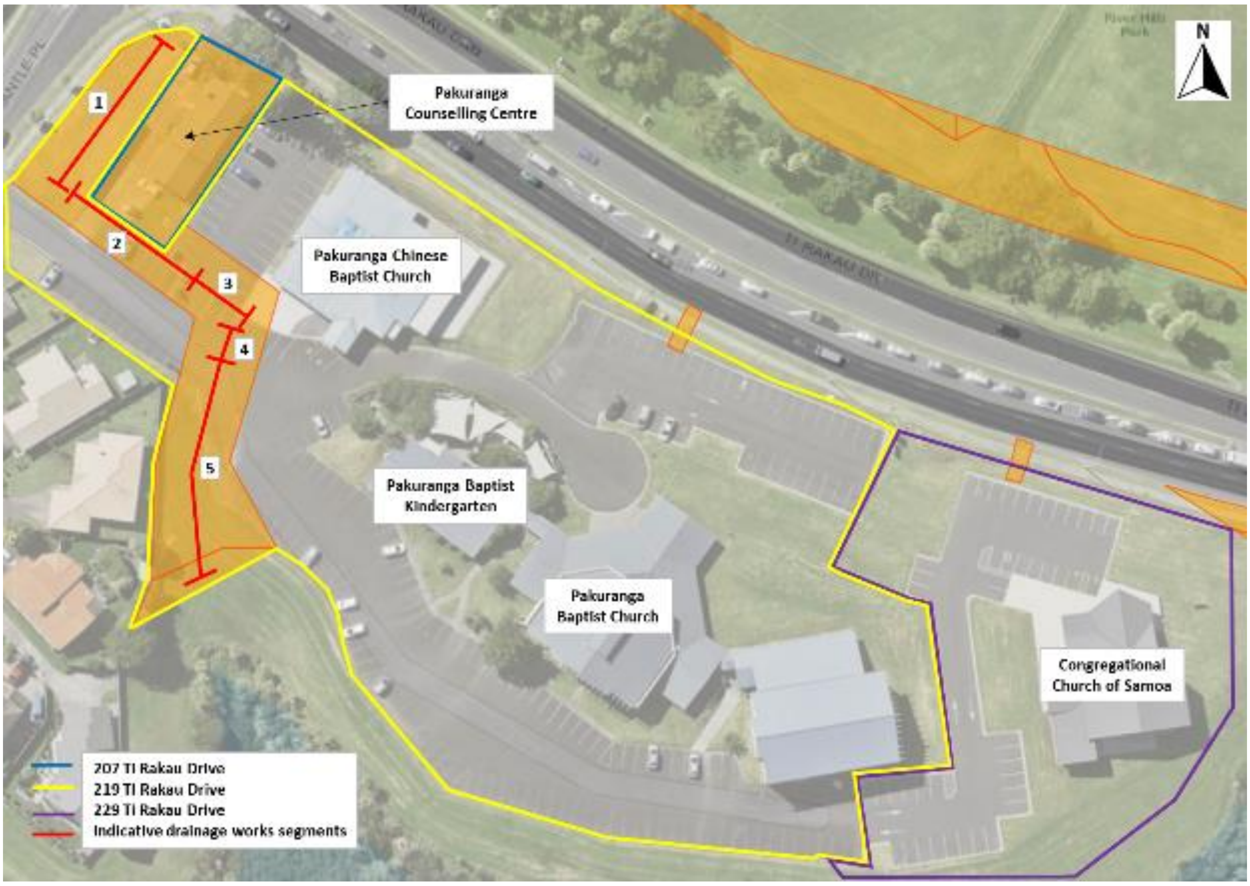


Figure 97: 207, 219 and 229 Ti Rakau Dr drainage works

Drainage works will be undertaken on these properties over a period of approximately one month. It is envisaged that the works will be completed in sections to maintain vehicle access to all the properties at all times. Furthermore, the drainage works will be undertaken during weekdays, with the possibility of works being undertaken on Saturdays as well.

At the end of each work week, the work zone will be reduced in size, while maintaining the safety of the work zone, to free up as many occupied parking spaces as possible. The Pakuranga Chinese Baptist Church currently offer one Saturday evening service, one Sunday morning service and one Sunday evening service. The Pakuranga Baptist Church currently offer one Sunday morning service.

Property Access:

In the existing environment, the Pakuranga Counselling Centre has one access off Ti Rakau Drive and one access off the private internal road to the off-street parking on the property. At least one of these accesses will be maintained at all times. Pedestrian access will be maintained at all times, and CTMPs will be employed to ensure this. Therefore, temporary effects to property access at 207 Ti Rakau Drive are considered negligible.

To avoid lateral shifts of the access and loss of parking as a result, the internal access to the Pakuranga Chinese Baptist Church will be reduced to a one-way system for a short period and will be managed through the CTMP. Appropriate liaison and advanced notice will be provided of the planned works.

Two-way access will be maintained for circulation on the internal roads of the property at 219 Ti Rakau Drive by using steel plating across trenches where necessary. Therefore, the temporary effects to property access at 207, 219 and 229 Ti Rakau Drive are considered to be very low.

Parking:

In the existing environment, the Counselling Centre at 207 Ti Rakau Drive has five parking spaces on site. The proposed drainage works will not have any effect on these parking spaces.

In the existing environment, 219 Ti Rakau Drive has a total of 220 parking spaces on site. The proposed drainage works in front of the Pakuranga Chinese Baptist Church are expected to affect 19 of these parking spaces. However, as stated above, the planned works will be staggered and is not expected to result in the loss of more than 10 parking spaces at any one time. Each segment of works will require roughly one week to complete.

To maintain two-way circulation on the internal roads, parking spaces will be removed temporarily. The planned works will result in the temporary loss of 15 parking spaces on the southern side of 219 Ti Rakau Drive during the work week. However, as stated above, the work zone size will be reduced at the end of the work week to free up as many parking spaces as possible. Therefore, it is expected that the temporary effects on parking will be very low.

5.5.6.7 168R Gossamer Drive – River Hills Park

A parcel of land along the southern boundary of 168R Ti Rakau Drive River Hills Park has been acquired by AT to allow for the eastbound Gossamer Drive bus station. Discussions are ongoing with the River Hills Park as well as the Fencibles United Football Club on the rearrangement of the fields on the property as a result of the Project.

However, from a transport perspective, the Project will have no temporary effects to property access and parking on-site.

5.5.7 Summary of Temporary Effects to Property Access and Parking

Overall, the temporary effects during construction on property access and parking will be mitigated appropriately and are considered to be negligible or very low. Where existing vehicle access arrangements and parking provisions cannot be maintained, appropriate mitigation measures have been proposed to provide levels of access and parking commensurate with the existing environment as far as is reasonably practicable.

Engagement with property owners or operators will be undertaken during construction to communicate the planned works and duration, the potential disruption and proposed mitigation measures as well as to develop additional measures or improve upon proposed measures if required. This will be a requirement of the CTMP.

Lastly, pedestrian access to properties will be maintained at all times. This will be ensured through the CTMPs.

5.6 Effects to Safety Performance

Safety measures will be in place during construction, ensured by the CTMPs. The safety and protection of the public, traffic and construction team is paramount, and all site operations will be focused on zero harm to all involved, associated and traveling through the project areas. This will be achieved through the following:

- Traffic management that separates the public / traffic operations as well as managing and maintaining public and traffic flow entering and exiting the construction operations within the project areas.

- Active communications with the local community and public travelling through the construction work zones to ensure they will be regularly updated on temporary traffic management operations.

- Before each work zone is ready to be opened following construction, an independent safety audit will be completed, and public notifications of the opening and new layouts will be made available.

5.7 Construction Traffic Management Plan

Construction Traffic Management Plans (CTMPs) will be employed for both EB2 and EB3R. The purpose of the CTMPs will be to avoid, remedy or mitigate the adverse effects of construction of the Project on transport, parking and property access so far as is reasonably practicable. The CTMPs will be developed in accordance with the conditions of the Notice of Requirement (NoR) / resource consent associated with the Project and will include management methods, controls and reporting to manage the potential effects on transport, parking and property access associated with the Project.

The CTMPs will be informed by practical experience with traffic management during construction and will reflect best practice through drawing on:

- The Code of Practice for Temporary Traffic Management prepared by the New Zealand Transport Agency, 4th Edition 2018 (CoPTTM)
- NZ Guide to Temporary Traffic Management (NZGTTM) which is currently in pre-consultation draft and will supersede the CoPTTM in due course

The CTMPs will set out the traffic management strategies that will be employed to manage the temporary effects during construction, including, but not limited to:

- Design standards
- Hours of operation
- Public transport
- Property access and parking
- Pedestrian and cyclists
- Emergency services
- Impacts on heavy haulage
- Impacts on taxi users
- Construction access and laydown
- Staff parking
- Site offices and satellite compounds
- Construction vehicle movements
- Transport network management
- Communicating traffic management impacts
- Temporary traffic management auditing
- Monitoring and reporting

The Project will be acting in and impacting on the network over the whole length of the construction period and over that time the construction's impacts will be monitored. The EBA will agree upon certain Key Performance Indicators (KPIs) to assess how well the EBA is performing at minimising community disruption. These KPIs will be reported to AT at an agreed interval.

The EBA will use the monitoring system SMATS iNode to track travel time through defined routes and compare these travel times to the normal travel time for that road at that time of day. This allows impacts of works to be identified without false-triggering of the system which may arise through normal congestion on busy routes. Additionally, Site Traffic Management Supervisors (STMSs) will monitor as part of their regular site checks and take action where possible to address the congestion.

Where disruption is identified as exceeding the trigger levels agreed with AT, the STMS will take action to reduce the impact of the works. This may include uplifting the closure or re-opening traffic lanes if this can be achieved quickly and safely.

Where disruption is occurring as a result of long-term Temporary Traffic Management (TTM), the Traffic Manager or Traffic Engineer will review the TTM measures and consider options to reduce the impact. The specific review process will depend on the nature and magnitude of each issue but will typically involve consultation with Auckland Transport Operations Centre (ATOC) and the Corridor Access Request (CAR) team from AT, and AT within the EBA to determine the acceptable level of disruption.

The review process may include reviewing staging of the construction activities, ability to provide further bus prioritisation at the expense of the general traffic, providing additional bus services as focus will be directed to provide prioritisation to bus service, or revised bus servicing. It is acknowledged that the retention of current public transport users is important for the busway utilisation after the project is completed.

6 Assessment of Permanent Effects upon Completion

The sections below provide an assessment of the permanent effects of EB2 and EB3R including:

- Future transport network
- General traffic effects
- Effects to bus services and facilities
- Effects to pedestrians and cyclists
- Effects to property access and parking
- Effects to safety performance

6.1 Project Benefits

In order to provide context to the benefits of the EB2 and EB3R sections of the Project and to reaffirm the benefits of the Project as a whole, the main elements of **Section 1.1.3** are reiterated here. Once delivered, the Project (EB2, 3 and 4) will provide:

- Better connections and sustainable travel options for pedestrians, cyclists, motorists, bus and train customers
- A reliable 40-minute bus and train trip between Botany Town Centre and Britomart (saving 20-minutes)
- Increase in public transport trips from 3,700 to 18,000 per day by 2028
- Increase in public transport mode share from 7% to 25% by 2028
- Reduce carbon emissions by 9,292 kg per day by 2028
- 24,000 more people with access to a rapid transit bus station within 1 km from home
- 5 km of busway between Pakuranga and Botany fully separated from other traffic
- 5 new bus stations with quality facilities
- 12 km of safe and separated walking and cycling infrastructure
- Reeves Road flyover to reduce vehicle congestion around Pakuranga Town Centre
- Encourage and support development of a more sustainable urban form and improve urban amenity
- Accommodates electric buses, a key part of AT's low-emission vehicle fleet by 2040

Although EB2 and EB3R are only two components of the Project as a whole, these sections will nevertheless provide:

- Significantly improved travel options for all modes of transport
- Increased public transport patronage and mode share through increased catchment and dedicated bus lanes
- Reduced carbon emissions
- Improved walking and cycling amenity and safety through dedicated infrastructure
- Reduced congestion, particularly around the Pakuranga Town Centre, through the new Reeves Road flyover

6.2 Future Transport Network

As stated in **Section 3.3**, a full RASF assessment was completed for the Project[30] and the section below summarises the key aspects of the future transport network and modal priority in the EB2 and EB3R project areas. Again, the RASF provides a systematic and consistent methodology for identifying the Place and Movement functions of roads and streets. In so doing, it reflects the needs and catchment of the adjoining land use as well as the movement of people, goods and services. Refer to **Figure 4** in **Section 3.3** which shows the RASF typology matrix, which is a function of Movement and Place significance.

In the future, the primary function of the Ti Rakau Drive and Pakuranga Road corridors will remain as Movement, but with more strategic functions. The Pakuranga Town Centre Masterplan promotes mixed-use retail zones along Ti Rakau Drive between Pakuranga Road and William Roberts Road. The primary function of the RRF will be Movement between Pakuranga Road and SEART. The proposed Eastern Busway bus stations will also attract more people within the area as the activities served by these bus stations will become local attractions.

Figure 98 outlines the future typology of the EB2 area.

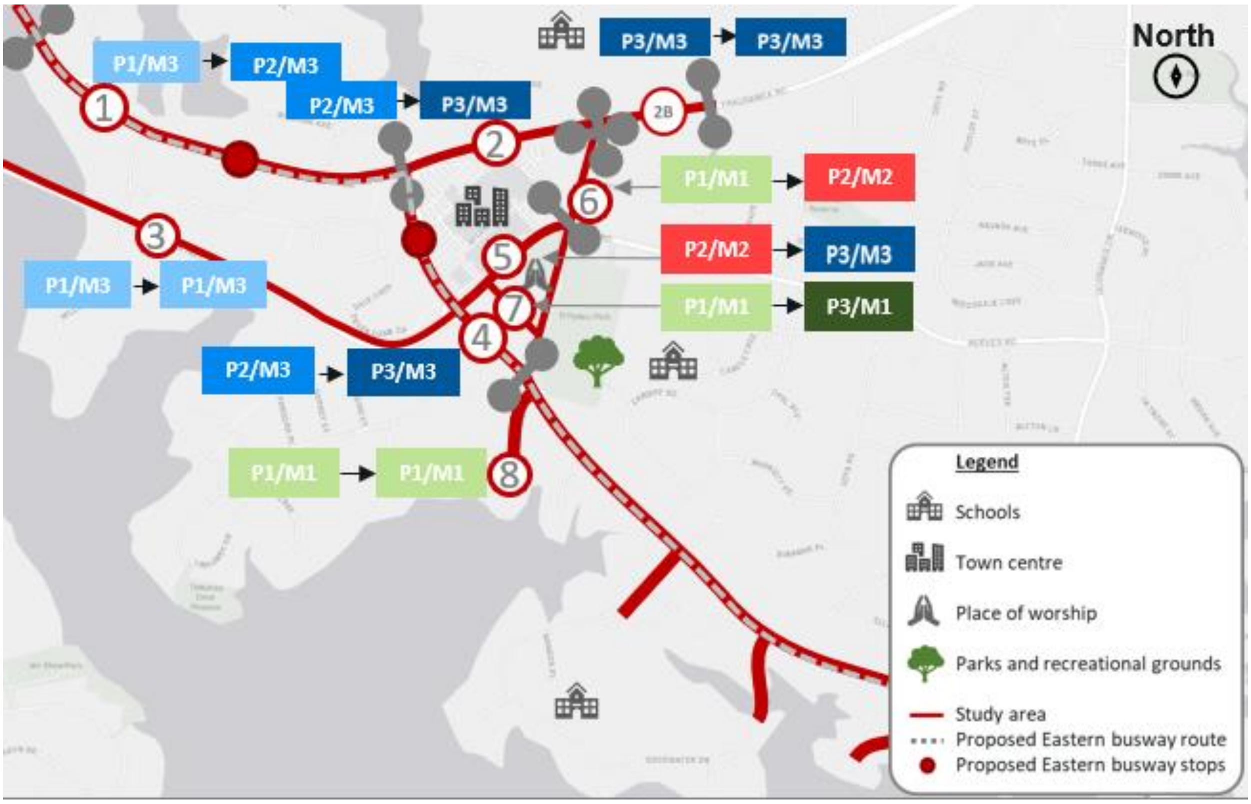


Figure 98: EB2 future typology

Figure 99 below outlines the future model priorities of the EB2 area.

[30] EB234-1-TE-RP-Z0-A2-Roads and Street Framework

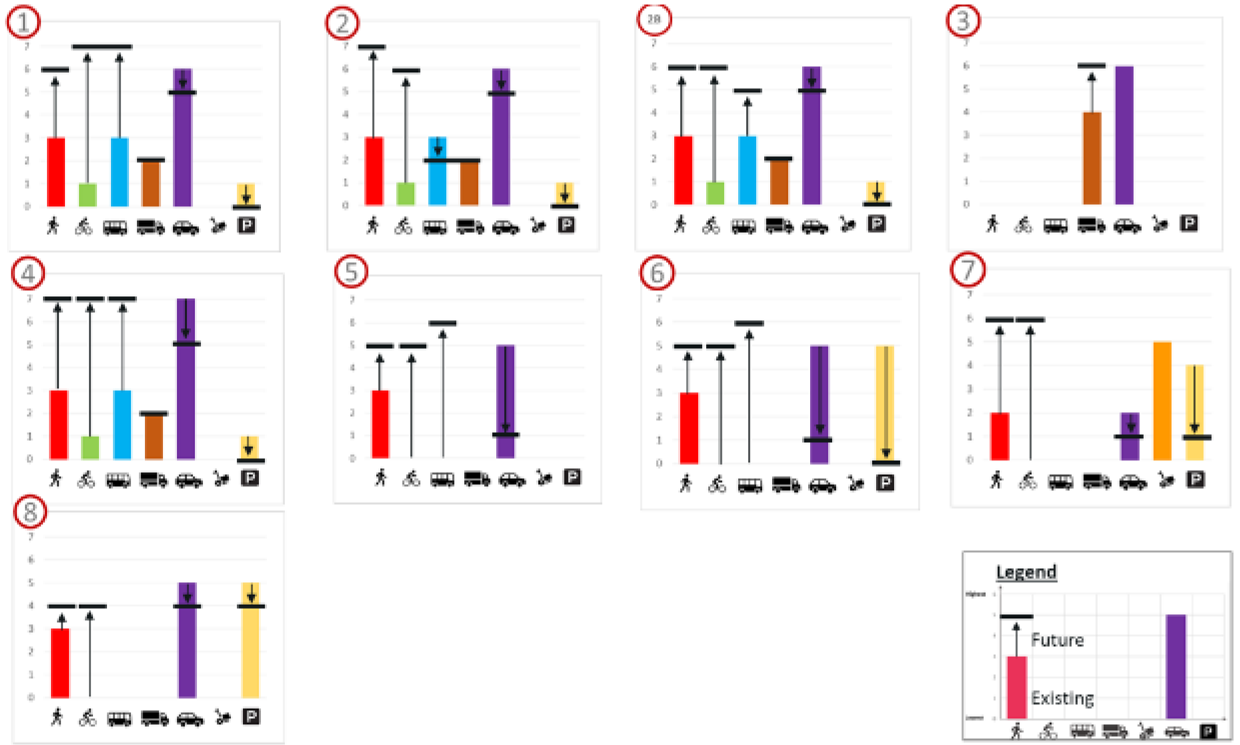


Figure 99: EB2 future modal priorities

While the corridors of Pakuranga Road and Ti Rakau Drive will carry more movements in future, Place function around the proposed bus stations in EB2 will become more important as these will attract more people. For this reason, the future Place typologies around the bus stations are marked as P2' as the stations will become more accessible with increased catchment and footfall.

The RRF will accommodate traffic from SEART and will largely prioritise active modes and public transport movements on the ground level. Reeves Road and William Roberts Road, which are currently town centre adjacent streets, will also be better integrated with the wider Town Centre. As a result, Place function on these streets will increase to 'P3'.

A general trend of improved pedestrian, cycling and bus modal priority is observed throughout the EB2 project area, as shown in **Figure 99**. As a result, the modal priority of general traffic as well as parking will decrease.

Figure 100 below outlines the future typology of the EB3R area.

Figure 100: EB3R future typology

Similar to EB2, the Place function around the proposed bus stations in EB3R are also marked as 'P2' (compared to the existing 'P1') as the stations will become more accessible, have increased catchments and higher footfall. The Movement and Place functions of the surrounding side roads will remain as per the existing environment.

Figure 101 outlines the future modal priorities of the EB3R area.

Figure 101: EB3R future modal priorities

Again, the modal priority of pedestrians, cyclists and buses will be improved throughout the EB3R project area, with a resultant decrease in modal priority of general traffic and parking.

6.3 General Traffic Effects

The sections below provide an assessment of permanent effects to general traffic upon completion of EB2 and EB3R. As stated in **Section 5.2.2**, general traffic effects refer to the movement of traffic across the road network as a whole. Similar to the assessments of the traffic environment during construction, the AIMSUN and SIDRA traffic modelling assessments were undertaken as per the methodology set out in **Section 2.4**.

6.3.1 Traffic Volumes

Table 35 outlines the expected AM and PM peak hour traffic volumes of the Do-Minimum and EB2/EB3R scenarios upon completion along key sections of the network, with a 2028 horizon year.

Table 35: Do-Minimum and EB2/EB3R (post construction) traffic volumes (2028)

Location	Direction	AM Peak		PM Peak	
		Do-Minimum [veh/h]	EB2/EB3R [veh/h]	Do-Minimum [veh/h]	EB2/EB3R [veh/h]
Pakuranga Rd (West of the RRF)[31]	Westbound	2,246	1,044	1,337	701
	Eastbound	1,548	1,005	2,725	1,326
Pakuranga Rd (East of the RRF)[32]	Westbound	2,304	2,951	1,331	1,572
	Eastbound	1,491	1,481	2,794	2,665
William Roberts Rd (Ti Rakau Dr – Reeves Rd)[33]	Northbound	35	503	42	485
	Southbound	35	249	75	224
Reeves Rd (West of William Roberts Rd)	Westbound	526	110	256	71
	Eastbound	240	86	791	221
Reeves Rd (East of William Roberts Rd)	Westbound	348	402	175	130
	Eastbound	310	414	607	665
RRF	Northbound	-	881	-	1,535
	Southbound	-	2,311	-	1,066
SEART (West of ramps)	Westbound	2,934	3,321	1,622	1,951
	Eastbound	1,387	1,786	3,135	2,905
Ti Rakau Dr (Pakuranga Rd – Reeves Rd)	Westbound	1,261	1,141	2,094	1,246
	Eastbound	1,319	691	958	778
Ti Rakau Dr (Reeves Rd – William Roberts Rd)	Westbound	2,062	1,720	1,524	1,635
	Eastbound	738	1,260	1,447	1,425
Ti Rakau Dr (William Roberts Rd – Edgewater Dr west)	Westbound	1,962	1,549	1,582	1,740
	Eastbound	740	974	1,446	1,171

[31] Relates to the section of Pakuranga Road west of William Roberts Road in the Do-Minimum scenario.
[32] The section of Pakuranga Road east of William Roberts Road in the Do-Minimum scenario.
[33] The section of William Roberts Road south of Reeves Road, prior to the completion of the extension, in the Do-Minimum scenario.

Location	Direction	AM Peak		PM Peak	
		Do-Minimum [veh/h]	EB2/EB3R [veh/h]	Do-Minimum [veh/h]	EB2/EB3R [veh/h]
Ti Rakau Dr (Edgewater Dr west – Gossamer Dr)	Westbound	1,600	1,615	1,652	1,866
	Eastbound	920	1,045	1,178	1,203
Gossamer Dr (At Ti Rakau Drive)	Northbound	359	399	697	621
	Southbound	1,224	681	499	615

A benefit of the RRF upon completion will be that less traffic is expected to travel on Pakuranga Road west, between Ti Rakau Drive and the RRF, as this is treated as the minor approach at the intersection. Instead, this traffic will travel along the RRF directly towards SEART. This trend is expected to occur in both the AM and PM peaks. Conversely, more traffic is expected to travel on Pakuranga Road east, to and from Howick, as this is treated as the major approach at the intersection.

The RRF is expected to experience somewhat cyclical traffic volumes with the majority of traffic heading southbound during the AM peak and returning northbound during the PM peak. A further benefit of the RRF is that Ti Rakau Drive in EB2, between Pakuranga Road and Reeves Road, is also expected to experience less traffic volumes in both directions during the AM and PM peaks.

The majority of the sections of Ti Rakau Drive in EB3R are predicted to experience increased traffic volumes in both directions during the AM and PM peaks. This likely due to the RRF diverting demand from Pakuranga Road directly to SEART, thus allowing more green time to be allocated at the Ti Rakau Drive / Reeves Road / SEART intersection to vehicles on Ti Rakau Drive.

As expected with the completion of the William Roberts Road extension, more traffic is predicted to travel along William Roberts Road between Ti Rakau Drive and Reeves Road in both directions during the AM and PM peaks.

Since general traffic will not be able to access Reeves Road from Ti Rakau Drive in the future and with the William Roberts Road link completed, traffic volumes are expected to be lower on Reeves Road west between William Roberts Road and Cortina Place. This section of Reeves Road will provide access to the Pakuranga Plaza. Reeves Road east, from William Roberts Road towards Pakuranga Heights, is expected to carry roughly the same traffic volumes westbound and eastbound in the future.

SEART is also expected to experience cyclical traffic volumes (similar to the existing environment), with the majority of traffic heading westbound during the AM peak and returning eastbound during the PM peak.

Gossamer Drive is expected to experience lower traffic volumes in the southbound direction during the AM peak. This is likely due to the removal of the left-turn slip lane on the northern approach at the intersection. However, Gossamer Drive is expected to experience marginally higher traffic volumes in the northbound direction in the AM peak. This is likely due to the increased length of the northbound kerbside exit lane.

6.3.2 Intersection Performance upon Completion

Intersection performance analyses of the transport network comprised of selected intersections in the EB2 and EB3R project areas was undertaken using SIDRA. Again, the analyses consisted of a comparison between the Do-Minimum and EB2/EB3R scenarios, with a 2028 horizon year, for both the AM and PM peak hours. The performance criteria for the assessment were based on the Level of Service (LOS), degree of Saturation (DOS) or v/c ratio and delay in seconds.

Permanent effects upon completion of EB2 and EB3R were assessed in a final scenario. The EB2/EB3R Final scenario simulates the completion of all EB2 works (see **Section 4.2.1**) and all EB3R works (see **Section 4.2.2**).

Traffic signal phasing diagrams per intersection are provided in **Appendix H** and lane performance summaries per intersection are provided in **Appendix I**.

Table 36 below provides a comparison of the intersection performance between the Do-Minimum and EB2/EB3R Final scenarios during the AM peak, with a 2028 horizon year.

Table 36: Intersection performance – Do-Minimum vs EB2/EB3R Final (AM peak)

<table>
<tr><th rowspan="2">Intersection</th><th colspan="3">Do-Minimum</th><th colspan="3">EB2/EB3R Final</th></tr>
<tr><th>LOS</th><th>DOS (v/c)</th><th>Delay [s]</th><th>LOS</th><th>DOS (v/c)</th><th>Delay [s]</th></tr>
<tr><td>Pakuranga Rd / Ti Rakau Dr</td><td>C</td><td>0.89</td><td>32</td><td>D</td><td>0.91</td><td>36</td></tr>
<tr><td>Pakuranga Rd / Brampton Ct</td><td>N/A</td><td>2.31</td><td>10</td><td>N/A</td><td>1.25</td><td>11</td></tr>
<tr><td>Pakuranga Rd / RRF</td><td colspan="3">Built during EB2</td><td>D</td><td>0.92</td><td>42</td></tr>
<tr><td>Reeves Rd / Aylesbury St</td><td>N/A</td><td>0.24</td><td>1</td><td>D</td><td>0.95</td><td>41</td></tr>
<tr><td>William Roberts Rd / Reeves Rd</td><td>N/A</td><td>0.69</td><td>8</td><td>E</td><td>0.91</td><td>75</td></tr>
<tr><td>William Roberts Rd / Cortina Pl</td><td colspan="3">Built during WRRE</td><td>N/A</td><td>0.39</td><td>2</td></tr>
<tr><td>Ti Rakau Dr / Aylesbury St / Palm Ave</td><td colspan="3">Built during EB2</td><td>D</td><td>0.99</td><td>55</td></tr>
<tr><td>Ti Rakau Dr/ Reeves Rd / SEART</td><td>D</td><td>0.91</td><td>54</td><td>D</td><td>0.84</td><td>40</td></tr>
<tr><td>Ti Rakau Dr / William Roberts Rd</td><td colspan="3">Built during WRRE</td><td rowspan="2">C</td><td rowspan="2">0.84</td><td rowspan="2">33</td></tr>
<tr><td>Ti Rakau Dr / Mattson Rd</td><td>B</td><td>0.78</td><td>15</td></tr>
<tr><td>Ti Rakau Dr western U-turn facility</td><td colspan="3">Built during EB3R</td><td>A</td><td>0.66</td><td>4</td></tr>
<tr><td>Edgewater 3-Stage Pedestrian Crossing</td><td colspan="3">Built during EB3R</td><td>C</td><td>0.86</td><td>23</td></tr>
<tr><td>Ti Rakau Dr / Edgewater Dr east</td><td>N/A</td><td>2.00</td><td>17</td><td>B</td><td>0.72</td><td>12</td></tr>
<tr><td>Ti Rakau Dr / Gossamer Dr</td><td>F</td><td>1.07</td><td>91</td><td>E</td><td>1.10</td><td>65</td></tr>
</table>

SIDRA analysis indicates that, overall, in the AM peak the EB2/EB3R Final scenario is expected to result in minimal adverse effects on intersection performance at the majority of intersections along the network.

Minor increases in delay are expected at the Pakuranga Road / Ti Rakau Drive intersection, however the intersection is still expected to operate at an acceptable LOS D.

Compared to the Do-Minimum scenario, similar intersection performance is expected at the Pakuranga Road / Brampton Court intersection overall during the AM peak. The high v/c ratio is governed by the right-turn out from the Pakuranga Plaza, but is still expected to be lower than the Do-Minimum scenario.

The Pakuranga Road / RRF intersection is expected to operate at an acceptable LOS D during the AM peak under the EB2/EB3R Final scenario.

The signalisation of the Reeves Road / Aylesbury Street and William Roberts Road / Reeves Road intersections is expected to result in acceptable levels of service and midblock queues blocking the bus lanes are predicted to be unlikely.

Once constructed, the following new intersections are expected to operate with spare capacity during the AM peak under the EB2/EB3R Final scenario, all with acceptable LOS and DOS:

- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads
- Ti Rakau Drive / William Roberts Road / Mattson Road crossroads
- Edgewater 3-stage pedestrian crossing
- Ti Rakau Drive western U-turn facility

Improved intersection performance is expected at the Ti Rakau Drive / Reeves Road / SEART and Ti Rakau Drive / Edgewater Drive east intersections under the EB2/EB3R Final scenario during the AM peak. The intersections are predicted to operate at an acceptable LOS D and LOS B, respectively.

Although an improvement, the Ti Rakau Drive / Gossamer Drive intersection is expected to operate near capacity. The movements operating near capacity are the southern Freemantle Place approach, one right-turn lane on the eastern Ti Rakau Drive approach and the Gossamer Drive approach. The trade-off is that all bus movements are expected to operate at LOS C and significant travel time improvements are predicted for the Botany to Pakuranga and SEART routes (see **Section 6.3.3**).

The performance of this intersection is a balance between all the competing modes in a constrained corridor. Different intersection layouts, phasing and cycle times have been investigated and assessed to balance the competing modes. The intersection DOS < 1.2 is within the TMRs for the overall intersection performance guiding the design of the Project. The only alternative to improve LOS would be to provide additional lanes.

Lastly, it should be noted that the proposed design of the Ti Rakau Drive / Gossamer Drive intersection under this assessment (EB2/EB3R only), is not identical to the proposed design of the intersection under the full Project (EB2, 3 and 4). Under the full Project, the intersection would have a more efficient geometric layout, and as a result would also have a more efficient traffic signal phasing.

Overall, the proposed design of EB2/EB3R is expected to lead to improved operations and reduced congestion for general traffic across the network, and importantly, bus movements are predicted to operate at LOS C and with spare capacity. Furthermore, despite the poor performance at some of the intersections, significant improvements in travel time are expected overall. Lastly, further improvements are expected to be achieved once the full Project (EB2, 3, and 4) has been implemented.

Table 37 below provides a comparison of the intersection performance between the Do-Minimum and EB2/EB3R Final scenarios during the PM peak, with a 2028 horizon year.

Table 37: Intersection performance – Do-Minimum vs EB2/EB3R Final (PM Peak)

Intersection	Do-Minimum			EB2/EB3R Final		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.92	53	D	0.94	43
Pakuranga Rd / Brampton Ct	N/A	1.81	9	N/A	1.98	29
Pakuranga Rd / RRF	Built during EB2			D	0.90	38
Reeves Rd / Aylesbury St	N/A	1.03	42	E	0.91	70
William Roberts Rd / Reeves Rd	N/A	1.05	26	E	0.90	53
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.39	3
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			E	0.99	70
Ti Rakau Dr/ Reeves Rd / SEART	E	0.98	56	D	0.98	51
Ti Rakau Dr / William Roberts Rd	Built during WRRE			C	0.75	32
Ti Rakau Dr / Mattson Rd	B	0.68	13			
Ti Rakau Dr western U-turn facility	Built during EB3R			A	0.80	6
Edgewater 3-Stage Pedestrian Crossing	Built during EB3R			B	0.82	17
Ti Rakau Dr / Edgewater Dr east	N/A	3.41	28	A	0.80	9
Ti Rakau Dr / Gossamer Dr	D	0.91	45	F	1.58	122

Similar to the AM peak, SIDRA analysis indicates that, overall, in the PM peak the EB2/EB3R Final scenario is expected to result in minimal adverse effects on intersection performance at the majority of intersections along the network.

Minor improvements in DOS and delay are expected at the Pakuranga Road / Ti Rakau Drive intersection, and the intersection is expected to operate at an acceptable LOS D.

Average delay at the Pakuranga Road / Brampton Court intersection is expected to increase due to the increased demand on the right-turn out from the Pakuranga Plaza. However, on average, the intersection is still expected to operate with an acceptable level of delay and all other access points to the Plaza are expected to have spare capacity should these vehicles wish to divert elsewhere.

Once constructed, the following new intersections are expected to operate with spare capacity during the PM peak under the EB2/EB3R Final Scenario, all with acceptable LOS and DOS:

- Pakuranga Road / RRF
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads
- Ti Rakau Drive / William Roberts Road / Mattson Road crossroads
- Edgewater 3-stage pedestrian crossing
- Ti Rakau Drive western U-turn facility

Similar to the AM peak hour, the signalisation of the Reeves Road / Aylesbury Street and William Roberts Road / Reeves Road intersections is expected to result in acceptable levels of service during the PM peak hour. Midblock queues blocking the bus lanes are predicted to be unlikely.

Improved intersection performance is expected at the Ti Rakau Drive / Reeves Road / SEART intersection under the EB2/EB3R Final Scenario in the PM peak. The intersection is predicted to operate at an acceptable LOS D.

The signalisation of the Ti Rakau Drive / Edgewater Drive east intersection is expected to significantly improve the average delay experienced during the PM peak.

The Ti Rakau Drive / Gossamer Drive intersection is expected to operate at LOS F during the PM peak. The failing movements are the through and right-turn lanes on the western Ti Rakau Drive approach, the right-turn lanes on the eastern Ti Rakau Drive approach, the Gossamer Drive approach and the Freemantle Place approach. Similar to the AM peak hour, the trade-off is that all bus movements are expected to operate at LOS C or better and significant travel time improvements are predicted for the Pakuranga and SEART to Botany routes (see **Section 6.3.3**).

As discussed above, the performance of the intersection is a balance between all the competing modes in a constrained corridor. The only alternative to improve LOS would be to provide additional lanes. Different intersection layouts, phasing and cycle times have been investigated to balance the competing modes. Also, the proposed design of the Ti Rakau Drive / Gossamer Drive intersection under this assessment (EB2/EB3R only), is different to the proposed design of the intersection under the full Project (EB2, 3 and 4). Under the full Project, the intersection would have a more efficient geometric layout and traffic signal phasing.

Again, the proposed design of EB2/EB3R is expected to lead to overall improved operations for general traffic across the network, and importantly, bus movements are predicted to operate at LOS C and with spare capacity. Furthermore, despite the poor performance at some of the intersections, significant improvements in travel time are expected overall as a result of EB2 and EB3R, and will further improve once the full Project has been implemented.

6.3.3 General Traffic Travel Times

Route travel times were determined using the AIMSUN model, with a 2028 horizon year. The same four routes presented in **Section 5.2.3** are assessed here for permanent effects to general traffic travel times in the EB2/EB3R Final Scenario.

Table 38 provides a comparison of the route travel times between the Do-Minimum and EB2/EB3R Final scenarios, with a 2028 horizon year.

Table 38: General traffic travel times – Do-Minimum vs EB2/EB3R Final (2028)

AM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
Botany - Pakuranga	24.7	15.4	-9.3	13.9	22.5	8.5
Botany - SEART	20.9	16.0	-4.9	13.7	21.9	8.3
Howick - Pakuranga	5.3	6.2	0.9	4.7	6.3	1.6
Howick - SEART	11.6	5.7	-5.9	8.0	7.6	-0.3
PM Peak						
Route	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
Botany - Pakuranga	18.4	13.0	-5.4	24.6	18.4	-6.2
Botany - SEART	11.6	10.0	-1.6	24.5	19.7	-4.8
Howick - Pakuranga	4.7	3.9	-0.8	3.4	4.6	1.2
Howick - SEART	5.0	2.8	-2.2	7.5	8.5	1.0

During the AM peak period, westbound (citybound) movements are prioritised along the transport network upon completion of EB2 and EB3R. Along with the completion of the RRF, this is predicted to lead to significant improvements in travel times from Botany to SEART and Pakuranga as well as from Howick to SEART. The route from Howick to Pakuranga is predicted to experience a negligible increase, as it is treated as a minor movement at the Pakuranga Road / RRF intersection. The prioritisation of westbound movements is however predicted to lead to manageable increases in travel times of some of the eastbound routes. However, this is expected to improve once the remaining sections of the Project are constructed.

Similarly, in the PM peak eastbound movements are prioritised. This is predicted to lead to significant improvements in travel times from Pakuranga and SEART towards Botany. The eastbound routes from Pakuranga and SEART towards Howick are predicted to experience negligible increases in travel time. Westbound routes are predicted to experience improvements in travel time during the PM peak period upon completion of EB2 and EB3R.

6.4 Effects to Bus Services and Facilities

The sections below provide details and assessment of the permanent effects upon completion to bus services and facilities in the EB2 and EB3R project areas. **Figure 102** shows the existing bus services operating through project areas. These include the 70, 72C, 72M, 72X, 352, 711 and 712 services.

As noted above, school bus service operating in the EB2 and EB3R project areas include the following:

- S415 – Pakuranga to Sacred Heart College
- S416 – Botany Downs to Sacred Heart College
- S440 – Bucklands Beach to Sancta Maria College
- S013 – Otara to Edgewater College
- S073 – Otahuhu to Edgewater College

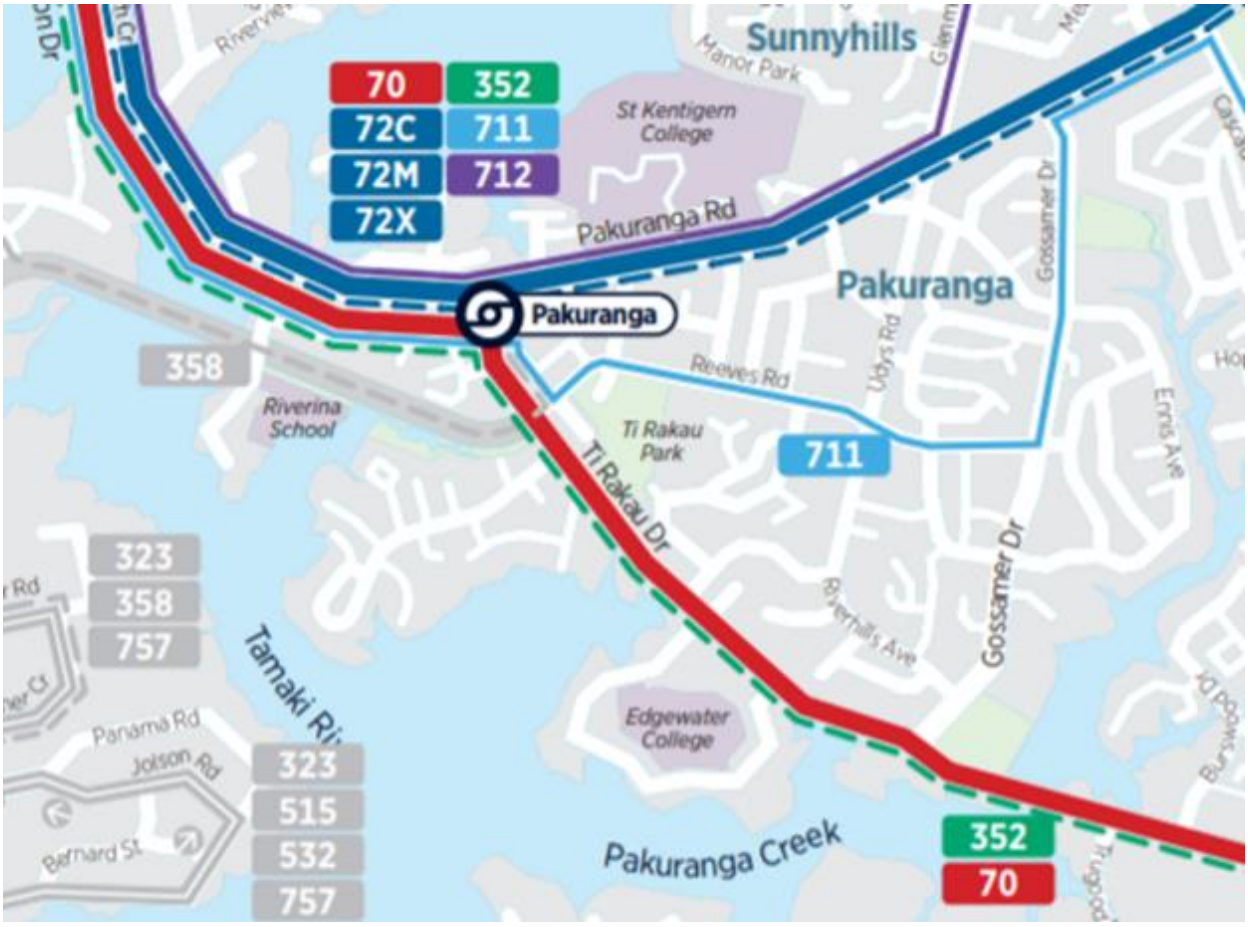


Figure 102: Existing bus services in the EB2 and EB3R project areas

6.4.1 Bus Station Overview

The sections below provide an overview of the bus stations that will be provided upon completion of EB2 and EB3R.

The benefits of the new stations will be the ability to support significantly higher public transport patronage through increased catchment and higher service frequencies through increased capacity. These benefits, in combination with improved customer accessibility, amenity and safety, will lead to an increase in mode share of public transport. A particular benefit of the Pakuranga Town Centre bus station will be the integration of all bus services in the EB2 and EB3R project areas, which will provide an improved transfer experience for passengers. Another benefit of the stations will be improved safety for buses.

6.4.1.1 Pakuranga Town Centre

A major interchange station will be provided in the Pakuranga Town Centre, on the northern side of Ti Rakau Drive, between Aylesbury Street and Reeves Road. The bus station will provide seating and sheltered cover for passengers boarding and alighting here. Furthermore, real-time information on service's estimated arrival times will be displayed on variable message boards along the platforms. Bicycle, scooter and e-bike storage will also be provided at this station. The bus station will be accessible to pedestrians and cyclists from all directions along all of the surrounding roads via separated footpaths, cycleways and signalised crossings. General vehicle access will be provided through a Kiss-and-Ride facility providing five drop-off spaces. **Figure 103** shows the layout of the proposed bus station in the Pakuranga Town Centre.

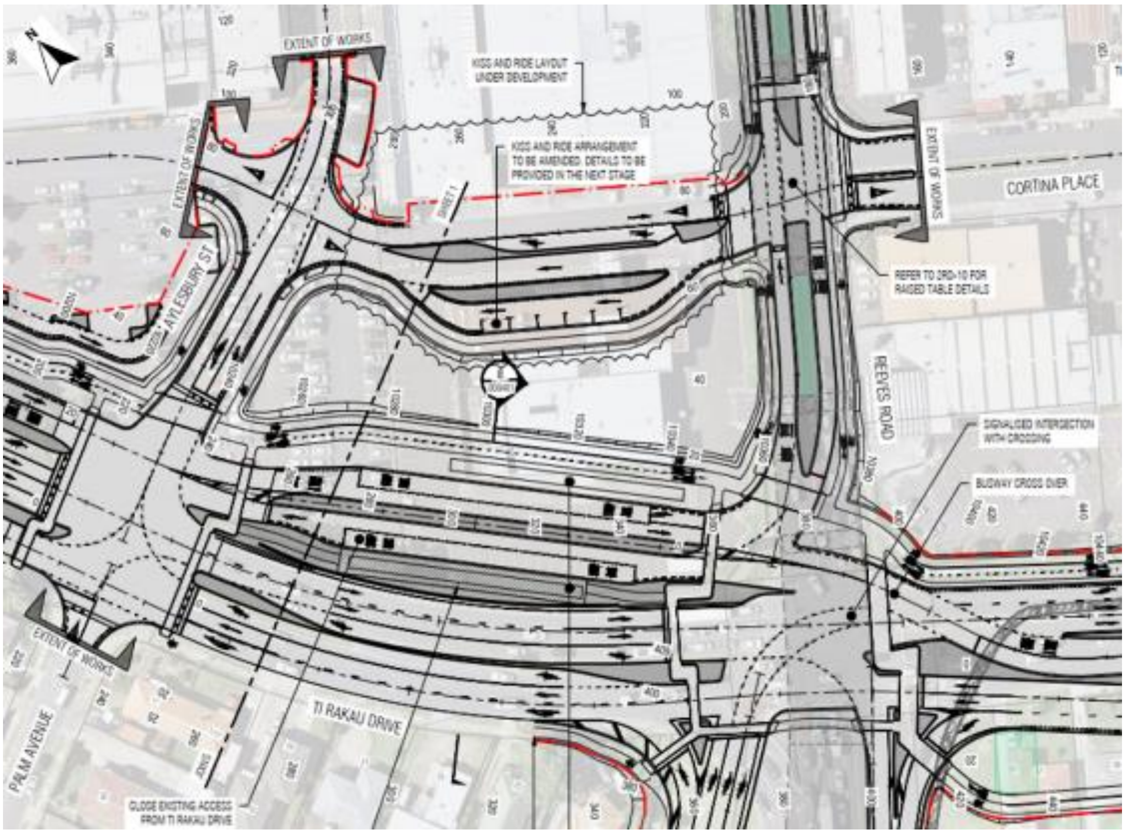


Figure 103: Proposed Pakuranga Town Centre major interchange station layout

6.4.1.2 Edgewater Drive

An intermediate station will be provided in the centre of Ti Rakau Drive, near Edgewater Drive west. As above, the bus station will provide seating and sheltered cover for passengers as well as real-time service information. Bicycle and scooter storage will also be provided. The bus station will be accessible to pedestrians and cyclists from both sides of Ti Rakau Drive via separated footpaths, cycleways and signalised crossings. **Figure 104** shows the layout of the proposed bus station at Edgewater Drive.

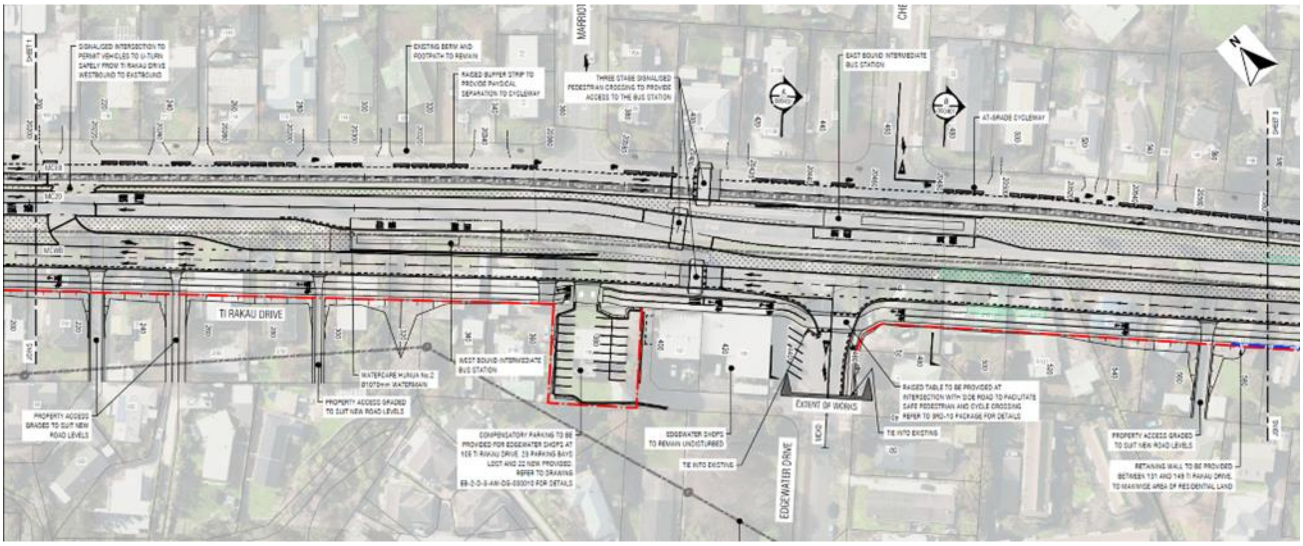


Figure 104: Proposed Edgewater Dr intermediate station layout

6.4.1.3 Gossamer Drive

An intermediate station will also be provided along Ti Rakau Drive, near Gossamer Drive. The westbound station will be provided along the centre of Ti Rakau Drive, while the eastbound station will be provided on the northern side of the Ti Rakau Drive carriageway.

With the full Project in place (EB2, 3 and 4), the bus lanes will continue on the northern side of Ti Rakau Drive and across the Pakuranga Creek towards Burswood (subject to a separate resource consent process). However, for the purposes of this ITA, the central running bus lanes will terminate at the western approach of the Ti Rakau Drive / Gossamer Drive intersection. Buses departing from the eastbound station will merge back into general traffic before the Ti Rakau Bridge. Similar to the Edgewater Drive station, this station will also provide seating, sheltered cover, real-time service information, and bicycle and scooter storage. The bus station will be accessible to pedestrians and cyclists from both sides of Ti Rakau Drive via separated footpaths, cycleways and signalised crossings.

Figure 105 below shows the layout of the proposed bus station at Gossamer Drive.

Figure 105: Proposed Gossamer Dr intermediate station layout

6.4.2 Future Patronage

Future patronage of bus services in the EB2 and EB3R project areas were determined from the MSM Auckland Regional Transport Models (EMME). These models forecast demands based on Auckland Council's Scenario I Modified Version 11.5 demographic and land use data. The outputs of these models include public transport demand and are based on a 2-hour period during the AM and PM Peaks.

Table 39 provides a comparison of bus patronage, predicted by the 2018 Base Model and the 2028 EB2/EB3R Model, at each of the proposed bus station locations during the AM peak period. It should be noted that the public transport demand shown below is a combination of both inbound and outbound services at these locations.

Table 39: AM peak period bus patronage – 2018 Base Model vs 2028 EB2/EB3R Model

Station	2018 Base Model			2028 EB2/EB3R Model		
	Boarding	Alighting	Total	Boarding	Alighting	Total
Pakuranga Town Centre	37	8	**45**	407	413	**820**
Edgewater Dr	72	0	**72**	208	60	**268**
Gossamer Dr	7	2	**9**	69	20	**89**

Table 40 provides a comparison of bus patronage, between the 2018 Base Model and the 2028 EB2/EB3R Model, during the PM peak period.

Table 40: PM peak period bus patronage – 2018 Base Model vs 2028 EB2/EB3R Model

Station	2018 Base Model			2028 EB2/EB3R Model		
	Boarding	Alighting	Total	Boarding	Alighting	Total
Pakuranga Town Centre	13	4	**17**	380	317	**697**
Edgewater Dr	50	0	**50**	69	143	**212**
Gossamer Dr	5	5	**10**	23	48	**71**

The proposed bus stations in the EB2 and EB3R project areas, as well as the proposed busway, are predicted to significantly increase public transport patronage during both the AM and PM peak periods. This trend is expected to continue throughout the day, leading to significant increases in daily public transport uptake.

As expected, the largest increase in bus patronage is predicted to occur at the major interchange station in the Pakuranga Town Centre. Nevertheless, the intermediate stations are also predicted to experience large increases in patronage, compared to the existing environment.

The benefit of increased public transport patronage is that it will lead to increased public transport mode share on the network. This will not only reduce congestion on the network, but will also reduce greenhouse gas emissions via a more sustainable movement of passengers through the network.

6.4.3 Platform Pedestrian Circulation

The level of service for customer circulation at the bus stations was determined based on the peak patronage at each location[34], with a target of LOS C (minimum 1.4 m^2 per person), for the peak 5-minute demand for boarding and peak 1-minute demand for alighting passengers. **Table 41** outlines the forecasted peak patronage by 2048, the resultant platform area required and the platform footprint of the design at each of the stations.

Table 41: Station patronage and platform area

Station	Direction	AM Peak period		PM Peak Period		Design Platform Footprint [m^2]
		Peak Patronage	Area Required [m^2]	Peak Patronage	Area Required [m^2]	
Pakuranga Town Centre	Inbound	73	102	60	84	**165**
	Outbound	41	57	45	63	
Edgewater Dr	Inbound	18	25	24	34	**105**
	Outbound	18	25	9	13	
Gossamer Dr	Inbound	18	25	24	34	**105**
	Outbound	18	25	9	13	

All station platform areas are being well provided for, with all stations requiring less area compared to provided platform footprint in the proposed design.

[34] EB234-2-TE-RP-Z0-0001_A1_Traffic Modelling and Analysis Report

6.4.4 Bus Station Loading Areas

An assessment was undertaken to determine the number of bus bays or loading areas at each of the bus stations, based on forecast patronage (EMME model) and bus numbers (provided by AT Metro) by 2048[35]. The assessment methodology to determine the number of bus bays and therefore the number of platforms required was determined using guidance from the Transit Capacity and Quality of Service Manual – Part 2 Transit Capacity (TCQSM). This included employing a given set of operating conditions and probability of acceptance of a bus entering a bus bay without delay.

Table 42 summarises the number of platforms and bus bays at each of the bus stations.

Table 42: Platform and bus bay requirements

Station	No. of Buses per Peak Hour	No. of Platforms (Inbound)	No. of Bus Bays (inbound)	No. of Platforms (Outbound)	No. of Bus Bays (Outbound)
Pakuranga Town Centre	74	1	3	1	3
Edgewater Dr	38	1	2	1	2
Gossamer Dr	38	1	2	1	2

The major interchange station in the Pakuranga Town Centre will consist of one platform per direction with three bus bays upon completion. The intermediate bus stations at Edgewater Drive and Gossamer Drive will consist of one platform per direction, each providing two bus bays upon completion, with the capability of providing a third bus bay in the future. Appropriate platforms and number of bus bays have been provided in the proposed design to cater for the predicted patronage and bus services by 2048.

6.4.5 Future Bus Services and Routes

The majority of bus services currently serving the EB2 and EB3R project areas will continue to do so by 2028, once EB2 and EB3R are operational. These include the 70, 72X, 352, 711 and 712 services. It is anticipated by AT that the 72C and the 72M services will be combined into one new 72 service. In addition, two new services will be added to the network; the 705 service between Meadowlands and Panmure, and the 706 service between Flatbush and Panmure.

The new 705 service will travel along Picton Street, Selwyn Road, Granger Road, Litten Road, Sandspit Road, Meadowland Drive, Millhouse Drive, Botany Road, along Ti Rakau Drive through the EB2 and EB3R project areas, on Pakuranga Road and will terminate at the Panmure Train Station.

The new 706 service will travel along Ormiston Road, Murphys Road, Stancombe Road, Chapel Road, along Ti Rakau Drive through the EB2 and EB3R project areas, on Pakuranga Road and will terminate at the Panmure Train Station.

The route of the 35 service will be extended northwards from Botany Town Centre, along Chapel Road, Whitford Road, Cook Street, and Picton Street to replace the 72C service along these roads. The new 72 service will cover the same route as the 72M service from Botany to Howick, but with higher

[35] EB234-2-TE-RP-Z0-0001_A1_Traffic Modelling and Analysis Report

frequencies. From Picton Street, the new 72 service will replace both the 72C and 72M services as it heads along Ridge Road and Pakuranga Road towards Panmure.

Services currently operating along Ti Rakau Drive, such as the 70 and 352 services, will continue to do so with no changes to their routes. The 711 service will experience a minor route change, specifically the 711 inbound service. The route of the 711 inbound service will in future proceed along Reeves Road towards Ti Rakau Drive and the new bus station in the Pakuranga Town Centre.

The services operating along Pakuranga Road will also experience a minor route change. The 72X, 712 and the new 72 services will turn off Pakuranga Road, at the intersection with the RRF, and onto the new bus lanes towards Reeves Road. These services will continue along Reeves Road towards Ti Rakau Drive and the new Pakuranga Town Centre bus station. **Figure 106** below shows the future bus services and routes that will be operating in the EB2 and EB3R project areas upon completion.

Figure 106: Future bus services and routes in the EB2 and EB3R project areas

In future, all bus services along Ti Rakau Drive will travel in dedicated bus lanes through the EB2 and EB3R project areas, as opposed to the general traffic lanes in the existing environment. All bus services travelling along Pakuranga Road will turn onto the new dedicated bus lanes alongside the RRF towards Reeves Road and Ti Rakau Drive. Overall, the new routes and the bus lanes are predicted to lead to significant improvements in bus travel times and patronage levels. The sections below discuss the improvements in bus service headways as well as the expected improvements in bus travel times.

6.4.6 Service Headways

Table 43 below provides a comparison of the bus service headways, between the existing environment and EB2/EB3R upon completion by 2028, during the AM, IP and PM peak periods. These include the 70, 72C, 72M, 72, 72X, 352, 705, 706, 711 and 712 services.

Table 43: Service headways – Existing Environment vs EB2/EB3R (2028)

Service Description	Direction	Existing Environment			EB2/EB3R 2028		
		AM Headway [min]	IP Headway [min]	PM Headway [min]	AM Headway [min]	IP Headway [min]	PM Headway [min]
70 – Botany to Auckland CBD	Inbound	8	10	10	5	7	7
	Outbound	10	7	7	7	7	5
72C – Botany and Howick to Panmure	Inbound	20	30	30	-	-	-
	Outbound	30	30	20	-	-	-
72M – Botany and Howick to Panmure	Inbound	-	30	30	-	-	-
	Outbound	30	30	-	-	-	-
72 – Botany and Howick to Panmure (replacement for 72C and 72M)	Inbound	-	-	-	5	12	15
	Outbound	-	-	-	15	12	5
72X – Botany and Howick to Auckland CBD	Inbound	10	-	-	10	-	-
	Outbound	-	-	10	-	-	10
352 – Manukau to Panmure	Inbound	20	20	20	12	12	12
	Outbound	20	20	20	12	12	12
705 – Meadowlands to Panmure (new route)	Inbound	-	-	-	15	-	-
	Outbound	-	-	-	-	-	15
706 – Flatbush to Panmure (new route)	Inbound	-	-	-	15	-	-
	Outbound	-	-	-	-	-	15
711 – Howick to Panmure	Inbound	20	60	60	15	30	30
	Outbound	60	60	20	30	30	15
712 – Bucklands Beach to Panmure	Inbound	23	30	30	10	20	20
	Outbound	30	30	20	20	20	10

Service headways will improve for the 70 service during all periods of the day. The benefit of this will be an increase in public transport patronage, especially during the peak periods.

Again, it is anticipated that the 72C and 72M services will be combined into one new 72 service. The new 72 service will provide improved headways compared to the services it is replacing. The 72 service headways will be 5 mins in the peak direction (AM = inbound, PM = outbound), 12 mins during the IP periods, and 15 mins in the off-peak direction.

It is expected that the service headways for the 72X service will remain the same upon completion of EB2 and EB3R. The frequencies are expected to be sufficient to service the predicted patronage by 2028 along this route.

Service headways of the 352 service will improve significantly, compared to the existing environment. It is expected that 12 min headways will be provided for this service across all of the periods.

Initially, the new 705 and 706 services are expected to run at 15 min headways in the peak directions only (AM = inbound, PM = outbound), with the capacity to expand the timetable if required in the future.

The 711 service headways will improve to 15 min in the peak directions, while service headways will be halved during the IP periods and the off-peak directions.

The 712 service headways will be halved for the peak directions, to 10 minutes, while the IP period and off-peak service headways will be improved to 20 minutes.

As above, these improved service headways will significantly increase public transport patronage and as a result lead to increased public transport mode share on the network. This will not only reduce congestion, but will also reduce greenhouse gas emissions by way of a more sustainable movement of passengers through the network.

6.4.7 Bus Travel Time

Bus route travel times were determined using the AIMSUN model, with a 2028 horizon year. The same bus routes presented in **Section 5.3.5**, with the addition of the new 72, 705 and 706 services, are assessed here for permanent effects to bus travel times in the EB2/EB3R Final Scenario. **Table 44** below provides a comparison of the bus route travel times between the Do-Minimum and EB2/EB3R Final scenarios, with a 2028 horizon year.

Table 44: Bus travel times – Do-Minimum vs EB2/EB3R Final

AM Peak						
Route Description	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	42.3	29.2	-13.0	26.9	28.4	1.5
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	20.6	-	-	16.0	-	-
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	15.8	-	-
72 – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	20.9	-	-	19.2	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	24.6	23.9		-	-	-
352 – Cryers Rd / Neales Rd to Panmure bus station	36.8	25.3	-11.5	29.1	30.5	1.4
705 – Cryers Rd / Stonedon Dr to Ellerslie Panmure Hwy Clare Pl	-	28.9	-	-	-	-
706 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	-	26.6	-	-	-	-
711 – Pakuranga Rd / Stanniland St to Panmure bus station	29.1	29.3	0.2	22.7	24.4	1.7
712 – Glenmore Rd / Meadway to Panmure bus station	22.6	25.3	2.6	16.6	20.5	4.0

PM Peak						
Route Description	Westbound			Eastbound		
	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]	Do Minimum [min]	EB2/EB3R Final [min]	Difference [min]
70 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	35.7	29.7	-6.0	38.1	32.1	-6.0
72C – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	14.6	-	-	14.8	-	-
72M – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	15.0	-	-	-	-	-
72 – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	17.3	-	-	20.6	-
72X – Pakuranga Rd / Stanniland St to Ellerslie Panmure Hwy Clare Pl	-	-	-	16.8	24.2	7.4
352 – Cryers Rd / Neales Rd to Panmure bus station	33.4	29.1	-4.3	27.9	35.5	7.6
705 – Cryers Rd / Stonedon Dr to Ellerslie Panmure Hwy Clare Pl	-	-	-	-	30.1	-
706 – Botany Town Centre bus station to Ellerslie Panmure Hwy / Clare Pl	-	-	-	-	32.3	-
711 – Pakuranga Rd / Stanniland St to Panmure bus station	23.8	25.2	1.4	24.5	32.2	7.6
712 – Glenmore Rd / Meadway to Panmure bus station	19.7	21.6	1.9	18.1	27.8	9.7

The 70 and 352 services, which travel along Ti Rakau Drive in the EB2 and EB3R project areas, are predicted to experience significant improvements in travel times during the AM peak in the westbound (inbound) direction. In the eastbound (outbound) direction, the 70 and 352 services are predicted to experience negligible increases in travel times. Both of these services will be running at higher frequencies during all periods of the day.

The new 72 route is predicted to have marginally longer travel times, in both directions during the AM peak, compared to the 72C and 72M routes it is replacing. Firstly, due to a longer route distance (+2.17km). Secondly, due to the expected increase in traffic volumes on Pakuranga Road, to the east of the RRF (see **Section 6.3.1**). However, the new 72 service will be running at higher frequencies in both directions.

The 711 and 712 routes are predicted to experience small to moderate increases in both directions during the AM peak. Again, headways for the 711 and 712 service will be significantly improved in the future.

The 70 service is predicted to experience improvements in travel times during the PM peak in both directions upon completion of EB2 and EB3R. The combination of improved travel times and higher service frequencies will lead to a faster and more reliable public transport trip between Botany and the Auckland CBD.

Similar to the AM peak, the new 72 service is predicted to have marginally longer travel times, in both directions, during the PM peak compared to the routes it is replacing. This is likely due to the longer route distance and expected increase in traffic volumes on Pakuranga Road, east of the RRF. However, the new 72 will be running at higher frequencies.

Travels times for the 72X, 711 and 712 services are predicted to increase in the outbound (eastbound) direction during the PM peak. This is likely due to the route changes of these services, particularly the additional number of intersections these services have to pass through as well as the expected increase in traffic volumes on Pakuranga Road, east of the RRF. Again, while service frequencies for the 72X are expected to remain the same, service headways for the 711 and 712 services however will be significantly improved. Furthermore, the integration off all services at the Pakuranga Town Centre station will provide for an improved transfer experience between services. Passengers will not be required to walk across the Pakuranga Plaza to transfer between services on Pakuranga Road and Ti Rakau Drive.

The 352 service is predicted to experience an increase in travel times in the outbound (eastbound) direction during the PM peak. This is likely due to the operation of the Ti Rakau Drive / Gossamer Drive intersection. As stated in **Section 6.3.2,** the proposed design of the Ti Rakau Drive / Gossamer Drive intersection under this assessment (EB2/EB3R only), is not identical to the proposed design of the intersection under the full Project (EB2, 3 and 4). Under the full Project, the intersection would have a more efficient geometric layout, and as a result would also have a more efficient traffic signal phasing. Therefore, additional travel time savings would be likely upon completion of the whole Project. Furthermore, under this assessment the 352 service turns right into Harris Road further downstream, which is predicted to be congested. Under the full Project, an improvement in travel time is expected as the 352 service would travel along the dedicated busway, along Burswood Drive and a short section of Ti Rakau Drive to turn left into Harris Road.

In line with the Project objectives, significant public transport capacity and travel time improvements are expected for bus services travelling on Ti Rakau Drive between Botany and Panmure, particularly in the peak directions of travel (westbound in the AM peak and eastbound in the PM peak). The expected travel time results do however indicate the potential need for future investment in public transport infrastructure on Pakuranga Road between the Pakuranga Town Centre and Howick.

In order to provide buses with a LOS of C or better, as per the TMRs, the following measures were included in the traffic signal design of EB2 and EB3R:

- Some form of priority is provided for buses, to balance the delays to vehicles and pedestrians
- Extending the current bus phase to enable an approaching bus to pass through the intersection
- Allowing the bus phase to interrupt once per cycle when a bus is on approach to the intersection
- Bus priority added in the form of approach and departure loops following review of traffic modelling
- Managing bus priority through SCATS using advance calls and departure loop inputs at each site
- Queue detection loops are provided on an as-needed basis only and in collaboration with AT

The above measures have been designed to adjust bus priority to suit traffic conditions and flow patterns, and to avoid blockage to busway movements and operate intersections efficiently. Therefore, the modelled average delay to buses at intersections within the project areas could potentially be reduced, further improving bus travel times.

Overall, bus travel times are predicted to improve across the network during the AM and PM peaks. The combination of improved travel times and higher service frequencies will lead to faster and more reliable public transport trips. In some cases where bus services are not expected to experience improvements in travel times, these services will still be improved in the form of the new bus stations, improved reliability and efficiency, and increased service frequencies.

6.4.8 School Bus Services

The S415 school bus service between Pakuranga and Sacred Heart College will in future also benefit from EB2. The S415 will depart from the Pakuranga Town Centre bus station, in the AM peak, and head westbound along the new Ti Rakau Drive bus lanes. At the intersection with Pakuranga Road, the S415 will join onto the EB1 bus lanes. In the afternoon, the S415 will return down Pakuranga Road, turning right onto the new Ti Rakau Drive bus lanes and terminate at the Pakuranga Town Centre bus station.

The S416 school bus service between Botany and Sacred Heart College will in future also benefit from EB2 as well as EB3R. In the AM peak, students will be able to board the S416 at the Gossamer Drive, Edgewater Drive and Pakuranga Town Centre bus stations as the service travels westbound along the new bus lanes on Ti Rakau Drive. As above, the S416 will turn left onto the EB1 Pakuranga Road bus lanes. In the afternoon, the S416 will return down the new Ti Rakau Drive bus lanes and students will be able to alight at the new EB2 and EB3R bus stations.

In the future, the S440 school bus service between Bucklands Beach and Sancta Maria College and Primary will remain on its current route and students will board and alight at the existing bus stops. The S440 will continue to proceed southbound on Gossamer Drive and turn left at the Ti Rakau Drive / Gossamer Drive intersection into the general traffic lanes and will not stop at the new Gossamer eastbound station in the AM peak. In the afternoon, the S440 will continue to turn right from Ti Rakau Drive onto Gossamer Drive from the general traffic lanes, and will not be able to stop at the Gossamer Drive westbound station.

The S013 school bus service between Otara and Edgewater College will in future continue to travel westbound along Ti Rakau Drive in the general traffic lanes during the AM peak, and will turn left into Edgewater Drive east. It will not stop on Ti Rakau Drive in the EB3R project area. In the afternoon, the S013 will experience a small change to its route. As the S013 departs from Edgewater College, the service will turn left at the Ti Rakau Drive / Edgewater Drive west intersection into the westbound general traffic lanes. The service will execute a U-turn manoeuvre at the western U-turn facility on Ti Rakau Drive and proceed as normal along the eastbound general traffic lanes. Again, the S013 will not stop along Ti Rakau Drive. The permanent effects to this school bus service are considered to be negligible.

In the future, the S073 school bus service between Otahuhu and Edgewater College will continue to turn right from SEART onto the eastbound general traffic lanes on Ti Rakau Drive, during the AM peak. The service will not be able to use the EB2 and EB3R bus lanes nor the Pakuranga Town Centre and Edgewater bus stations. The service will not stop along Ti Rakau Drive. As the Edgewater Drive west intersection is left-in left-out only in the proposed design, the S073 will experience a small change to its route. The service will proceed eastbound along Ti Rakau Drive and execute a U-turn manoeuvre at the Edgewater Drive east intersection, to be able to turn left into Edgewater Drive west. In the afternoon, the S073 will continue to turn left onto the westbound Ti Rakau Drive general traffic lanes at Edgewater Drive west and head towards SEART. Again, the service will not be able to use the new bus lanes nor the new bus stations and will not stop along Ti Rakau Drive. The permanent effects to this school bus service are considered to be negligible.

Overall, school bus services travelling in the bus lanes are expected to experience similar travel time improvements as presented in **Section 6.4.7** and services travelling in the general traffic lanes are expected to experience similar travel time improvements as presented in **Section 6.3.3**.

6.5 Effects to Pedestrians and Cyclists

The Project will provide dedicated footpaths and cycleways to improve pedestrian and cyclist amenity and safety. Further benefits of this infrastructure will be greater connectivity and accessibility not only across the network, but especially in proximity to the bus stations, resulting in increased catchment as well as the potential for mode shift to occur.

In the EB2 and EB3R project areas, a combination of bidirectional and unidirectional cycleways will be provided along Ti Rakau Drive between Pakuranga Road and Gossamer Drive. Unidirectional cycleways will also be provided on Pakuranga Road between Ti Rakau Drive and the RRF. The majority of the existing footpaths will be retained while new footpaths will be provided along sections of Ti Rakau Drive, William Roberts Road, Cortina Place and Mattson Road.

In the future, raised tables (raised pedestrian platforms) will be implemented across all priority-controlled side streets along the southern side of Ti Rakau Drive in the EB2 and EB3R project areas. These include:

- Palm Avenue and Aylesbury Street (raised intersection)
- Tiraumea Drive
- Roseburn Place
- Edgewater Drive west
- Wheatley Avenue
- Freemantle Place and Gossamer Drive (raised intersection)

Raised tables will also be implemented in the Pakuranga Town Centre area, the Reeves Road / Cortina Place intersection will be a raised intersection. **Figure 107** shows an example of a raised table in the proposed design at the Ti Rakau Drive / Edgewater west intersection.

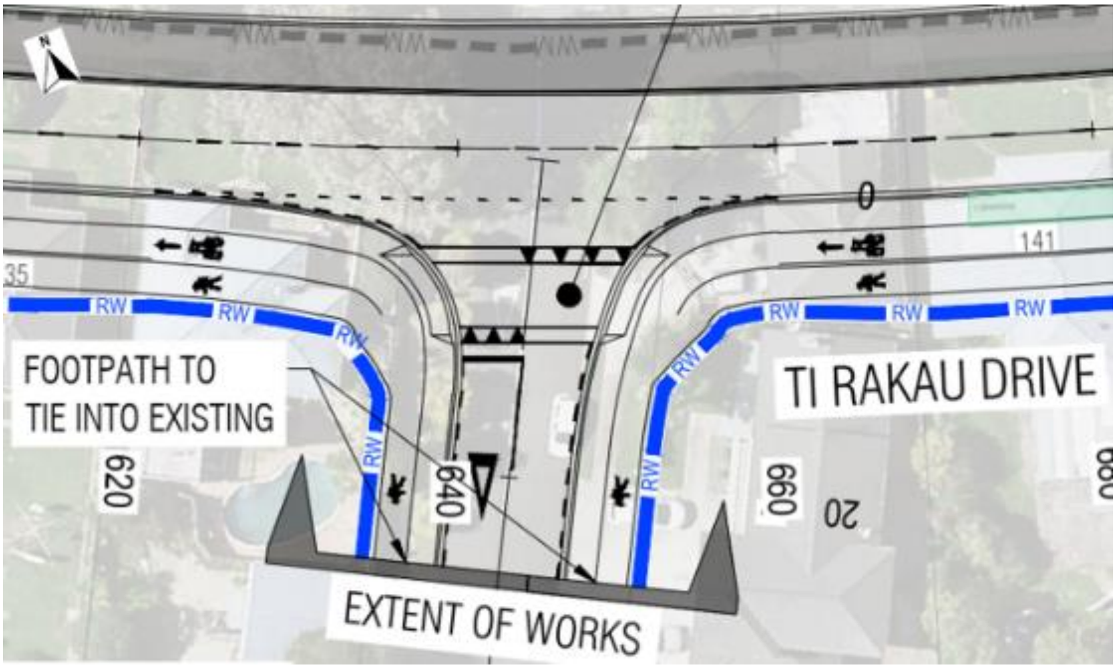


Figure 107: Example of raised tables in the proposed design

The presence of these crossing facilities will aid pedestrians and cyclists by simplifying the crossing task, increasing visibility by creating a visual cue for drivers to reduce their speed as they approach the intersections, and encourage courtesy between drivers and pedestrians. This will reduce the risk of potential conflict between vehicles and pedestrians. It should be noted that these raised tables will not be marked as formal pedestrian crossings. Compared to the existing environment, signalised pedestrian and/or cycle crossings will be provided more frequently along Ti Rakau Drive. Users will have safe and more direct travel routes, which will provide a connected network that encourages active modes. Signalised pedestrian crossings will be provided across all approaches of the following intersections:

- Pakuranga Road / Ti Rakau Drive (with a raised zebra crossing on the left-turn slip lane)
- Pakuranga Road / RRF (except northern approach)
- Reeves Road / Aylesbury Street (except eastern approach)
- Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads
- Ti Rakau Drive / Reeves Road / SEART
- William Roberts Road / Reeves Road
- Ti Rakau Drive / William Roberts Road / Mattson Road crossroads
- Ti Rakau Drive / Edgewater Drive east (except western approach)
- Ti Rakau Drive / Gossamer Drive

Additionally, a pedestrian crossing will also be provided at the Edgewater bus station. Lastly, the existing signalised pedestrian crossing on Pakuranga Road, constructed as part of EB1, will remain. The existing midblock pedestrian crossing on Reeves Road will be removed to avoid potential sightline issues. This is because the columns of the RRF will be located along the centre of Reeves Road, which may obstruct the view of pedestrians to vehicles.

Bidirectional cycleways will be provided along the northern side of Ti Rakau Drive, between Pakuranga Road and William Roberts Road. An eastbound unidirectional cycleway will be provided along the northern side of Ti Rakau Drive between William Roberts Road and Gossamer Drive, while a westbound unidirectional cycleway will be provided on the southern side of Ti Rakau Drive between Gossamer Drive and Reeves Road. Unidirectional cycleways will also be provided on both sides of Pakuranga Road between Ti Rakau Drive and the RRF. Together, these cycleways will tie into the existing cycleways provided on Pakuranga Road west of Ti Rakau Drive, as part of EB1.

Providing dedicated cycleways creates a physically separated and safe space that facilitates cycle movements through the network. This provides users with a more attractive mode of travel and supports the uptake of cycling. Furthermore, the cycleways will facilitate improved accessibility to the bus stations, increasing uptake of public transport across the network. Signalised shared pedestrian and cyclist crossings will be provided at the following intersections:

- Northern approach of Pakuranga Road / Ti Rakau Drive
- Northern approach of Ti Rakau Drive / Aylesbury Street / Pam Avenue
- Northern and Eastern approach of Ti Rakau Drive / Reeves Road / SEART
- All approaches of Ti Rakau Drive / William Roberts Road / Mattson Road
- Eastern and southern approaches of Ti Rakau Drive / Edgewater Drive east
- Northern and western approaches of Ti Rakau Drive / Gossamer Drive

Overall, pedestrian and cyclist amenity and safety will be improved. The Project will also provide greater accessibility and connectivity to public transport, increasing catchment and mode shift.

6.6 Effects to Property Access and Parking

6.6.1 EB2 – Reeves Road

The proposed design of Reeves Road in the EB2 project area does not provide any on-street parking. However, no on-street parking is provided in the existing environment. Therefore, the proposed design will have no effects on on-street parking.

6.6.1.1 3 Reeves Road (Gull Service Station)

Figure 108 shows the location and property boundary of 3 Reeves Road, as well as the Gull service station (red outline) developed on the site. Access to the property from Reeves Road will not be maintained in the proposed design as the section of Reeves Road between TI Rakau Drive and Cortina Place will be bus only. Discussions are ongoing with the owner regarding loss of direct road access onto Reeves Road.

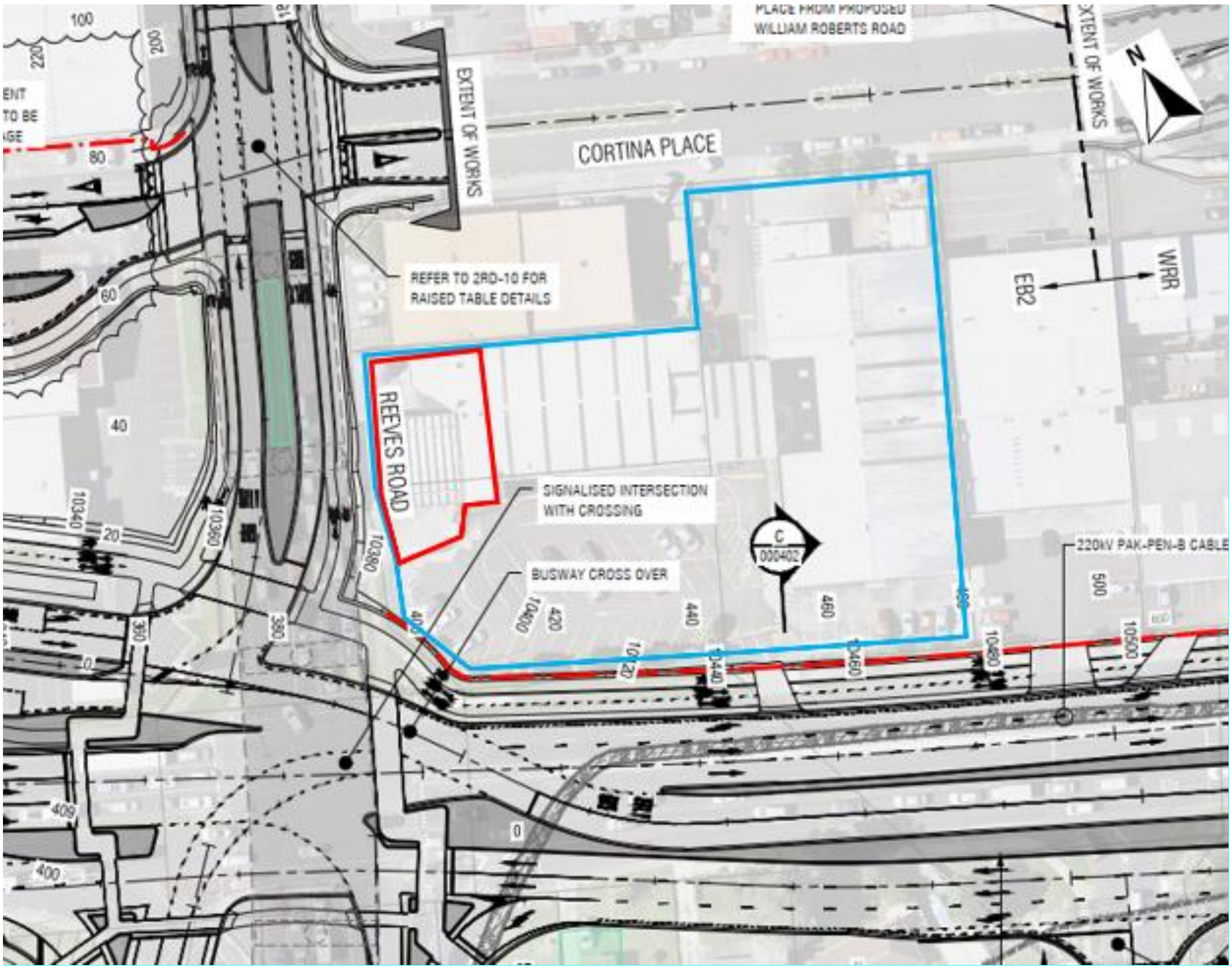


Figure 108: 3 Reeves Rd and Gull service station (red outline) upon completion

6.6.1.2 2 Cortina Place and 5 Reeves Road

As stated in **Section 5.1.1.1**, the properties at 2 Cortina Place and 5 Reeves Road have been acquired by AT and will be used as site offices during construction. Upon completion, these properties will be handed back or will be demolished for redevelopment in the future. **Figure 109** shows the location of 2 Cortina Place (yellow outline), 5 Reeves Road (blue outline) and the proposed design of the adjacent roads.

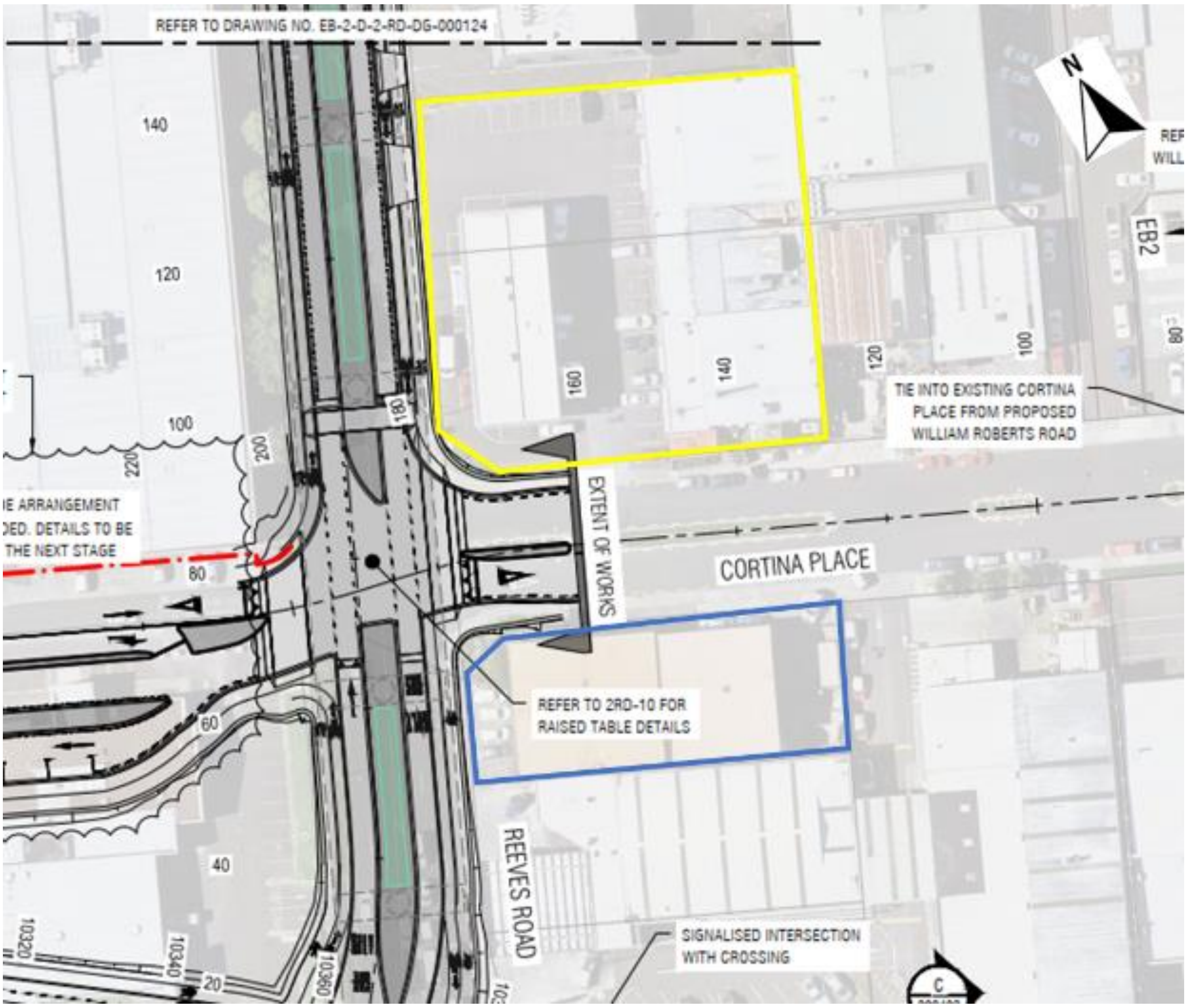


Figure 109: 2 Cortina Pl (yellow outline) and 5 Reeves Rd (blue outline) upon completion

The property at 5 Reeves Road will in future have no vehicle access from Reeves Road as the section of Reeves Road between Ti Rakau Drive and Cortina Place will be bus only. The property will however still be accessible via Cortina Place.

Upon completion, vehicle access from Reeves Road to the property at 2 Cortina Place will be reinstated. In future, the access from Reeves Road will be left-in/left-out only. However, this access will be in addition to the existing access off Cortina Place. Permanent effects to property access and parking at these properties are considered to be negligible.

6.6.1.3 11 Reeves Road (Eastside Pups Dog Grooming and Daycare)

Vehicle access from Reeves Road to the property at 11 Reeves Road will be reinstated once construction of the RRF and ground level works have been completed. The access will be left-in/left-out only due to the location of the columns of the RRF and potential sightline issues of opposing traffic. Although the access will be somewhat different compared to the existing environment, the permanent effects to property access are expected to be very low. **Figure 110** shows the location of 11 Reeves Road (blue outline) and the proposed design of Reeves Road.

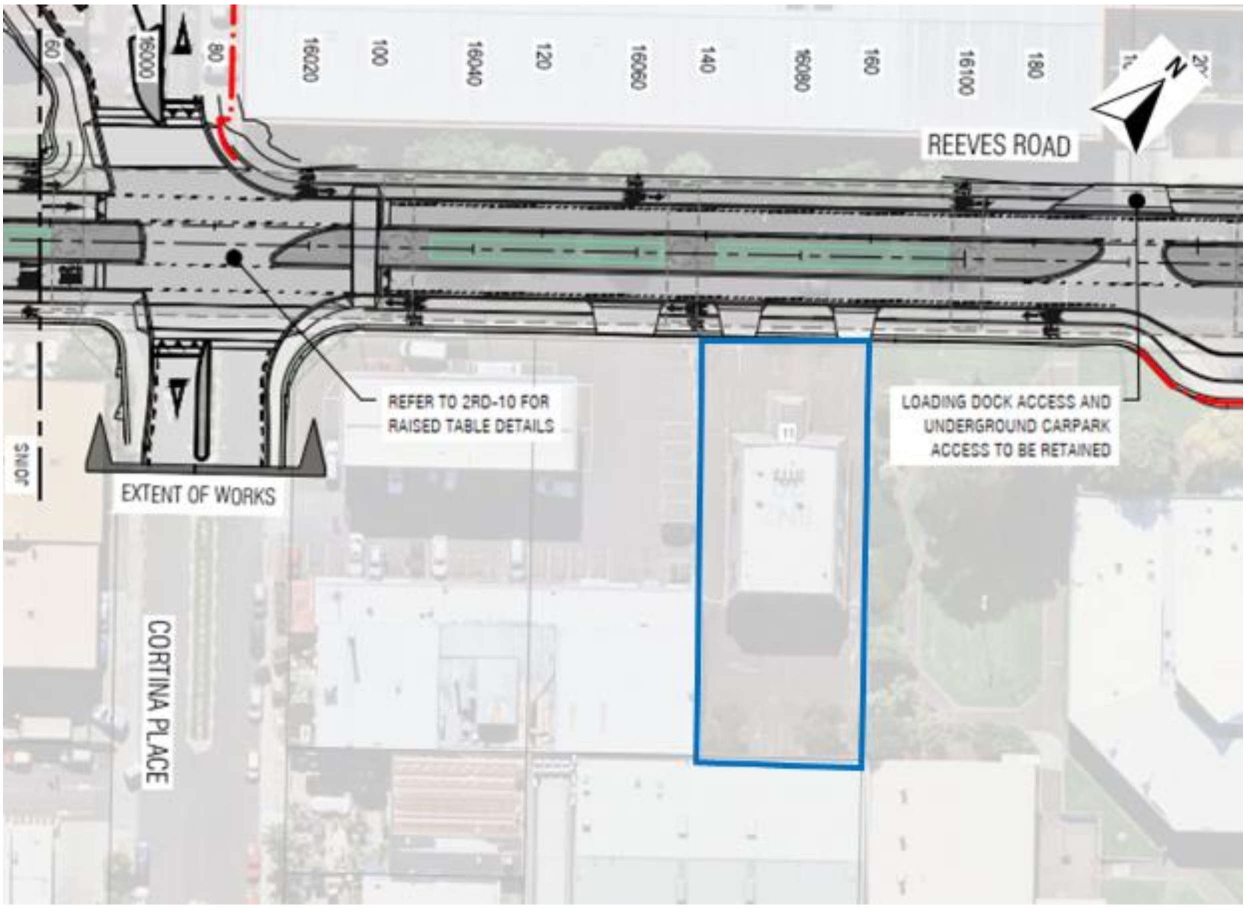


Figure 110: 11 Reeves Rd (blue outline) upon completion

6.6.1.4 13R Reeves Road (Te Tuhi)

Upon completion of the Reeves Road, access to the property at 13R Reeves Road (Pakuranga Community Centre) will be reinstated largely similar to the existing environment, and the temporary drop-off along William Roberts Road will be removed. Permanent effects to property access are expected to be negligible. **Figure 111** shows the location of the Te Tuhi development on 13R Reeves Road (blue outline) and the permanent access arrangement at the property.

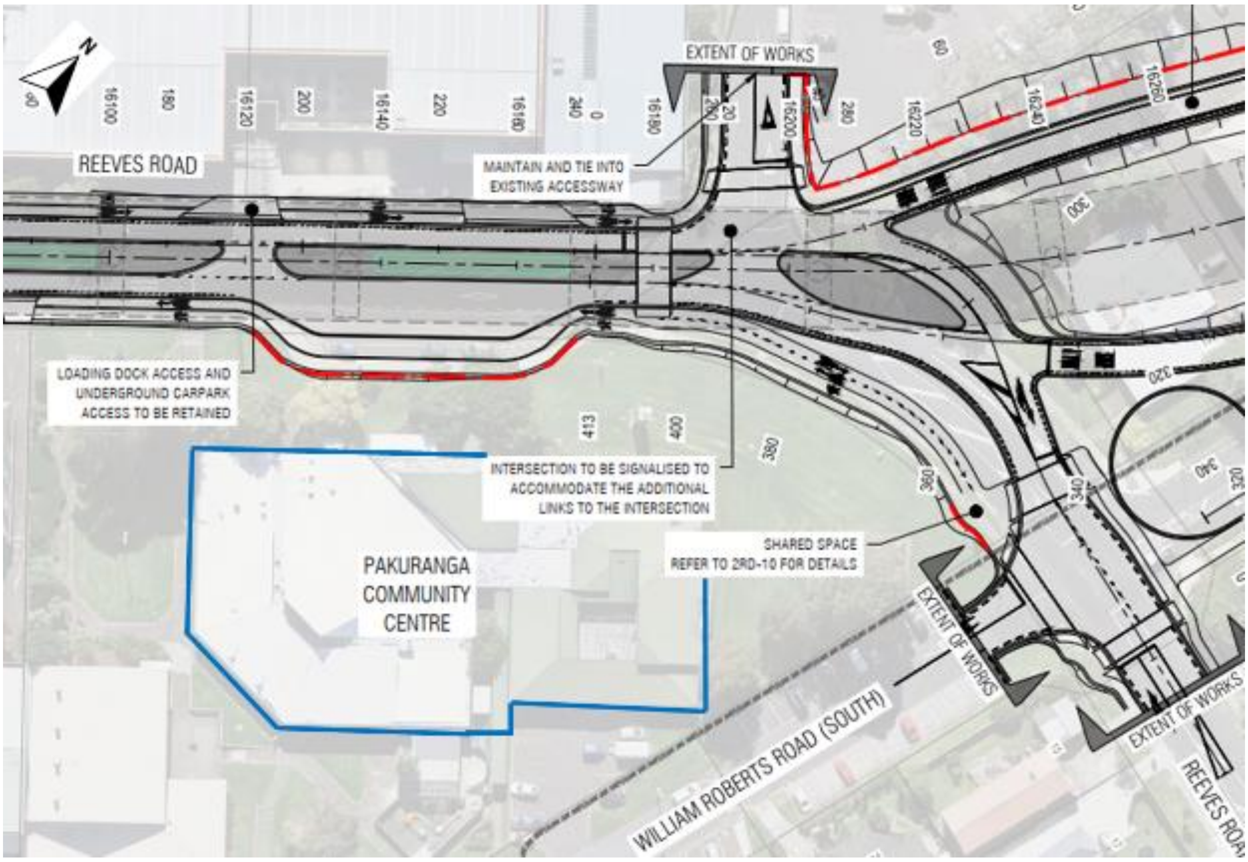


Figure 111: 13R Reeves Rd upon completion

6.6.1.5 7 Aylesbury Street and 2R Ti Rakau Drive (The Warehouse and Pakuranga Library)

Upon completion of Reeves Road, access to The Warehouse's goods access will be reinstated as per the existing environment (left-in left-out) with delivery vehicles approaching from the south via Cortina Place and exiting to the north on Reeves Road. A similar access arrangement will be provided to the Library service entrance. Access to the undercover carpark will be provided via Cortina Place to the south and Reeves Road to the north. **Figure 112** shows the permanent access arrangements at 7 Aylesbury Street (blue outline) and 2R Ti Rakau Drive (yellow outline) upon completion.

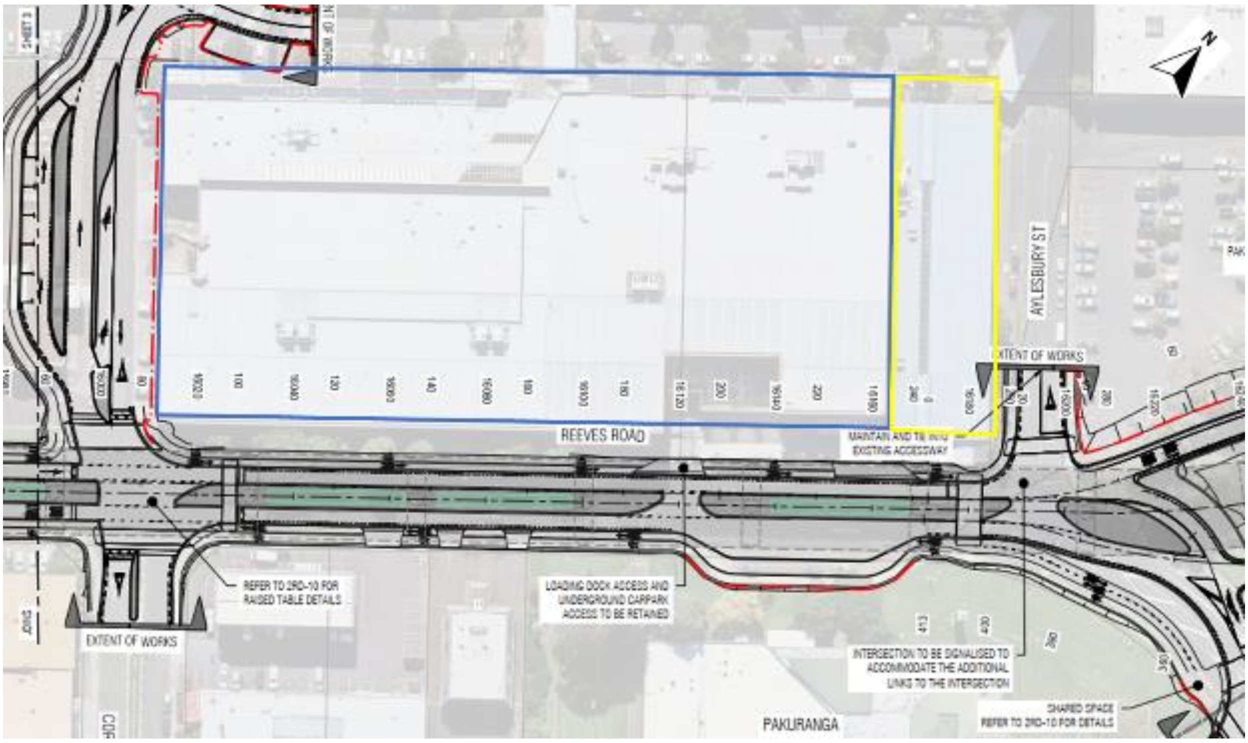


Figure 112: 7 Aylesbury St (blue outline) and 2R Ti Rakau Dr (yellow outline) upon completion

Permanent effects to property access, upon the completion of construction, are expected to be negligible as these access arrangements are largely similar to the existing environment and background traffic volumes on Reeves Road will be significantly reduced.

6.6.2 EB2 – William Roberts Road

6.6.2.1 William Roberts Road North

Upon completion, William Roberts Road north will no longer function as a through route between Reeves Road and Pakuranga Road, but rather as a local road to the surrounding residential properties. Each end of William Roberts Road north will be converted to a cul-de-sac with access off Ayr Road, and will provide ample on-street parking to the surrounding properties. Accesses to the remaining properties on the eastern side of the road will be maintained as per the existing environment. Overall, less through traffic will travel on William Roberts Road north, improving safety and the increased travel distance via Ayr Road to Lewis Road of roughly 300 m is considered to be negligible. Therefore, permanent effects to property access and parking are considered to be negligible.

6.6.2.2 William Roberts Road South

As stated in the WRRE ITA, the proposed WRRE design will result in the permanent loss of 12 parking spaces on William Roberts Road south, near the Pakuranga Leisure Centre and Ti Rakau Park.

Further north on William Roberts Road south, a total of 42 on-street parking spaces are provided at a 90˚ angle to the carriageway. To improve the safety of vehicles turning out from these parking spaces, and to avoid tracking curves passing over the road centre line, it is recommended that the angle of these parking spaces be adjusted (see **Figure 113**). The proposed design will provide 20 fewer on-street parking spaces.

Figure 113: William Roberts Rd south parking adjustments

Therefore, the combined loss of on-street parking along William Roberts Road south due to the proposed design of WRRE and EB2, is 32 parking spaces.

Of the 32 parking spaces lost along William Roberts Road south, 16 parking spaces are located within Open Space zoned land (blue outline, see **Figure 114** below) and will require mitigation which is outlined below. The remaining 16 parking spaces are located within the road reserve (red outline below). As stated in **Section 3.7.3**, the average parking utilisation on William Roberts Road is not expected to exceed 49% on weekdays and 33% on weekends based on observations of current utilisation. Therefore, the permanent effects of the loss of these 16 parking spaces are considered to be very low.

Figure 114: William Roberts Rd south zoning and on-street parking

Nevertheless, it is proposed that a new off-street parking area will be constructed in Ti Rakau Park with access off William Roberts Road. The parking area will provide 21 additional parking spaces (24 in total, however three spaces are displaced). The proposed layout is shown in **Figure 115**.

Figure 115: William Roberts Rd south parking loss mitigation

The proposed parking area will be located near the new raised pedestrian crossing on William Roberts Road, connecting the proposed parking area with the existing footpaths on the western side of the carriageway. The proposed parking area will mitigate the effects on parking in Open Spaced zoned land along William Roberts Road south.

Stakeholder engagement is ongoing with Auckland Council to develop this option as well as relocating the existing playground to provide the necessary space for the proposed carpark.

6.6.3 EB2 – Pakuranga Road

In the proposed design, the kerbside lanes along Pakuranga Road between Ti Rakau Drive and the RRF will be converted to unidirectional cycleways. As such, no on-street parking will be provided along this section of Pakuranga Road in the future. Intermittent gaps will be provided in the buffer islands to allow for drainage to catchpits, but also to allow vehicular access to all properties with access off Pakuranga Road, similar to the existing environment (see **Figure 116** below).

As noted above, Pakuranga Road is largely similar to Ti Rakau Drive in the EB3R project area, in terms of traffic volumes and operating speeds, and so it is not unreasonable to assume that Pakuranga Road experiences the same low level of parking utilisation in the existing environment during weekdays and weekends. Based on this assumption, the permanent effects on on-street parking are expected to be negligible.

The majority of the clearway sections along Pakuranga Road, east of the existing William Roberts Road intersection (see **Section 5.5.4**), will be retained upon completion of the Pakuranga Road / RRF tie-in.

6.6.3.1 141 Pakuranga Road (GAS Service Station)

In the future, access from Pakuranga Road to the property at 141 Pakuranga Road will be largely similar to the existing environment. The proposed design will provide unidirectional cycleways in the kerbside lanes on Pakuranga Road, as well as buffer islands to separate the cycleways and the general traffic running lanes.

As above, intermittent gaps will be provided in the buffer islands to allow for drainage to catchpits, but also to allow vehicular access to this property, similar to the existing environment. **Figure 116** below shows the location of 141 Pakuranga Road (blue outline) and the proposed design along Pakuranga Road.

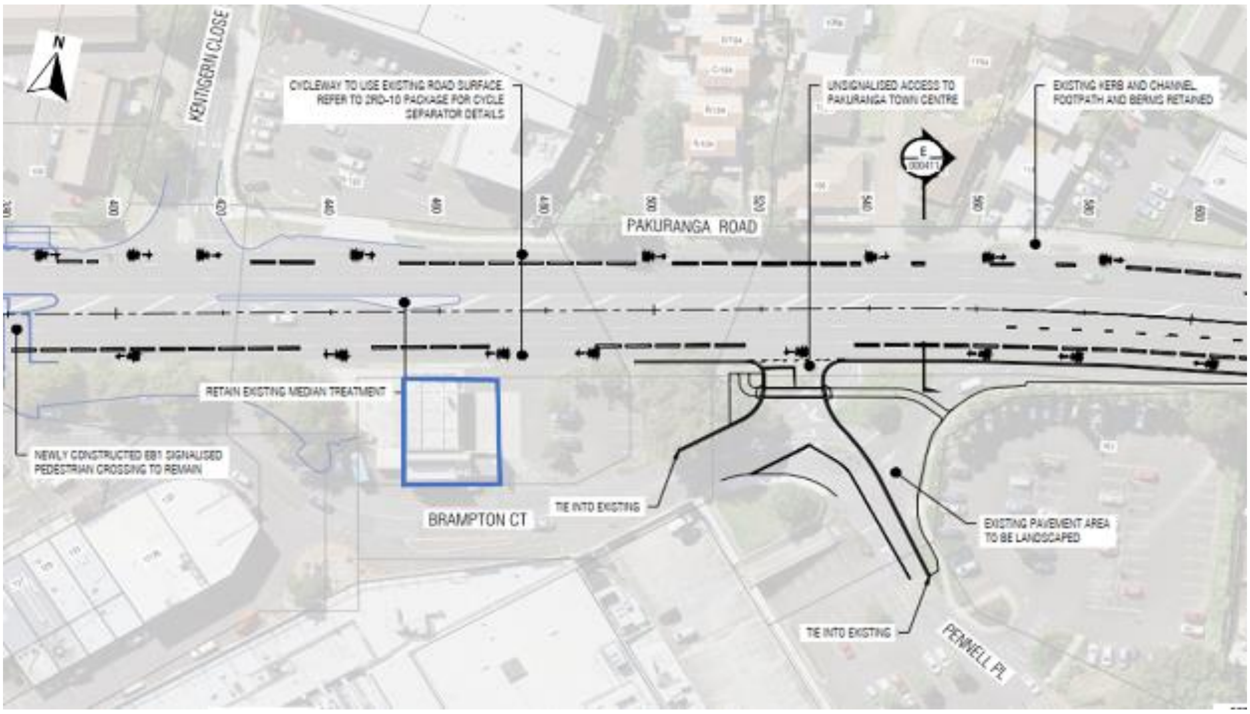


Figure 116: 141 Pakuranga Road (blue outline) upon completion

6.6.4 EB2 – Ti Rakau Drive, Side Roads and Properties

6.6.4.1 Ti Rakau Drive

The proposed design of Ti Rakau Drive in the EB2 project area, between Pakuranga Road and Reeves Road does not provide any on-street parking. However, no on-street parking is provided in the existing environment. Therefore, the proposed design will have no effects on on-street parking.

As per the existing environment, left-in/left-out access to the residential properties (3-27 Ti Rakau Drive) on the western side of the carriageway will be maintained. Upon completion, residents of these properties will no longer be able to use the existing U-turn facility on Ti Rakau Drive to head east. However, vehicles will still be able to turn right into Pakuranga Road and Brampton Court to execute a U-turn manoeuvre if required to head east along Ti Rakau Drive. Therefore, the permanent effects to these residential properties are considered to be very low.

6.6.4.2 Side Roads

Upon completion of the new Ti Rakau Drive / Aylesbury Street / Palm Avenue crossroads intersection, a raised intersection will be provided, with no effect on property access. No on-street parking is allowed on this section of Palm Avenue in the existing environment. Therefore, the final design will have no effects on on-street parking and property access along Palm Avenue.

6.6.4.3 Pakuranga Plaza

Property Access:

Upon completion of construction, the Plaza will be served by six access points in total including:

- Reeves Road / Cortina Place / Private Access Road intersection (unsignalised)
- The undercover carpark access off Reeves Road
- Reeves Road / Aylesbury Street intersection (signalised)
- Ti Rakau Drive / Aylesbury Street / Palm Avenue intersection (signalised)
- Pakuranga Road / Brampton Court intersection (unsignalised)
- The Pepler Street exit onto Pakuranga Road

The two existing Aylesbury Street accesses off Ti Rakau Drive will be combined into one crossroads intersection with Palm Avenue, the intersection will be raised and will be signalised. Furthermore, the Pakuranga Road / Brampton Court access will be realigned to provide improved access to vehicles turning right from Pakuranga Road eastbound. Although the total number of access points to the Plaza will be reduced by one compared to the existing environment, it is expected that the signalisation of two accesses will lead to an overall improvement in capacity and vehicle access to Pakuranga Plaza.

Parking:

Overall, the proposed design will result in the permanent loss of 257 of the 1,355 parking spaces at the Pakuranga Plaza. However, parking survey data showed that utilisation does not exceed 60% on an average weekday or weekend. As such, it is expected that the Plaza would still have 285 unoccupied parking spaces upon completion of construction. Therefore, the permanent effects of the proposed design on parking at the Pakuranga Plaza are considered to be negligible.

Figure 117 below shows the Pakuranga Plaza and the proposed design of the surrounding roads.

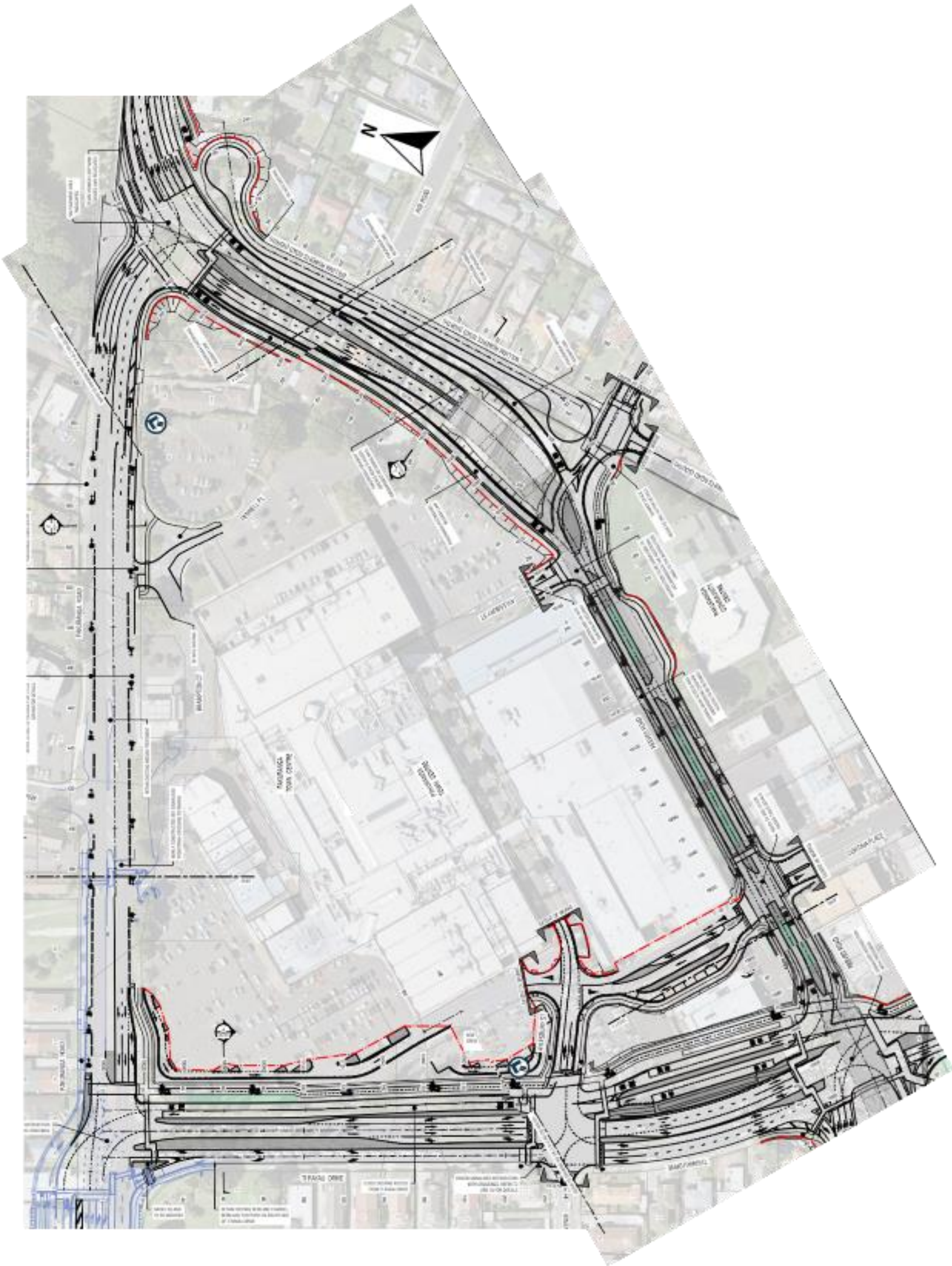


Figure 117: Pakuranga Plaza upon completion

6.6.4.4 26 Ti Rakau Drive

Upon completion of construction, 26 Ti Rakau Drive will be significantly redeveloped. A bus station will be provided between Aylesbury Street and Reeves Road, and a 'Kiss-and-Ride' facility will be provided on the private access road off Aylesbury Street that will consist of five parking spaces. Scooter and bike parking facilities will also be provided near the bus station. The remainder of 26 Ti Rakau Drive will be developed into open space, to improve amenity around the bus station (see **Figure 118**).

Figure 118: 26 Ti Rakau Dr artistic representation upon completion

6.6.5 EB3R – Ti Rakau Drive, Side Roads and Properties

6.6.5.1 Ti Rakau Drive

The proposed design of Ti Rakau Drive in the EB3R project area will provide online bus lanes along the centre of the carriageway, from Reeves Road to Gossamer Drive. In addition, unidirectional cycleways will be provided on both sides of Ti Rakau Drive. The cycleway on the northern side of the carriageway will be provided in the existing eastbound kerbside / parking lane and will be separated from the adjacent general traffic lanes by a buffer island. The cycleway on the southern side of Ti Rakau Drive will be separated from the general traffic running lanes by a grass berm. The proposed EB3R design of Ti Rakau Drive will provide no on-street parking between Reeves Road and Gossamer Drive.

However, as stated in **Section 3.7.4**, the average utilization of the existing on-street parking is poor with only 3% occupancy on weekdays and 8% on Saturdays. This is not unexpected as this high-volume road does not create an appealing location to park vehicles and is likely leading to a high perceived risk of crashes. Furthermore, the acquisition of the majority of the residential properties on the southern frontage of Ti Rakau Drive will remove the need for on-street parking along this section.

The current left-in/left-out access arrangements to the remaining properties on both sides of Ti Rakau Drive will be maintained upon completion. Access to these properties from the opposite side of Ti Rakau Drive will be facilitated by the new U-turn facility along the corridor as well as the U-turn manoeuvres provided at the Ti Rakau Drive / William Roberts Road / Mattson Road, Ti Rakau Drive / Edgewater Drive east and Ti Rakau Drive / Gossamer Drive intersections. Therefore, the permanent effects on property access and on-street parking are considered to be negligible.

6.6.5.2 Side Roads

Tiraumea Drive, Roseburn Place, Edgewater Drive and Wheatley Avenue:

Changes along the side roads of Tiraumea Drive, Roseburn Place, Edgewater Drive west, Wheatley Avenue and Edgewater Drive east as a result of the proposed design will be limited to the approaches of the intersections with Ti Rakau Drive. As such, permanent effects on on-street parking and property access along these side roads are considered to be negligible.

Marriott Road and Chevis Place:

No changes are proposed along Marriott Road and Chevis Place. Therefore, the proposed design will have no permanent effects on on-street parking and property access along these side roads.

Mattson Road:

The proposed design along Mattson Road is relatively more extensive. The Mattson Road approach will be set back approximately 27m south and 36m west of its current location where it intersects Ti Rakau Drive. This will provide space for the new westbound lanes on Ti Rakau Drive. However, the properties on the southern side of Ti Rakau Drive have been acquired, removing the need for on-street parking. Accesses to properties along Mattson Road not acquired by AT will be maintained and will interface with the new alignment of Mattson Road similar to the existing environment. Therefore, the permanent effects on on-street parking and property access along Mattson Road are considered to be negligible.

Gossamer Drive:

In the proposed design, the Gossamer Drive approach limit line will be set back approximately 15 m from its current location and the kerbside exit lane will be extended to 100 m. NSAAT line markings are currently provided on the eastern side of the road up to the bus stop near the intersection with Riverhills Avenue. These markings will be replicated on the western side of the road. This will result in the loss of on-street parking in front of 169, 171, 173 and 175 Gossamer Drive. It is likely that these properties have sufficient off-street parking, and that on-street parking is not occupied on a regular basis. Accesses to properties along Gossamer Drive not acquired by AT will be maintained and will interface with the roadway similar to the existing environment. Therefore, the permanent effects on on-street parking and property access along Gossamer Drive are considered to be negligible.

Freemantle Place:

The Freemantle Place approach will be set back approximately 11 m. NSAAT line markings are provided on the western side of the road for approximately 31 m from the limit line. The line markings will be reinstated upon completion and will result in the loss of one parking space in front of 3 Freemantle Place. The existing line markings on the eastern side of the road will be retained. Property access along Freemantle Place will be maintained as per the existing environment. Therefore, the permanent effects on on-street parking and property access along Freemantle Place are considered to be negligible.

6.6.5.3 Residential Properties on Southern Frontage of Ti Rakau Drive

Upon completion of the new westbound lanes on Ti Rakau Drive in EB3R, the temporary residential access tracks at 75A, 83, 83A-C, 87-91, 97, 103A, 129, 145, 175A, 177, 183-185 and 191 Ti Rakau Drive will be disestablished. Residents will be able to use their existing driveways off the new Ti Rakau Drive westbound lanes. The accesses will be left-in/left-out only, similar to the existing environment. Therefore, permanent effects to property access at these properties are considered to be negligible.

6.6.5.4 107 and 109 Ti Rakau Drive – Edgewater Shops

Upon completion, the temporary carpark at 105 Ti Rakau Drive will be made permanent. The carpark will provide 22 parking spaces. Access to and from the proposed carpark will be via Ti Rakau Drive, similar to the existing environment (see **Figure 119** below). Access to the refuse collection area to the rear of the property will be largely similar to the existing environment. Therefore, the effects of the proposed carpark on property access and parking are considered to be negligible.

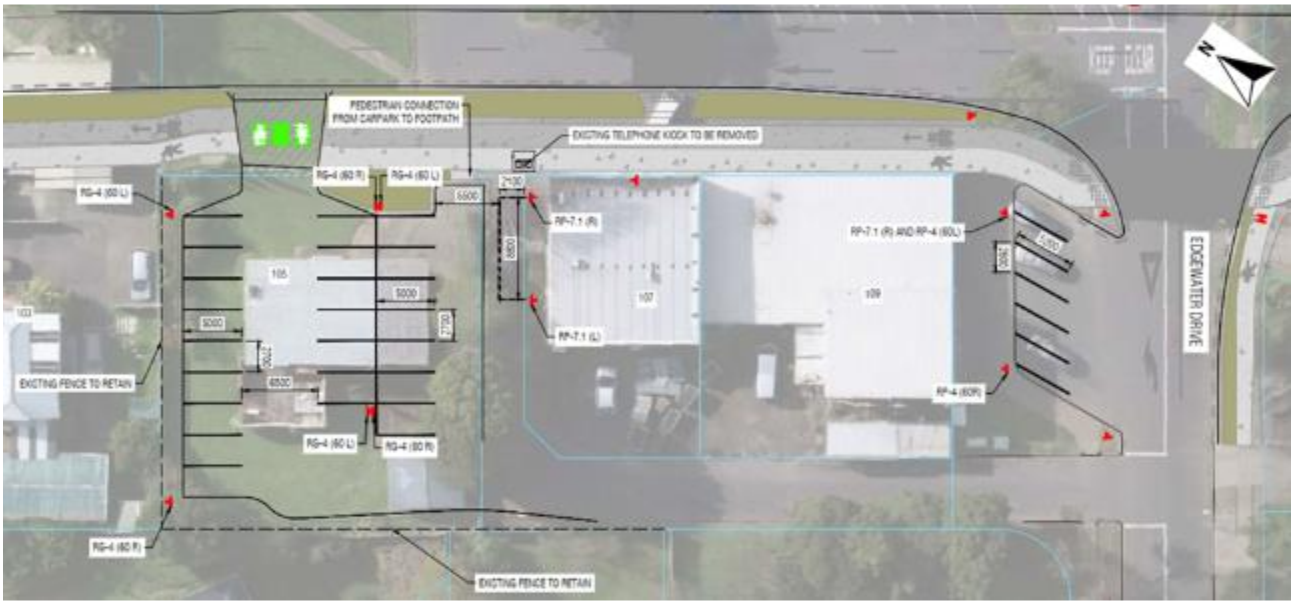


Figure 119: Edgewater Shops proposed parking area upon completion

6.6.5.5 32 Edgewater Drive – Edgewater College

In the existing environment, Edgewater College is accessed from both the Edgewater Drive west and east intersections with Ti Rakau Drive, which provide for all movements in and out. The proposed design of the Ti Rakau Drive / Edgewater Drive west and east intersections is left-in left-out only.

As stated in **Section 4.2.2.2**, a U-turn facility will be provided between Edgewater Drive west and Wheatley Avenue which will enable eastbound traffic on Ti Rakau Drive to execute a U-turn manoeuvre and turn into Edgewater Drive west. Furthermore, a U-turn manoeuvre will also be provided on the western approach at the Ti Rakau Drive / Gossamer Drive intersection. This will enable eastbound traffic on Ti Rakau Drive to execute a U-turn and turn into Edgewater Drive east.

Overall, permanent effects to property access at Edgewater College are considered to be negligible. Permanent effects to school bus services to and from Edgewater College are assessed in **Section 6.4.8**.

6.6.5.6 207, 219 and 229 Ti Rakau Drive – Pakuranga Baptist Church

Access from Ti Rakau to the property at 207 Ti Rakau Drive (Pakuranga Counselling Centre) will be maintained in the future. Therefore, permanent effects to property access are considered to be very low. **Figure 120** below shows the location of 207 Ti Rakau Drive (blue outline) and the proposed design of the adjacent roads.

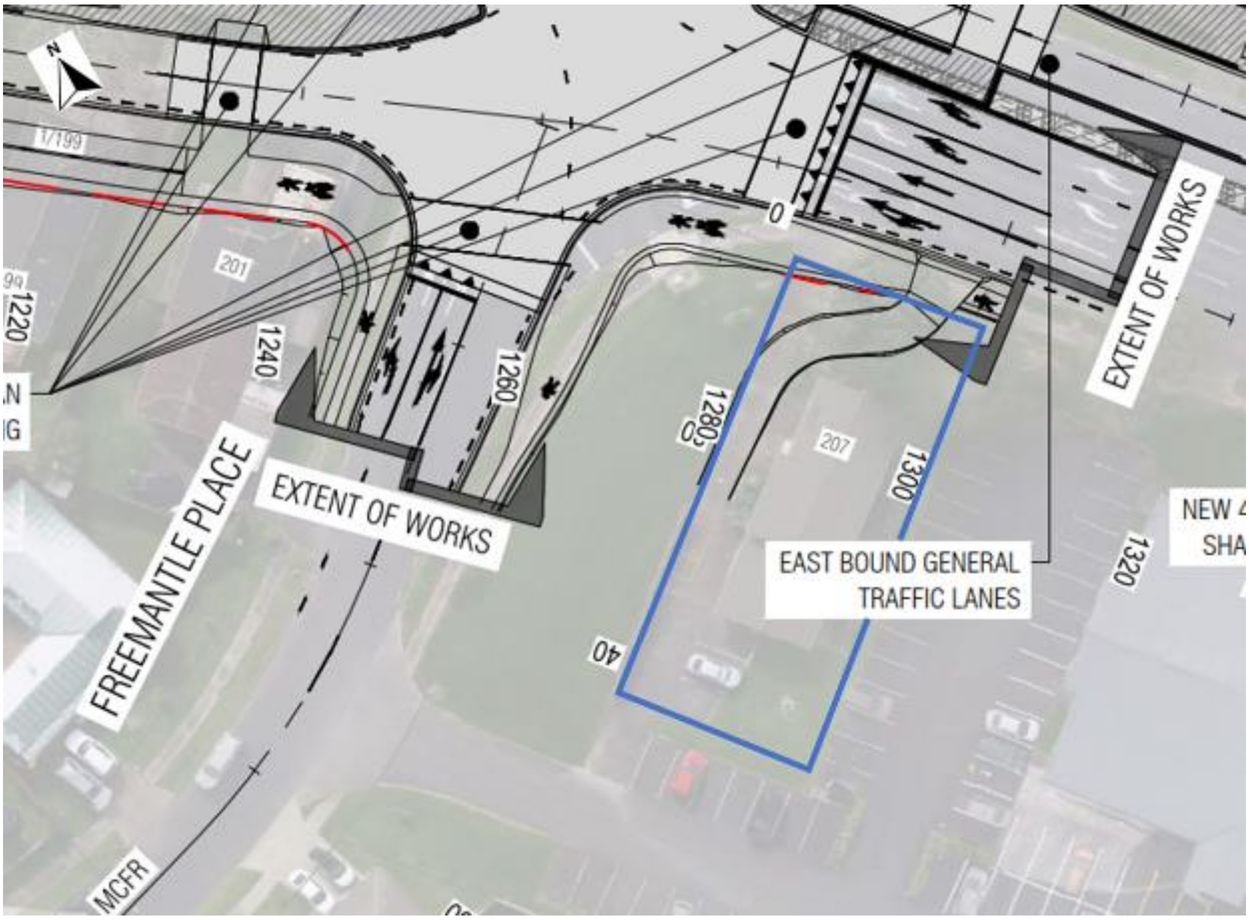


Figure 120: 207 Ti Rakau Drive (blue outline) upon completion

No changes to property access or parking are proposed at 209 and 229 Ti Rakau Drive in the proposed design. Access to these properties will be maintained as per the existing environment.

6.6.5.7 168R Gossamer Drive – River Hills Park

As stated in **Section 5.5.6.7**, a parcel of land along the southern boundary of 168R Ti Rakau Drive River Hills Park has been acquired to allow for the eastbound Gossamer Drive bus station. Discussions are ongoing with the Council as well as the Fencibles United Football Club on the rearrangement of the fields on the property as a result of the Project. **Figure 121** below shows the proposed field rearrangements at the River Hills Park.

Figure 121: 168R Gossamer Drive upon completion

However, from a transport perspective, the Project will have no permanent effects to property access and parking on-site.

6.7 Effects to Safety Performance

The sections below discuss the potential effects on safety performance in the context of EB2 and EB3R upon completion.

A Safe Systems Assessment (SSA) was undertaken of the proposed EB2 and EB3R design layouts. As stated in **Section 3.8.2**, the SSA was conducted in accordance with the Auckland Transport Safe System Assessment Guidelines which are based on the Austroads 2016, Research Report AP-R509-16, Safe System Assessment Framework. The above-mentioned report section also provides details on the types of crashes assessed as well as the SSA framework. A summary of the findings is presented below.

6.7.1 EB2

Table 45 provides an assessment summary and comparison of the SSA of the existing environment and the proposed design of EB2. Again, each crash type is scored based on exposure, likelihood and severity and a lower score corresponds with a safer system. It should be noted that Location C in EB2 indicates the location of the bus station upon completion of the Project.

Table 45: EB2 SSA – existing vs future environment

ZONE EB2 ASSESSMENT SUMMARY											
EXISTING LAYOUT	R-O-R	H-O	INT	OTHER	M/C	P1	P2	P3	C1	C2	TOTAL
A) TI RAKAU DR - MB	16	16	32	16	64	24	48	0	36	36	288
B) TI RAKAU DR - INT	16	16	32	16	48	24	0	48	36	36	272
C) TI RAKAU DR - MB	16	16	32	16	64	24	48	0	36	36	288
D) TI RAKAU DR - INT	16	16	24	16	48	18	0	24	36	27	225
E) TI RAKAU DR - MB	8	16	16	24	48	24	48	0	31.5	27	243
F) TI RAKAU DR - INT	16	16	24	24	48	18	48	36	31.5	27	289
G) TI RAKAU DR - MB	16	16	0	24	48	0	48	0	36	0	188
H) PAKURANGA RD - INT	16	16	24	16	48	12	0	24	36	36	228
I) PAKURANGA RD - MB	16	24	24	24	48	18	36	0	36	36	262
J) PAKURANGA RD - INT	16	24	32	16	64	18	0	48	36	36	290
K) REEVES RD - MB	9	13.5	15.75	13.5	36	18	36	0	31.5	36	209
L) REEVES RD - INT	15.75	13.5	18	13.5	36	21	0	48	36	36	238
M) WILLIAM ROBERTS RD - MB	NOT APPLICABLE										
N) CORTINA PL - MB	3	3	0	5.25	28	0	24	0	24	0	87
O) CORTINA PL - INT	9	13.5	18	15.75	42	21	0	48	27	36	230
P) PAKURANGA HWY - MB	24	0	0	24	32	0	0	0	0	0	80
Q) REEVES RD FLYOVER - MB	NOT APPLICABLE										
CDD LAYOUT	R-O-R	H-O	INT	OTHER	M/C	P1	P2	P3	C1	C2	TOTAL
A) TI RAKAU DR - MB	12	12	0	12	32	0	48	0	22.5	0	139
B) TI RAKAU DR - INT	0	0	0	0	36	8	0	12	30	20	106
C) TI RAKAU DR - MB	12	12	0	12	32	0	64	0	30	0	162
D) TI RAKAU DR - INT	12	12	24	12	48	24	0	48	25	30	235
E) TI RAKAU DR - MB	6	6	12	21	40	12	48	0	15	22.5	183
F) TI RAKAU DR - INT	12	6	15	18	48	12	0	24	15	15	165
G) TI RAKAU DR - MB	12	6	0	12	32	0	48	0	15	0	125
H) PAKURANGA RD - INT	12	12	18	12	48	15	0	24	15	15	171
I) PAKURANGA RD - MB	12	18	18	15	40	18	36	0	15	26.25	198
J) PAKURANGA RD - INT	18	12	12	12	32	15	0	30	36	36	203
K) REEVES RD - MB	0	0	0	0	18	6	18	0	12	12	66
L) REEVES RD - INT	0	0	0	0	15	6	0	12	15	15	63
M) WILLIAM ROBERTS RD - MB	0	0	0	0	12	7.5	15	0	24	24	83
N) CORTINA PL - MB	0	0	0	0	21	0	18	0	24	0	63
O) CORTINA PL - INT	0	0	0	0	12	8	0	16	16	16	68
P) PAKURANGA HWY - MB	16	0	0	16	16	0	0	0	0	0	48
Q) REEVES RD FLYOVER - MB	12	0	0	12	32	0	0	0	0	0	56

Apart from the product score for P2 type crashes (midblock crossings) remaining unchanged, the total score of Location A is significantly reduced. Due to the removal of one uncontrolled intersection into the Pakuranga Plaza, a reduced likelihood score for intersection and motorcycle crashes is expected. The C2 crash type is eliminated due to the removal of the unsignalised access into the Pakuranga Plaza.

Due to the new design providing a greater physical separation between carriageways and by replacing an unsignalised intersection (Palm Avenue) with traffic signals on all approaches, the total score for all general traffic type crashes for Location C has reduced.

The SSA shows that the product score for general traffic type crashes across all locations and for motorcycle crashes at most locations, are slightly reduced. This is due to a reduction in the posted speed limit from 60km/h to 50km/h, reducing the severity score.

Overall, the proposed design of EB2 is a balance between the competing modes of travel. The proposed design will provide staged crossings at various locations to reduce pedestrian delay, improve safety and discourage jaywalking. Overall, the product score of the proposed design is lower throughout EB2 compared to the existing environment.

6.7.2 EB3R

Table 46 below provides an assessment summary and comparison of the SSA of the existing environment and the proposed design of EB3R. It should be noted that Location F and H in EB3R indicate the locations of the bus stations upon completion of the Project.

Table 46: EB3R SSA – existing vs future environment

ZONE EB3R ASSESSMENT SUMMARY											
EXISTING LAYOUT	**R-O-R**	**H-O**	**INT**	**OTHER**	**M/C**	**P1**	**P2**	**P3**	**C1**	**C2**	**TOTAL**
A) ROSEBURN PL	8	16	32	24	64	24	48	0	27	36	279
B) MARRIOTT RD	8	16	32	24	64	24	48	0	27	36	279
C) EDGEWATER DR / CHEVIS PL	8	16	16	24	48	24	48	24	27	27	262
D) WHEATLY AVE	8	16	32	24	64	24	36	0	27	36	267
E) EDGEWATER DR	8	0	32	24	64	24	0	0	27	36	215
F) GOSSAMER STATION WB	8	0	0	24	32	0	0	0	27	18	109
G) GOSSAMER DR INTERSECTION	24	24	24	24	48	18	0	36	36	18	252
H) GOSSAMER STATION EB	8	16	0	8	16	0	32	0	36	0	116
CDD LAYOUT	**R-O-R**	**H-O**	**INT**	**OTHER**	**M/C**	**P1**	**P2**	**P3**	**C1**	**C2**	**TOTAL**
A) ROSEBURN PL	6	6	12	18	48	8	64	0	10	20	192
B) MARRIOTT RD	6	6	12	24	48	8	64	0	20	30	218
C) EDGEWATER DR / CHEVIS PL	4	4	8	16	24	8	20	0	16	24	124
D) WHEATLY AVE	6	6	12	18	48	8	48	0	10	20	176
E) EDGEWATER DR	6	0	12	18	48	8	0	0	10	20	122
F) GOSSAMER STATION WB	6	6	0	18	32	0	32	0	20	20	134
G) GOSSAMER DR INTERSECTION	8	10	10	12	24	8	0	24	20	24	140
H) GOSSAMER STATION EB	6	12	0	6	16	0	48	0	10	0	98

Although the total scores for Locations A, B and C are significantly reduced, the product score for P2 type crashes is slightly increased. This is due to the expected increase in pedestrian movements and slight increase in likelihood of pedestrians rushing to the bus station.

The total score of Location F is slightly increased, compared to the existing environment. Similar to the above, this is due to the expected increase in pedestrian movements and slight increase in likelihood of pedestrians rushing to the bus station.

A large improvement is observed in the product score for location G in the proposed design. This is due to a reduced product score in general traffic type crashes, including motorcycle crashes. Through the provision of a raised intersection, approach speeds of vehicles will reduce, causing severity and likelihood of general traffic type crashes to reduce.

A reduced product score is also observed for both pedestrian and cyclist crashes. Due to the reduced approach speed, the severity of pedestrian crashes is expected to reduce. The provision of a separate cycling facility will also reduce exposure and likelihood of cycling crashes.

As above, the proposed design will provide staged crossings at various locations in order to reduce pedestrian delay, improve safety and discourage jaywalking. Overall, the product score of the proposed design is lower throughout EB3R compared to the existing environment.

7 Mitigation Summary

The sections below provide a summary of the mitigation measures proposed in this ITA to mitigate the potential adverse effects of the Project both during construction and upon completion.

7.1 Mitigation Measures during Construction

The mitigation measures to be employed during construction will form part of the conditions of the CTMP.

7.1.1 Construction Support Areas

- The properties at 2 Cortina Place and 5 Reeves Road will serve as site offices for the Project. It is envisaged that, at least for the initial year of construction, site office staff will use public transport for commuter trips and will access the site offices on foot. A WTMP will be developed to reduce the number of private vehicles travelling to the worksites and to increase the accessibility of the worksites through more travel options. Following the initial year and as construction activities ramp up, a staff carpark will be provided at 26 Ti Rakau Drive.

- The operation and movement of the Gantry at the Pennell Place CSA will be under strict construction traffic management control. Advance notice and appropriate public communication of such infrequent activities will be undertaken prior to these being initiated. This will be achieved through the Construction Traffic Management Plan (CTMP).

- During the operation of the William Roberts Road north construction yard, it is proposed that the Pakuranga Road / William Roberts Road intersection will be signalised temporarily. This will improve the capacity of the right-turn movements into and out of William Roberts Road and improve the safety of turning across three lanes of through traffic.

7.1.2 Hours of Operation

- It is anticipated that some night works will be undertaken to minimise the disruption to the public, businesses and traffic. Night works will be intermittent, and will not be continuous in a single location or activity. These works will be controlled in part by the Project’s consent conditions and management plans, including the Construction Noise and Vibration Management Plan (CNVMP).

7.1.3 Construction Vehicles and Routes

- Community engagement will be undertaken to raise awareness of the increase in construction vehicles that will pass through William Roberts Road south and Reeves Road due to the increase in exposure to some vulnerable users in the area. Construction vehicle drivers will also be briefed on these properties so that additional caution is employed when driving through these areas. This will be achieved through the CTMP.

7.1.4 General Traffic

- To mitigate the potential adverse effects to travel times during all Construction Scenarios, appropriate public engagement will be undertaken, and on-road messaging will be provided. This is expected to lead to changes in travel behaviour, such as peak spreading, flexible working and alternative route selection, that could lead to decreased traffic volumes. This in turn could lead to more manageable queues, lower delays and improved travel times on the network. This will be managed through the CTMP.
- It is expected that the effects of the Pakuranga Road drainage works (Construction Scenario 1.1) can be managed by utilising the flush median as a running lane in order to maintain three lanes westbound and two lanes eastbound during these works.
- The pedestrian crossing on the eastern arm of the Ti Rakau Drive / Reeves Road / SEART intersection will require removal for the duration of Construction Scenario 1.2 to 2 to allow for more efficient traffic signal phasing, which will assist in managing the increased demand on Ti Rakau Drive.
- In the PM peak, during Construction Scenario 1.1, it is recommended that Signal Phase D at the Pakuranga Road / St Kentigern College intersection be modified to a variable phase, only to be called when necessary. This will assist in managing the Pakuranga Road eastbound demand during the drainage works.
- During Construction Scenario 1.2 to 1.4, in the PM peak, it is recommended that fixed time cycles of 150sec and offsets be implemented at the following intersections to facilitate better coordination between closely spaced intersections:
    - Pakuranga Road / William Roberts Road (temporary traffic signal) – reference
    - Pakuranga Road / St Kentigern College – offset = 13sec
- In the PM peak, during Construction Scenario 2, it is recommended that fixed time cycles of 150sec and offsets be implemented at the following intersections:
    - Ti Rakau Drive / Reeves Road / SEART – reference
    - Ti Rakau Drive / Aylesbury Street / Palm Avenue – offset = 11sec
    - Pakuranga Road / Ti Rakau Drive – offset = 28sec
- Consultation with ATOC will be undertaken to implement these traffic signal adjustment measures.
- A temporary traffic signal will be provided at the Ti Rakau Drive / Edgewater Drive east intersection during the construction of the Ti Rakau Drive / Edgewater Drive west intersection. This will ensure that signalised movements for vehicles turning into and out of Edgewater Drive are maintained.

7.1.5 Bus Services and Facilities

- During the closure of Reeves Road, the 711 outbound (eastbound) service will be diverted temporarily to the newly completed WRRE.

- Once William Roberts Road north is closed, the 711 inbound (westbound) service will also be diverted to the WRRE and will utilise bus stop (ID 6127) to pick-up/drop-off passengers at the Pakuranga Plaza.

- Opportunities will be explored during the development of the CTMP to improve bus travel times during all Construction Scenarios, such as the provision of temporary bus priority or temporary bus lanes where feasible, along with measures to manage travel demand through the provisions of the SSTMPs.

- Appropriate public communication and advance warning of the planned works will be undertaken prior to the works being initiated. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which could lead to changes in travel behaviour such as travelling outside the peak periods or using alternative routes.

7.1.6 Pedestrians and Cyclists

- Pedestrian crossings and footpaths will be maintained at all times during construction. Should this be unachievable, temporary facilities will be provided to ensure pedestrian connectivity. This will be ensured through the CTMP.

7.1.7 Property Access and Parking

- Access from Reeves Road to the Gull Service Station at 3 Reeves Road will not be maintained during the Reeves Road closure. Discussions are ongoing with the owner regarding loss of direct road access onto Reeves Road.

- During the Reeves Road closure, a temporary two-way access will be provided from Cortina Place to the Eastside Pups Dog Grooming and Daycare at 11 Reeves Road.

- Access to The Warehouse's goods entrance at 7 Aylesbury Street and the service entrance to the Pakuranga Library and Citizens Advice Bureau at 2R Ti Rakau Drive will be maintained through the work site. Removable barriers will be installed in the median and the existing masonry wall on the property boundary will be removed, if required, and will be re-installed following construction.

- During the Reeves Road closure, the main access to Te Tuhi at 13R Reeves Road will be closed and a temporary drop-off area with a temporary walkway leading to the main entrance will be provided on William Roberts Road.

- Access to the GAS Service Station at 141 Pakuranga Road and the Pakuranga Plaza via Brampton Court will be maintained during the longitudinal drainage works on Pakuranga Road by completing the works in sections and via steel plating across the trenches. The construction team will also liaise with the operators of the service station to ensure sufficient access widths are provided, as and when required, for fuel delivery tankers.

- During Phase 1 of Ti Rakau Drive in EB3R, the remaining properties on the southern frontage will not have access to Ti Rakau Drive while the westbound lanes are constructed. Temporary residential access will therefore be provided during this phase via chip seal access tracks along the back of the acquired properties accessed through side streets. Properties that would use these access tracks include 75, 83, 83A-C, 87, 98, 91, 97, 103A, 129, 145, 175A, 177, 183, 185 and 191 Ti Rakau Drive.

- A temporary parking area, with 18 parking spaces, will be provided at 105 Ti Rakau Drive for the Edgewater Shops located at 107 and 109 Ti Rakau Drive during construction. The temporary carpark will be accessed via Edgewater Drive west and the access road to the rear of the commercial buildings. Temporary signage will be provided to direct customers.

- Drainage works at 207, 219 and 229 Ti Rakau Drive will be undertaken in sections to maintain vehicle access to all properties at all times. Furthermore, at the end of the work week, the work zone will be reduced in size, while maintaining safety, to free up as many occupied parking spaces as possible.

7.2 Mitigation Measures upon Completion

- Access to the Gull Service Station at 3 Reeves Road will not be maintained from Reeves Road. Discussions are ongoing with the owner regarding the loss of direct road access from Reeves Road.
- To mitigate the loss of 16 parking spaces located within the Open Space zoned land along William Roberts Road south an off-street parking area will be provided in Ti Rakau Park providing 21 additional parking spaces. Stakeholder engagement is ongoing with Auckland Council to develop this option as well as relocating the existing playground to provide the necessary space for the proposed carpark.
- To mitigate the removal of the parking spaces at the Edgewater Shops (107 and 109 Ti Rakau Drive), the temporary carpark at 105 Ti Rakau Drive will be made permanent and will provide 22 parking spaces.

- Discussions are ongoing with Council and Fencibles United Football Club to rearrange the fields on River Hills Park as a result of the parcel of land that has been acquired along the southern boundary of 168R Ti Rakau Drive to facilitate the eastbound Gossamer Drive bus station.

8 Conclusions

During the development of the updated construction methodology, based on an updated design, efforts have been made to add efficiencies to the overall construction programme and produce construction staging so as to minimise the adverse transport effects. This process has led to a more refined construction staging.

Overall, the temporary effects of the various CSAs as well as the construction traffic in the project areas will be mitigated appropriately and are considered to be negligible or very low. A WTMP will be developed to reduce private vehicle trips and to increase worksite accessibility through more travel options. CTMPs will be developed to avoid, remedy or mitigate the adverse effects of construction on transport, parking and property access so far as is reasonably practicable. The CTMPs will be developed in accordance with the conditions of consent and will include management strategies, controls and reporting protocols to achieve this. Hours of operation, especially night works, will be controlled in part by the Project's consent conditions and management plans, including the CNVMP.

Overall, the temporary effects on intersection performance during all construction scenarios across the network are considered to be negligible to low, with some mitigation measures in place. Appropriate measures have been proposed to support the operation of the construction yard, as well as during drainage works on Pakuranga Road, the RRF tie-in and works on the Edgewater Drive loop.

Although the temporary effects to intersection performance during construction are predicted to be negligible to low, some adverse effects to general traffic and bus travel times are expected, particularly during Construction Scenario 1.3[36]. These effects are not unexpected due to the number of additional intersections and ongoing construction activities. Various mitigation options were tested; however, it is expected that the only alternative to improve travel times would be to add more lanes, which would be expected to have significant implications on construction cost and programme. Furthermore, increases in travel times through the project area are inherent in the majority of transport projects of this scale, as are changes in travel behaviour that could be reasonably expected to reduce traffic volumes on the network, such as peak spreading, flexible working options and alternative route selection. With appropriate public engagement and on-road messaging, it is expected that these travel behaviour changes could occur This in turn could lead to more manageable queues, lower delays and improved travel times on the network. These will be managed through the CTMP process.

It should be noted that these effects are temporary, and once constructed, the RRF and EB2/EB3R as a whole will alleviate congestion, particularly around the Pakuranga Town Centre. Nevertheless, to mitigate these effects, appropriate public communication and advanced warning of the planned works will be undertaken prior to the works being initiated. Also, opportunities to improve bus travel times will be explored in the development of the CTMPs along with measures to manage travel demand through the provisions of the SSTMPs. Public communication and signage will also be provided during construction informing motorists of the works and potential delays, which would lead to changes in travel behaviour. Based on the above, the potential adverse effects to general traffic and bus travel times are considered to be mitigated as far as is reasonably practicable.

[36] Construction Scenario 1.3 simulates the closure of Reeves Road as well as the ongoing construction of the RRF (i.e., not constructed yet).

Temporary effects to pedestrian and cyclists during construction are considered to be negligible overall. Pedestrian crossings and footpaths will be maintained at all times during construction. Should this be unachievable, temporary facilities and diversions will be provided to ensure pedestrian connectivity.

Overall, the temporary effects during construction on property access and parking will be mitigated appropriately and are considered to be negligible or very low. Where existing vehicle access arrangements and parking provisions cannot be maintained, appropriate mitigation measures have been proposed to provide levels of access and parking commensurate with the existing environment as far as is reasonably practicable.

Engagement with property owners or operators will be undertaken during construction to communicate the planned works and duration, the potential disruption and proposed mitigation measures as well as to develop additional measures or improve upon proposed measures if required. Lastly, pedestrian access to properties will be maintained at all times. This will be ensured through the CTMPs.

Safety measures will be in place during construction, ensured by the CTMPs. The safety and protection of the public, traffic and construction team is paramount, and all site operations will be focused on zero harm to all involved, associated with and traveling through the project areas.

In the existing environment, Auckland's eastern suburbs are experiencing a range of transport related problems and challenges. The completion of EB2 and EB3R will improve upon these shortcomings through the following:

- Significantly improved travel options for all modes of transport
- Increased public transport patronage and mode share through increased catchment and dedicated bus lanes
- Reduced carbon emissions
- Improved walking and cycling amenity and safety through dedicated infrastructure
- Reduced congestion, particularly around the Pakuranga Town Centre, through the new Reeves Road flyover

The main elements of the proposed design of EB2 and EB3R include dedicated bus lanes along Ti Rakau Drive, connecting to the EB1 bus lanes at Pakuranga Road and terminating at Gossamer Drive, as well as three new bus stations along the corridor. A new link between Pakuranga Road and SEART in the form of the Reeves Road Flyover (RRF). Dedicated cycleways on Pakuranga Road, between Ti Rakau Drive and the RRF, and along Ti Rakau Drive from Pakuranga Road to Gossamer Drive.

In the future, the Ti Rakau Drive and Pakuranga Road corridors will have more strategic Place functions, in addition to the Movement of people and goods. The proposed Eastern Busway bus stations will also attract more people within the area as the activities served by these bus stations will become local attractions. Modal priority of pedestrians, cyclists and buses will be improved, and as a result modal priority of general traffic and parking will decrease across the project areas.

Overall, the proposed design of EB2 and EB3R is expected to lead to acceptable operations for general traffic across the network, and importantly, bus movements are predicted to operate at LOS C and with spare capacity. The RRF is expected to relieve congestion around the Pakuranga Town Centre by removing traffic from Ti Rakau Drive and providing a direct and faster link between Pakuranga Road and SEART. Furthermore, significant improvements in travel times are expected overall, especially from Botany towards Pakuranga and SEART.

Benefits of the new stations will be the ability to support significantly higher public transport patronage through increased catchment and higher service frequencies through increased capacity. These benefits, in combination with improved customer accessibility, amenity and safety, will lead to an increase in mode share of public transport. A particular benefit of the Pakuranga Town Centre bus station will be the integration of all bus services in the EB2 and EB3R project areas, which will provide an improved transfer experience for passengers. Another benefit of the stations will be improved safety for buses.

EB2 and EB3R are predicted to result in a significant increase in public transport patronage in the future. As such, bus station platforms and loading areas have been designed to provide appropriate levels of service and capacity to support this uptake in public transport. Along with this, bus service headways, reliability and efficiency will also be improved overall. The combination of these public transport upgrades is expected to significantly increase public transport mode share, which in turn will reduce congestion and reduce greenhouse gas emissions by way of a more sustainable movement of people through the network. Overall, the proposed design is predicted to improve bus travel times across the network. The combination of improved travel times and higher service frequencies will lead to faster and more reliable public transport trips.

The Project will provide dedicated footpaths and cycleways to improve pedestrian and cyclist amenity and safety. Providing dedicated cycleways will create a physically separated and safe space that facilitates cycle movements through the network, which will provide users with a more attractive mode of travel and supports the uptake of cycling. Furthermore, the cycleways will facilitate improved accessibility to the bus stations, resulting in increased catchment as well as the potential for mode shift to occur, increasing uptake of public transport across the network.

Lastly, the proposed design of EB2 and EB3R will provide an overall safer transport system for all modes of transport through the project areas with the aim to reduce fatal and serious injury crashes. The proposed design will provide staged crossings at various locations in order to reduce pedestrian delay, improve safety and discourage jaywalking. Raised pedestrian platforms will also be provided to create a low-speed environment, and to aid pedestrians and cyclists by simplifying the crossing task. Furthermore, these facilities will increase visibility by creating a visual cue for drivers to reduce their speed as they approach, and encourage courtesy between drivers and pedestrians.

In conclusion, with the proposed mitigation measures in place, the potential adverse effects during construction and upon completion of EB2 and EB3R are considered to be negligible to low overall. Furthermore, the proposed design is predicted to result in significant improvements and a range of benefits overall.

Appendix A

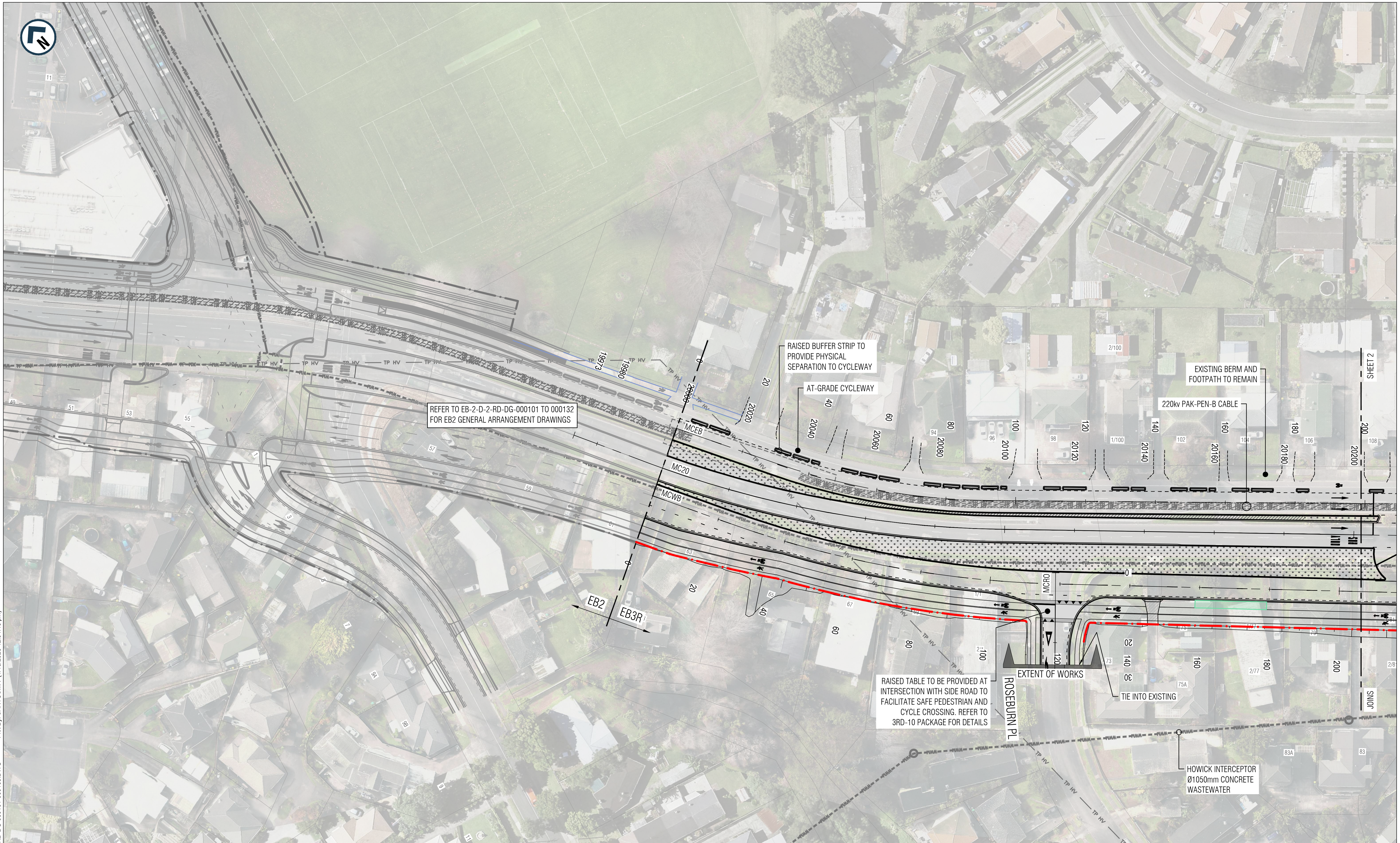
Reeves Road Closure Detour Assessment

Appendix B

EB2 General Arrangement Plans

Appendix C

EB3R General Arrangement Plans



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C	19/01/2023	M. Santos	RE-ISSUED FOR STAGE 2 SUBMISSION
B	12/10/2023	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
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KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 | A3 SCALE 1:1000

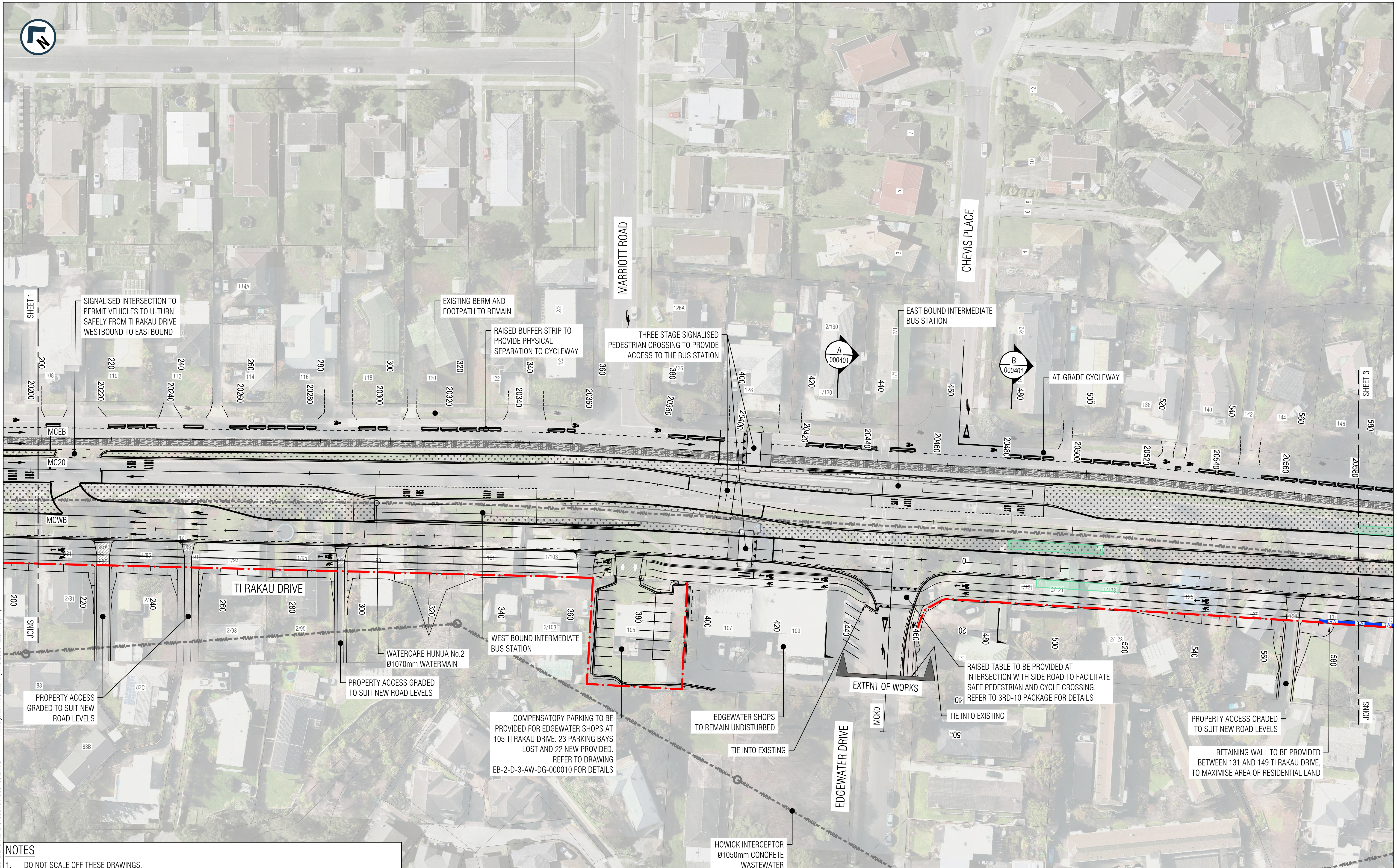
Design Package: ROADWORK GEOMETRIC DESIGN

Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 1 OF 5

Drawing Number: EB-2-D-3-RD-DG-000101

Revision: C

Filename: EB-2-D-3-RD-DG-000101-000105.DWG   Plot By: SANTOSMR (1/18/2023 12:54:43 pm)



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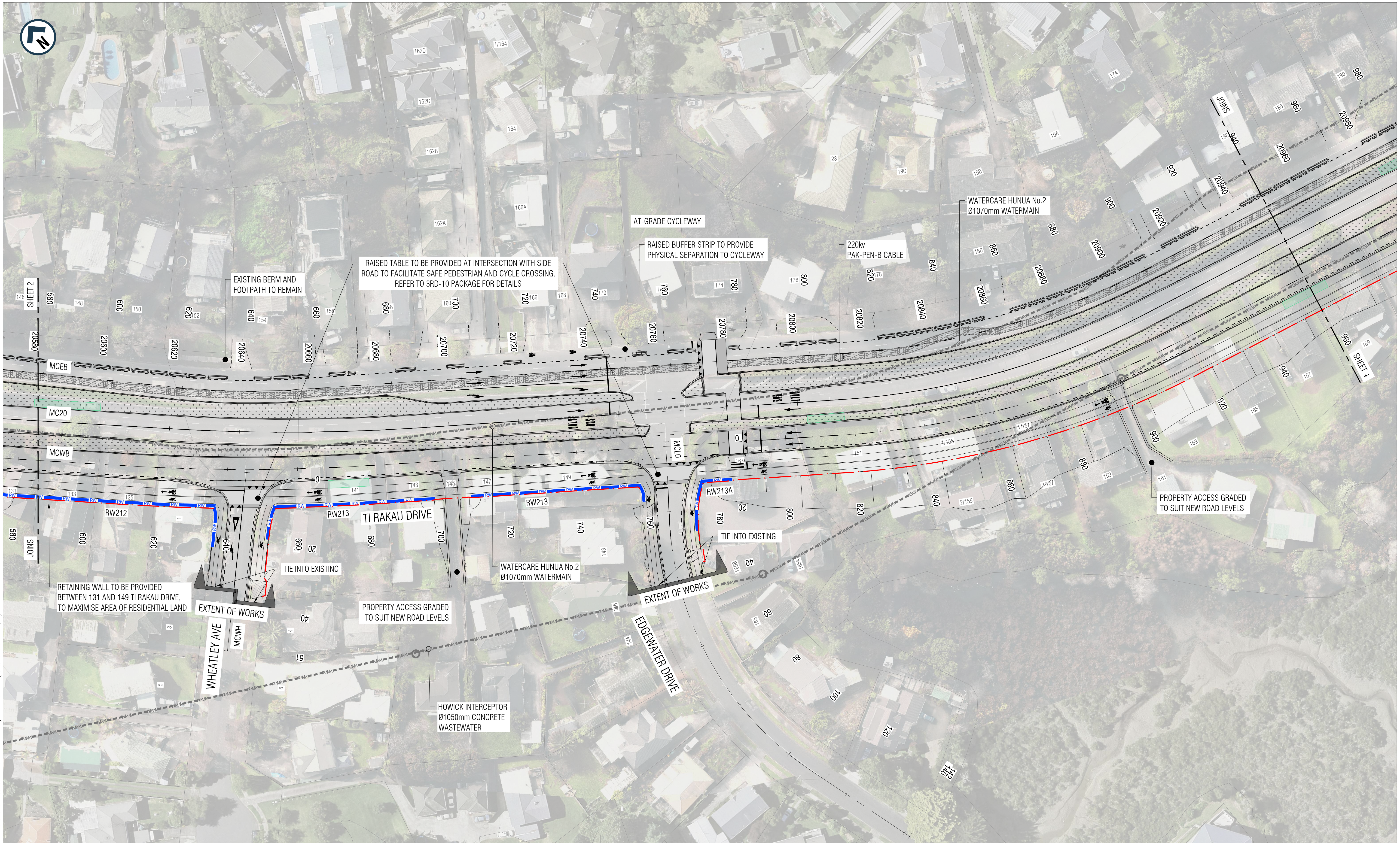
KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

Drawing Status	STAGE 2
Horizontal Datum	NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum	2016 NEW ZEALAND
Scale	A1 1:500, A3 1:1000
Design Package	ROADWORK GEOMETRIC DESIGN
Drawing Title	TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 2 OF 5
Drawing Number	EB-2-D-3-RD-DG-000102
Revision	C



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KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 3 OF 5
Drawing Number: EB-2-D-3-RD-DG-000103
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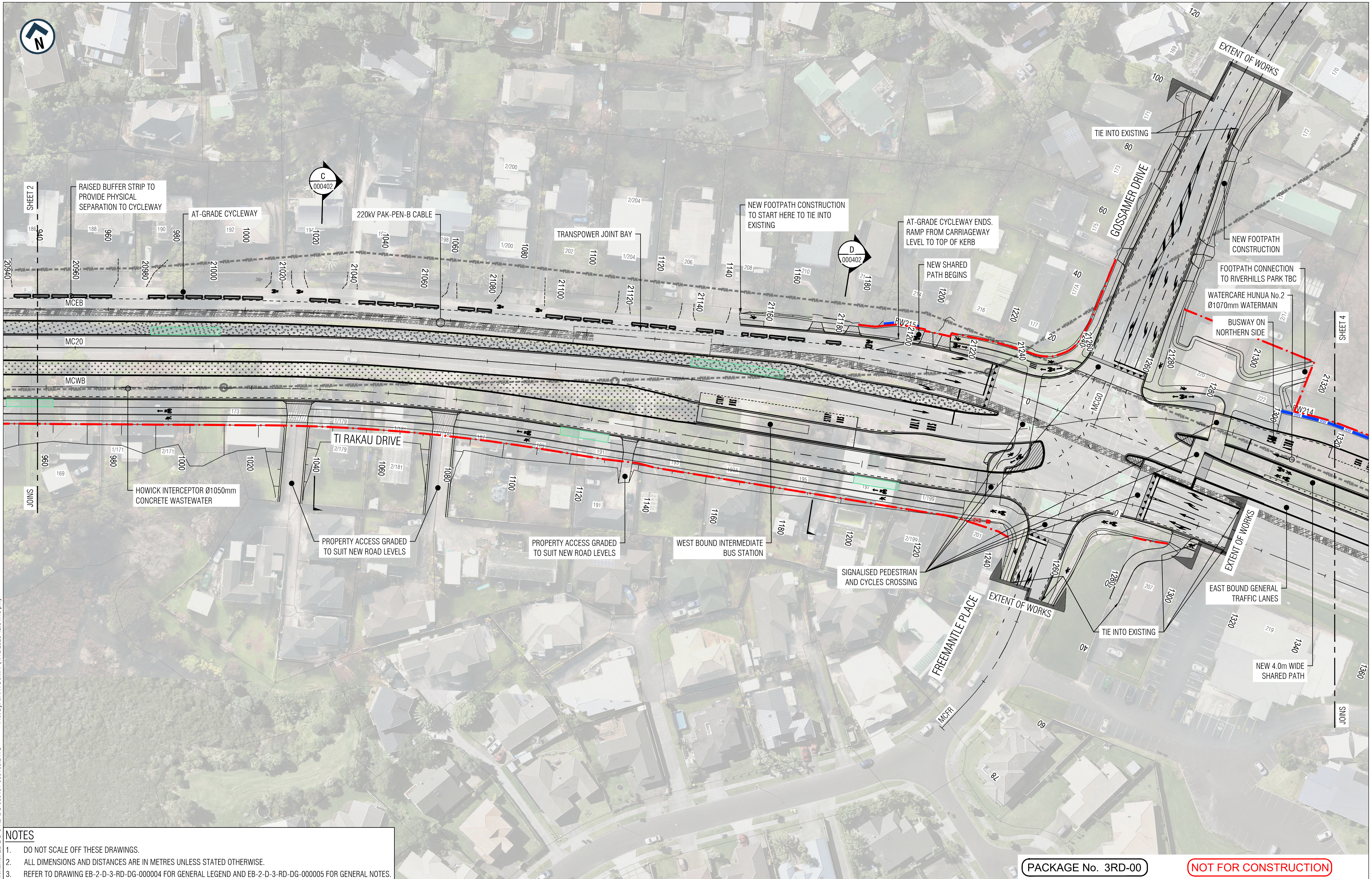

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Date	19/01/2023	Approver Signature	

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KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

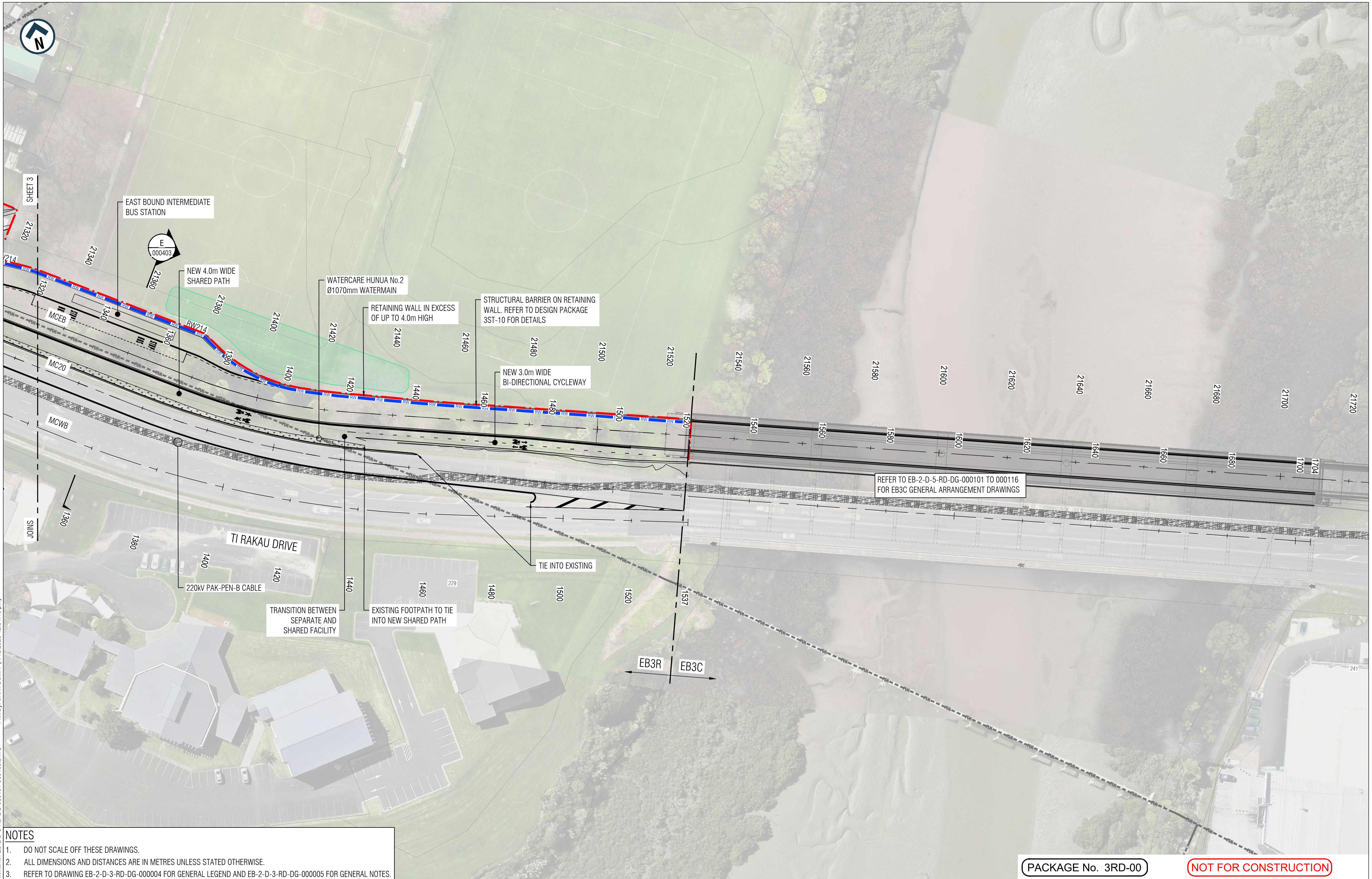
Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN

Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 4 OF 5

Drawing Number: EB-2-D-3-RD-DG-000104

Revision: C



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWING EB-2-D-3-RD-DG-000004 FOR GENERAL LEGEND AND EB-2-D-3-RD-DG-000005 FOR GENERAL NOTES.

Filename: EB-2-D-3-RD-DG-000101-000105.DWG Plot By: SANTOSMR (1/18/2023 12:54:43 pm)

REV	DATE	DRAWN	REVISION DESCRIPTION
C	19/01/2023	M. Santos	RE-ISSUED FOR STAGE 2 SUBMISSION
B	12/10/2023	M. Santos	ISSUED FOR STAGE 2 SUBMISSION
A	28/03/2022	M. Santos	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

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Designed	A. Tavildar	Checked	D. Angus
Drawn	M. Santos	Checked	M. Dalvi
Approved	S. Jones		
Date	19/01/2023	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

Drawing Status: STAGE 2
Horizontal Datum: NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum: 2016 NEW ZEALAND
A1 SCALE 1:500 A3 SCALE 1:1000

Design Package: ROADWORK GEOMETRIC DESIGN
Drawing Title: TI RAKAU DRIVE GENERAL ARRANGEMENT PLAN SHEET 5 OF 5
Drawing Number: EB-2-D-3-RD-DG-000105
Revision: C

Appendix D

Construction Scenario 1.1 – Phasing Diagrams

Appendix E

Construction Scenario 1.1 – Lane Performance Summaries

Appendix F

Construction Scenario 2 – Phasing Diagrams

Appendix G

Construction Scenario 2 – Lane Performance Summaries

Appendix H

EB2/EB3R Final Scenario – Phasing Diagrams

PHASING SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 100 seconds (Site User-Given Phase Times)

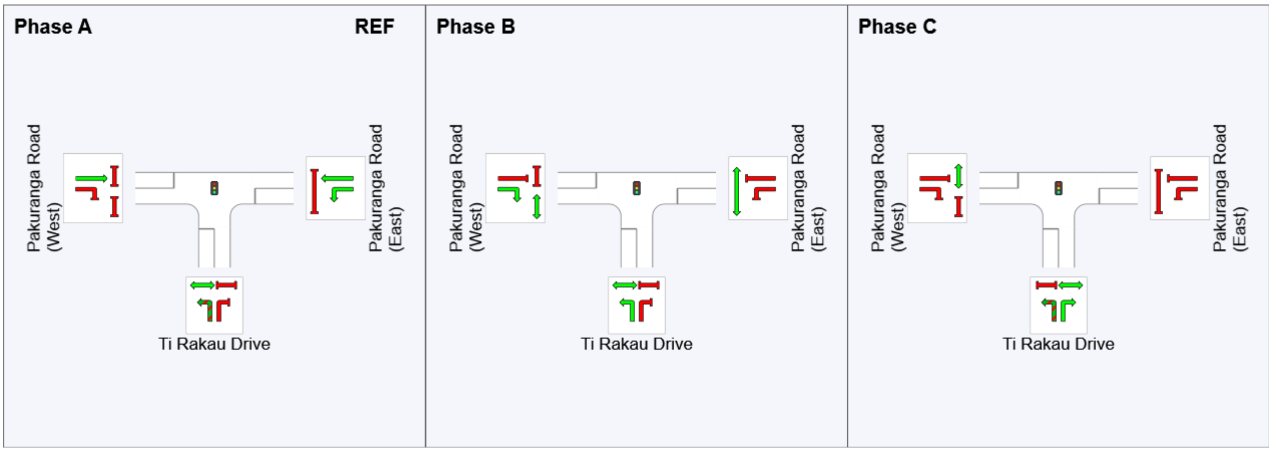
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	39	69
Green Time (sec)	34	24	25
Phase Time (sec)	40	30	30
Phase Split	40%	30%	30%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM_Edgewater EAST Signal.sip9

PHASING SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

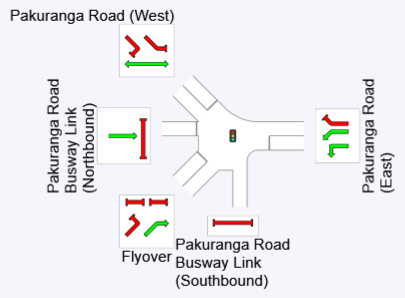
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	43	74	93
Green Time (sec)	37	25	13	51
Phase Time (sec)	43	31	19	57
Phase Split	29%	21%	13%	38%

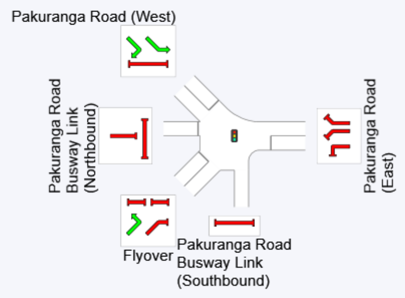
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

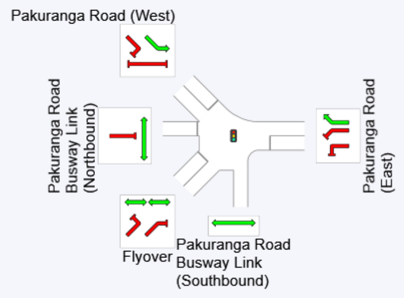
Phase A **REF**



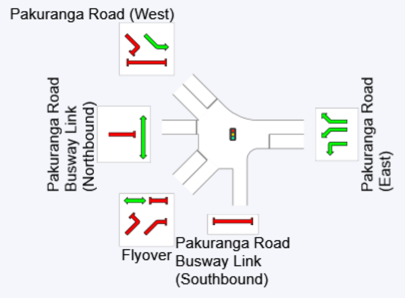
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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PHASING SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	73	97	114	139
Green Time (sec)	66	18	11	19	6
Phase Time (sec)	72	24	17	24	13
Phase Split	48%	16%	11%	16%	9%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 22 March 2023 10:08:58 am
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PHASING SUMMARY

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, F, E
Output Phase Sequence: A, B, C, D, F, E

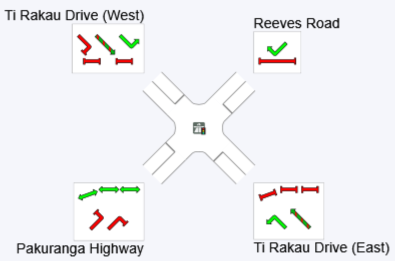
Phase Timing Summary

Phase	A	B	C	D	F	E
Phase Change Time (sec)	0	32	52	72	106	131
Green Time (sec)	26	14	14	29	17	11
Phase Time (sec)	32	20	19	37	25	17
Phase Split	21%	13%	13%	25%	17%	11%

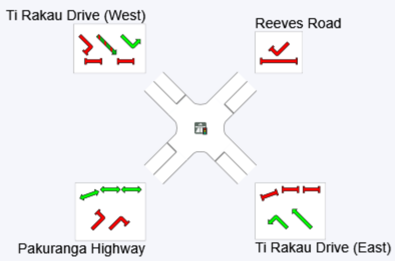
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

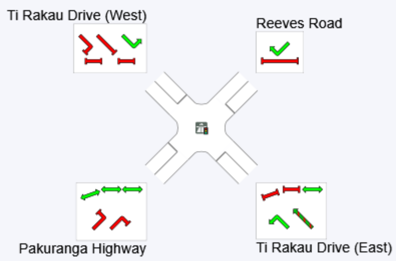
Phase A **REF**



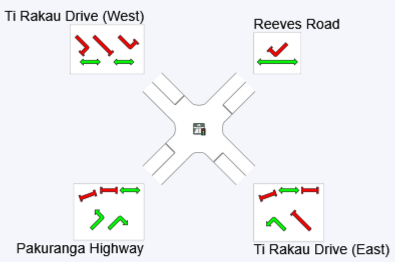
Phase B



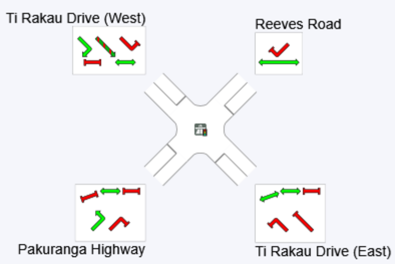
Phase C



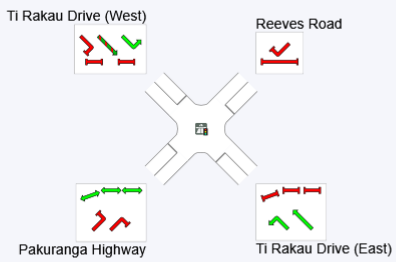
Phase D



Phase F



Phase E



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Practical Cycle Time)

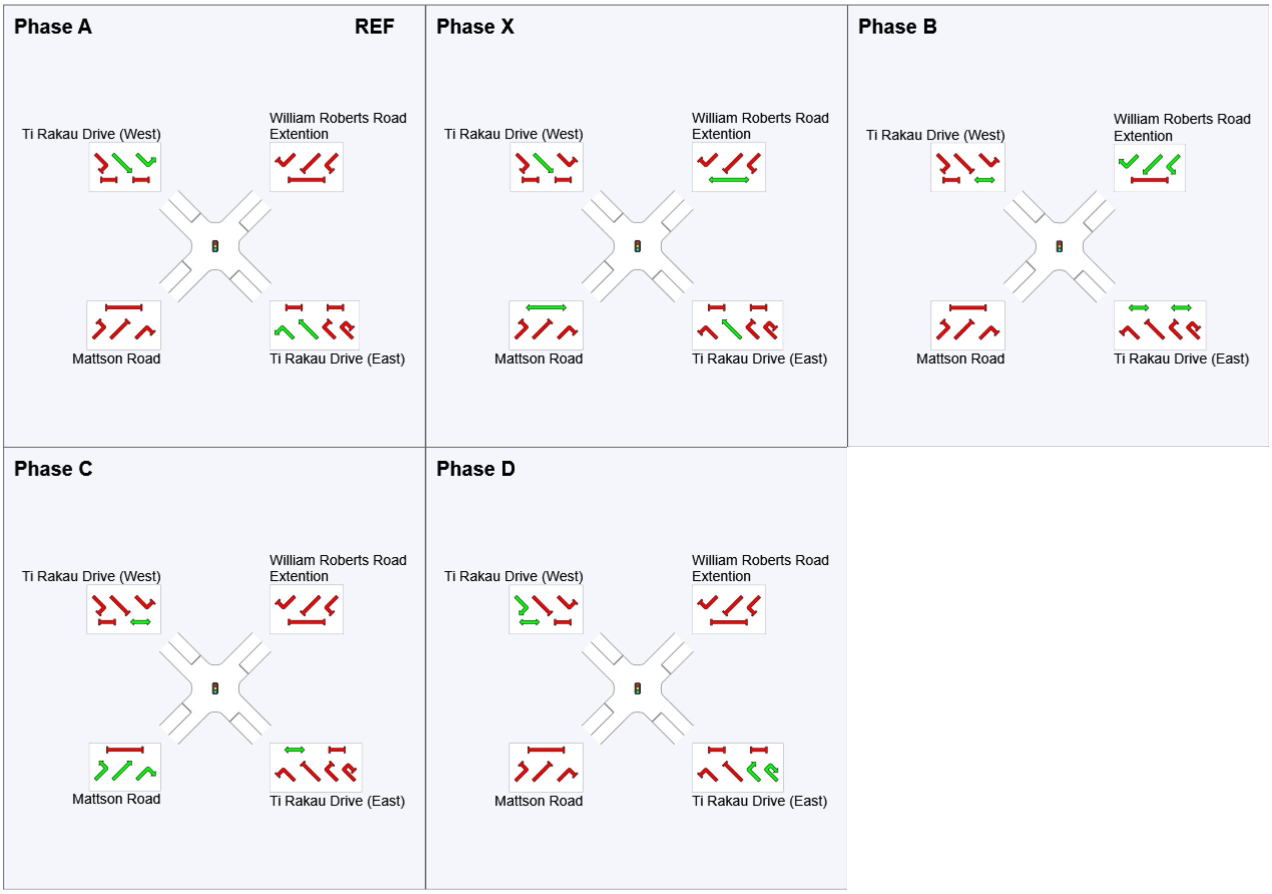
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, X, B, C, D
Output Phase Sequence: A, X, B, C, D

Phase Timing Summary

Phase	A	X	B	C	D
Phase Change Time (sec)	0	43	68	87	102
Green Time (sec)	35	19	13	7	12
Phase Time (sec)	41	25	21	13	20
Phase Split	34%	21%	18%	11%	17%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 30 seconds (Site Practical Cycle Time)

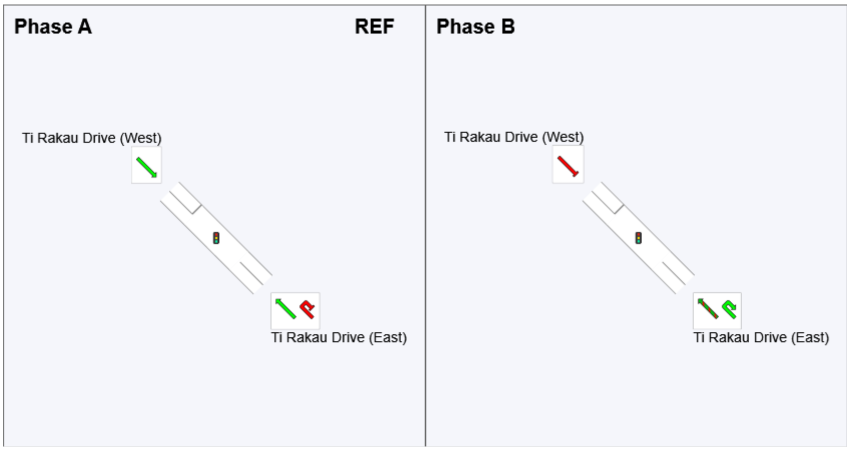
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Opposed Turns
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	18
Green Time (sec)	12	6
Phase Time (sec)	18	12
Phase Split	60%	40%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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PHASING SUMMARY

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 40 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

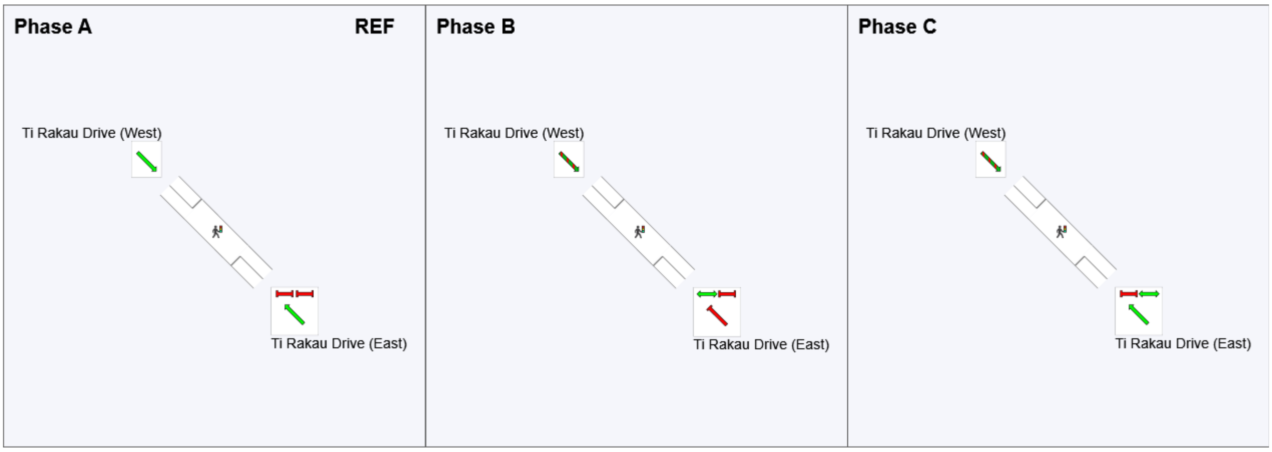
Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	2	23
Green Time (sec)	***	15	11
Phase Time (sec)	2	21	17
Phase Split	5%	53%	43%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 50 seconds (Site Practical Cycle Time)

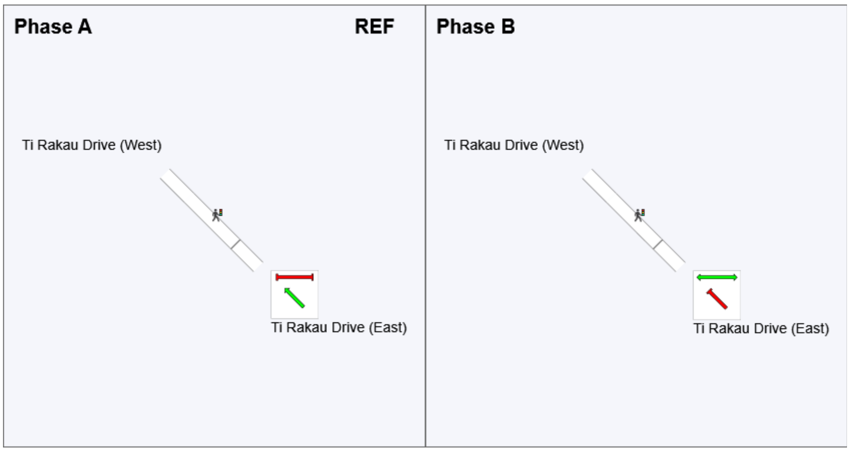
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	33
Green Time (sec)	27	11
Phase Time (sec)	33	17
Phase Split	66%	34%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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PHASING SUMMARY

Site: 101 [12.0 Edgewater Dr (East) / Ti Rakau Dr -Signalised - Import (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Practical Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, D*, C
Output Phase Sequence: A, B, D*, C
(* Variable Phase)

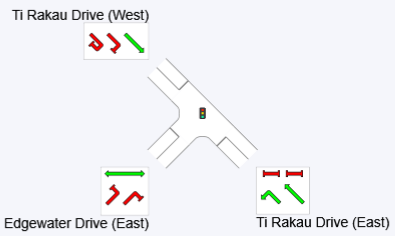
Phase Timing Summary

Phase	A	B	D	C
Phase Change Time (sec)	1	47	62	101
Green Time (sec)	39	8	32	13
Phase Time (sec)	46	15	39	20
Phase Split	38%	13%	33%	17%

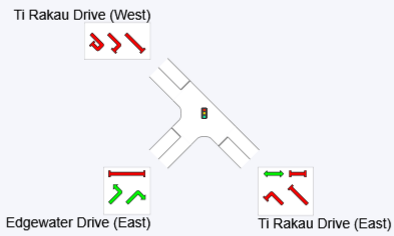
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

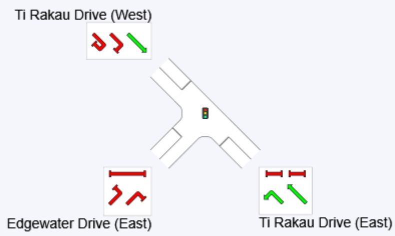
Phase A **REF**



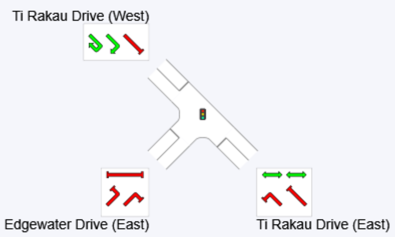
Phase B



Phase D **VAR**



Phase C



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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LANE SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	19	5.3	19	5.3	34	0.552	100	92.2	LOS F	1.4	10.2	Short	9	0.0	NA
Lane 2	23	13.0	23	13.0	67	0.344	100	85.5	LOS F	1.6	12.3	Full	285	0.0	0.0
Approach	42	9.5	42	9.5		0.552		88.5	LOS F	1.6	12.3				
East: Ti Rakau Drive (East)															
Lane 1	765	11.4	765	11.4	960	0.797	100	23.4	LOS C	26.9	207.1	Full	636	0.0	0.0
Lane 2	744	11.5	744	11.5	933[1]	0.797	100	22.3	LOS C	24.7	190.2	Full	636	0.0	0.0
Lane 3 (B)	28	100.0	28	100.0	266	0.105	100	34.9	LOS C	1.1	14.0	Short	60	0.0	NA
Lane 4	168	6.7	168	6.7	235	0.712	82[6]	72.9	LOS E	10.9	80.7	Short	150	0.0	NA
Lane 5	204	6.7	204	6.7	235	0.868	100	82.9	LOS F	14.7	108.7	Short	103	0.0	NA
Approach	1909	11.8	1909	11.8		0.868		33.9	LOS C	26.9	207.1				
North: Gossamer Drive															
Lane 1	323	9.2	323	9.2	295	1.098	100	143.4	LOS F	30.6	231.4	Short	150	0.0	NA
Lane 2	327	9.2	327	9.2	298	1.098	100	143.3	LOS F	30.9	233.6	Full	1010	0.0	0.0
Lane 3	39	5.1	39	5.1	126	0.309	100	78.1	LOS E	2.5	18.4	Short	28	0.0	NA
Approach	689	9.0	689	9.0		1.098		139.7	LOS F	30.9	233.6				
West: Ti Rakau Drive (West)															
Lane 1	19	5.3	19	5.3	838	0.023	100	14.2	LOS B	0.3	2.4	Short	28	0.0	NA
Lane 2	434	13.0	434	13.0	484[1]	0.897	100	72.4	LOS E	31.1	242.0	Full	445	0.0	0.0
Lane 3	426	13.0	426	13.0	475[1]	0.897	100	72.3	LOS E	30.5	237.1	Full	445	0.0	0.0
Lane 4	22	9.1	22	9.1	199	0.110	100	65.5	LOS E	1.3	9.6	Short	23	0.0	NA
Lane 5 (B)	27	100.0	27	100.0	271	0.100	100	34.8	LOS C	1.0	13.5	Full	445	0.0	0.0
Approach	928	15.3	928	15.3		0.897		69.9	LOS E	31.1	242.0				
Intersection	3568	12.2	3568	12.2		1.098		64.3	LOS E	31.1	242.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

Approach Lane Flows (veh/h)

South: Fremantle Place

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	-	-	19	5.3	34	0.552	100	26.4	2
Lane 2	-	11	12	23	13.0	67	0.344	100	NA	NA
Approach	19	11	12	42	9.5		0.552			

East: Ti Rakau Drive (East)

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	16	749	-	765	11.4	960	0.797	100	NA	NA
Lane 2	-	744	-	744	11.5	933[1]	0.797	100	NA	NA
Lane 3	-	28	-	28	100.0	266	0.105	100	0.0	2
Lane 4	-	-	168	168	6.7	235	0.712	82[6]	0.0	2
Lane 5	-	-	204	204	6.7	235	0.868	100	19.9	4
Approach	16	1521	372	1909	11.8		0.868			

North: Gossamer Drive

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	323	-	-	323	9.2	295	1.098	100	55.1	2
Lane 2	327	-	-	327	9.2	298	1.098	100	NA	NA
Lane 3	-	10	29	39	5.1	126	0.309	100	0.0	2
Approach	650	10	29	689	9.0		1.098			

West: Ti Rakau Drive (West)

Mov. From W To Exit:	L2 N	T1 E	R2 S	U W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	-	-	-	19	5.3	838	0.023	100	0.0	2
Lane 2	-	434	-	-	434	13.0	484[1]	0.897	100	NA	NA
Lane 3	-	426	-	-	426	13.0	475[1]	0.897	100	NA	NA
Lane 4	-	-	11	11	22	9.1	199	0.110	100	0.0	3
Lane 5	-	27	-	-	27	100.0	271	0.100	100	NA	NA
Approach	19	887	11	11	928	15.3		0.897			

	Total	%HV	Deg.Satn (v/c)
Intersection	3568	12.2	1.098

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Fremantle Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Gossamer Drive Merge Type: **Zipper**												
Exit Short Lane	1	150	50.0	102	106	2.50	2.00	198	1679	0.118	0.0	0.0
Merge Lane	2	-	50.0	99	102	2.50	2.00	204	1684	0.121	0.0	0.0

West Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**		
Full Length Lane	1	Merge Analysis not applied.
Full Length Lane	2	Merge Analysis not applied.
Full Length Lane	3	Merge Analysis not applied.

PHASING SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 100 seconds (Site Practical Cycle Time)

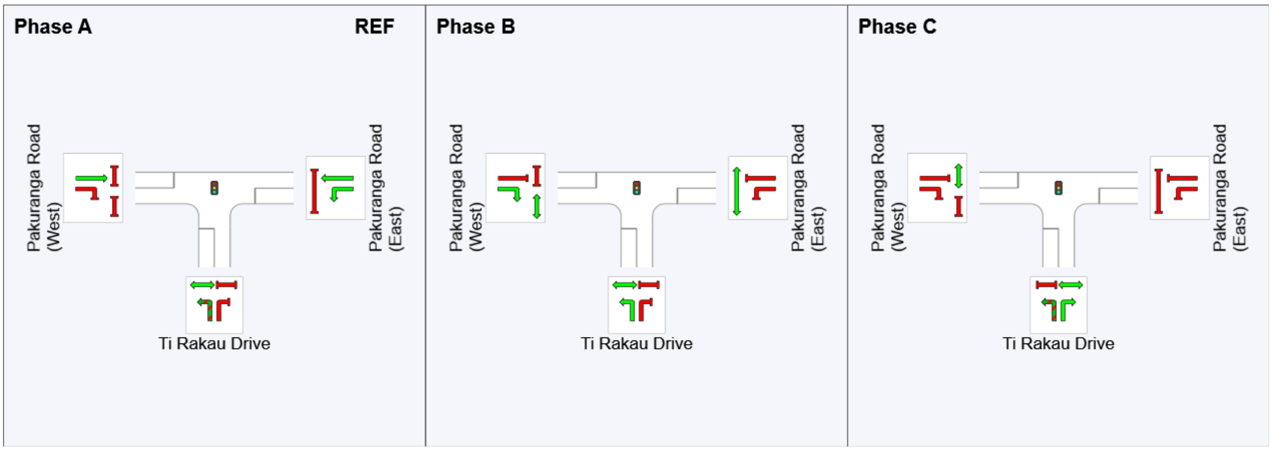
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	37	67
Green Time (sec)	31	24	27
Phase Time (sec)	37	30	33
Phase Split	37%	30%	33%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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PHASING SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 120 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

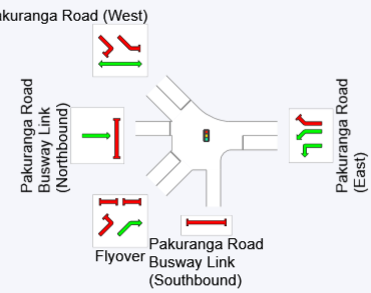
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	68	89	108
Green Time (sec)	62	15	13	6
Phase Time (sec)	68	21	19	12
Phase Split	57%	18%	16%	10%

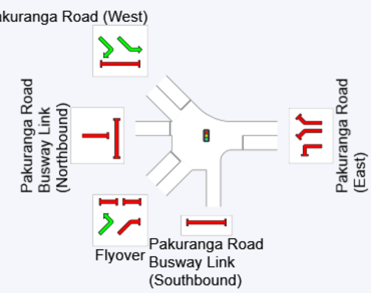
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

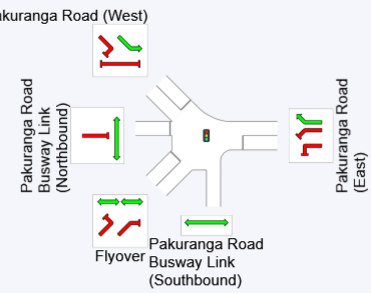
Phase A **REF**



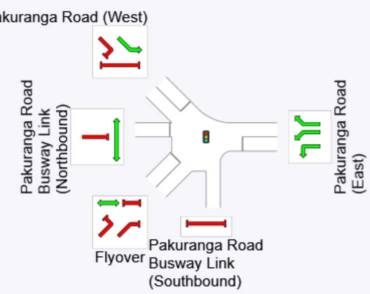
Phase B



Phase C



Phase D



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, E
Output Phase Sequence: A, B, C, D, E

Phase Timing Summary

Phase	A	B	C	D	E
Phase Change Time (sec)	0	76	98	115	139
Green Time (sec)	70	16	11	18	6
Phase Time (sec)	76	22	17	23	12
Phase Split	51%	15%	11%	15%	8%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 150 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D, F, E
Output Phase Sequence: A, B, C, D, F, E

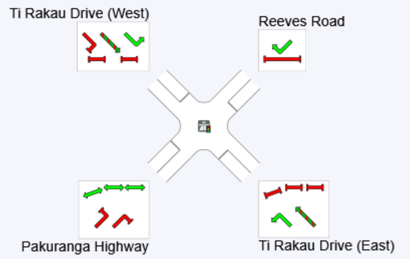
Phase Timing Summary

Phase	A	B	C	D	F	E
Phase Change Time (sec)	0	15	30	53	96	116
Green Time (sec)	9	9	17	38	12	26
Phase Time (sec)	15	15	22	46	20	32
Phase Split	10%	10%	15%	31%	13%	21%

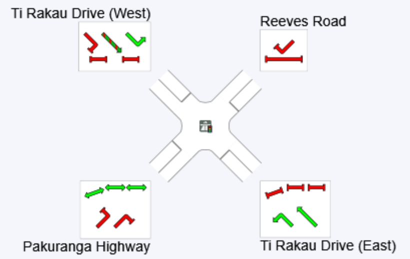
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

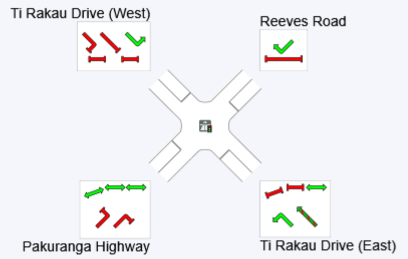
Phase A **REF**



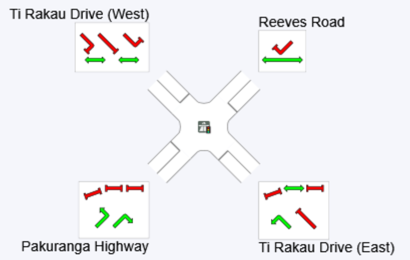
Phase B



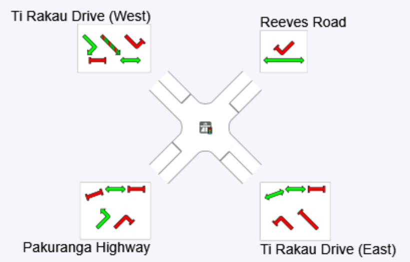
Phase C



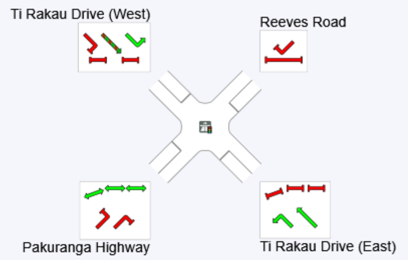
Phase D



Phase F



Phase E



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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PHASING SUMMARY

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Practical Cycle Time)

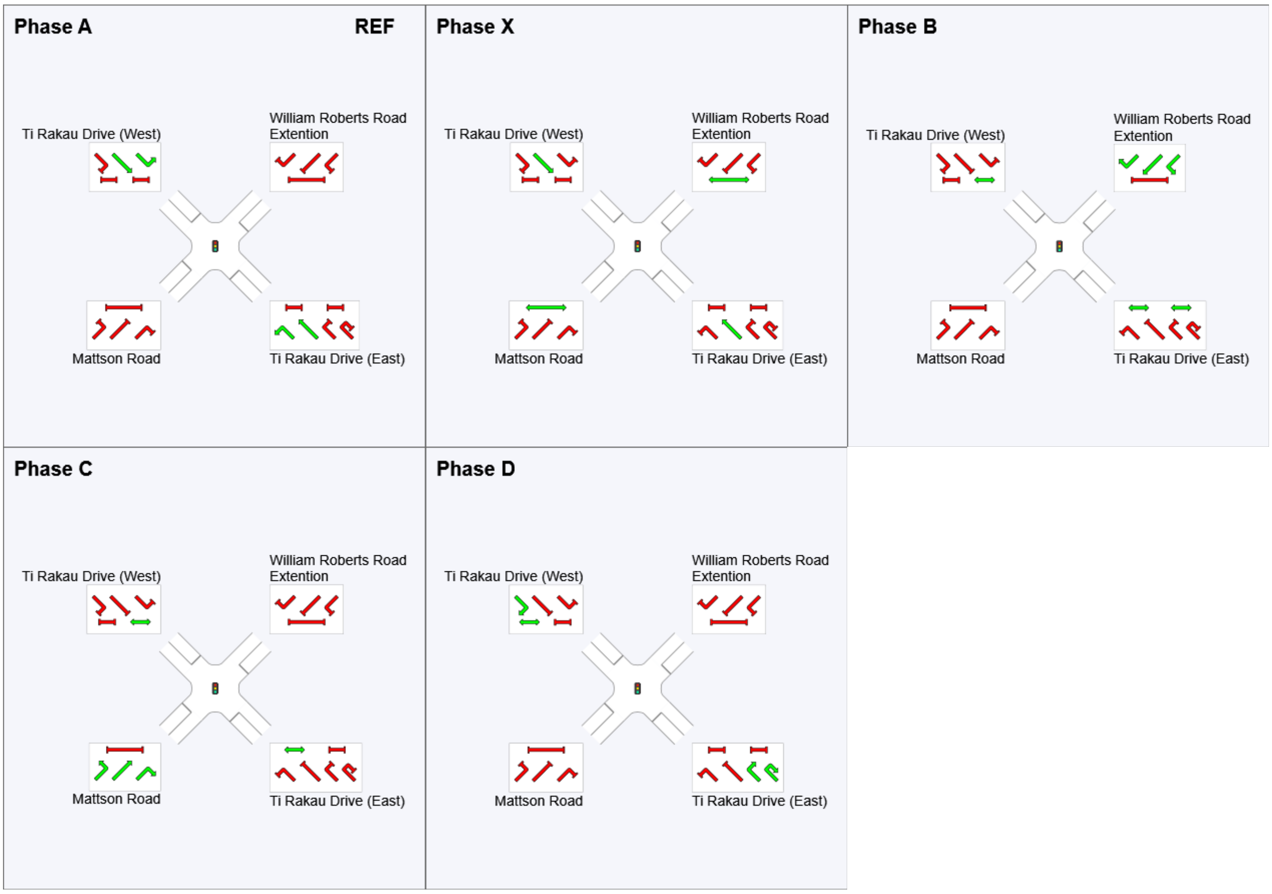
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, X, B, C, D
Output Phase Sequence: A, X, B, C, D

Phase Timing Summary

Phase	A	X	B	C	D
Phase Change Time (sec)	0	44	69	86	100
Green Time (sec)	36	19	11	6	14
Phase Time (sec)	42	25	19	12	22
Phase Split	35%	21%	16%	10%	18%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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PHASING SUMMARY

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 30 seconds (Site Practical Cycle Time)

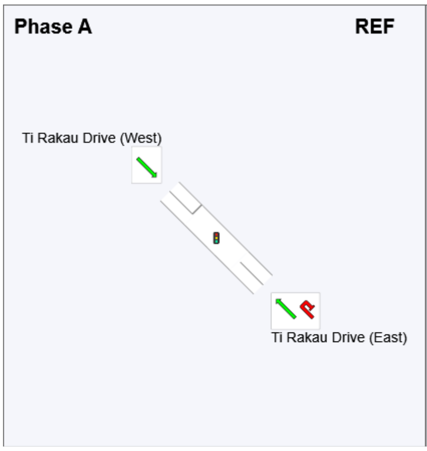
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Opposed Turns
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

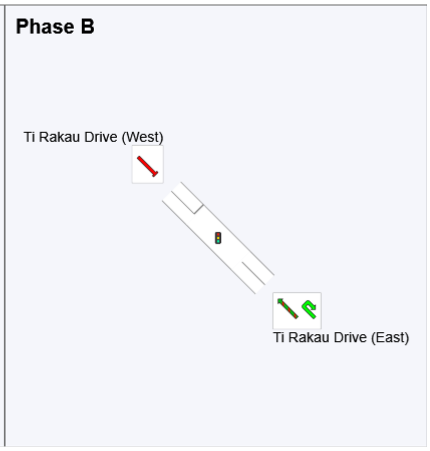
Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	18
Green Time (sec)	12	6
Phase Time (sec)	18	12
Phase Split	60%	40%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence





REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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PHASING SUMMARY

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 40 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

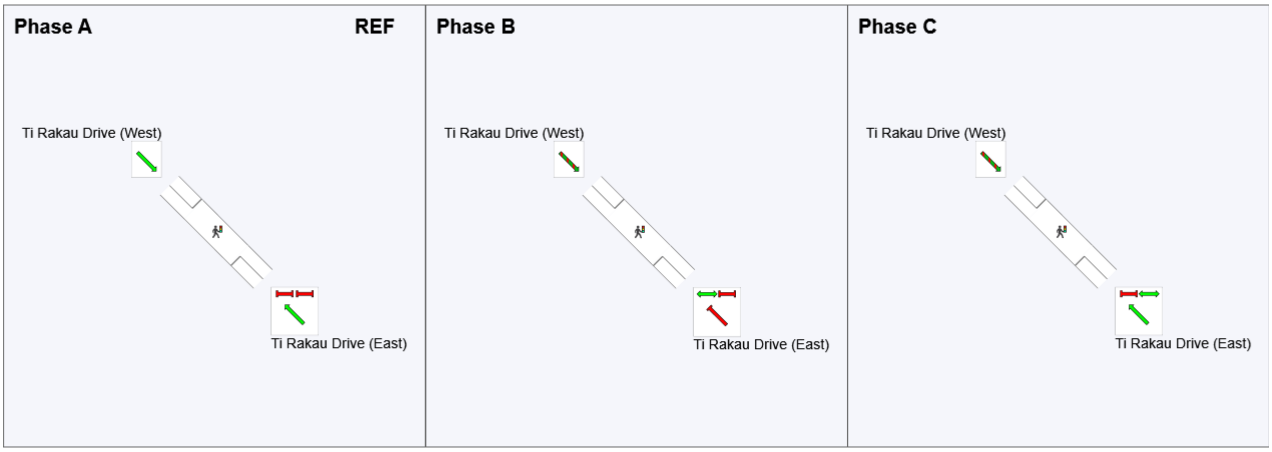
Phase Timing Summary

Phase	**A**	**B**	**C**
Phase Change Time (sec)	0	2	23
Green Time (sec)	***	15	11
Phase Time (sec)	2	21	17
Phase Split	5%	53%	43%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified. If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

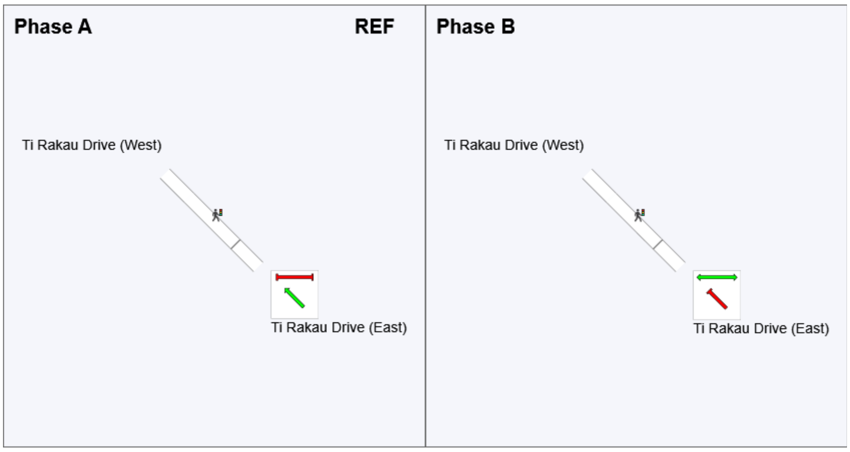
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Phase Timing Summary

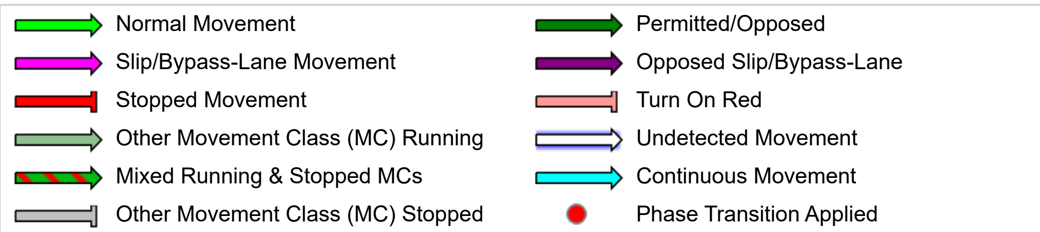
Phase	A	B
Phase Change Time (sec)	0	43
Green Time (sec)	37	11
Phase Time (sec)	43	17
Phase Split	72%	28%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



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PHASING SUMMARY

Site: 101 [12.0 Edgewater Dr (East) / Ti Rakau Dr -Signalised - Import - Import (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Practical Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Leading Right Turn
Reference Phase: Phase A
Input Phase Sequence: A, B, D*, C
Output Phase Sequence: A, B, D*, C
(* Variable Phase)

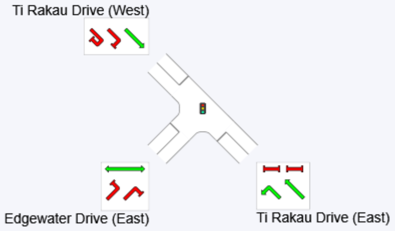
Phase Timing Summary

Phase	A	B	D	C
Phase Change Time (sec)	1	45	60	106
Green Time (sec)	37	8	39	8
Phase Time (sec)	44	15	46	15
Phase Split	37%	13%	38%	13%

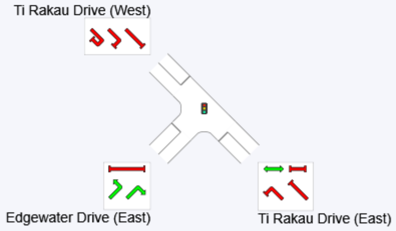
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

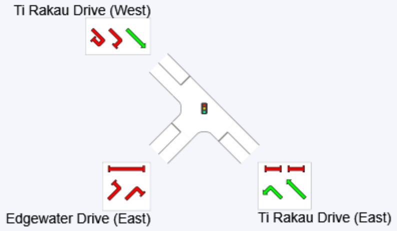
Phase A **REF**



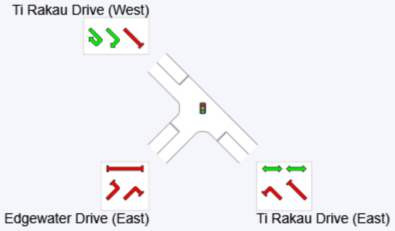
Phase B



Phase D **VAR**



Phase C



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM_Edgewater EAST Signal.sip9

CCG PHASING SUMMARY

Common Control Group: CCG3 [Aylesbury/ WR/ Reeves Rd]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (CCG Practical Cycle Time)

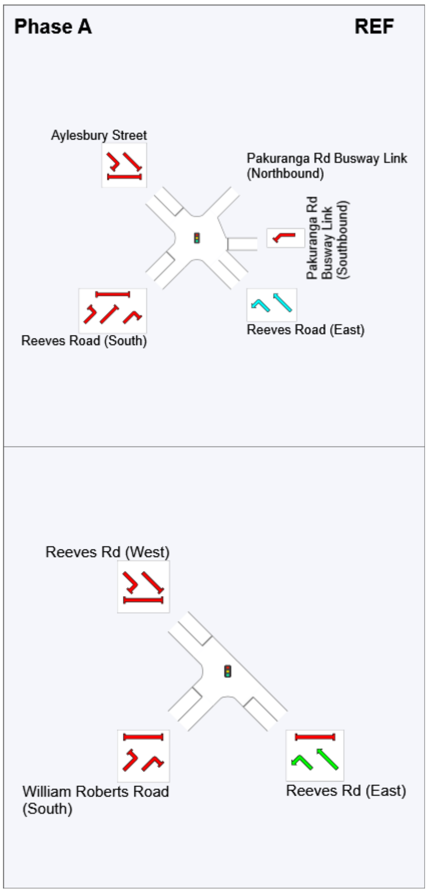
Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: CCG Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, C2, D, E
Output Phase Sequence: A, B, C, C2, D, E

Phase Timing Summary (CCG)

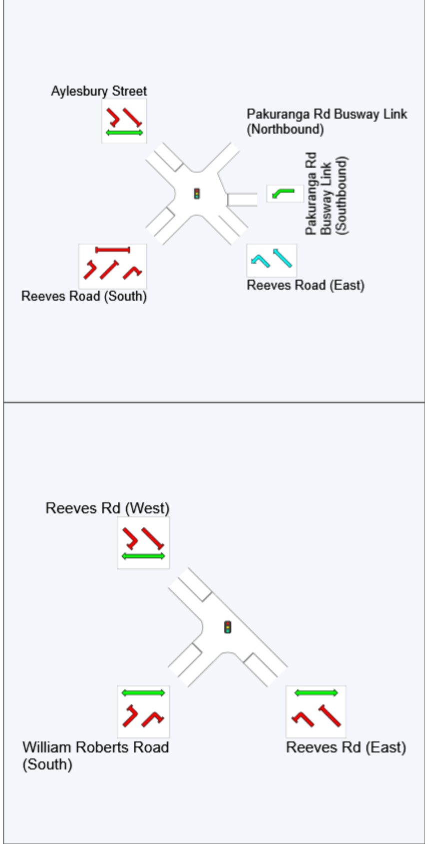
Phase	A	B	C	C2	D	E
Phase Change Time (sec)	2	20	40	59	77	97
Green Time (sec)	12	14	12	12	14	49
Phase Time (sec)	18	21	18	18	20	55
Phase Split	12%	14%	12%	12%	13%	37%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

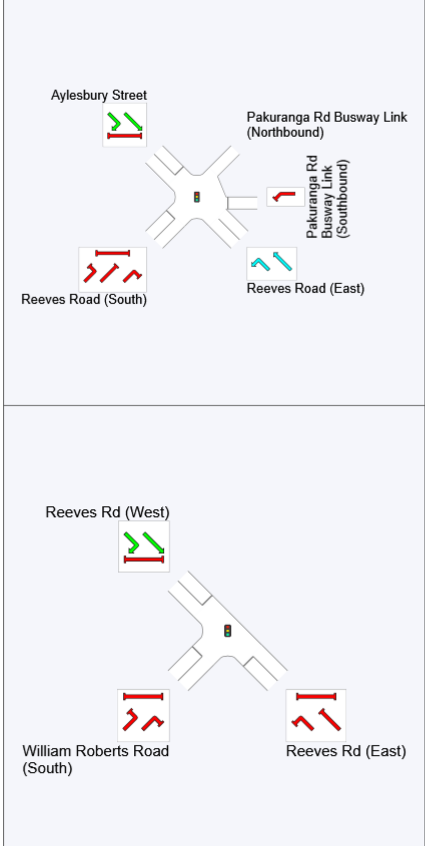
Output Phase Sequence (CCG)



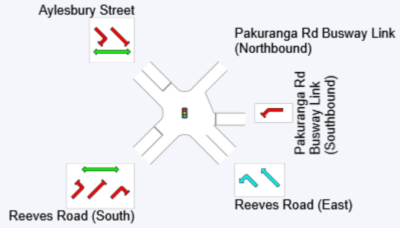
Phase B

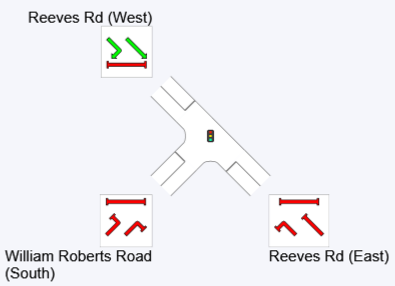


Phase C

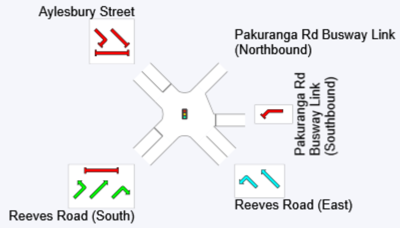


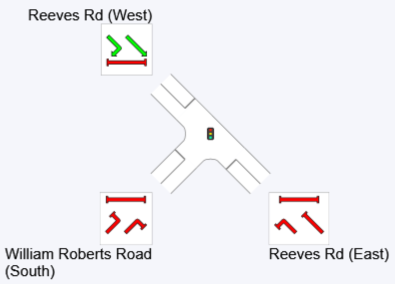
Phase C2



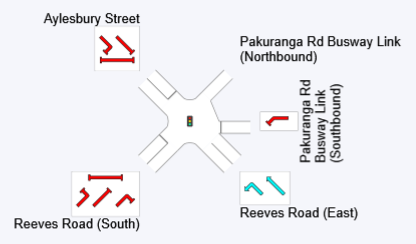


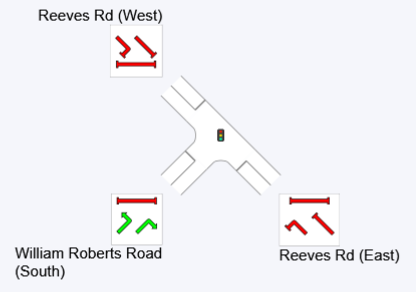
Phase D





Phase E





REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

PHASING SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 160 seconds (Site User-Given Phase Times)

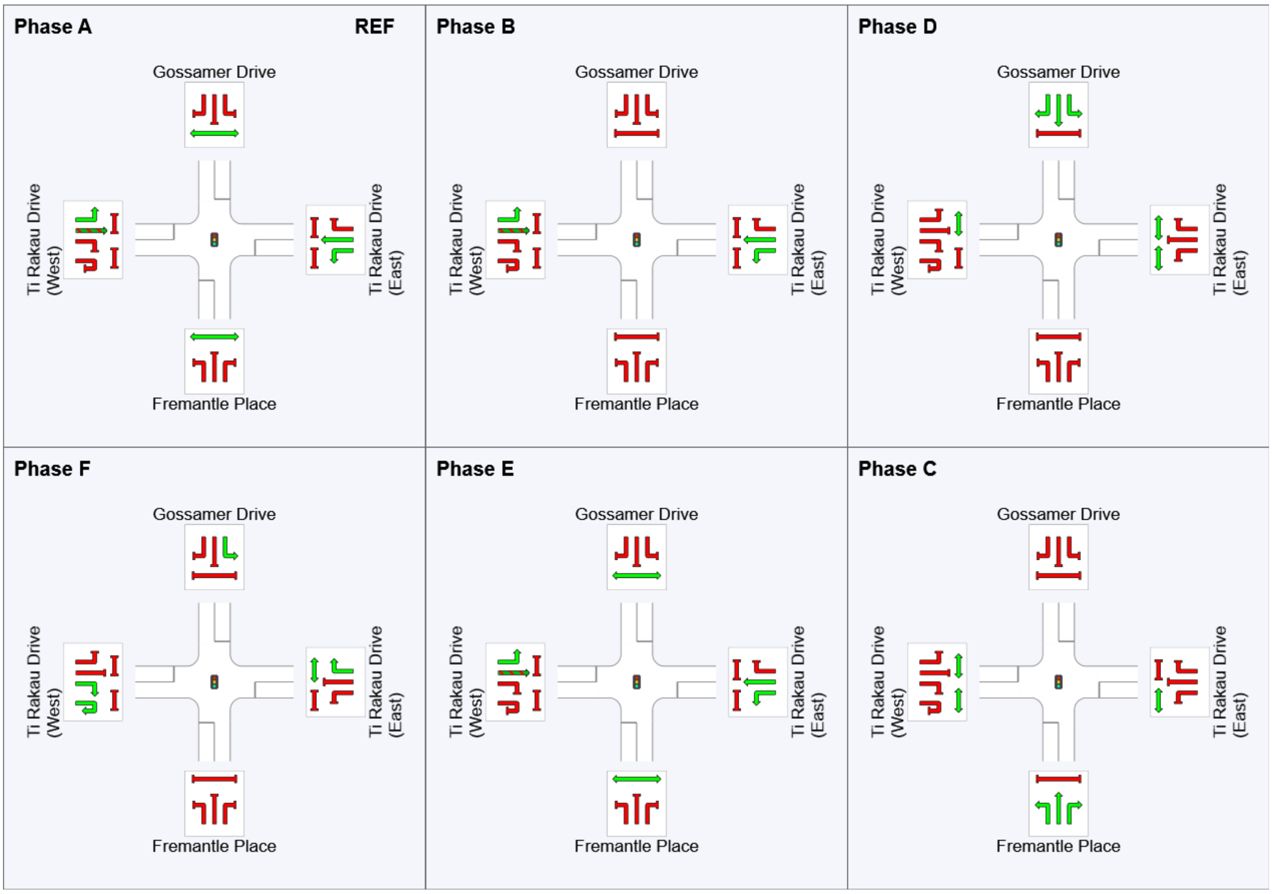
Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, D, F, E, C
Output Phase Sequence: A, B, D, F, E, C

Phase Timing Summary

Phase	A	B	D	F	E	C
Phase Change Time (sec)	0	59	83	99	118	143
Green Time (sec)	57	18	10	17	19	10
Phase Time (sec)	63	24	12	23	26	12
Phase Split	39%	15%	8%	14%	16%	8%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

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Appendix I

EB2/EB3R Final Scenario – Lane Performance Summaries

LANE SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 100 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	865	9.6	865	9.6	951	0.910	100	36.4	LOS D	33.6[N4]	254.3[N4]	Full	174	0.0	50.0
Lane 2	276	6.9	276	6.9	440	0.627	100	41.1	LOS D	10.9	80.9	Full	174	0.0	0.0
Lane 3 (B)	53	100.0	53	100.0	279	0.190	100	27.7	LOS C	1.4	17.7	Full	174	0.0	0.0
Approach	1194	13.0	1194	13.0		0.910		37.1	LOS D	33.6	254.3				
East: Pakuranga Road (East)															
Lane 1	121	1.7	121	1.7	621	0.194	100	29.6	LOS C	3.7	26.4	Short	21	0.0	NA
Lane 2	383	6.1	382	6.1	518[1]	0.737	100	31.1	LOS C	14.4	105.8	Full	98	0.0	21.9
Lane 3	468	6.1	467	6.1	634	0.737	100	32.1	LOS C	18.4	135.2	Full	98	0.0	44.6
Approach	972	5.6	970[N1]	5.6		0.737		31.4	LOS C	18.4	135.2				
West: Pakuranga Road (West)															
Lane 1 (B)	23	100.0	23	100.0	263	0.087	100	27.4	LOS C	0.6	7.3	Full	380	0.0	0.0
Lane 2	338	7.3	338	7.3	630	0.536	100	28.8	LOS C	11.9	88.8	Full	380	0.0	0.0
Lane 3	338	7.3	338	7.3	630	0.536	100	28.8	LOS C	11.9	88.8	Full	380	0.0	0.0
Lane 4	285	17.9	285	17.9	393	0.724	100	44.7	LOS D	12.0	97.2	Short	178	0.0	NA
Lane 5	285	17.9	285	17.9	393	0.724	100	44.7	LOS D	12.0	97.2	Short	105	0.0	NA
Approach	1267	13.7	1267	13.7		0.724		35.9	LOS D	12.0	97.2				
Intersection	3433	11.2	3431[N1]	11.2		0.910		35.1	LOS D	33.6	254.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	865	-	865	9.6	951	0.910	100	NA	NA
Lane 2	-	276	276	6.9	440	0.627	100	NA	NA
Lane 3	53	-	53	100.0	279	0.190	100	NA	NA
Approach	918	276	1194	13.0		0.910			

East: Pakuranga Road (East)

Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	S	W			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	121	-	121	1.7	621	0.194	100	35.9	2
Lane 2	-	382	382	6.1	518 [1]	0.737	100	NA	NA
Lane 3	-	467	467	6.1	634	0.737	100	NA	NA
Approach	121	849	970	5.6		0.737			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	-	23	23	100.0	263	0.087	100	NA	NA
Lane 2	338	-	338	7.3	630	0.536	100	NA	NA
Lane 3	338	-	338	7.3	630	0.536	100	NA	NA
Lane 4	-	285	285	17.9	393	0.724	100	0.0	3
Lane 5	-	285	285	17.9	393	0.724	100	8.0	4
Approach	675	592	1267	13.7		0.724			

	Total	%HV	Deg.Satn (v/c)
Intersection	3431	11.2	0.910

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

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LANE SUMMARY

Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1	510	5.6	510	5.6	1788	0.285	100	0.7	LOS A	0.3	2.4	Full	121	0.0	0.0
Lane 2	533	5.9	533	5.9	1868	0.285	100	0.0	LOS A	0.0	0.0	Full	121	0.0	0.0
Approach	1043	5.8	1043	5.8		0.285		0.3	NA	0.3	2.4				
West: Pakuranga Road (West)															
Lane 1	520	7.3	520	7.3	1852	0.281	100	0.0	LOS A	0.0	0.0	Full	108	0.0	0.0
Lane 2	441	7.3	441	7.3	1568	0.281	100	0.0	LOS A	0.0	0.0	Full	108	-14.1 [N3]	0.0
Lane 3	34	3.1	34	3.1	502	0.067	100	13.2	LOS B	0.2	1.3	Short	30	0.0	NA
Approach	995	7.1	995	7.1		0.281		0.5	NA	0.2	1.3				
SouthWest: Pakuranga Plaza															
Lane 1	55	5.5	55	5.5	44	1.254	100	401.2	LOS F	8.2	60.1	Full	196	-11.1 [N7]	0.0
Approach	55	5.5	55	5.5		1.254		401.2	LOS F	8.2	60.1				
Intersection	2093	6.4	2093	6.4		1.254		10.9	NA	8.2	60.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	59	451	510	5.6	1788	0.285	100	NA	NA
Lane 2	-	533	533	5.9	1868	0.285	100	NA	NA
Approach	59	984	1043	5.8		0.285			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R3 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	520	-	520	7.3	1852	0.281	100	NA	NA
Lane 2	441	-	441	7.3	1568	0.281	100	NA	NA
Lane 3	-	34	34	3.1	502	0.067	100	0.0	2

Approach	961	34	995	7.1		0.281				
SouthWest: Pakuranga Plaza										
Mov. From SW To Exit:	L3 W	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	13	42	55	5.5	44	1.254	100	NA	NA	
Approach	13	42	55	5.5		1.254				

	Total	%HV	Deg.Satn (v/c)
Intersection	2093	6.4	1.254

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Pakuranga Plaza Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1 (B)	28	100.0	28	100.0	687	0.041	100	16.6	LOS B	0.7	8.9	Short	24	0.0	NA
Lane 2	1016	5.3	1016	5.3	1103[1]	0.921	100	40.3	LOS D	63.5	464.5	Full	183	0.0	100.0
Lane 3	1059	5.3	1059	5.3	1149	0.921	100	40.4	LOS D	68.4	500.4	Full	183	0.0	100.0
Lane 4	439	5.0	439	5.0	592[1]	0.741	100	33.1	LOS C	19.8	144.5	Full	183	0.0	0.0
Lane 5	439	5.0	439	5.0	592[1]	0.741	100	33.1	LOS C	19.8	144.5	Short	60	0.0	NA
Approach	2980	6.1	2980	6.1		0.921		38.0	LOS D	68.4	500.4				
NorthWest: Pakuranga Road (West)															
Lane 1	384	6.6	380	6.7	1224	0.311	100	13.9	LOS B	10.0	74.2	Full	121	0.0	0.0
Lane 2	384	6.6	380	6.7	1224	0.311	100	13.9	LOS B	10.0	74.2	Full	121	0.0	14.1[8]
Lane 3	237	8.9	235	8.9	290	0.812	100	75.3	LOS E	15.9	119.8	Short	98	0.0	NA
Approach	1004	7.2	996[N1]	7.2		0.812		28.4	LOS C	15.9	119.8				
West: Pakuranga Road Busway Link (Northbound)															
Lane 1 (B)	9	100.0	9	100.0	295	0.031	100	45.9	LOS D	0.4	5.8	Full	215	0.0	0.0
Approach	9	100.0	9	100.0		0.031		45.9	LOS D	0.4	5.8				
SouthWest: Flyover															
Lane 1	167	9.0	167	9.0	298	0.560	100	68.2	LOS E	10.2	76.8	Short	70	0.0	NA
Lane 2	328	7.4	328	7.4	391[1]	0.838	100	66.9	LOS E	21.3	158.4	Full	1162	0.0	0.0
Lane 3	385	7.4	385	7.4	460	0.838	100	67.8	LOS E	25.6	190.7	Full	1162	0.0	0.0
Approach	880	7.7	880	7.7		0.838		67.6	LOS E	25.6	190.7				
Intersection	4873	6.8	4865[N1]	6.8		0.921		41.4	LOS D	68.4	500.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L2 S	L1 SW	R1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	-	-	28	100.0	687	0.041	100	0.0	2
Lane 2	-	1016	-	1016	5.3	1103[1]	0.921	100	NA	NA

				Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 3	-	1059	-	1059	5.3	1149	0.921	100	NA	NA
Lane 4	-	-	439	439	5.0	592[1]	0.741	100	NA	NA
Lane 5	-	-	439	439	5.0	592[1]	0.741	100	98.5	4
Approach	28	2075	877	2980	6.1		0.921			

NorthWest: Pakuranga Road (West)

Mov. From NW To Exit:	L1 E	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	380	-	380	6.7	1224	0.311	100	NA	NA
Lane 2	380	-	380	6.7	1224	0.311	100	NA	NA
Lane 3	-	235	235	8.9	290	0.812	100	33.4	2
Approach	761	235	996	7.2		0.812			

West: Pakuranga Road Busway Link (Northbound)

Mov. From W To Exit:	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	9	100.0	295	0.031	100	NA	NA
Approach	9	9	100.0		0.031			

SouthWest: Flyover

Mov. From SW To Exit:	L2 NW	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	167	-	167	9.0	298	0.560	100	23.4	2
Lane 2	-	328	328	7.4	391[1]	0.838	100	NA	NA
Lane 3	-	385	385	7.4	460	0.838	100	NA	NA
Approach	167	713	880	7.7		0.838			

	Total	%HV	Deg.Satn (v/c)
Intersection	4865	6.8	0.921

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Pakuranga Road Busway Link (Southbound) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthWest Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
SouthWest Exit: Flyover Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									

CCG LANE SUMMARY

Common Control Group: CCG3 [Aylesbury/ WR/ Reeves Rd]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 160 seconds (CCG Practical Cycle Time)

Lane Use and Performance (CCG)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]															
SouthEast: Reeves Road (East)															
Lane 1	231	7.8	231	7.8	1757	0.131	100	1.9	LOS A	0.0	0.0	Full	27	0.0	0.0
Approach	231	7.8	231	7.8		0.131		1.9	LOS A	0.0	0.0				
East: Pakuranga Rd Busway Link (Southbound)															
Lane 1 (B)	28	100.0	28	100.0	100	0.281	100	81.7	LOS F	1.9	25.0	Full	203	0.0	0.0
Approach	28	100.0	28	100.0		0.281		81.7	LOS F	1.9	25.0				
NorthWest: Aylesbury Street															
Lane 1	23	8.7	23	8.7	64	0.358	100	87.0	LOS F	1.7	12.6	Full	284	0.0	0.0
Approach	23	8.7	23	8.7		0.358		87.0	LOS F	1.7	12.6				
SouthWest: Reeves Road (South)															
Lane 1	97	18.7	97	18.7	101	0.953	100	108.5	LOS F	8.2	66.3	Full	180	-3.7 N7	0.0
Approach	97	18.7	97	18.7		0.953		108.5	LOS F	8.2	66.3				
Intersection	379	17.4	379	17.4		0.953		40.2	LOS D	8.2	66.3				
Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]															
SouthEast: Reeves Rd (East)															
Lane 1	402	7.5	402	7.5	440	0.913	100	83.7	LOS F	31.7	235.9	Full	810	0.0	0.0
Approach	402	7.5	402	7.5		0.913		83.7	LOS F	31.7	235.9				
NorthWest: Reeves Rd (West)															
Lane 1	86	10.5	86	10.5	458	0.188	100	2.0	LOS A	0.1	1.1	Full	27	0.0	0.0
Approach	86	10.5	86	10.5		0.188		2.0	LOS A	0.1	1.1				
SouthWest: William Roberts Road (South)															
Lane 1	404	9.9	404	9.9	445	0.909	100	80.7	LOS F	31.9	242.0	Full	223	0.0	22.5
Approach	404	9.9	404	9.9		0.909		80.7	LOS F	31.9	242.0				
Intersection	892	8.9	892	8.9		0.913		74.5	LOS E	31.9	242.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (CCG) (veh/h)

Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]

SouthEast: Reeves Road (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	191	40	231	7.8	1757	0.131	100	NA	NA
Approach	191	40	231	7.8		0.131			

East: Pakuranga Rd Busway Link (Southbound)

Mov. From E To Exit:	L1 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	28	100.0	100	0.281	100	NA	NA
Approach	28	28	100.0		0.281			

NorthWest: Aylesbury Street

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	12	11	23	8.7	64	0.358	100	NA	NA
Approach	12	11	23	8.7		0.358			

SouthWest: Reeves Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	12	9	76	97	18.7	101	0.953	100	NA	NA
Approach	12	9	76	97	18.7		0.953			

	Total	%HV	Deg.Satn (v/c)
Intersection	379	17.4	0.953

Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]

SouthEast: Reeves Rd (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	219	183	402	7.5	440	0.913	100	NA	NA
Approach	219	183	402	7.5		0.913			

NorthWest: Reeves Rd (West)

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	60	26	86	10.5	458	0.188	100	NA	NA
Approach	60	26	86	10.5		0.188			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	50	354	404	9.9	445	0.909	100	NA	NA
Approach	50	354	404	9.9		0.909			

	Total	%HV	Deg.Satn (v/c)
Intersection	892	8.9	0.913

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis (CCG)	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]												
SouthEast Exit: Reeves Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthEast Exit: Pakuranga Rd Busway Link (Northbound) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Aylesbury Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: Reeves Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]												
SouthEast Exit: Reeves Rd (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Reeves Rd (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
NorthEast: William Roberts Road (North)															
Lane 1	249	8.4	249	8.4	1487	0.167	100	2.4	LOS A	0.5	3.9	Full	223	0.0	0.0
Approach	249	8.4	249	8.4		0.167		2.4	NA	0.5	3.9				
NorthWest: Cortina Place															
Lane 1	146	10.3	146	10.3	715	0.204	100	3.7	LOS A	0.6	4.2	Full	177	-13.3 N7	0.0
Approach	146	10.3	146	10.3		0.204		3.7	LOS A	0.6	4.2				
SouthWest: William Roberts Road (South)															
Lane 1	501	9.2	501	9.2	1291	0.388	100	1.0	LOS A	0.8	6.1	Full	110	-16.8 N7	0.0
Approach	501	9.2	501	9.2		0.388		1.0	NA	0.8	6.1				
Intersection	896	9.2	896	9.2		0.388		1.8	NA	0.8	6.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

NorthEast: William Roberts Road (North)

Mov. From NE To Exit:	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	181	68	249	8.4	1487	0.167	100	NA	NA
Approach	181	68	249	8.4		0.167			

NorthWest: Cortina Place

Mov. From NW To Exit:	L2 NE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	77	69	146	10.3	715	0.204	100	NA	NA
Approach	77	69	146	10.3		0.204			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	151	350	501	9.2	1291	0.388	100	NA	NA

Approach	151	350	501	9.2	0.388

	Total	%HV	Deg.Satn (v/c)
Intersection	896	9.2	0.388

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
NorthEast Exit: William Roberts Road (North) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Cortina Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

LANE SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive (East)															
Lane 1	350	9.0	350	9.0	392	0.893	100	76.1	LOS E	21.3 [N4]	160.7 [N4]	Full	110	-43.1 [N3]	50.0
Lane 2	665	9.6	665	9.6	744 [1]	0.893	100	55.2	LOS E	21.2 [N4]	160.7 [N4]	Full	110	0.0	50.0
Lane 3	31	3.2	31	3.2	69	0.450	100	85.3	LOS F	2.1	15.4	Short	86	0.0	NA
Lane 4 (B)	53	100.0	53	100.0	613	0.086	100	4.4	LOS A	0.0	0.6	Full	110	0.0	0.0
Approach	1099	13.6	1099	13.6		0.893		60.2	LOS E	21.3	160.7				
East: Aylesbury Street															
Lane 1	110	9.1	110	9.1	139	0.791	100	48.1	LOS D	5.3	40.3	Short	30	-0.4 [N3]	NA
Lane 2	155	6.5	155	6.5	157 [1]	0.986	100	113.0	LOS F	7.9 [N4]	58.4 [N4]	Full	40	0.0	50.0
Approach	265	7.5	265	7.5		0.986		86.1	LOS F	7.9	58.4				
North: Ti Rakau Drive (West)															
Lane 1 (B)	23	100.0	23	100.0	613	0.038	100	4.4	LOS A	0.0	0.2	Full	174	0.0	0.0
Lane 2	108	11.1	108	11.1	980	0.110	100	17.1	LOS B	2.9	22.6	Short	91	0.0	NA
Lane 3	280	16.3	280	16.3	733	0.382	100	33.4	LOS C	12.2	97.0	Full	174	-0.4 [N3]	0.0
Lane 4	280	16.3	280	16.3	733	0.382	100	33.4	LOS C	12.2	97.0	Full	174	-0.4 [N3]	0.0
Lane 5	12	0.0	12	0.0	70	0.170	100	83.1	LOS F	0.8	5.6	Short	64	0.0	NA
Approach	703	17.9	703	17.9		0.382		30.8	LOS C	12.2	97.0				
West: Palm Avenue															
Lane 1	111	5.4	111	5.4	164	0.677	100	73.9	LOS E	7.3	53.6	Full	87	-32.0 [N7]	0.0
Approach	111	5.4	111	5.4		0.677		73.9	LOS E	7.3	53.6				
Intersection	2178	13.8	2178	13.8		0.986		54.6	LOS D	21.3	160.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	85	265	-	350	9.0	392	0.893	100	NA	NA

Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 2	-	665	-	665	9.6	744[1]	0.893	100	NA	NA
Lane 3	-	-	31	31	3.2	69	0.450	100	0.0	2
Lane 4	-	53	-	53	100.0	613	0.086	100	NA	NA
Approach	85	983	31	1099	13.6		0.893			
East: Aylesbury Street										
Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	110	-	-	110	9.1	139	0.791	100	42.1	2
Lane 2	-	10	145	155	6.5	157[1]	0.986	100	NA	NA
Approach	110	10	145	265	7.5		0.986			
North: Ti Rakau Drive (West)										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	-	23	-	23	100.0	613	0.038	100	NA	NA
Lane 2	108	-	-	108	11.1	980	0.110	100	0.0	3
Lane 3	-	280	-	280	16.3	733	0.382	100	NA	NA
Lane 4	-	280	-	280	16.3	733	0.382	100	NA	NA
Lane 5	-	-	12	12	0.0	70	0.170	100	0.0	4
Approach	108	583	12	703	17.9		0.382			
West: Palm Avenue										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	52	20	39	111	5.4	164	0.677	100	NA	NA
Approach	52	20	39	111	5.4		0.677			

	Total	%HV	Deg.Satn (v/c)
Intersection	2178	13.8	0.986

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
East Exit: Aylesbury Street Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
West Exit: Palm Avenue Merge Type: **Not Applied**											

Full Length Lane	1	Merge Analysis not applied.

LANE SUMMARY

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	888	12.6	888	12.6	1322	0.672	100	12.7	LOS B	17.0 [N4]	131.5 [N4]	Full	90	0.0	50.0
Lane 2	416	10.1	415	10.1	498	0.835	100	40.8	LOS D	17.3 [N4]	131.5 [N4]	Full	90	-50.0 [N7]	50.0
Lane 3	415	10.1	415	10.1	498	0.835	100	40.8	LOS D	17.3 [N6]	131.5 [N6]	Full	90	-50.0 [N3]	50.0
Lane 4 (B)	25	100.0	25	100.0	199	0.126	100	35.0	LOS C	1.0	12.6	Full	90	0.0	0.0
Approach	1744	12.7	1744	12.7		0.835		26.4	LOS C	17.3	131.5				
NorthEast: Reeves Road															
Lane 1 (B)	28	100.0	28	100.0	292	0.096	100	31.0	LOS C	1.0	12.4	Full	50	0.0	0.0
Approach	28	100.0	28	100.0		0.096		31.0	LOS C	1.0	12.4				
NorthWest: Ti Rakau Drive (West)															
Lane 1 (B)	22	100.0	22	100.0	225	0.098	100	34.0	LOS C	0.8	10.4	Full	110	0.0	0.0
Lane 2	269	16.0	268	16.0	504	0.533	100	32.2	LOS C	11.8	93.6	Full	110	0.0	0.4
Lane 3	269	16.0	268	16.0	504	0.533	100	32.2	LOS C	11.8	93.6	Full	110	0.0	0.4
Lane 4	121	12.4	121	12.4	192	0.629	100	75.9	LOS E	7.8	60.5	Short	85	0.0	NA
Approach	680	18.1	680	18.1		0.629		40.0	LOS D	11.8	93.6				
SouthWest: Pakuranga Highway															
Lane 1	183	5.5	183	5.5	325	0.563	100	49.5	LOS D	9.8	71.6	Short	125	-50.0 [N7]	NA
Lane 2	241	9.7	241	9.7	339	0.710	100	69.5	LOS E	15.0	114.0	Short	220	0.0	NA
Lane 3	241	9.7	241	9.7	339	0.710	100	69.5	LOS E	15.0	114.0	Full	623	0.0	0.0
Lane 4	241	9.7	241	9.7	339	0.710	100	69.5	LOS E	15.0	114.0	Short	195	0.0	NA
Approach	906	8.8	906	8.8		0.710		65.5	LOS E	15.0	114.0				
Intersection	3358	13.5	3358	13.5		0.835		39.7	LOS D	17.3	131.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N6 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows) but average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE	L2	T1	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	SW	NW			veh/h	v/c	%	%	No.
Lane 1	888	-	888	12.6	1322	0.672	100	NA	NA
Lane 2	-	415	415	10.1	498	0.835	100	NA	NA
Lane 3	-	415	415	10.1	498	0.835	100	NA	NA
Lane 4	-	25	25	100.0	199	0.126	100	NA	NA
Approach	888	856	1744	12.7		0.835			

NorthEast: Reeves Road

Mov. From NE To Exit:	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	28	100.0	292	0.096	100	NA	NA
Approach	28	28	100.0		0.096			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	13	-	22	100.0	225	0.098	100	NA	NA
Lane 2	-	268	-	268	16.0	504	0.533	100	NA	NA
Lane 3	-	268	-	268	16.0	504	0.533	100	NA	NA
Lane 4	-	-	121	121	12.4	192	0.629	100	0.0	3
Approach	9	550	121	680	18.1		0.629			

SouthWest: Pakuranga Highway

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	183	-	183	5.5	325	0.563	100	0.0	2
Lane 2	-	241	241	9.7	339	0.710	100	0.0	3
Lane 3	-	241	241	9.7	339	0.710	100	NA	NA
Lane 4	-	241	241	9.7	339	0.710	100	0.0	3
Approach	183	723	906	8.8		0.710			

	Total	%HV	Deg.Satn (v/c)
Intersection	3358	13.5	0.835

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
Full Length Lane	4	Merge Analysis not applied.										
NorthEast Exit: Reeves Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

SouthWest Exit: Pakuranga Highway Merge Type: **Zipper**												
Exit Short Lane	1	280	50.0	60	64	2.50	2.00	888	1728	0.514	0.0	0.0
Merge Lane	2	-	50.0	444	472	2.50	2.00	121	1175	0.103	0.6	0.7

LANE SUMMARY

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	471	11.6	471	11.6	755	0.623	100	29.2	LOS C	19.2	147.6	Short	115	0.0	NA
Lane 2	561	12.0	561	12.0	900	0.623	100	23.2	LOS C	21.1	163.1	Full	207	0.0	0.0
Lane 3	458	12.0	458	12.0	735[1]	0.623	100	21.4	LOS C	15.9	122.8	Full	207	0.0	0.0
Lane 4	114	8.2	114	8.2	151	0.750	100	68.1	LOS E	6.3	47.4	Short	45	0.0	NA
Lane 5 (B)	25	100.0	25	100.0	597	0.042	100	0.7	LOS A	0.0	0.4	Full	207	0.0	0.0
Approach	1628	13.0	1628	13.0		0.750		27.2	LOS C	21.1	163.1				
NorthEast: William Roberts Road Extention															
Lane 1	102	9.8	102	9.8	187	0.545	100	58.8	LOS E	5.3	40.0	Full	112	0.0	0.0
Lane 2	148	8.8	148	8.8	189	0.782	100	63.3	LOS E	8.2	61.9	Full	110	0.0	0.0
Approach	250	9.2	250	9.2		0.782		61.4	LOS E	8.2	61.9				
NorthWest: Ti Rakau Drive (West)															
Lane 1	388	9.8	388	9.8	504	0.770	100	48.9	LOS D	19.4	147.0	Full	107	0.0	44.2
Lane 2	431	13.6	431	13.6	891	0.484	100	21.0	LOS C	14.7	115.2	Full	107	0.0	21.7
Lane 3	410	13.6	410	13.6	846[1]	0.484	100	20.7	LOS C	13.8	107.6	Full	107	0.0	15.5
Lane 4	22	18.2	22	18.2	164	0.135	100	59.4	LOS E	1.1	8.8	Short	20	0.0	NA
Lane 5 (B)	13	100.0	13	100.0	597	0.022	100	0.6	LOS A	0.0	0.2	Full	107	0.0	0.0
Approach	1264	13.4	1264	13.4		0.770		29.9	LOS C	19.4	147.0				
SouthWest: Mattson Road															
Lane 1	27	0.0	27	0.0	108	0.249	100	66.0	LOS E	1.4	10.0	Short	20	0.0	NA
Lane 2	86	9.3	86	9.3	103[1]	0.835	100	73.1	LOS E	5.0	37.9	Full	282	0.0	0.0
Approach	113	7.1	113	7.1		0.835		71.4	LOS E	5.0	37.9				
Intersection	3255	12.6	3254[N1]	12.6		0.835		32.4	LOS C	21.1	163.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Approach Lane Flows (veh/h)

Mov. From SE To Exit:	L2 SW	T1 NW	R2 NE	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
SouthEast: Ti Rakau Drive (East)											
Lane 1	35	436	-	-	471	11.6	755	0.623	100	37.9	2
Lane 2	-	561	-	-	561	12.0	900	0.623	100	NA	NA

Lane 3	-	458	-	-	458	12.0	735[1]	0.623	100	NA	NA
Lane 4	-	-	61	53	114	8.2	151	0.750	100	19.7	3
Lane 5	-	25	-	-	25	100.0	597	0.042	100	NA	NA
Approach	35	1479	61	53	1628	13.0		0.750			

NorthEast: William Roberts Road Extention

Mov. From NE To Exit:	L2 SE	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	102	-	-	102	9.8	187	0.545	100	NA	NA
Lane 2	-	12	136	148	8.8	189	0.782	100	NA	NA
Approach	102	12	136	250	9.2		0.782			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	388	-	-	388	9.8	504	0.770	100	NA	NA
Lane 2	-	431	-	431	13.6	891	0.484	100	NA	NA
Lane 3	-	410	-	410	13.6	846[1]	0.484	100	NA	NA
Lane 4	-	-	22	22	18.2	164	0.135	100	0.0	3
Lane 5	-	13	-	13	100.0	597	0.022	100	NA	NA
Approach	388	854	22	1264	13.4		0.770			

SouthWest: Mattson Road

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	-	-	27	0.0	108	0.249	100	0.0	2
Lane 2	-	56	30	86	9.3	103[1]	0.835	100	NA	NA
Approach	27	56	30	113	7.1		0.835			

	Total	%HV	Deg.Satn (v/c)
Intersection	3254	12.6	0.835

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthEast Exit: William Roberts Road Extention Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
Full Length Lane	4	Merge Analysis not applied.									
SouthWest Exit: Mattson Road											

Merge Type: **Not Applied**		
Full Length Lane	1	Merge Analysis not applied.

LANE SUMMARY

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 30 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	781	11.7	781	11.7	1803	0.433	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 2	781	11.7	781	11.7	1803	0.433	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 3	51	3.9	51	3.9	270	0.189	100	17.9	LOS B	0.6	4.5	Short	14	0.0	NA
Lane 4 (B)	25	100.0	25	100.0	478	0.052	100	2.1	LOS A	0.1	0.9	Full	147	0.0	0.0
Approach	1637	12.8	1637	12.8		0.433		0.6	LOS A	0.6	4.5				
NorthWest: Ti Rakau Drive (West)															
Lane 1	474	13.2	474	13.2	715	0.663	100	9.2	LOS A	5.7	44.2	Full	73	0.0	0.0
Lane 2	474	13.2	474	13.2	715	0.663	100	9.2	LOS A	5.7	44.2	Full	73	0.0	0.0
Lane 3 (B)	13	100.0	13	100.0	478	0.027	100	2.1	LOS A	0.0	0.5	Full	73	0.0	0.0
Approach	961	14.4	961	14.4		0.663		9.1	LOS A	5.7	44.2				
Intersection	2598	13.4	2598	13.4		0.663		3.8	LOS A	5.7	44.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	781	-	781	11.7	1803	0.433	100	NA	NA
Lane 2	781	-	781	11.7	1803	0.433	100	NA	NA
Lane 3	-	51	51	3.9	270	0.189	100	0.0	2
Lane 4	25	-	25	100.0	478	0.052	100	NA	NA
Approach	1586	51	1637	12.8		0.433			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	474	474	13.2	715	0.663	100	NA	NA
Lane 2	474	474	13.2	715	0.663	100	NA	NA
Lane 3	13	13	100.0	478	0.027	100	NA	NA
Approach	961	961	14.4		0.663			

	Total	%HV	Deg.Satn (v/c)

Intersection	2598	13.4	0.663

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

LANE SUMMARY

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 40 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Ti Rakau Drive (East)															
Lane 1 (B)	25	100.0	25	100.0	370	0.068	100	5.5	LOS A	0.2	2.2	Full	45	0.0	0.0
Approach	25	100.0	25	100.0		0.068		5.5	LOS A	0.2	2.2				
NorthWest: Ti Rakau Drive (West)															
Lane 1	523	12.6	523	12.6	727	0.719	100	12.3	LOS B	2.3 N4	17.5 N4	Full	12	0.0	50.0
Lane 2	522	12.6	522	12.6	727	0.719	100	12.3	LOS B	2.3 N4	17.5 N4	Full	12	0.0	50.0
Lane 3 (B)	13	100.0	13	100.0	370	0.035	100	5.4	LOS A	0.1	1.1	Full	12	0.0	0.0
Approach	1058	13.7	1058	13.7		0.719		12.2	LOS B	2.3	17.5				
Intersection	1083	15.7	1083	15.7		0.719		12.0	LOS B	2.3	17.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	25	25	100.0	370	0.068	100	NA	NA
Approach	25	25	100.0		0.068			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	523	523	12.6	727	0.719	100	NA	NA
Lane 2	522	522	12.6	727	0.719	100	NA	NA
Lane 3	13	13	100.0	370	0.035	100	NA	NA
Approach	1058	1058	13.7		0.719			

	Total	%HV	Deg.Satn (v/c)
Intersection	1083	15.7	0.719

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

LANE SUMMARY

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	804	11.5	804	11.5	930	0.864	100	22.4	LOS C	8.5 N4	65.8 N4	Full	45	0.0	50.0
Lane 2	804	11.5	804	11.5	930	0.864	100	22.4	LOS C	8.5 N4	65.8 N4	Full	45	0.0	50.0
Approach	1607	11.5	1607	11.5		0.864		22.4	LOS C	8.5	65.8				
Intersection	1607	11.5	1607	11.5		0.864		22.4	LOS C	8.5	65.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)								
Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	804	804	11.5	930	0.864	100	NA	NA
Lane 2	804	804	11.5	930	0.864	100	NA	NA
Approach	1607	1607	11.5		0.864			

	Total	%HV	Deg.Satn (v/c)
Intersection	1607	11.5	0.864

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length	Percent Opng in Lane	Opposing Flow Rate		Critical Gap	Follow-up Headway	Lane Flow Rate	Capacity	Deg. Satn	Min. Delay	Merge Delay
		m	%	veh/h	pcu/h	sec	sec	veh/h	veh/h	v/c	sec	sec
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-AM_Edgewater EAST Signal.sip9

LANE SUMMARY

Site: 101 [12.0 Edgewater Dr (East) / Ti Rakau Dr -Signalised - Import (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	765	11.3	765	11.3	1067	0.717	100	9.8	LOS A	15.8	121.2	Full	445	0.0	0.0
Lane 2	766	11.6	766	11.6	1067	0.717	100	9.5	LOS A	15.8	121.5	Full	445	0.0	0.0
Lane 3 (B)	25	100.0	25	100.0	707	0.035	100	5.6	LOS A	0.3	3.9	Full	445	0.0	0.0
Approach	1556	12.9	1556	12.9		0.717		9.6	LOS A	15.8	121.5				
NorthWest: Ti Rakau Drive (West)															
Lane 1	474	12.9	474	12.9	1059	0.447	100	7.4	LOS A	7.6	59.2	Full	109	0.0	0.0
Lane 2	474	12.9	474	12.9	1059	0.447	100	7.4	LOS A	7.6	59.2	Full	109	0.0	0.0
Lane 3	105	10.0	105	10.0	145	0.724	100	68.1	LOS E	5.8	44.3	Short	50	0.0	NA
Lane 4 (B)	14	100.0	14	100.0	707	0.019	100	5.5	LOS A	0.2	2.1	Full	109	0.0	0.0
Approach	1066	13.7	1066	13.7		0.724		13.4	LOS B	7.6	59.2				
SouthWest: Edgewater Drive (East)															
Lane 1	23	0.0	23	0.0	125	0.185	100	65.1	LOS E	1.2	8.4	Full	789	0.0	0.0
Approach	23	0.0	23	0.0		0.185		65.1	LOS E	1.2	8.4				
Intersection	2645	13.1	2645	13.1		0.724		11.6	LOS B	15.8	121.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	36	729	765	11.3	1067	0.717	100	NA	NA
Lane 2	-	766	766	11.6	1067	0.717	100	NA	NA
Lane 3	-	25	25	100.0	707	0.035	100	NA	NA
Approach	36	1520	1556	12.9		0.717			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	R2 SW	U NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	474	-	-	474	12.9	1059	0.447	100	NA	NA
Lane 2	474	-	-	474	12.9	1059	0.447	100	NA	NA
Lane 3	-	13	93	105	10.0	145	0.724	100	4.0	2
Lane 4	14	-	-	14	100.0	707	0.019	100	NA	NA

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Approach	961	13	93	1066	13.7	0.724			
SouthWest: Edgewater Drive (East)									
Lane 1	11	13	23	0.0	125	0.185	100	NA	NA
Approach	11	13	23	0.0		0.185			

	Total	%HV	Deg.Satn (v/c)
Intersection	2645	13.1	0.724

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
SouthWest Exit: Edgewater Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [AM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Fremantle Place															
Lane 1	19	5.3	19	5.3	34	0.552	100	92.2	LOS F	1.4	10.2	Short	9	0.0	NA
Lane 2	23	13.0	23	13.0	67	0.344	100	85.5	LOS F	1.6	12.3	Full	285	0.0	0.0
Approach	42	9.5	42	9.5		0.552		88.5	LOS F	1.6	12.3				
East: Ti Rakau Drive (East)															
Lane 1	765	11.4	765	11.4	960	0.797	100	23.4	LOS C	26.9	207.1	Full	636	0.0	0.0
Lane 2	744	11.5	744	11.5	933 [1]	0.797	100	22.3	LOS C	24.7	190.2	Full	636	0.0	0.0
Lane 3 (B)	28	100.0	28	100.0	266	0.105	100	34.9	LOS C	1.1	14.0	Short	60	0.0	NA
Lane 4	168	6.7	168	6.7	235	0.712	82 [6]	72.9	LOS E	10.9	80.7	Short	150	0.0	NA
Lane 5	204	6.7	204	6.7	235	0.868	100	82.9	LOS F	14.7	108.7	Short	103	0.0	NA
Approach	1909	11.8	1909	11.8		0.868		33.9	LOS C	26.9	207.1				
North: Gossamer Drive															
Lane 1	323	9.2	323	9.2	295	1.098	100	143.4	LOS F	30.6	231.4	Short	150	0.0	NA
Lane 2	327	9.2	327	9.2	298	1.098	100	143.3	LOS F	30.9	233.6	Full	1010	0.0	0.0
Lane 3	39	5.1	39	5.1	126	0.309	100	78.1	LOS E	2.5	18.4	Short	28	0.0	NA
Approach	689	9.0	689	9.0		1.098		139.7	LOS F	30.9	233.6				
West: Ti Rakau Drive (West)															
Lane 1	19	5.3	19	5.3	838	0.023	100	14.2	LOS B	0.3	2.4	Short	28	0.0	NA
Lane 2	434	13.0	434	13.0	484 [1]	0.897	100	72.4	LOS E	31.1	242.0	Full	445	0.0	0.0
Lane 3	426	13.0	426	13.0	475 [1]	0.897	100	72.3	LOS E	30.5	237.1	Full	445	0.0	0.0
Lane 4	22	9.1	22	9.1	199	0.110	100	65.5	LOS E	1.3	9.6	Short	23	0.0	NA
Lane 5 (B)	27	100.0	27	100.0	271	0.100	100	34.8	LOS C	1.0	13.5	Full	445	0.0	0.0
Approach	928	15.3	928	15.3		0.897		69.9	LOS E	31.1	242.0				
Intersection	3568	12.2	3568	12.2		1.098		64.3	LOS E	31.1	242.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

Approach Lane Flows (veh/h)

South: Fremantle Place

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	-	-	19	5.3	34	0.552	100	26.4	2
Lane 2	-	11	12	23	13.0	67	0.344	100	NA	NA
Approach	19	11	12	42	9.5		0.552			

East: Ti Rakau Drive (East)

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	16	749	-	765	11.4	960	0.797	100	NA	NA
Lane 2	-	744	-	744	11.5	933[1]	0.797	100	NA	NA
Lane 3	-	28	-	28	100.0	266	0.105	100	0.0	2
Lane 4	-	-	168	168	6.7	235	0.712	82[6]	0.0	2
Lane 5	-	-	204	204	6.7	235	0.868	100	19.9	4
Approach	16	1521	372	1909	11.8		0.868			

North: Gossamer Drive

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	323	-	-	323	9.2	295	1.098	100	55.1	2
Lane 2	327	-	-	327	9.2	298	1.098	100	NA	NA
Lane 3	-	10	29	39	5.1	126	0.309	100	0.0	2
Approach	650	10	29	689	9.0		1.098			

West: Ti Rakau Drive (West)

Mov. From W To Exit:	L2 N	T1 E	R2 S	U W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	19	-	-	-	19	5.3	838	0.023	100	0.0	2
Lane 2	-	434	-	-	434	13.0	484[1]	0.897	100	NA	NA
Lane 3	-	426	-	-	426	13.0	475[1]	0.897	100	NA	NA
Lane 4	-	-	11	11	22	9.1	199	0.110	100	0.0	3
Lane 5	-	27	-	-	27	100.0	271	0.100	100	NA	NA
Approach	19	887	11	11	928	15.3		0.897			

	Total	%HV	Deg.Satn (v/c)
Intersection	3568	12.2	1.098

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Fremantle Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Gossamer Drive Merge Type: **Zipper**												
Exit Short Lane	1	150	50.0	102	106	2.50	2.00	198	1679	0.118	0.0	0.0
Merge Lane	2	-	50.0	99	102	2.50	2.00	204	1684	0.121	0.0	0.0

West Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**		
Full Length Lane	1	Merge Analysis not applied.
Full Length Lane	2	Merge Analysis not applied.
Full Length Lane	3	Merge Analysis not applied.

LANE SUMMARY

Site: 1.0 [1.0 Pakuranga Rd / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 100 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive															
Lane 1	994	7.3	994	7.3	1054	0.943	100	44.2	LOS D	34.2[N4]	254.3[N4]	Full	174	0.0	50.0
Lane 2	253	4.7	253	4.7	483	0.524	100	38.4	LOS D	9.5	69.3	Full	174	0.0	0.0
Lane 3 (B)	53	100.0	53	100.0	279	0.190	100	27.7	LOS C	1.4	17.7	Full	174	0.0	0.0
Approach	1300	10.6	1300	10.6		0.943		42.4	LOS D	34.2	254.3				
East: Pakuranga Road (East)															
Lane 1	64	1.6	63	1.6	566	0.112	100	31.0	LOS C	2.0	13.9	Short	21	0.0	NA
Lane 2	288	5.2	284	5.2	515[1]	0.551	100	30.4	LOS C	10.1	74.2	Full	98	0.0	0.0
Lane 3	324	5.2	320	5.2	582	0.551	100	31.1	LOS C	11.7	85.8	Full	98	0.0	2.9
Approach	676	4.9	668[N1]	4.9		0.551		30.8	LOS C	11.7	85.8				
West: Pakuranga Road (West)															
Lane 1 (B)	23	100.0	23	100.0	263	0.087	100	27.4	LOS C	0.6	7.3	Full	380	0.0	0.0
Lane 2	509	5.4	509	5.4	581	0.875	100	45.3	LOS D	24.6	180.3	Full	380	0.0	0.0
Lane 3	509	5.4	509	5.4	581	0.875	100	45.3	LOS D	24.6	180.3	Full	380	0.0	0.0
Lane 4	357	8.1	357	8.1	419	0.851	100	52.1	LOS D	17.0	127.5	Short	178	0.0	NA
Lane 5	357	8.1	357	8.1	419	0.851	100	52.1	LOS D	17.0	127.5	Short	105	0.0	NA
Approach	1753	7.8	1753	7.8		0.875		47.8	LOS D	24.6	180.3				
Intersection	3729	8.2	3721[N1]	8.3		0.943		42.9	LOS D	34.2	254.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
South: Ti Rakau Drive									
Lane 1	994	-	994	7.3	1054	0.943	100	NA	NA
Lane 2	-	253	253	4.7	483	0.524	100	NA	NA
Lane 3	53	-	53	100.0	279	0.190	100	NA	NA
Approach	1047	253	1300	10.6		0.943			
East: Pakuranga Road (East)									
Mov.	L2	T1	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	S	W			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	63	-	63	1.6	566	0.112	100	0.0	2
Lane 2	-	284	284	5.2	515[1]	0.551	100	NA	NA
Lane 3	-	320	320	5.2	582	0.551	100	NA	NA
Approach	63	604	668	4.9		0.551			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	-	23	23	100.0	263	0.087	100	NA	NA
Lane 2	509	-	509	5.4	581	0.875	100	NA	NA
Lane 3	509	-	509	5.4	581	0.875	100	NA	NA
Lane 4	-	357	357	8.1	419	0.851	100	0.0	3
Lane 5	-	357	357	8.1	419	0.851	100	32.8	4
Approach	1017	736	1753	7.8		0.875			

	Total	%HV	Deg.Satn (v/c)
Intersection	3721	8.3	0.943

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

LANE SUMMARY

Site: 2.1 [2.1 Pakuranga Plaza / Pakuranga Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Pakuranga Road (East)															
Lane 1	344	5.0	344	5.0	1799	0.191	100	0.6	LOS A	0.2	1.3	Full	121	0.0	0.0
Lane 2	359	4.9	359	4.9	1879	0.191	100	0.0	LOS A	0.0	0.0	Full	121	0.0	0.0
Approach	703	5.0	703	5.0		0.191		0.3	NA	0.2	1.3				
West: Pakuranga Road (West)															
Lane 1	640	5.2	640	5.2	1876	0.341	100	0.0	LOS A	12.7 N5	92.7 N5	Full	108	0.0	1.2
Lane 2	629	5.2	629	5.2	1846	0.341	100	0.0	LOS A	10.0 N5	73.0 N5	Full	108	0.0	0.0
Lane 3	24	0.0	24	0.0	803	0.030	100	9.7	LOS A	0.1	0.6	Short	30	0.0	NA
Approach	1293	5.1	1293	5.1		0.341		0.2	NA	12.7	92.7				
SouthWest: Pakuranga Plaza															
Lane 1	59	6.8	59	6.8	30	1.983	100	1002.4	LOS F	16.2	120.4	Full	196	-39.2 N7	0.0
Approach	59	6.8	59	6.8		1.983		1002.4	LOS F	16.2	120.4				
Intersection	2055	5.1	2055	5.1		1.983		29.0	NA	16.2	120.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N5 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows).
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L1 SW	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	36	308	344	5.0	1799	0.191	100	NA	NA
Lane 2	-	359	359	4.9	1879	0.191	100	NA	NA
Approach	36	667	703	5.0		0.191			

West: Pakuranga Road (West)

Mov. From W To Exit:	T1 E	R3 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	640	-	640	5.2	1876	0.341	100	NA	NA
Lane 2	629	-	629	5.2	1846	0.341	100	NA	NA
Lane 3	-	24	24	0.0	803	0.030	100	0.0	2

Approach	1269	24	1293	5.1		0.341			
SouthWest: Pakuranga Plaza									
Mov. From SW To Exit:	L3 W	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	21	38	59	6.8	30	1.983	100	NA	NA
Approach	21	38	59	6.8		1.983			

	Total	%HV	Deg.Satn (v/c)
Intersection	2055	5.1	1.983

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
West Exit: Pakuranga Road (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
SouthWest Exit: Pakuranga Plaza Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 3.0 [3.0 Pakuranga Highway / Pakuranga Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 120 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Pakuranga Road (East)															
Lane 1 (B)	28	100.0	28	100.0	676	0.041	100	14.9	LOS B	0.6	7.4	Short	24	0.0	NA
Lane 2	481	5.5	481	5.5	1066[1]	0.451	100	16.1	LOS B	12.9	94.2	Full	183	0.0	0.0
Lane 3	509	5.5	509	5.5	1130	0.451	100	16.4	LOS B	13.9	102.1	Full	183	0.0	0.0
Lane 4	291	4.1	291	4.1	347[1]	0.839	100	59.1	LOS E	15.9	115.5	Full	183	0.0	0.0
Lane 5	291	4.1	291	4.1	347[1]	0.839	100	59.1	LOS E	15.9	115.5	Short	60	0.0	NA
Approach	1600	6.6	1600	6.6		0.839		31.8	LOS C	15.9	115.5				
NorthWest: Pakuranga Road (West)															
Lane 1	642	5.0	634	5.0	704	0.899	100	53.9	LOS D	24.2[N4]	176.8[N4]	Full	121	0.0	50.0
Lane 2	609	5.0	601	5.0	669[1]	0.899	100	53.7	LOS D	24.2[N4]	176.8[N4]	Full	121	0.0	50.0
Lane 3	76	11.8	75	11.8	213	0.352	100	58.0	LOS E	3.7	28.6	Short	98	0.0	NA
Approach	1327	5.4	1310[N1]	5.4		0.899		54.0	LOS D	24.2	176.8				
West: Pakuranga Road Busway Link (Northbound)															
Lane 1 (B)	9	100.0	9	100.0	617	0.015	100	14.9	LOS B	0.2	2.9	Full	215	0.0	0.0
Approach	9	100.0	9	100.0		0.015		14.9	LOS B	0.2	2.9				
SouthWest: Flyover															
Lane 1	119	9.2	119	9.2	223	0.533	100	60.4	LOS E	6.0	45.6	Short	70	0.0	NA
Lane 2	666	4.7	666	4.7	871[1]	0.764	100	27.3	LOS C	25.6	186.7	Full	1162	0.0	0.0
Lane 3	750	4.7	750	4.7	981	0.764	100	29.0	LOS C	31.1	226.1	Full	1162	0.0	0.0
Approach	1535	5.0	1535	5.0		0.764		30.7	LOS C	31.1	226.1				
Intersection	4471	5.9	4454[N1]	5.9		0.899		37.9	LOS D	31.1	226.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

East: Pakuranga Road (East)

Mov. From E To Exit:	L2 S	L1 SW	R1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	-	-	28	100.0	676	0.041	100	0.0	2
Lane 2	-	481	-	481	5.5	1066[1]	0.451	100	NA	NA

Lane 3	-	509	-	509	5.5	1130	0.451	100	NA	NA
Lane 4	-	-	291	291	4.1	347[1]	0.839	100	NA	NA
Lane 5	-	-	291	291	4.1	347[1]	0.839	100	76.3	4
Approach	28	990	582	1600	6.6		0.839			

NorthWest: Pakuranga Road (West)

Mov. From NW To Exit:	L1 E	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	634	-	634	5.0	704	0.899	100	NA	NA
Lane 2	601	-	601	5.0	669[1]	0.899	100	NA	NA
Lane 3	-	75	75	11.8	213	0.352	100	0.0	2
Approach	1235	75	1310	5.4		0.899			

West: Pakuranga Road Busway Link (Northbound)

Mov. From W To Exit:	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	9	100.0	617	0.015	100	NA	NA
Approach	9	9	100.0		0.015			

SouthWest: Flyover

Mov. From SW To Exit:	L2 NW	R1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	119	-	119	9.2	223	0.533	100	0.0	2
Lane 2	-	666	666	4.7	871[1]	0.764	100	NA	NA
Lane 3	-	750	750	4.7	981	0.764	100	NA	NA
Approach	119	1416	1535	5.0		0.764			

	Total	%HV	Deg.Satn (v/c)
Intersection	4454	5.9	0.899

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Pakuranga Road Busway Link (Southbound) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
East Exit: Pakuranga Road (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthWest Exit: Pakuranga Road (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
SouthWest Exit: Flyover Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									

CCG LANE SUMMARY

Common Control Group: CCG3 [Aylesbury/ WR/ Reeves Rd]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 150 seconds (CCG Practical Cycle Time)

Lane Use and Performance (CCG)

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]															
SouthEast: Reeves Road (East)															
Lane 1	71	7.0	71	7.0	1769	0.040	100	1.9	LOS A	0.0	0.0	Full	27	0.0	0.0
Approach	71	7.0	71	7.0		0.040		1.9	LOS A	0.0	0.0				
East: Pakuranga Rd Busway Link (Southbound)															
Lane 1 (B)	28	100.0	28	100.0	106	0.264	100	75.9	LOS E	1.8	23.3	Full	203	0.0	0.0
Approach	28	100.0	28	100.0		0.264		75.9	LOS E	1.8	23.3				
NorthWest: Aylesbury Street															
Lane 1	122	4.9	122	4.9	134	0.911	100	90.5	LOS F	9.2	67.2	Full	284	-8.2 [N7]	0.0
Approach	122	4.9	122	4.9		0.911		90.5	LOS F	9.2	67.2				
SouthWest: Reeves Road (South)															
Lane 1	128	12.5	127	12.6	148	0.864	100	86.0	LOS F	9.3	71.8	Full	180	-9.5 [N7]	0.0
Approach	128	12.5	127	12.6		0.864		86.0	LOS F	9.3	71.8				
Intersection	349	15.8	348	15.8		0.911		69.6	LOS E	9.3	71.8				
Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]															
SouthEast: Reeves Rd (East)															
Lane 1	131	5.3	131	5.3	146	0.898	100	91.6	LOS F	9.7	71.0	Full	810	0.0	0.0
Approach	131	5.3	131	5.3		0.898		91.6	LOS F	9.7	71.0				
NorthWest: Reeves Rd (West)															
Lane 1	221	5.4	221	5.4	635	0.348	100	13.2	LOS B	4.2	30.8	Full	27	0.0	26.9
Approach	221	5.4	221	5.4		0.348		13.2	LOS B	4.2	30.8				
SouthWest: William Roberts Road (South)															
Lane 1	504	6.9	504	6.9	578	0.871	100	60.0	LOS E	33.1	245.6	Full	223	0.0	23.8
Approach	504	6.9	504	6.9		0.871		60.0	LOS E	33.1	245.6				
Intersection	856	6.3	855 [N1]	6.3		0.898		52.7	LOS D	33.1	245.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (CCG) (veh/h)

Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]

SouthEast: Reeves Road (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	56	15	71	7.0	1769	0.040	100	NA	NA
Approach	56	15	71	7.0		0.040			

East: Pakuranga Rd Busway Link (Southbound)

Mov. From E To Exit:	L1 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	28	100.0	106	0.264	100	NA	NA
Approach	28	28	100.0		0.264			

NorthWest: Aylesbury Street

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	111	11	122	4.9	134	0.911	100	NA	NA
Approach	111	11	122	4.9		0.911			

SouthWest: Reeves Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	9	108	127	12.6	148	0.864	100	NA	NA
Approach	11	9	108	127	12.6		0.864			

	Total	%HV	Deg.Satn (v/c)
Intersection	348	15.8	0.911

Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]

SouthEast: Reeves Rd (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	84	47	131	5.3	146	0.898	100	NA	NA
Approach	84	47	131	5.3		0.898			

NorthWest: Reeves Rd (West)

Mov. From NW To Exit:	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	185	36	221	5.4	635	0.348	100	NA	NA
Approach	185	36	221	5.4		0.348			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	24	480	504	6.9	578	0.871	100	NA	NA
Approach	24	480	504	6.9		0.871			

	Total	%HV	Deg.Satn (v/c)
Intersection	855	6.3	0.898

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis (CCG)	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
Site: 5.2v [5.2 Aylesbury St/ Reeves Rd/ Busway Link signalised]												
SouthEast Exit: Reeves Road (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthEast Exit: Pakuranga Rd Busway Link (Northbound) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Aylesbury Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: Reeves Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Site: 7.3v [7.3 William Roberts Rd / Reeves Rd signalised]												
SouthEast Exit: Reeves Rd (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
NorthWest Exit: Reeves Rd (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

Organisation: AECOM AUSTRALIA PTY LTD | Licence: NETWORK / Enterprise | Processed: Wednesday, 22 March 2023 1:16:54 pm
Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM_Edgewater EAST Signal.sip9

LANE SUMMARY

Site: 7.1 [7.1 William Roberts Rd / Cortina Pl (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Give-Way (Two-Way)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
NorthEast: William Roberts Road (North)															
Lane 1	137	5.1	137	5.1	1557	0.088	100	2.0	LOS A	0.2	1.7	Full	223	0.0	0.0
Approach	137	5.1	137	5.1		0.088		2.0	NA	0.2	1.7				
NorthWest: Cortina Place															
Lane 1	292	9.2	292	9.2	744	0.393	100	4.2	LOS A	1.4	10.7	Full	177	-17.3[N3]	0.0
Approach	292	9.2	292	9.2		0.393		4.2	LOS A	1.4	10.7				
SouthWest: William Roberts Road (South)															
Lane 1	485	7.0	484	7.0	1243	0.390	100	1.0	LOS A	0.7	5.2	Full	110	-21.1[N7]	0.0
Approach	485	7.0	484[N1]	7.0		0.390		1.0	NA	0.7	5.2				
Intersection	914	7.4	913[N1]	7.4		0.393		2.2	NA	1.4	10.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

NorthEast: William Roberts Road (North)

Mov. From NE To Exit:	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	105	32	137	5.1	1557	0.088	100	NA	NA
Approach	105	32	137	5.1		0.088			

NorthWest: Cortina Place

Mov. From NW To Exit:	L2 NE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	167	125	292	9.2	744	0.393	100	NA	NA
Approach	167	125	292	9.2		0.393			

SouthWest: William Roberts Road (South)

Mov. From SW To Exit:	L2 NW	T1 NE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	130	355	484	7.0		1243	0.390	100	NA	NA
Approach	130	355	484	7.0			0.390			
	Total	%HV	Deg.Satn (v/c)							
Intersection	913	7.4	0.393							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
NorthEast Exit: William Roberts Road (North) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Cortina Place Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
SouthWest Exit: William Roberts Road (South) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									

LANE SUMMARY

Site: 4.0 [4.0 Palm Ave / Aylesbury St (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Ti Rakau Drive (East)															
Lane 1	411	7.2	411	7.2	417	0.987	100	115.3	LOS F	21.6[N4]	160.7[N4]	Full	110	-44.8[N3]	50.0
Lane 2	773	6.8	773	6.8	782[1]	0.987	100	89.6	LOS F	21.7[N4]	160.7[N4]	Full	110	0.0	50.0
Lane 3	66	4.5	66	4.5	68	0.967	100	108.7	LOS F	5.3	38.8	Short	86	0.0	NA
Lane 4 (B)	53	100.0	53	100.0	645	0.082	100	4.4	LOS A	0.0	0.6	Full	110	0.0	0.0
Approach	1303	10.6	1303	10.6		0.987		95.2	LOS F	21.7	160.7				
East: Aylesbury Street															
Lane 1	48	6.3	48	6.3	131	0.365	100	43.4	LOS D	2.2	15.9	Short	30	0.0	NA
Lane 2	141	7.1	141	7.1	158[1]	0.893	100	86.5	LOS F	7.9[N4]	58.4[N4]	Full	40	0.0	50.0
Approach	189	6.9	189	6.9		0.893		75.6	LOS E	7.9	58.4				
North: Ti Rakau Drive (West)															
Lane 1 (B)	23	100.0	23	100.0	645	0.036	100	4.4	LOS A	0.0	0.2	Full	174	0.0	0.0
Lane 2	275	8.0	275	8.0	1022	0.269	100	17.8	LOS B	8.1	60.9	Short	91	0.0	NA
Lane 3	237	7.4	236	7.4	824	0.287	100	29.4	LOS C	9.4	69.6	Full	174	0.0	0.0
Lane 4	237	7.4	236	7.4	824	0.287	100	29.4	LOS C	9.4	69.6	Full	174	0.0	0.0
Lane 5	29	3.4	29	3.5	69	0.421	100	85.0	LOS F	2.0	14.4	Short	64	0.0	NA
Approach	800	10.1	799[N1]	10.1		0.421		26.7	LOS C	9.4	69.6				
West: Palm Avenue															
Lane 1	90	4.4	90	4.4	165	0.544	100	71.9	LOS E	5.7	41.6	Full	87	-26.2[N7]	0.0
Approach	90	4.4	90	4.4		0.544		71.9	LOS E	5.7	41.6				
Intersection	2382	9.9	2381[N1]	9.9		0.987		69.8	LOS E	21.7	160.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

South: Ti Rakau Drive (East)

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	77	334	-	411	7.2	417	0.987	100	NA	NA
Lane 2	-	773	-	773	6.8	782[1]	0.987	100	NA	NA
Lane 3	-	-	66	66	4.5	68	0.967	100	0.0	2
Lane 4	-	53	-	53	100.0	645	0.082	100	NA	NA
Approach	77	1160	66	1303	10.6		0.987			

East: Aylesbury Street

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	48	-	-	48	6.3	131	0.365	100	0.0	2
Lane 2	-	17	124	141	7.1	158[1]	0.893	100	NA	NA
Approach	48	17	124	189	6.9		0.893			

North: Ti Rakau Drive (West)

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	-	23	-	23	100.0	645	0.036	100	NA	NA
Lane 2	275	-	-	275	8.0	1022	0.269	100	0.0	3
Lane 3	-	236	-	236	7.4	824	0.287	100	NA	NA
Lane 4	-	236	-	236	7.4	824	0.287	100	NA	NA
Lane 5	-	-	29	29	3.5	69	0.421	100	0.0	4
Approach	275	496	29	799	10.1		0.421			

West: Palm Avenue

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	32	24	34	90	4.4	165	0.544	100	NA	NA
Approach	32	24	34	90	4.4		0.544			

	Total	%HV	Deg.Satn (v/c)
Intersection	2381	9.9	0.987

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
East Exit: Aylesbury Street Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
North Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
West Exit: Palm Avenue Merge Type: **Not Applied**											

Full Length Lane	1	Merge Analysis not applied.

LANE SUMMARY

Site: 5.0 [5.0 Pakuranga Highway / Reeves Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Single Point Interchange (Signals) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 150 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	802	7.7	796	7.7	1424	0.559	100	9.6	LOS A	17.4	129.6	Full	90	0.0	48.6
Lane 2	416	7.2	413	7.2	482	0.858	100	47.9	LOS D	17.7[N4]	131.5[N4]	Full	90	-50.0[N7]	50.0
Lane 3	417	7.2	413	7.2	482	0.858	100	47.9	LOS D	17.7[N6]	131.5[N6]	Full	90	-50.0[N3]	50.0
Lane 4 (B)	13	100.0	13	100.0	279	0.047	100	34.1	LOS C	0.5	6.4	Full	90	0.0	0.0
Approach	1648	8.2	1635[N1]	8.2		0.858		29.2	LOS C	17.7	131.5				
NorthEast: Reeves Road															
Lane 1 (B)	9	100.0	9	100.0	190	0.047	100	44.5	LOS D	0.4	5.3	Full	50	0.0	0.0
Approach	9	100.0	9	100.0		0.047		44.5	LOS D	0.4	5.3				
NorthWest: Ti Rakau Drive (West)															
Lane 1 (B)	53	100.0	53	100.0	319	0.166	100	34.9	LOS C	2.0	25.5	Full	110	0.0	0.0
Lane 2	198	6.8	197	6.8	260	0.759	100	42.5	LOS D	9.3	69.2	Full	110	0.0	0.0
Lane 3	198	6.8	197	6.8	260	0.759	100	42.5	LOS D	9.3	69.2	Full	110	0.0	0.0
Lane 4	81	9.9	81	9.9	138	0.586	100	79.9	LOS E	5.3	40.6	Short	85	0.0	NA
Approach	529	16.6	529	16.6		0.759		47.4	LOS D	9.3	69.2				
SouthWest: Pakuranga Highway															
Lane 1	341	5.9	341	5.9	348	0.979	100	113.8	LOS F	32.5	238.9	Short	125	-50.0[N7]	NA
Lane 2	343	7.3	343	7.3	452	0.760	100	64.4	LOS E	21.2	157.7	Short	220	0.0	NA
Lane 3	343	7.3	343	7.3	452	0.760	100	64.4	LOS E	21.2	157.7	Full	623	0.0	0.0
Lane 4	343	7.3	343	7.3	452	0.760	100	64.4	LOS E	21.2	157.7	Short	195	0.0	NA
Approach	1371	6.9	1371	6.9		0.979		76.7	LOS E	32.5	238.9				
Intersection	3557	9.2	3543[N1]	9.2		0.979		50.3	LOS D	32.5	238.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.
N4 Average back of queue has been restricted to the available queue storage space.
N6 Continuous Lane results determined by Back of Queue values of downstream lanes (proportional to lane movement flows) but average back of queue has been restricted to the available queue storage space.
N7 The capacity reduction has been determined from the queue blockage probability of a Site further downstream due to intermediate continuous lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	796	-	796	7.7	1424	0.559	100	NA	NA
Lane 2	-	413	413	7.2	482	0.858	100	NA	NA
Lane 3	-	413	413	7.2	482	0.858	100	NA	NA
Lane 4	-	13	13	100.0	279	0.047	100	NA	NA
Approach	796	839	1635	8.2		0.858			

NorthEast: Reeves Road

Mov. From NE To Exit:	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	9	9	100.0	190	0.047	100	NA	NA
Approach	9	9	100.0		0.047			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	28	25	-	53	100.0	319	0.166	100	NA	NA
Lane 2	-	197	-	197	6.8	260	0.759	100	NA	NA
Lane 3	-	197	-	197	6.8	260	0.759	100	NA	NA
Lane 4	-	-	81	81	9.9	138	0.586	100	0.0	3
Approach	28	420	81	529	16.6		0.759			

SouthWest: Pakuranga Highway

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	341	-	341	5.9	348	0.979	100	75.6	2
Lane 2	-	343	343	7.3	452	0.760	100	22.5	3
Lane 3	-	343	343	7.3	452	0.760	100	NA	NA
Lane 4	-	343	343	7.3	452	0.760	100	0.0	3
Approach	341	1030	1371	6.9		0.979			

	Total	%HV	Deg.Satn (v/c)
Intersection	3543	9.2	0.979

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
Full Length Lane	4	Merge Analysis not applied.									
NorthEast Exit: Reeves Road Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									

Full Length Lane	3	Merge Analysis not applied.										
SouthWest Exit: Pakuranga Highway Merge Type: **Zipper**												
Exit Short Lane	1	280	50.0	40	42	2.50	2.00	796	1753	0.454	0.0	0.0
Merge Lane	2	-	50.0	398	413	2.50	2.00	81	1267	0.064	0.4	0.5

LANE SUMMARY

Site: 7.0 [7.0 William Roberts Rd/ Mattson Rd/ Ti Rakau Drive (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Scheme Design
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	495	7.3	490	7.3	695	0.706	100	34.3	LOS C	21.7	161.1	Short	115	0.0	NA
Lane 2	638	7.5	632	7.5	896 [1]	0.706	100	23.4	LOS C	24.5	182.3	Full	207	0.0	3.5
Lane 3	545	7.5	540	7.5	766 [1]	0.706	100	21.8	LOS C	19.4	144.7	Full	207	0.0	0.0
Lane 4	132	7.0	131	7.0	176	0.747	100	66.4	LOS E	7.2	53.6	Short	45	0.0	NA
Lane 5 (B)	13	100.0	13	100.0	607	0.021	100	0.6	LOS A	0.0	0.2	Full	207	0.0	0.0
Approach	1822	8.1	1806 [N1]	8.1		0.747		28.8	LOS C	24.5	182.3				
NorthEast: William Roberts Road Extention															
Lane 1	106	8.5	106	8.5	160	0.664	100	62.4	LOS E	5.7	42.9	Full	112	0.0	0.0
Lane 2	117	6.8	117	6.8	164	0.715	100	62.5	LOS E	6.4	47.3	Full	110	0.0	0.0
Approach	223	7.6	223	7.6		0.715		62.5	LOS E	6.4	47.3				
NorthWest: Ti Rakau Drive (West)															
Lane 1	390	7.2	390	7.2	527	0.740	100	46.3	LOS D	18.8	139.4	Full	107	0.0	39.3
Lane 2	540	7.0	540	7.0	943	0.573	100	21.8	LOS C	19.4	143.9	Full	107	0.0	42.3
Lane 3	501	7.0	501	7.0	874 [1]	0.573	100	21.1	LOS C	17.5	129.5	Full	107	0.0	32.5
Lane 4	41	7.3	41	7.3	205	0.200	100	57.6	LOS E	2.0	14.8	Short	20	0.0	NA
Lane 5 (B)	25	100.0	25	100.0	607	0.041	100	0.6	LOS A	0.0	0.3	Full	107	0.0	0.0
Approach	1497	8.6	1497	8.6		0.740		28.6	LOS C	19.4	143.9				
SouthWest: Mattson Road															
Lane 1	10	0.0	10	0.0	93	0.108	100	66.3	LOS E	0.5	3.7	Short	20	0.0	NA
Lane 2	54	3.7	54	3.7	93	0.580	100	68.9	LOS E	3.0	21.6	Full	282	0.0	0.0
Approach	64	3.1	64	3.1		0.580		68.5	LOS E	3.0	21.6				
Intersection	3606	8.2	3590 [N1]	8.2		0.747		31.5	LOS C	24.5	182.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	R2 NE	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	76	414	-	-	490	7.3	695	0.706	100	46.1	2

Lane 2	-	632	-	-	632	7.5	896[1]	0.706	100	NA	NA
Lane 3	-	540	-	-	540	7.5	766[1]	0.706	100	NA	NA
Lane 4	-	-	63	68	131	7.0	176	0.747	100	31.0	3
Lane 5	-	13	-	-	13	100.0	607	0.021	100	NA	NA
Approach	76	1599	63	68	1806	8.1		0.747			

NorthEast: William Roberts Road Extention

Mov. From NE To Exit:	L2 SE	T1 SW	R2 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	106	-	-	106	8.5	160	0.664	100	NA	NA
Lane 2	-	33	84	117	6.8	164	0.715	100	NA	NA
Approach	106	33	84	223	7.6		0.715			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	L2 NE	T1 SE	R2 SW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	390	-	-	390	7.2	527	0.740	100	NA	NA
Lane 2	-	540	-	540	7.0	943	0.573	100	NA	NA
Lane 3	-	501	-	501	7.0	874[1]	0.573	100	NA	NA
Lane 4	-	-	41	41	7.3	205	0.200	100	0.0	3
Lane 5	-	25	-	25	100.0	607	0.041	100	NA	NA
Approach	390	1066	41	1497	8.6		0.740			

SouthWest: Mattson Road

Mov. From SW To Exit:	L2 NW	T1 NE	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	-	-	10	0.0	93	0.108	100	0.0	2
Lane 2	-	30	24	54	3.7	93	0.580	100	NA	NA
Approach	10	30	24	64	3.1		0.580			

	Total	%HV	Deg.Satn (v/c)
Intersection	3590	8.2	0.747

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthEast Exit: William Roberts Road Extention Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
Full Length Lane	4	Merge Analysis not applied.									

SouthWest Exit: Mattson Road Merge Type: **Not Applied**		
Full Length Lane	1	Merge Analysis not applied.

LANE SUMMARY

Site: 8.1 [8.1 U-turn - West of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 30 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	867	7.4	858	7.5	1850	0.464	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 2	867	7.4	858	7.5	1850	0.464	100	0.1	LOS A	0.0	0.0	Full	147	0.0	0.0
Lane 3	65	6.2	64	6.2	266	0.242	100	18.1	LOS B	0.8	5.8	Short	14	0.0	NA
Lane 4 (B)	13	100.0	13	100.0	478	0.027	100	2.1	LOS A	0.0	0.5	Full	147	0.0	0.0
Approach	1811	8.1	1794 N1	8.1		0.464		0.7	LOS A	0.8	5.8				
NorthWest: Ti Rakau Drive (West)															
Lane 1	592	7.2	591	7.2	741	0.797	100	12.6	LOS B	8.7	64.4	Full	73	0.0	3.6
Lane 2	592	7.2	591	7.2	741	0.797	100	12.6	LOS B	8.7	64.4	Full	73	0.0	3.6
Lane 3 (B)	25	100.0	25	100.0	478	0.052	100	2.1	LOS A	0.1	0.9	Full	73	0.0	0.0
Approach	1208	9.1	1207 N1	9.1		0.797		12.4	LOS B	8.7	64.4				
Intersection	3019	8.5	3002 N1	8.5		0.797		5.4	LOS A	8.7	64.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	U SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	858	-	858	7.5	1850	0.464	100	NA	NA
Lane 2	858	-	858	7.5	1850	0.464	100	NA	NA
Lane 3	-	64	64	6.2	266	0.242	100	0.0	2
Lane 4	13	-	13	100.0	478	0.027	100	NA	NA
Approach	1730	64	1794	8.1		0.464			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	591	591	7.2	741	0.797	100	NA	NA
Lane 2	591	591	7.2	741	0.797	100	NA	NA
Lane 3	25	25	100.0	478	0.052	100	NA	NA
Approach	1207	1207	9.1		0.797			

	Total	%HV	Deg.Satn (v/c)
Intersection	3002	8.5	0.797

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										

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Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM_Edgewater EAST Signal.sip9

LANE SUMMARY

Site: 9.1 [9.1 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 40 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1 (B)	13	100.0	13	100.0	370	0.035	100	5.4	LOS A	0.1	1.1	Full	45	0.0	0.0
Approach	13	100.0	13	100.0		0.035		5.4	LOS A	0.1	1.1				
NorthWest: Ti Rakau Drive (West)															
Lane 1	602	7.3	601	7.3	751	0.801	100	15.4	LOS B	2.4 N4	17.5 N4	Full	12	0.0	50.0
Lane 2	602	7.3	601	7.3	751	0.801	100	15.4	LOS B	2.4 N4	17.5 N4	Full	12	0.0	50.0
Lane 3 (B)	25	100.0	25	100.0	370	0.068	100	5.5	LOS A	0.2	2.2	Full	12	0.0	0.0
Approach	1228	9.2	1227 N1	9.2		0.801		15.2	LOS B	2.4	17.5				
Intersection	1241	10.2	1240 N1	10.2		0.801		15.1	LOS B	2.4	17.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	13	13	100.0	370	0.035	100	NA	NA
Approach	13	13	100.0		0.035			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	601	601	7.3	751	0.801	100	NA	NA
Lane 2	601	601	7.3	751	0.801	100	NA	NA
Lane 3	25	25	100.0	370	0.068	100	NA	NA
Approach	1227	1227	9.2		0.801			

	Total	%HV	Deg.Satn (v/c)
Intersection	1240	10.2	0.801

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									
Full Length Lane	2	Merge Analysis not applied.									
Full Length Lane	3	Merge Analysis not applied.									
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**											
Full Length Lane	1	Merge Analysis not applied.									

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Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM_Edgewater EAST Signal.sip9

LANE SUMMARY

Site: 9.2 [9.2 Staggered Crossing - East of Marriot Rd (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Pedestrian Crossing (Signalised) - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 60 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	897	7.4	889	7.4	1089	0.817	100	16.4	LOS B	8.8 N4	65.8 N4	Full	45	0.0	50.0
Lane 2	898	7.4	889	7.4	1089	0.817	100	16.4	LOS B	8.8 N4	65.8 N4	Full	45	0.0	50.0
Approach	1795	7.4	1778 N1	7.4		0.817		16.4	LOS B	8.8	65.8				
Intersection	1795	7.4	1778 N1	7.4		0.817		16.4	LOS B	8.8	65.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N4 Average back of queue has been restricted to the available queue storage space.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	889	889	7.4	1089	0.817	100	NA	NA
Lane 2	889	889	7.4	1089	0.817	100	NA	NA
Approach	1778	1778	7.4		0.817			

	Total	%HV	Deg.Satn (v/c)
Intersection	1778	7.4	0.817

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length	Percent Opng in Lane	Opposing Flow Rate		Critical Gap	Follow-up Headway	Lane Flow Rate	Capacity	Deg. Satn	Min. Delay	Merge Delay
		m	%	veh/h	pcu/h	sec	sec	veh/h	veh/h	v/c	sec	sec
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										

Project: C:\Users\jacques.vandenheever\Eastern Busway Alliance\PAA - 05 DESIGN MGMNT\12 Transport\3-3. Integrated Transport Assessment\ITA 2 - EB2,3R\Version 9 (Addendum)\AIMSUN and SIDRA\Operational\2028 EB2-EB3R-Final-Xroads-PM_Edgewater EAST Signal.sip9

LANE SUMMARY

Site: 101 [12.0 Edgewater Dr (East) / Ti Rakau Dr -Signalised - Import - Import (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	85% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
SouthEast: Ti Rakau Drive (East)															
Lane 1	947	7.1	938	7.1	1171	0.801	100	9.2	LOS A	18.4	136.9	Full	445	0.0	0.0
Lane 2	950	7.2	940	7.2	1174	0.801	100	8.9	LOS A	18.5	137.4	Full	445	0.0	0.0
Lane 3 (B)	13	100.0	13	100.0	756	0.017	100	4.4	LOS A	0.1	1.6	Full	445	0.0	0.0
Approach	1910	7.7	1891 N1	7.8		0.801		9.0	LOS A	18.5	137.4				
NorthWest: Ti Rakau Drive (West)															
Lane 1	626	7.2	626	7.2	1173	0.533	100	6.6	LOS A	9.1	67.9	Full	109	0.0	0.0
Lane 2	626	7.2	626	7.2	1173	0.533	100	6.6	LOS A	9.1	67.9	Full	109	0.0	0.0
Lane 3	21	0.0	21	0.0	106	0.199	100	66.6	LOS E	1.1	7.7	Short	50	0.0	NA
Lane 4 (B)	26	100.0	26	100.0	756	0.035	100	4.4	LOS A	0.3	3.4	Full	109	0.0	0.0
Approach	1299	9.0	1299	9.0		0.533		7.5	LOS A	9.1	67.9				
SouthWest: Edgewater Drive (East)															
Lane 1	28	3.7	28	3.7	122	0.233	100	65.6	LOS E	1.5	10.7	Full	789	0.0	0.0
Approach	28	3.7	28	3.7		0.233		65.6	LOS E	1.5	10.7				
Intersection	3237	8.2	3218 N1	8.3		0.801		8.9	LOS A	18.5	137.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Approach Lane Flows (veh/h)

SouthEast: Ti Rakau Drive (East)

Mov. From SE To Exit:	L2 SW	T1 NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	58	879	938	7.1	1171	0.801	100	NA	NA
Lane 2	-	940	940	7.2	1174	0.801	100	NA	NA
Lane 3	-	13	13	100.0	756	0.017	100	NA	NA
Approach	58	1832	1891	7.8		0.801			

NorthWest: Ti Rakau Drive (West)

Mov. From NW To Exit:	T1 SE	R2 SW	U NW	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	626	-	-	626	7.2	1173	0.533	100	NA	NA
Lane 2	626	-	-	626	7.2	1173	0.533	100	NA	NA
Lane 3	-	11	11	21	0.0	106	0.199	100	0.0	2

Lane 4	26	-	-	26	100.0	756	0.035	100	NA	NA
Approach	1278	11	11	1299	9.0		0.533			

SouthWest: Edgewater Drive (East)

Mov. From SW To Exit:	L2 NW	R2 SE	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	18	28	3.7	122	0.233	100	NA	NA
Approach	11	18	28	3.7		0.233			

	Total	%HV	Deg.Satn (v/c)
Intersection	3218	8.3	0.801

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
SouthEast Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
NorthWest Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
Full Length Lane	3	Merge Analysis not applied.										
SouthWest Exit: Edgewater Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 13.0 [13.0 Gossamer Dr / Ti Rakau Dr (Site Folder: AM)]

Network: N101 [PM - Continous Lane & Phase & Single lane (Network Folder: General)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 160 seconds (Site User-Given Phase Times)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	85% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Fremantle Place															
Lane 1	10	0.0	10	0.0	56	0.179	100	90.5	LOS F	0.7	5.1	Short	9	0.0	NA
Lane 2	24	4.2	24	4.2	110	0.218	100	84.0	LOS F	1.7	12.0	Full	285	0.0	0.0
Approach	34	2.9	34	2.9		0.218		85.9	LOS F	1.7	12.0				
East: Ti Rakau Drive (East)															
Lane 1	886	7.2	886	7.2	1099	0.806	100	23.8	LOS C	31.8	236.6	Full	636	0.0	0.0
Lane 2	887	7.3	887	7.3	1101 [1]	0.806	100	23.6	LOS C	31.6	234.6	Full	636	0.0	0.0
Lane 3 (B)	13	100.0	13	100.0	735	0.018	100	11.5	LOS B	0.2	3.1	Short	60	0.0	NA
Lane 4	232	6.4	232	6.4	179	1.293	82 [6]	345.2	LOS F	37.5	276.7	Short	150	0.0	NA
Lane 5	282	6.4	282	6.4	179	1.578	100	588.5	LOS F	59.6	440.3	Short	103	0.0	NA
Approach	2300	7.6	2300	7.6		1.578		125.4	LOS F	59.6	440.3				
North: Gossamer Drive															
Lane 1	295	8.9	295	8.9	297	0.991	100	120.1	LOS F	27.5	207.5	Short	150	0.0	NA
Lane 2	258	8.9	258	8.9	261 [1]	0.991	100	120.1	LOS F	23.8	179.5	Full	1010	0.0	0.0
Lane 3	61	3.3	61	3.3	109	0.558	100	86.7	LOS F	4.4	31.3	Short	28	0.0	NA
Approach	614	8.3	614	8.3		0.991		116.8	LOS F	27.5	207.5				
West: Ti Rakau Drive (West)															
Lane 1	100	4.0	100	4.0	964	0.104	100	13.5	LOS B	2.2	16.0	Short	28	0.0	NA
Lane 2	539	7.6	539	7.6	541 [1]	0.996	100	108.2	LOS F	49.6	369.8	Full	445	0.0	0.0
Lane 3	500	7.6	500	7.6	502 [1]	0.996	100	108.4	LOS F	45.5	338.9	Full	445	0.0	0.0
Lane 4	108	6.5	108	6.5	86 [1]	1.262	100	324.8	LOS F	17.0	125.3	Short	23	0.0	NA
Lane 5 (B)	25	100.0	25	100.0	276	0.091	100	34.2	LOS C	0.9	12.3	Full	445	0.0	0.0
Approach	1272	9.0	1272	9.0		1.262		117.8	LOS F	49.6	369.8				
Intersection	4220	8.1	4220	8.1		1.578		121.5	LOS F	59.6	440.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
6 Lane under-utilisation due to downstream effects

Approach Lane Flows (veh/h)

South: Fremantle Place

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	-	-	10	0.0	56	0.179	100	0.0	2
Lane 2	-	10	14	24	4.2	110	0.218	100	NA	NA
Approach	10	10	14	34	2.9		0.218			

East: Ti Rakau Drive (East)

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	23	863	-	886	7.2	1099	0.806	100	NA	NA
Lane 2	-	887	-	887	7.3	1101 [1]	0.806	100	NA	NA
Lane 3	-	13	-	13	100.0	735	0.018	100	0.0	2
Lane 4	-	-	232	232	6.4	179	1.293	82 [6]	100.0	2
Lane 5	-	-	282	282	6.4	179	1.578	100	100.0	4
Approach	23	1763	514	2300	7.6		1.578			

North: Gossamer Drive

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	295	-	-	295	8.9	297	0.991	100	44.9	2
Lane 2	258	-	-	258	8.9	261 [1]	0.991	100	NA	NA
Lane 3	-	18	43	61	3.3	109	0.558	100	25.2	2
Approach	553	18	43	614	8.3		0.991			

West: Ti Rakau Drive (West)

Mov. From W To Exit:	L2 N	T1 E	R2 S	U W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	100	-	-	-	100	4.0	964	0.104	100	0.0	2
Lane 2	-	539	-	-	539	7.6	541 [1]	0.996	100	NA	NA
Lane 3	-	500	-	-	500	7.6	502 [1]	0.996	100	NA	NA
Lane 4	-	-	14	94	108	6.5	86 [1]	1.262	100	100.0	3
Lane 5	-	25	-	-	25	100.0	276	0.091	100	NA	NA
Approach	100	1064	14	94	1272	9.0		1.262			

	Total	%HV	Deg.Satn (v/c)
Intersection	4220	8.1	1.578

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

6 Lane under-utilisation due to downstream effects

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Fremantle Place Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Ti Rakau Drive (East) Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
Full Length Lane	2	Merge Analysis not applied.										
North Exit: Gossamer Drive Merge Type: **Zipper**												
Exit Short Lane	1	150	50.0	90	92	2.50	2.00	289	1695	0.171	0.0	0.0
Merge Lane	2	-	50.0	145	148	2.50	2.00	179	1628	0.110	0.0	0.1

West Exit: Ti Rakau Drive (West) Merge Type: **Not Applied**		
Full Length Lane	1	Merge Analysis not applied.
Full Length Lane	2	Merge Analysis not applied.
Full Length Lane	3	Merge Analysis not applied.

Appendix J

Base 2018 Model Update Report

Appendix K

EB2 – Indicative Construction Staging Diagrams

Appendix L

EB3R – Indicative Construction Staging Diagrams

Appendix M

Construction Scenario 1.2 – Phasing Diagrams

Appendix N

Construction Scenario 1.2 – Lane Performance Summaries

Appendix O

Construction Scenario 1.3 – Phasing Diagrams

Appendix P

Construction Scenario 1.3 – Lane Performance Summaries

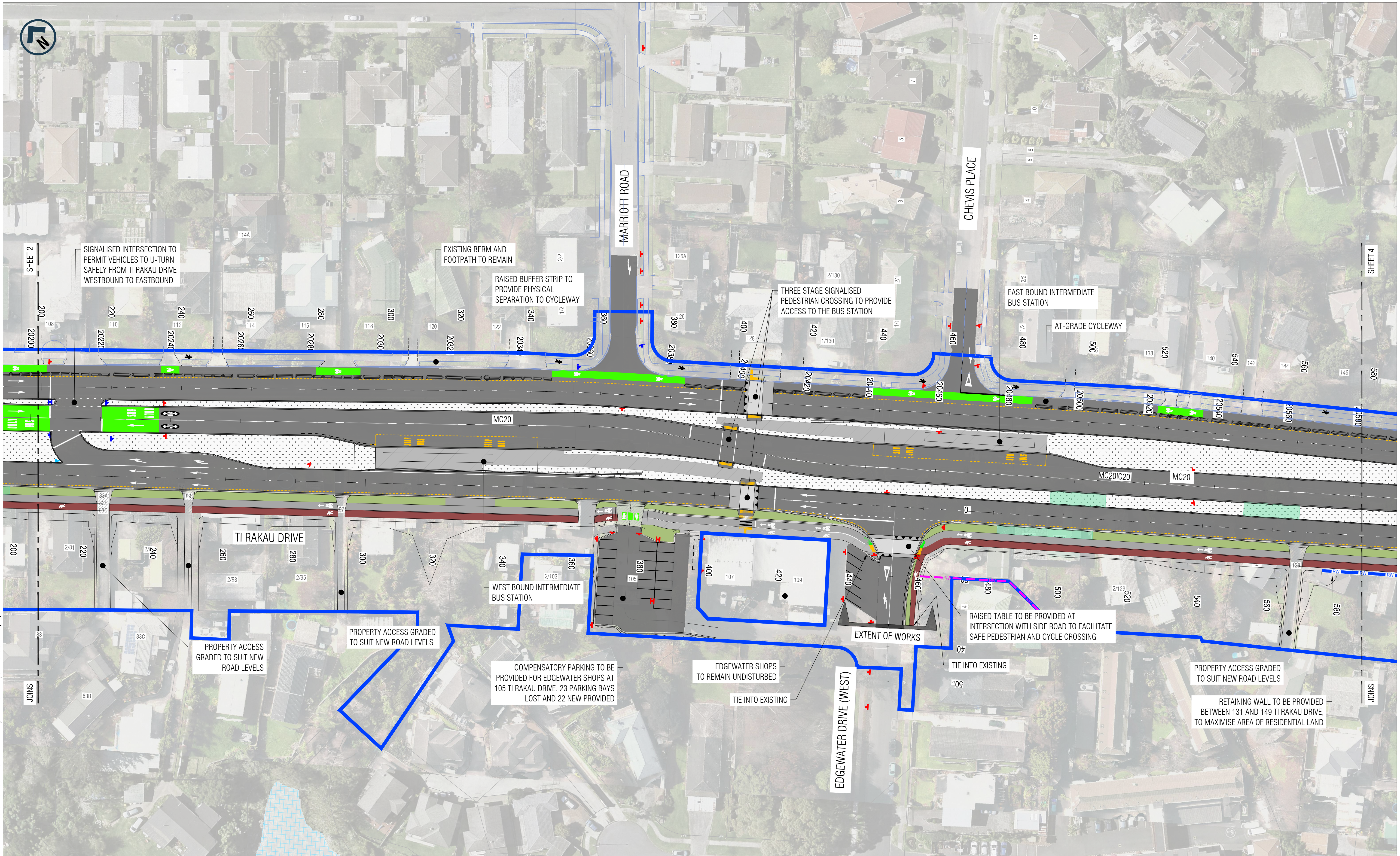
Appendix Q

Construction Scenario 1.4 – Phasing Diagrams

Appendix R

Construction Scenario 1.4 – Lane Performance Summaries

ENGINEERING PLANS



Filename: EB-2-R-3-PL-DG-100131-100136.DWG

Plot By: SANTOSMR (2/24/2023 3:48:58 pm)

NOTES
1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.

FOR LODGEMENT

REV	DATE	DRAWN	REVISION DESCRIPTION
C	27/02/2023	M. Santos	GEOMETRIC DESIGN UPDATE
B	25/08/2022	C. Tamayo	PROPOSED CONSTRUCTION BOUNDARY ADDED
A	31/05/2022	S. Sokolov	FOR LODGEMENT

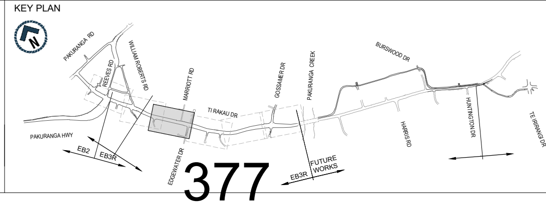
A1 ORIGINAL SIZE

ORIGINAL IN COLOUR

Designed	-	Checked	-
Drawn	S. Sokolov	Checked	M. Dalvi
Approved	S. Jones		
Date	27/02/2023	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

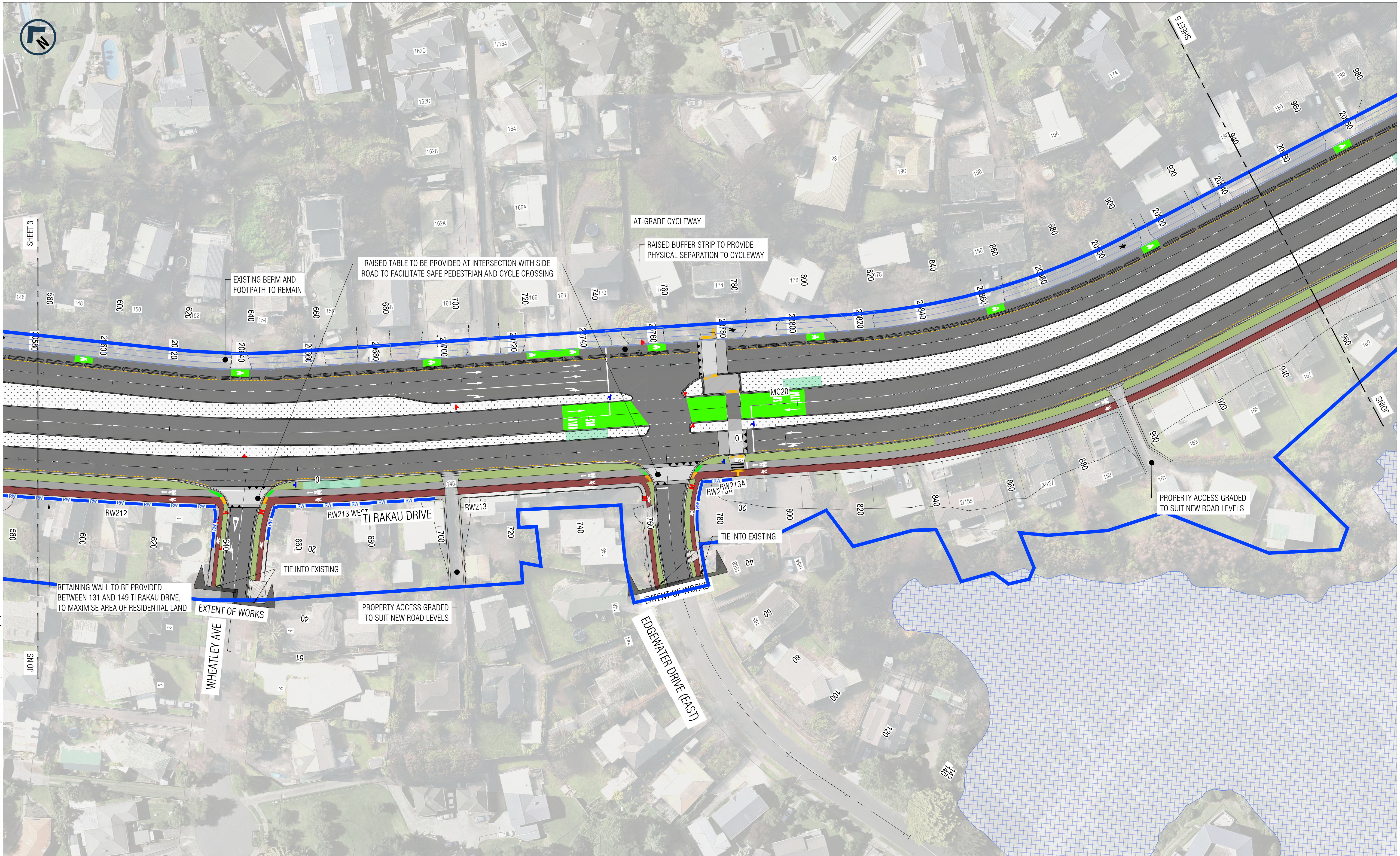
KEY PLAN



AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status	FOR LODGEMENT
Horizontal Datum	NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum	2016 NEW ZEALAND
A1 SCALE 1:500	A3 SCALE 1:1000
Design Package	CONSENTING
Drawing Title	TI RAKAU DRIVE CONSENT PLAN SHEET 3 OF 6
Drawing Number	EB-2-R-3-PL-DG-100133
Revision	C



Filename: EB-2-R-3-PL-DG-100131-100136.DWG   Plot By: SANTOSMR (2/24/2023 3:48:58 pm)

NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.

REV	DATE	DRAWN	REVISION DESCRIPTION
C	27/02/2023	M. Santos	GEOMETRIC DESIGN UPDATE
B	25/08/2022	C. Tamayo	PROPOSED CONSTRUCTION BOUNDARY ADDED
A	31/05/2022	S. Sokolov	FOR LODGEMENT

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

Designed	-	Checked	-
Drawn	S. Sokolov	Checked	M. Dalvi
Approved	S. Jones		
Date	27/02/2023	Approver Signature	

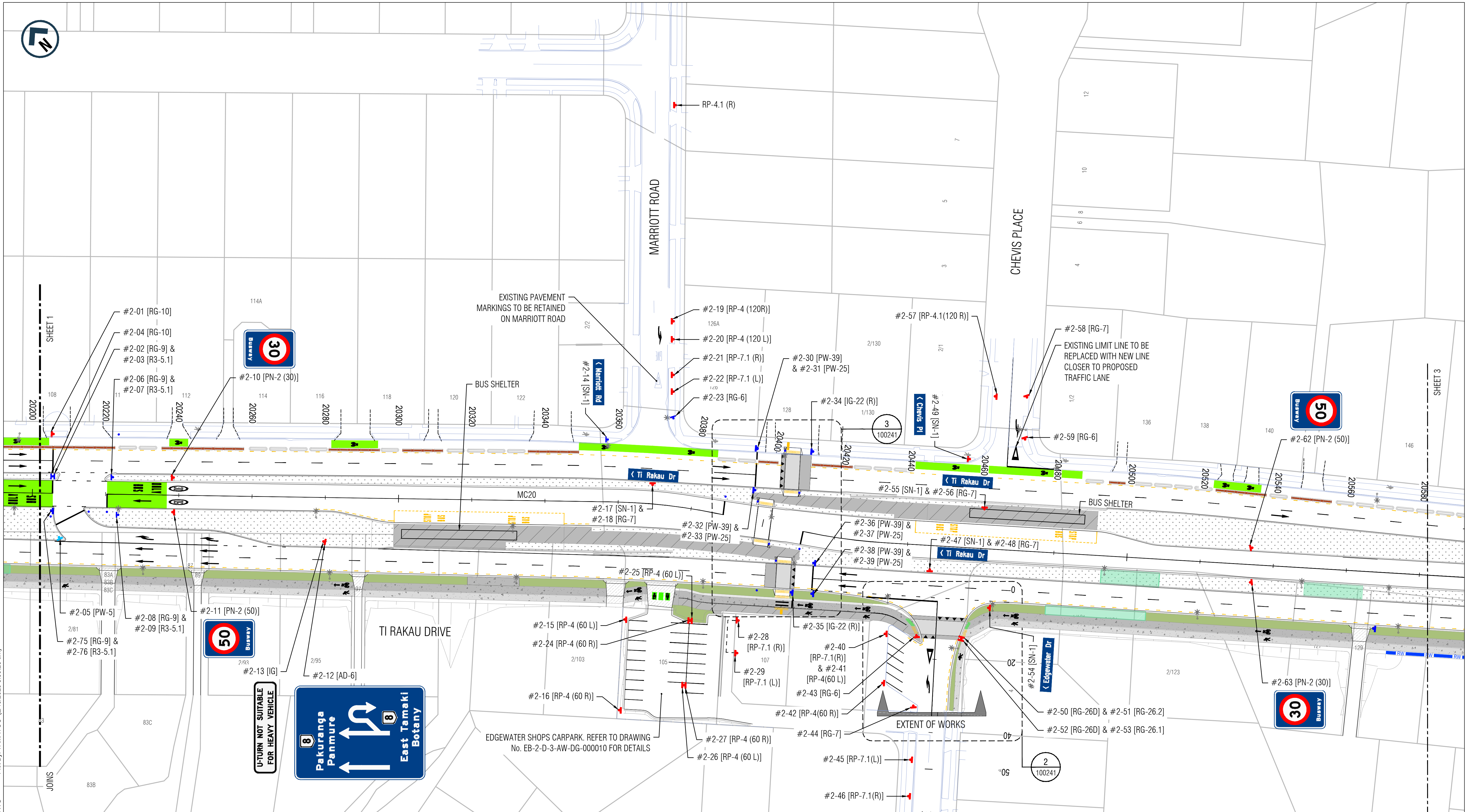
Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status	FOR LODGEMENT
Horizontal Datum	NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum	2016 NEW ZEALAND
A1 SCALE 1:500	A3 SCALE 1:1000
Design Package	CONSENTING
Drawing Title	TI RAKAU DRIVE CONSENT PLAN SHEET 4 OF 6
Drawing Number	EB-2-R-3-PL-DG-100134
Revision	C



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-3-RD-DG-100004 FOR LEGEND AND EB-2-D-3-RD-DG-100005 FOR GENERAL NOTES AND SPECIFICATIONS.
4. REFER TO DRAWINGS EB-2-D-3-RD-DG-100250 SERIES FOR SIGN FACE DETAILS.
5. REFER TO DRAWINGS EB-2-D-3-RD-DG-100260 SERIES FOR SIGN SCHEDULE.
6. REFER TO DRAWING EB-2-D-3-RD-DG-100271 FOR ROAD MARKINGS SCHEDULE.
7. REFER TO DRAWING EB-2-D-3-RD-DG-100281 FOR SIGN INSTALLATION DETAILS.

PACKAGE No. 3RD-10

NOT FOR CONSTRUCTION

Filename: EB-2-D-3-RD-DG-100201-100205.DWG

Plot By: TAMAYOC (2/13/2023 8:59:23 am)

REV	DATE	DRAWN	REVISION DESCRIPTION
B	13/02/2023	C. Tamayo	ISSUED FOR STAGE 2 SUBMISSION
A	12/04/2022	C. Tamayo	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

Designed	J. Atuluwage	Checked	D. Angus
Drawn	C. Tamayo	Checked	M. Dalvi
Approved	S. Jones		
Date	13/02/2023		Approver Signature

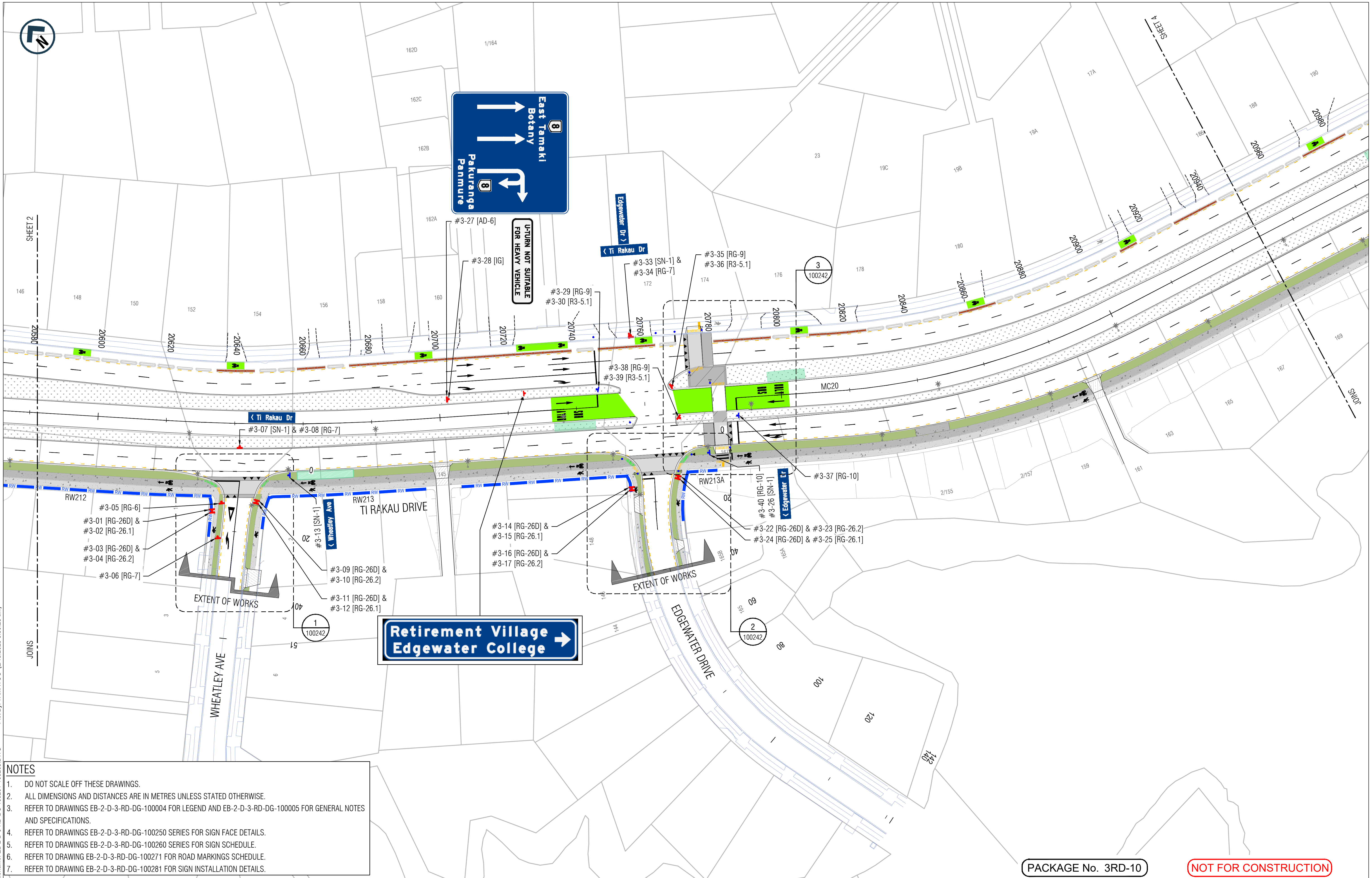
Scale Bar: 0 12.5 25 m — A1 1:500, A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

Eastern Busway

Drawing Status	STAGE 2
Horizontal Datum	NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum	2016 NEW ZEALAND
A1 SCALE	1:500
A3 SCALE	1:1000
Design Package	ROADWORK DETAILING
Drawing Title	TI RAKAU DRIVE SIGNS AND LINE MARKINGS PLAN SHEET 2 OF 5
Drawing Number	EB-2-D-3-RD-DG-100202
Revision	B



NOTES

1. DO NOT SCALE OFF THESE DRAWINGS.
2. ALL DIMENSIONS AND DISTANCES ARE IN METRES UNLESS STATED OTHERWISE.
3. REFER TO DRAWINGS EB-2-D-3-RD-DG-100004 FOR LEGEND AND EB-2-D-3-RD-DG-100005 FOR GENERAL NOTES AND SPECIFICATIONS.
4. REFER TO DRAWINGS EB-2-D-3-RD-DG-100250 SERIES FOR SIGN FACE DETAILS.
5. REFER TO DRAWINGS EB-2-D-3-RD-DG-100260 SERIES FOR SIGN SCHEDULE.
6. REFER TO DRAWING EB-2-D-3-RD-DG-100271 FOR ROAD MARKINGS SCHEDULE.
7. REFER TO DRAWING EB-2-D-3-RD-DG-100281 FOR SIGN INSTALLATION DETAILS.

PACKAGE No. 3RD-10

NOT FOR CONSTRUCTION

Plot By: TAMAYOC (2/13/2023 8:59:23 am)

Filename: EB-2-D-3-RD-DG-100201-100205.DWG

REV	DATE	DRAWN	REVISION DESCRIPTION
B	13/02/2023	C. Tamayo	ISSUED FOR STAGE 2 SUBMISSION
A	12/04/2022	C. Tamayo	ISSUED FOR STAGE 1 SUBMISSION

ORIGINAL SIZE A1

ORIGINAL IN COLOUR

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the Alliance quality assurance system to ISO 9001. Printed copies of this document are UNCONTROLLED. Do not scale from this drawing

Designed	J. Atuluwage	Checked	D. Angus
Drawn	C. Tamayo	Checked	M. Dalvi
Approved	S. Jones		
Date	13/02/2023	Approver Signature	

Scale Bar 0 12.5 25 m A1 1:500 A3 1:1000

KEY PLAN

AUCKLAND MANUKAU EASTERN TRANSPORT INITIATIVE
EASTERN BUSWAY ALLIANCE
(PAKURANGA TO BOTANY)

AT Eastern Busway

Drawing Status	STAGE 2
Horizontal Datum	NZGD 2000 MOUNT EDEN CIRCUIT
Vertical Datum	2016 NEW ZEALAND
A1 SCALE 1:500	A3 SCALE 1:1000

Design Package: ROADWORK DETAILING

Drawing Title: TI RAKAU DRIVE SIGNS AND LINE MARKINGS PLAN SHEET 3 OF 5

Drawing Number: EB-2-D-3-RD-DG-100203

Revision: B