TE TUPU NGĀTAHI
SUPPORTING GROWTH

Trig Road Assessment of Transport Effects

Version 1.0

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WAKA KOTAHI
NZ TRANSPORT AGENCY

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Document Status

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Acronym/Term	Description
AEE	Assessment of Environmental Effects
AT	Auckland Transport
ATAP	Auckland Transport Alignment Plan
AUP:OP	Auckland Unitary Plan Operative in Part 2016
CTMP	Construction Traffic Management Plan
ITA	Integrated Transport Assessment
LoS	Level of Service
MSM	Macro Strategic Model
NoR	Notice of Requirement
RMA	Resource Management Act 1991
RPTP	Regional Public Transport Plan
RTN	Rapid Transit Network
SH16	State Highway 16
SH18	State Highway 18
SSTMP	Site Specific Traffic Management Plan
TDM	Transport Design Manual
Waka Kotahi	Waka Kotahi NZ Transport Agency

1 Introduction

1.1 Background

Auckland's population is growing rapidly; driven by both natural growth (more births than deaths) and migration from overseas and other parts of New Zealand. The Auckland Plan 2050 anticipates that this growth will generate demand for an additional 313,000 dwellings and require land for approximately 263,000 additional employment opportunities.

In response to this demand, the Auckland Unitary Plan Operative in Part 2016 (**AUP:OP**) identifies 15,000 hectares of predominantly rural land for future urbanisation. The Future Urban Land Supply Strategy 2017 (**FULSS**) prepared by Auckland Council sets out the anticipated timing for the future urbanisation of these areas. To enable the urban development of greenfield land, appropriate bulk infrastructure needs to be planned and delivered.

The Supporting Growth Programme is a collaboration between Auckland Transport (**AT**) and Waka Kotahi NZ Transport Agency (**Waka Kotahi**), to investigate, plan and deliver the transport networks needed to support Auckland's future urban growth areas over the next 30 years.

1.2 Purpose of this Report

Trig Road, Whenuapai has been identified in the Supporting Growth Programme as a future arterial corridor that is needed to support the urban development of Whenuapai.

This report has been prepared to support AT's notice of requirement (**NoR**) and application for resource consents for the Trig Road Corridor Upgrade (the **Project**). The NoR under the Resource Management Act 1991 (**RMA**) is to designate land for the construction, operation and maintenance of the Project.

Funding for the upgrade of Trig Road between Hobsonville Road and State Highway 18 (**SH18**) has been identified in the Regional Land Transport Plan and as such AT are also applying for the necessary resource consents under the RMA, concurrently with the NoR process.

This report provides an assessment of transport effects associated with the construction and operation of the Project. This assessment has been prepared to inform the Assessment of Environmental Effects (**AEE**) for the NoR and resource consent applications.

2 Trig Road Project Description

The Project consists of the widening and upgrade of Trig Road between the SH18 off-ramps and Hobsonville Road. The widening has capacity to provide for a two-lane arterial standard corridor including new footpaths on both sides of the road and a cycleway which is indicatively shown as a dedicated bi-direction cycleway on the eastern side of the corridor. The Project will upgrade the current rural standard corridor to an urban standard, which is appropriate to support the soon to be urban environment on either side of Trig Road.

To tie into the existing road network, the Project also includes the signalisation of the intersections at Trig Road/Hobsonville Road and Luckens Road/Hobsonville Road and the upgrade of Hobsonville Road between these intersections. This will require some localised widening of the road corridor along Hobsonville Road. To tie into the northern section of Trig Road, the line markings on the existing road corridor will be remarked. An overview of the design is provided in Figure 1.

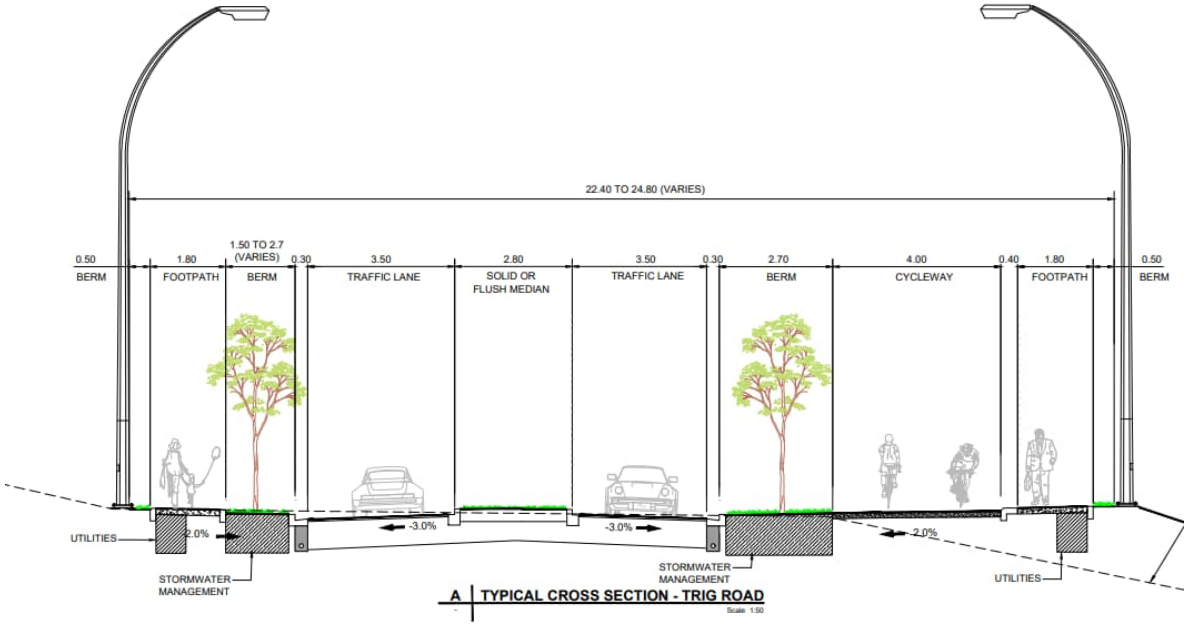
Figure 1: Whenuapai – Trig Road Corridor Upgrade

2.1 Project Features

The key transport features within the Project indicatively include[1]:

- Two-lane arterial standard road (24m cross section) between the SH18 off ramps and Hobsonville Road.
- Signalised intersection at Trig Road and Hobsonville Road.
- Signalised intersection at Hobsonville Road and Luckens Road.
- Upgrade of Hobsonville Road between Luckens Road and Trig Road to four lanes.
- 1.8m footpaths on both sides of Trig Road and Hobsonville Road.
- 4.0m bi-directional cycle route on the eastern side of Trig Road.
- 2.0m separated cycle paths on both sides of Hobsonville Road within the extent of the Project works.
- Remarking of the overbridge and the northern section of Trig Road to tie into the existing road configuration.

Figure 2: Proposed Indicative Trig Road Cross Section



[1] The following cross sections are indicative and design details including specific dimensions will be confirmed via the Outline Plan of Works.

3 Assessment Framework

3.1 Statutory Context

3.1.1 Notice of Requirement

This assessment has been prepared to support the NoR process for the Project. Section 171 of the RMA sets out the matters that must be considered by a territorial authority in making a recommendation on a NoR. This includes consideration of the actual or potential effects (including positive effects) on the environment of allowing the requirement.

3.1.2 Resource Consent Applications

AT are also seeking regional resource consents under the AUP:OP and resource consent under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.

Overall, the application is assessed as a Discretionary Activity.

3.1.3 Whenuapai Structure Plan 2016

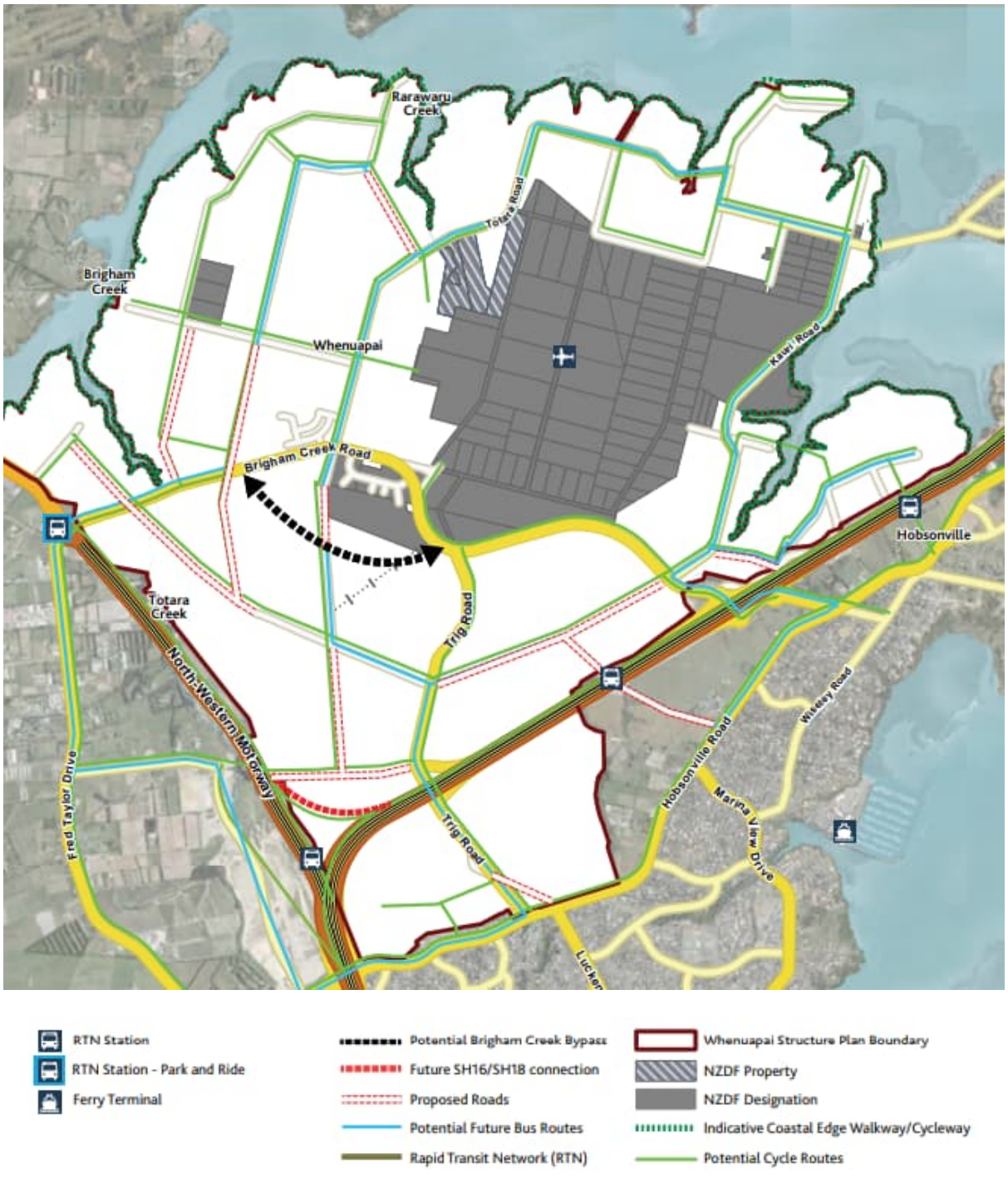
A structure plan is a high-level plan for a large area that shows the generally intended arrangement of various land uses (e.g. centres, housing, employment and parks) and infrastructure (e.g. transport and stormwater), and how the area connects to adjacent urban areas and wider infrastructure networks. A structure plan forms the basis of more detailed changes that are later made to the AUP:OP through the plan change process.

The Whenuapai Structure Plan (**WSP**) was completed in 2016 by Auckland Council.

From a transport perspective, the WSP identifies the required transport infrastructure to support the expected changes in land use including walking and cycling facilities, public transport facilities and a high-level framework for the roading network. The transport infrastructure identified in the WSP is shown below in Figure 3.

Trig Road is shown as a key arterial that plays a network role as a future public transport route and a future cycling route. The corridor is shown with a realignment and further details are provided on this in Section 4.2.5.

Figure 3: Whenuapai Structure Plan – Transport Network



3.2 Project Objectives

The Project Objectives are as follows:

- **Project Objective 1**: Provide an urban arterial transport corridor between State Highway 18 and Hobsonville Road to support and integrate with the planned urban residential growth of Whenuapai.

- **Project Objective 2**: Provide arterial transport corridors that are safe for all transport users.
- **Project Objective 3**: Contribute to mode shift by providing a choice of transport options including walking, cycling and public transport.

4 Receiving Environment

Chapter Summary: Receiving Environment

The existing transport environment includes two key arterial corridors, Hobsonville Road that travels east-west, and Trig Road that travels north-south towards Whenuapai.

Trig Road is currently two lanes wide, with a narrow footpath on one side. The posted speed limit on Trig Road from Hobsonville Road to Ryans Road is 50kph, increasing to 80kph beyond Ryans Road. There are currently no cycle facilities provided and the corridor can be characterised as generally rural in standard. The intersection with Hobsonville Road is a priority-controlled intersection with acceleration and deceleration lanes provided for left turning vehicles into and out of Trig Road.

Hobsonville Road is two lanes wide, with footpaths on both sides. There are no cycle facilities on either side of the road. Luckens Road intersects with Hobsonville Road with a priority-controlled intersection. This intersection also provides acceleration and deceleration lanes for left turning vehicles on to and from Luckens Road.

The SH18 overbridge currently provides one traffic lane in each direction and a flush median. Footpaths are provided on both sides of the bridge. The footpath on the eastern side is not connected to any other existing footpath. There are no dedicated cycle facilities on the bridge.

Other than bus stops, there are no dedicated public transport facilities on Trig Road or Hobsonville Road. Bus services currently run on both Hobsonville Road and Trig Road, with increased frequency and services expected as the Whenuapai area progressively urbanises.

In terms of the likely-future network, the vision for the Project area is consistent with the wider vision for Auckland, providing for a safe and efficient network that allows communities to travel with a choice of modes. This means supporting travellers to increasingly make the choice to walk, cycle and use public transport rather than travel by private vehicle.

Based on the Whenuapai Structure Plan, the future land use for the land around the Project is likely to be residential.

A key part of this residential intensification is to ensure that the local arterial network delivers sufficient movement function that provides safe facilities for walking, cycling and public transport use. In terms of this Project, the local arterial infrastructure includes providing**:**

- Bus priority at intersections and on Hobsonville Road to facilitate improvements in the reliability of bus journey times.
- Walking and cycling facilities that are appropriate for higher levels of patronage and enable safe segregated use of the facilities.
- An appropriate urban context with lowered vehicle speeds and more reliable access to the wider network.

4.1 Approach to Receiving Environment

A key objective of the Supporting Growth Programme is to protect land now to ensure that the transport networks required to support growth areas in the future, around Auckland, can be provided in an efficient and co-ordinated manner. This Project supports the development of housing in the immediate vicinity of Trig Road and currently has funding to be constructed in the near future.

In the context of an RMA assessment process, considering the environment as it exists today will not be a true reflection of the real-world environment in which the transport corridor will operate. Accordingly, when considering the environment within which the effects of the construction and operation of the transport corridor are likely to occur, this assessment considers both the existing environment and the likely future environment for the Project area.

The Whenuapai Structure Plan provides an indication of the future urban context in which the corridor is likely to operate. At the time of the assessment this information indicates that the likely receiving environment will be residential in nature, with a mix of high and medium density shown in the plan.

4.2 Transport Specific Context

The following section provides a brief summary of the existing transport environment and the likely future transport environment.

4.2.1 Existing Transport Environment

Table 1 and Table 2 provide a summary of the existing road network and key characteristics.

Table 1: Existing Road Transport Network

Existing Corridor	Key Characteristics
Trig Road	• 50 kph posted speed limit from Hobsonville Road to north of the Ryans Road intersection • 80 kph posted speed limit for remaining northern section of corridor • SH18 access with east facing ramps • Two lanes for entire corridor • Footpath approximately 1.2m wide on the western side only with no dedicated crossing facilities • No dedicated cycle facilities • Overbridge over SH18 with two lanes and a 1.8m – 2.0m wide footpath on the western and eastern side • Given the currently semi-rural land use within Whenuapai and adjacent to Trig Road the existing public transport network is relatively limited. There are currently two key routes that operate on Trig Road and Hobsonville Road, each with 30min frequencies in the peak periods. (Route 114 and 120)
Hobsonville Road	• 50 kph posted limit • Two lanes with a central flush median • Kerb side lane in each direction to facilitate merging from Trig Road and Luckens Road • Identified as an over dimension route • Footpaths are provided on both sides of the road approximately 1.2m wide. A small pedestrian refuge is provided on Hobsonville Road between Luckens Road and Trig Road within the flush median • No dedicated cycle facilities • Currently two key bus routes operate on Hobsonville Road, each with 30min frequencies in the peak periods (Route 114 and 120) • Due to high use of the 120-bus service on Hobsonville Road, AT intends to increase services to a core 20-minute frequency service 7 days per week between 6am and 7pm, and then a 30-minute frequency until 11pm. It is also planned to provide a 'peak overlay' between Westgate and Constellation in the peak direction (to Constellation in AM, from Constellation in PM), to give a 10-minute frequency on this core section

Table 2: Existing Intersections with Hobsonville Road

Existing Corridor	Key Characteristics
Trig Road and Hobsonville Road	• Priority controlled intersection • Separate left and right turn approach lanes on Trig Road • The intersection is relatively large in scale, with deceleration and acceleration lanes on Hobsonville Road, likely a result of previously higher speed limits on Hobsonville Road • Dedicated right turn bay on Hobsonville Road • No dedicated pedestrian facilities, raised central island on Trig Road approach • No dedicated cycling facilities
Luckens Road and Hobsonville Road	• Priority controlled intersection • Separate left and right turn approach lanes on Luckens Road • The intersection is relatively large in scale, with deceleration and acceleration lanes on Hobsonville Road, likely a result of previously higher speed limits on Hobsonville Road • Dedicated right turn bay on Hobsonville Road • No dedicated pedestrian facilities, raised central island on Luckens Road approach • No dedicated cycling facilities

4.2.2 Existing Traffic Volumes

Existing traffic volumes on Trig Road and Hobsonville Road have been counted by AT in December 2020 and December 2021. The results of these surveys are shown in Table 3 below. It is expected that the future urbanisation and strategic transport infrastructure will have a notable effect in terms of future traffic volumes and transport demand on these corridors.

Table 3: Existing Traffic Volumes on Trig Road

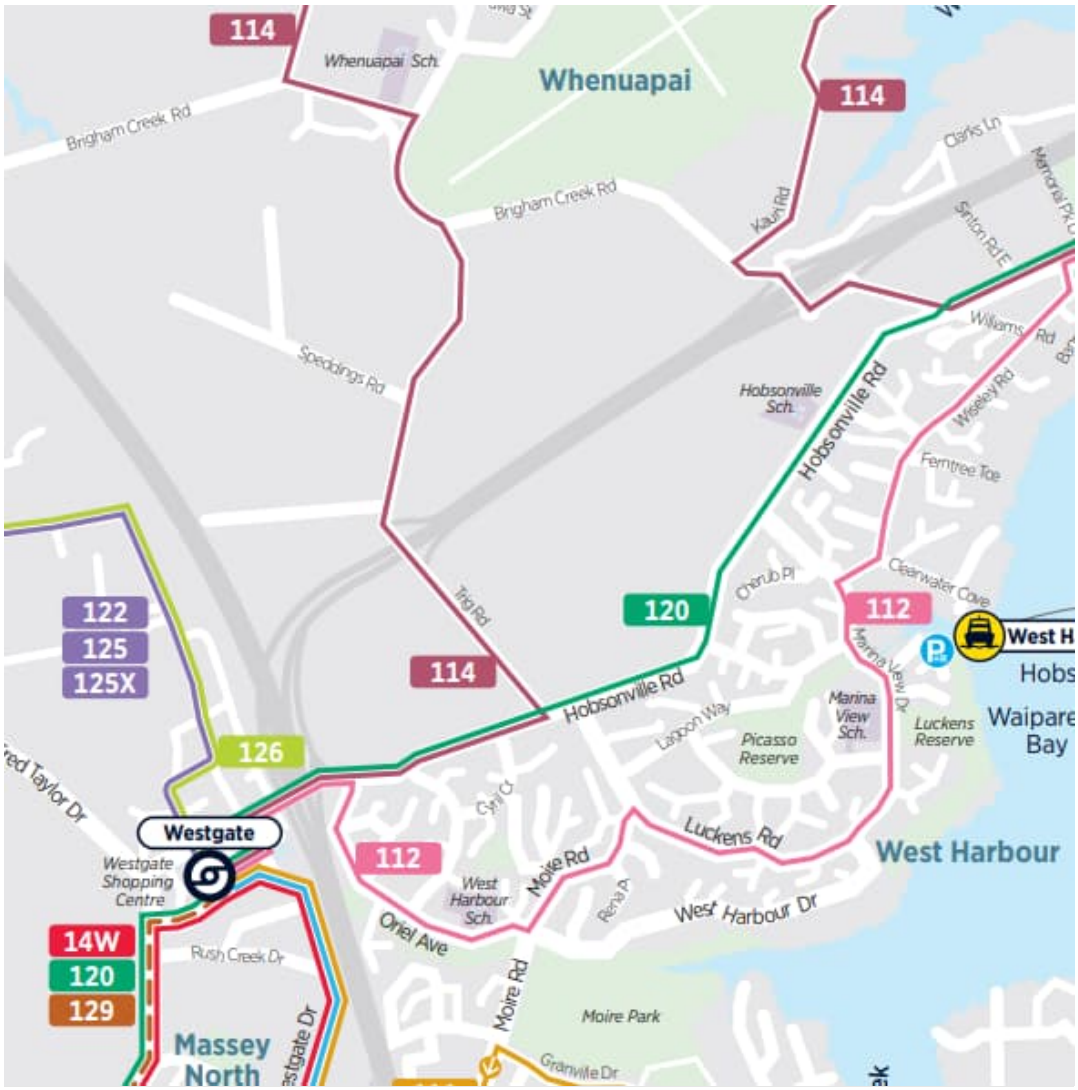
Location of Count	Survey Date	5 Day ADT[2]	7-day ADT	AM Peak Volumes	PM Peak Volumes
Trig Road between Spedding Road and Brigham Creek Road	December 2020	4,160	4,180	430	490
Trig Road between Ryan's Road and Motorway Overbridge	December 2021	6,890	6,460	590	690
Hobsonville Road between Luckens Road and Westpark Drive	February 2022	14,170	13,300	1,220	1,380
Hobsonville Road between Fitzherbert Avenue and Cyril Crescent	November 2020	18,720	17,830	1,400	1,760

4.2.3 Existing Bus Services

The following figure shows the existing bus services in the Whenuapai region. As detailed in Table 1, the two key services are Route 114 and Route 120.

[2] Average Daily Traffic (ADT)

Figure 4: Existing Bus Services in Whenuapai



4.2.4 Future Transport Network

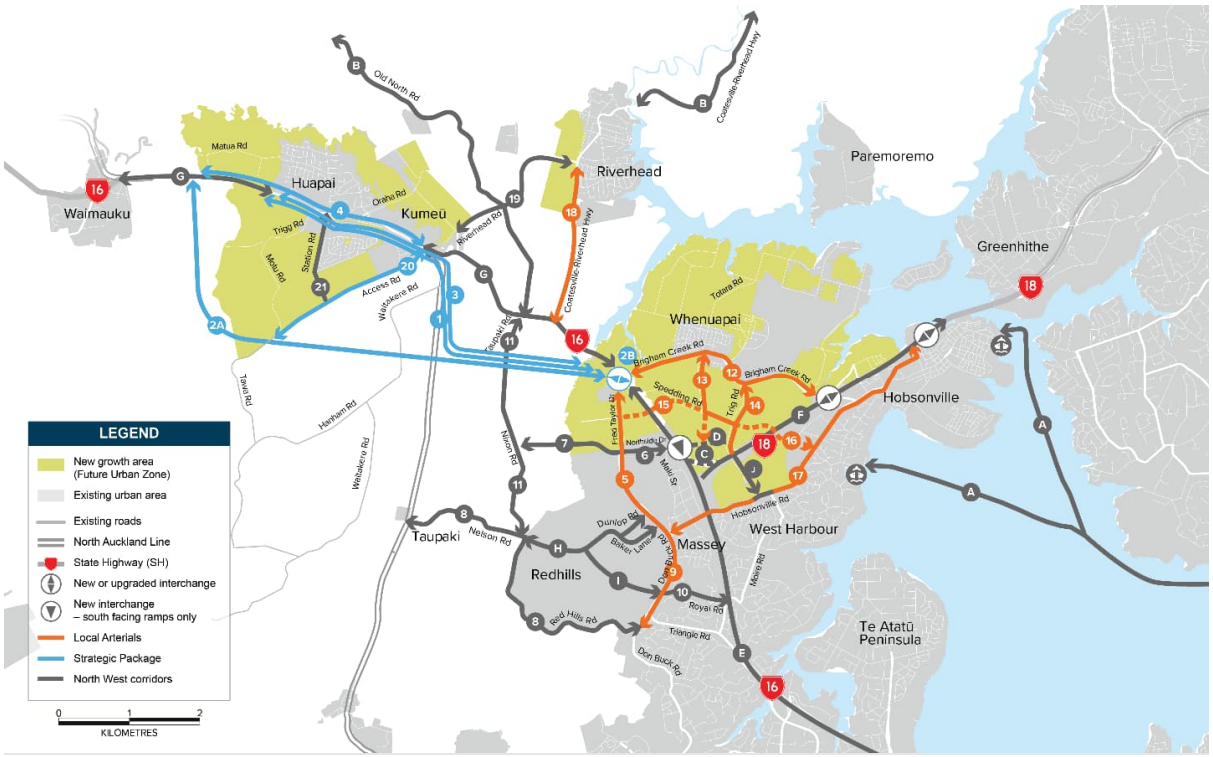
The transport corridors within Whenuapai and the surrounding area will be delivered as part of the wider urbanisation that is scheduled to occur in the North West of Auckland.

To understand the future transport network an indicative transport network for the North West has been developed to support Auckland Council's planned urban growth and is shown below in Figure 5.

The future urban area proposed by Auckland Council includes the urbanisation of currently rural areas as shown in yellow in Figure 5. The Whenuapai area is expected to provide for 8,100 to 10,700 dwellings (depending on density), 8,600 jobs and over 300 hectares of new business land[3].

[3] Whenuapai Structure Plan, September 2016

Figure 5: Indicative North West Transport Network



Subsequent to the North West Indicative Business Case for the Supporting Growth Programme, the Housing Infrastructure Detailed Business Case was completed under the Supporting Growth Programme, which focussed on the development of the southern section of Trig Road (this Project) and the Redhills network.

Through these assessments it was established that Trig Road will continue to facilitate key movements, including providing access to SH18 and will be an important north-south connection as Whenuapai urbanises. There are future urban areas immediately adjacent to Trig Road, and future developments will be able to connect to this key corridor via future developer delivered collector roads.

Once the area around Trig Road is urbanised, the road will need to serve a variety of movement needs, including:

- Access to and from the east facing motorway ramps to SH18
- Facilitating north-south non-motorway movement between business and residential land in Whenuapai, and the existing residential areas around West Harbour and Hobsonville
- Provide opportunities for future developments to deliver connections for collector road access to the surrounding residential land
- Provide access from Whenuapai to wider destinations such as the Westgate Shopping Mall and the ferry terminals at West Harbour and Hobsonville.

Trig Road will therefore serve a range of local and strategic uses across a range of modes and consequently needs to provide the appropriate facilities associated with an urban arterial.

Hobsonville Road will play an increasingly important public transport role and will facilitate local east-west movements between Westgate and Hobsonville.

4.2.5 Previously Indicated Trig Road Alignment

As identified above, the Trig Road alignment within the WSP was identified to be realigned to meet with Luckens Road. The intention of this realignment was to provide a single intersection along Hobsonville Road and provide a direct north to south route from Whenuapai to West Harbour.

Further investigations identified that in order to meet geometric requirements, the realignment would result in significant earthworks including a substantial volume of fill to address the location within a valley. The follow-on impacts from this included significant property effects, limited ability for adjacent land uses to connect to the corridor due to height differences, and significant visual impacts.

When compared to an upgrade of the existing corridor, it was concluded that by upgrading both the Trig Road and Luckens Road intersections and providing an upgraded corridor on Trig Road that a similar transport outcome, that supported north south movements and provided safe intersections, could be delivered without the impacts identified.

The development of the alignment is set out in the Assessment of Alternatives report attached to the AEE.

4.2.6 Future Walking and Cycling Network

The WSP indicates that Trig Road and Hobsonville Road will form part of the cycling network for Whenuapai and notes that this would include the provision of dedicated cycle facilities.

4.2.7 Future Local Public Transport

In the longer term, there will be changes to the supporting local network to deliver an integrated public transport network. These changes have been identified through discussions with AT public transport network developers and reflect the outcomes sought by the WSP.

The changes include:

- Local services on Trig Road connecting to Hobsonville Road, Moire Road and Wisely Road
- Local services along Hobsonville Road will become a *frequent* route, which is defined as having a service at least every 10 minutes from 7am to 7pm, 7 days per week.

It is noted that the longer term future public transport network has been developed on the basis of significant public sector investment including a rapid transit network on SH18 with associated interchanges, an additional road crossing of SH18 between Brigham Creek and Trig Road, a Northside Drive connection over SH16 to Westgate and connections between SH16 and SH18 to facilitate movements from Westgate to Whenuapai.

In the interim period between these investments and the investment of rapid transit to the North West, Trig Road and Hobsonville Road will play a critical part in the delivery of a public transport network to support the developing more intensive urban form in Whenuapai.

The Regional Public Transport Plan (RPTP) provides a 10-year indication of public transport provisions. In terms of the two existing services on Trig Road and Hobsonville Road, Table 4 summarises the proposed changes to these services over the next 10 years.

Table 4: Bus Services as proposed in RPTP 2018 – 2028

	2018	2021	2028
Route 114	30 minute services in weekday peak, 60 minute in interpeak, no evening service	30 minute services in weekday peak, 60 minute in interpeak, no evening service	20 minute services weekday peak, 20 minute interpeak, 30 minute evening service
Route 120	30 minute services in weekday peak, 30 minute in interpeak, 60 minute evening service	15 minute services in weekday peak, 20 minute in interpeak, 20 minute evening service	10 minute services weekday peak, 15 minute interpeak, 15 minute evening service

4.2.8 Future Traffic Volumes

Current and forecast traffic volumes for Trig Road are shown in Table 5 and Figure 6. Considerable growth in traffic volumes is forecast between now and 2038, aligned with the planned projected urbanisation of the Whenuapai area.

Table 5: Trig Road – Traffic volumes to 2048+

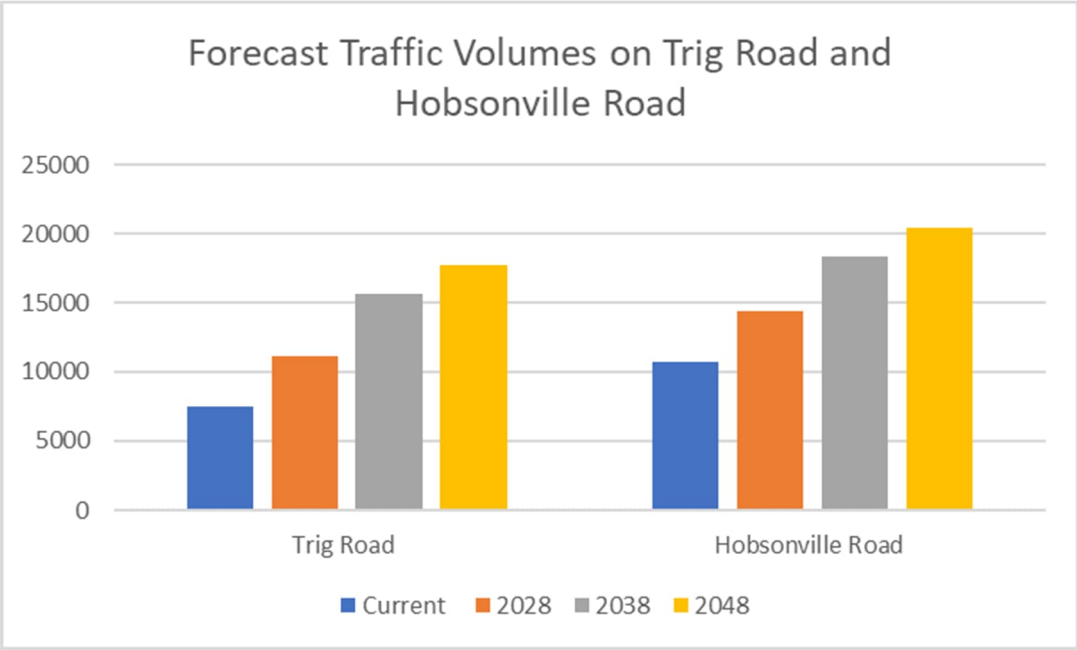
	Current[4]	2028	2038	2048+
Trig Road (forecast)	7,500	11,100	15,700	17,700
% growth on previous decade	-	**48%**	**41%**	**12%**
Hobsonville Road (forecast)	10,700	14,400	18,400	20,400
% growth on previous decade	-	**35%**	**28%**	**11%**

When considering north and south movements, and wider connectivity through the West Harbour area, a strong connection to Luckens Road is critical. Luckens Road connects directly to Marina View Drive, facilitating a loop through West Harbour and back to Hobsonville Road.

Of those turning right out of Trig Road in the morning peak period, it is predicted some 60% travel through to turn right into Luckens Road. Of those turning left from Luckens, approximately 60% again turn right into Trig Road. These proportions demonstrate the importance of considering the Luckens Road intersection in coordination with the Trig Road intersection.

[4] Based on the SATURN modelling based year, calibrated against 2015 surveyed traffic volumes.

Figure 6: Trig Road and Hobsonville Road – Predicted Daily traffic volumes to 2048+



4.3 Summary of Transport Specific Context

Overall, it is considered that the existing transport facilities on Trig Road are currently commensurate to facilities provided in a rural area. The existing network has intermittent facilities for walking and cycling, a low level of public transport and no dedicated facilities to provide for reliable and attractive travel by bus.

Walking and cycling facilities are currently limited to narrow facilities for pedestrians and no facilities for cyclists. The lack of safe and attractive facilities for active modes encourages travel by car, even for shorter distance trips, such as to Westgate, that could be reasonably be undertaken by foot or bike. The intersections have poor crossing facilities, with no dedicated facilities for pedestrians and cyclists, further reinforcing travel choice by car.

In terms of vehicle movements to and from Trig Road and Luckens Road, delays for right turning vehicles in particular can be highly variable in the peak periods. Additionally, the intersections in their existing form are wide and accommodate higher speed turning movements more conducive to high speed rural roads, consistent with the legacy operation of Hobsonville Road as a rural state highway. This encourages higher speed intersection movements, increasing safety risks for drivers and further reducing amenity and safety for pedestrians and cyclists at intersections.

Limited bus priority measures mean that buses will experience the same delays as private vehicles. These delays are expected to increase in the future with increasing urbanisation in the area. Accordingly, without the Project, this results in limited safe and viable transport choices for the existing and future communities in the area and maintains a reliance on private vehicles to travel. Additionally, the form and function of the intersections and the road environment on Trig Road and Hobsonville Road does not contribute to quality urban outcomes sought for future urban development in the area.

5 Methodology and Analysis

5.1 Approach to Assessment of Operational Transport Effects

As detailed in Section 3.2, the Project has an identified set of Project Objectives. From a transport perspective these objectives are focused predominately on the themes of connectivity, safe travel choice and mode shift. In order to assess the transport effects of the Project the follow methods have been utilised.

5.1.1 Transport Modelling

Throughout the transport network analysis process, a range of different transport modelling tools have been used to undertake quantitative assessments of the transport system. These then inform decisions about planning the transport network, corridors, and intersections.

The impacts of the Projects on the future transport environment are assessed using forecasting transport models, owned by the Auckland Forecasting Centre (AFC). The models include:

- The regional multi-modal model (MSM). This model creates estimates of car, truck and public transport movements at a regional level based on land use, network and policy inputs. This model is the primary tool to estimate future PT usage. Generally, this model is run using regional assumptions as per recent Auckland Transport Alignment Plan (ATAP) planning, but with scenario-specific inputs in the growth areas.
- A local traffic model (SATURN). This uses the traffic demands from MSM on a more detailed representation of the road network.
- A strategic active model (walk/cycling) model (SAMM). This tool gives strategic-level estimates of walking and cycling demands.

The assessment of operational effects will therefore be informed by modelled estimates of travel and network performance for a future full-build-out scenario.

A key input to the models are regional land use forecasts, which influence the future quantum and location of travel. Regionally agreed land use forecasts are prepared by Auckland Council via the Auckland Forecasting Centre (AFC), with the most recent available forecasts (at the time of this assessment), referred to as Scenario I11.5. Those forecasts are based on regional population forecasts from Statistics NZ, with spatial allocation to individual spatial areas based on the AFC land use model and known detail around specific land use planning processes.

Land use forecasts have inherent uncertainty, particularly in terms of the specific rate of new growth in specific areas. Currently, there is additional uncertainty around the likely outcomes and rate and location of higher-density development sought through central Government policies such as the National Policy Statement on Urban Development (NPS-UD) and Auckland Council's Plan Change 78. A key intent of those policies is to enable higher density development, especially around high-quality public transport systems. The specific planning response to those policies is currently being progressed by Auckland Council, and revised land use forecasts reflecting any expected changes were not available at the time of preparing this assessment. Generally, it is considered that this Project is not inconsistent with such policy direction, regarding supporting higher density urban development via more sustainable travel modes. Given this context, the use of those available I11.5 forecasts is considered acceptable for this assessment.

In addition to the SATURN modelling, SIDRA[5] modelling has been undertaken to assess the operational outputs of key intersections along the project corridors. The regional model (MSM) was used to inform assessment of the public transport network components.

In regard to traffic modelling analysis used in this report, a Level of Service (LOS) metric has been used. This refers to a qualitative measure used to assess the quality of motor vehicle traffic service. LOS is used to analyse road corridors and intersections by categorising traffic flow and assigning quality levels of traffic based on a performance measure ranging from A to F and can be summarised as follows:

- **LOS A: free flow**. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes.
- **LOS B: reasonably free flow**. LOS A speeds are maintained, manoeuvrability within the traffic stream is slightly restricted.
- **LOS C: stable flow, at or near free flow**. Ability to manoeuvre through lanes is noticeably restricted and lane changes require more driver awareness.
- **LOS D: approaching unstable flow**. Speeds slightly decrease as traffic volume slightly increase. Freedom to manoeuvre within the traffic stream is much more limited and driver comfort levels decrease.
- **LOS E: unstable flow, operating at capacity**. Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to manoeuvre in the traffic stream and speeds rarely reach the posted limit.
- **LOS F: forced or breakdown flow.** Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required. Travel time cannot be predicted, with generally more demand than capacity.

5.1.2 Relevant Standards and Guidelines

Integrated Transport Assessment

The AT Integrated Transport Assessment (**ITA**) Guidelines[6] have been used to inform the preparation of this ITA. In particular, the Guidelines identify that an ITA should provide an assessment of the accessibility of a proposal by walking, cycling, public transport and private motor vehicles. The Guidelines also indicate that the ITA should consider the potential effects a proposal could have on the transport network and any mitigation measures needed to ensure that any adverse effects of a proposal are avoided, remedied, or mitigated.

Design Standards

The proposed cross section has been developed in coordination with AT design specialists and in reference to AT's Transport Design Manual (**TDM**)[7].

[5] SIDRA modelling enables an assessment of individual intersections using inputs from regional models.
[6] Integrated Transport Assessment Guidelines, January 2015, Auckland Transport
[7] https://at.govt.nz/about-us/manuals-guidelines/roads-and-streets-framework-and-the-transport-design-manual/

It is considered that the TDM enables a design consistent with the future aspirations for the Whenuapai area, including providing facilities to support travel by walking, cycling, and public transport.

5.1.3 Assessment Methodology - Transport Mode

Table 6 summarises how each mode/element of transport has been assessed in terms of operational effects as a result of the Project.

Table 6: Summary of Assessment Methodology

Network Component	Information sources	Assessment Method
Walking and Cycling	Walking and Cycling network plans Proposed cross sections	Qualitative assessment to determine alignment with walking and cycling strategic documents and design compliance with Transport Design Manual
Safety	CAS database Project design drawings	Quantitative assessment of potential safety risk based on design features Qualitative assessment to determine alignment with AT's 'Vision Zero' standards
Public Transport	RPTP Strategic Regional Documents	Qualitative assessment to determine alignment with RPTP and other strategic documents Qualitative and Quantitative assessment using key model outputs including intersection performance
Access	Typical travel speeds Engineering standards	Qualitative assessment identifying where there is a potential effect on access Quantitative assessment of the change in travel time for properties with reduced accessibility
General Traffic	Transport Model – SATURN Model and Paramics Model Proposed design	Qualitative and Quantitative assessment using key model outputs including traffic volumes, intersection performance Qualitative assessment of surrounding network connections
Roads and Streets Framework (RASF) Assessment	Roads and Streets Framework	Qualitative and Quantitative assessment of the proposed corridor against the RASF principles
Overall Assessment against Project Objectives	Connectivity Travel Choice Mode Shift	Qualitative assessment based on above assessments

5.2 Approach to Assessment of Construction Traffic Effects

5.2.1 Construction Traffic Effects

In order to assess the potential construction traffic effects, an indicative construction methodology has prepared. This can be found in the AEE.

Based on the indicative construction methodology an assessment of construction effects has been completed. This assessment will consider:

- An overview of key considerations including speed, potential impacts to pedestrians and cyclists and property access
- Identification of any works that should not occur at the same time
- Assessment of potential conflict areas with vulnerable road users that will need specific mitigation within a Construction Traffic Management Plan (**CTMP**) and / or Site-Specific Traffic Management Plans (**SSTMP**).

The Project specific construction effects will be managed via a CTMP and/or SSTMP which will be developed immediately prior to implementation when the greatest certainty is available.

5.2.2 Temporary Traffic Management

The impact of any temporary traffic management measures implemented to undertake the projects will be re-assessed in the future, prior to construction, when a greater level of detail is available in terms of the specific construction methodology and traffic environment.

It is noted that there may be some nuances between projects delivered 'online' as they are existing roads and those delivered 'offline' as new greenfield roads. It is noted that the majority of the Project is expected to be delivered online. As such, any future assessment should be required to consider potential road closures, any capacity reductions on key corridors through lane closures, and any other ancillary effects such as shoulder closures.

At the time of construction of the Project or any stage of the Project, a Construction Traffic Management Plan (**CTMP**) will be developed with the purpose of managing traffic and transport effects on the local community and wider network and community. The CTMP will consider the effects on the transport network of potential road closures, any capacity reductions on key corridors through lane closure, and effects of any other ancillary activities such as shoulder closures.

6 Assessment of Transport Effects

Chapter Summary

The assessment of transport effects of the Project has identified the following outcomes and it is considered that, where necessary, the adverse effects identified in this report can be appropriately mitigated through the measures identified and detailed in Section 7. Significant positive transport effects of the Project, including the provision of separated walking and cycling facilities and public transport priority measures have also been identified.

Assessment of Walking and Cycling Effects

- All corridors within the Project are proposed to include separated walking and cycling facilities to encourage increased mode share for walking and cycling. This is achieved through the provision of safe separated facilities.
- The proposed facilities are a considerable improvement on the existing facilities and provide a significant contribution to achieving the Project outcomes. In particular the provision of high-quality walking and cycling facilities will support walking and cycling as a safe travel choice for future and existing communities.
- On Trig Road a bi-directional cycle way is indicatively proposed to minimise potential conflict between cyclists and existing driveways encouraging greater numbers of cyclists.
- Dedicated cycle and pedestrian crossings are proposed at all new and upgraded intersections to provide safe crossing facilities for pedestrians and cyclists.

Assessment of Safety Effects

- The Project design is consistent with Vision Zero outcomes sought by AT and prioritises facilities to support safe travel by foot, bike or public transport.
- The provision of separated facilities significantly improves safety for people that travel by walking and cycling.
- By reducing the speed of the corridor to 50 km/hr, this will offer further safety benefits when compared to the current 80 km/hr speed environment. This speed reduction is appropriate for the future urban context for Trig Road.

Assessment of Public Transport Effects

- The provision of bus priority at the intersections of Trig Road and Hobsonville Road and the provision of bus priority on Hobsonville Road from Luckens Road is consistent with the future route intentions identified in the Regional Public Transport Plan and ensures that buses are provided with reliable journey times, making travel by bus more attractive.
- The implementation of bus priority at these intersections will improve bus reliability and travel times, encouraging mode shift to public transport.
- Prioritising bus services at this intersection is consistent with the future RTN intentions for the North West, enabling connectivity to a new planned RTN station at Westgate.

Assessment of Access Effects

- For the majority of existing properties, there will be limited to no change to vehicle access provided.
- For existing properties that are rural and gain access from Trig Road, existing use access will be reinstated however once these properties are developed for urban purposes, they will need to gain access via future roads extending from Trig Road which will need to be provided by developers as the land is developed for urban purposes.
- Existing driveways that are remaining will be reformed in accordance with standards contained in AUP:OP where possible. Where this is not possible these properties have been included within the designation boundary as additional works may be required to provide a suitable access, or in some circumstances the properties acquired.

Chapter Summary

- Existing vehicle movements for most properties will be maintained. However, in the case of the dwellings between Trig Road and Luckens Road, right-in right-out movements will no longer be achievable because of a raised central median provided as a safety measure at the intersection approaches. The existing and future local network will allow right turn movements and facilitate access through the surrounding road network.

Assessment of General Traffic Effects

- The proposed intersections, as modelled with 2048 traffic volumes, operate well. Both intersections are predicted to operate within the theoretical capacities of the proposed design in both the morning and evening periods, with an overall LoS C or D at the intersections. This means a delay for drivers of between 20 and 55 seconds at the intersection.
- The queue lengths predicted for most approaches and times, demonstrate there is sufficient stacking space allowed. In the PM peak period, the 95th -percentile queue for vehicles on the Hobsonville Road approach may exceed the distance between intersections; however the provision of bus lanes between the intersections will limit the impact this would otherwise have had on bus reliability.
- The provision of traffic signals at both intersections will result in greater reliability, in particular for vehicles wishing to turn right from Luckens Road and Trig Road. The ability to turn right is currently variable, and it is considered that with the forecasted increase in traffic on Hobsonville Road, this variability will also increase.

Roads and Streets Framework Assessment

- A draft Roads and Streets Framework Assessment has been completed. This assessment indicates that Trig Road will have a Place 1/Movement 2 functionality.
- A Place 1 recognises that the adjacent land use has a primarily local function, with a small catchment of users.
- A Movement 2 recognises that the network function is of medium strategic significance with increasing volumes of users. It provides a connection to a strategic route – SH18.

Assessment of Construction Effects

- Construction effects are proposed to be managed via a detailed CTMP. This will be completed in relation to a confirmed construction methodology at the time of delivery of the Project.
- Given the expected future volumes on the surrounding road network, construction traffic movements are capable of being accommodated within the existing road network.
- Specific measures related to access and safe movement of vulnerable road users are expected to be provided at the time of resource consent.

6.1 Walking and Cycling

Trig Road is close to several key trip attractors, including Westgate shopping centre and public transport interchange (1km west of Trig Road), and business land planned in Whenuapai (1 to 3km north and east of Trig Road). West Harbour ferry terminal is 2.6km east of Trig Road on the current road network. Due to the relative distances, there are many opportunities to encourage local residents to walk or cycle to these facilities. The proposed separated cycle lane and footpaths will provide safe alternative transport options and encourage a mode shift for these local movements.

Based on the TDM, specifically the Urban Street and Road Design Guide, the standard for walking and cycling is to provide separated, protected walking and cycling facilities where general traffic volumes exceed 5,000 vehicles per day and 30kph. Consistent with AT's 'Vision Zero' objectives, the

proposed design provides for separated cycling facilities, given that the expected traffic speeds are in excess of 30 km/hr.

Trig Road and Hobsonville Road meet these triggers and therefore these facilities are proposed, not only for safety, but also to provide walking and cycling opportunities equal to those available to people who choose to drive, i.e. that footpaths and cycleways are safe, coherent, and connected.

Table 7: Geometry of Walking and Cycling Facilities

Standards	Minimum Standard Width	Comment
Auckland TDM	**Footpaths:** 1.8m minimum.	A 1.8m footpath is proposed on Hobsonville Road and Trig Road on both sides of the corridor. This is in accordance with the AT TDM requirements.
	Cycle Paths 2.0m width recommended for raised cycle paths. No specific width recommended for two way facilities but notes that a cyclist has an envelope of approximately 1.0m.	A 4.0m wide two-way facility is proposed for Trig Road, and 3.7m over the SH18 over-bridge. 2.0m raised separated cycle paths are proposed for Hobsonville Road. These facilities are in accordance with the AT TDM requirements.

6.1.1 Indicative Cycling Facilities

Typically cycling facilities would be provided on both sides of the corridor, allowing for high levels of access to adjacent properties. Through a series of design workshops with AT specialists, a two-way cycle facility on one side of the corridor was agreed to be appropriate on the eastern side of Trig Road, due to the high number of vehicle crossings on the western side. Once the land is urbanised on the north eastern and western side, it is expected that these properties will be accessed via future collector roads from Trig Road, rather than driveways directly on to Trig Road. Locating the cycleway on the eastern side of Trig Road means that cycle facility users will not have to cross multiple vehicle crossings, reducing the potential for conflict and accidents.

It is noted however, that should the urban context or environment along Trig Road change, there may be a desire to implement typical one way cycle facilities on each side of the corridor. The proposed corridor width would be capable of achieving these reconfigured cycle facilities in the future if required.

A 4.0m cycling facility is planned to enable two cyclists to pass each other with generous separation.

The cycle facility will also connect into future intentions for a strategic shared path on the southern side of SH18 and the proposed cycle provisions along Hobsonville Road.

The intersection of Trig Road and Luckens Road with Hobsonville Road will be provided with dedicated signalised cycle crossing facilities. These are considered to provide a significant increase in the level of service provided for cyclists at these intersections compared to the existing environment.

6.1.2 Pedestrian Facilities

Full signalised pedestrian crossings are to be provided at the signalised intersections of Trig Road and Hobsonville Road and Hobsonville Road and Luckens Road. There is an existing small pedestrian refuge located between Trig Road and Luckens Road on Hobsonville Road, which will be removed. The proposed signalised intersections on Hobsonville Road are considered to provide a significant increase in the level of service provided to pedestrians compared to the existing environment.

It is expected that additional pedestrian crossing facilities will be provided on Trig Road, south of the SH18 interchange, at such time that there is greater certainty in regard to adjacent land uses, the location of future collector roads and the location of bus stops. The proposed design provides a flush median which provides sufficient road corridor space to not preclude this crossing from being provided. These crossing facilities could also be provided in coordination with the delivery of the collector network, which will intersect with Trig Road.

For pedestrians, a pedestrian refuge has been provided to the south of the interchange ramps to enable pedestrians to connect with the footpath on the western side of Trig Road. This is considered a safe and appropriate facility. It is also noted that the form of the ramp intersections will be further investigated as part of subsequent business cases being completed by the Supporting Growth Programme, in conjunction with the remainder of Trig Road.

6.1.3 Integration with the Existing Network

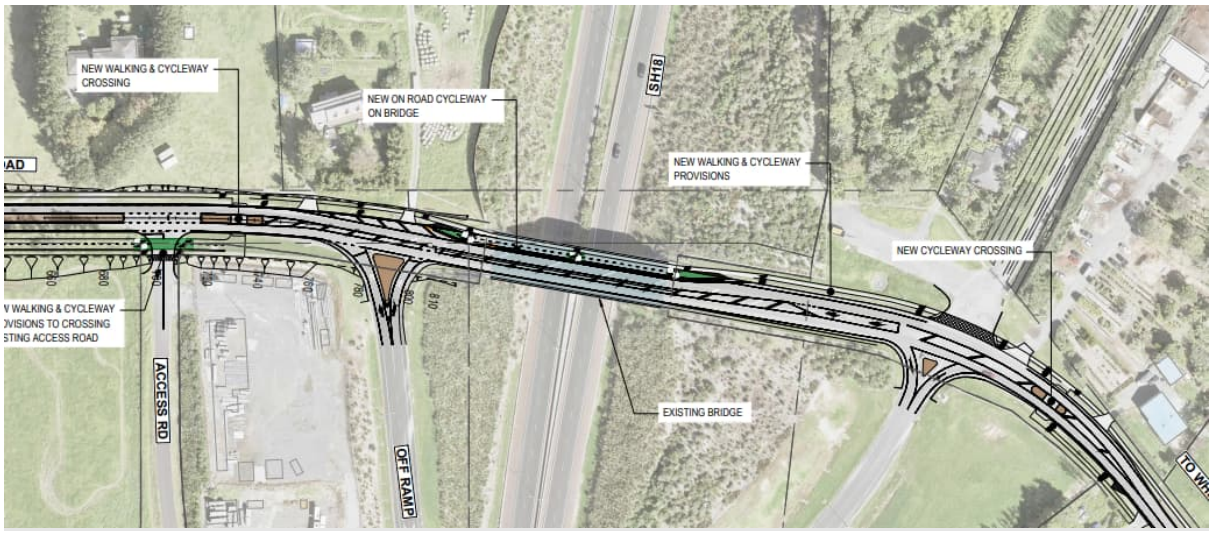
Ongoing wider network planning is being undertaken by AT, Waka Kotahi and the Supporting Growth Programme. Over time the Project will integrate with wider future elements of the network, including the continuation of Trig Road and SH16/18 connections including the strategic cycling facilities adjacent to SH18. This planning and subsequent implementation will occur over time. The Outline Plan will enable detail to be provided to show the effective integration with the network existing at the time of construction.

An important consideration with walking and cycling is the tie-in to the existing network where the Project extents ‘end’. In the case of Trig Road, there are three important transition points that were considered in the iterative geometric design process. They are Trig Road to Hobsonville Road; Hobsonville Road to Luckens Road; and Trig Road as it crosses SH18 on the over-bridge. It is recommended that specific details on the proposed tie ins at these locations are detailed within the Outline Plan.

The Outline Plan should include the proposed tie in locations and design for these tie ins for all modes of transport. This will detail the safe transition from the Project to the existing road network on Hobsonville Road and Trig Road. This may include safely transitioning cyclists back onto the road network.

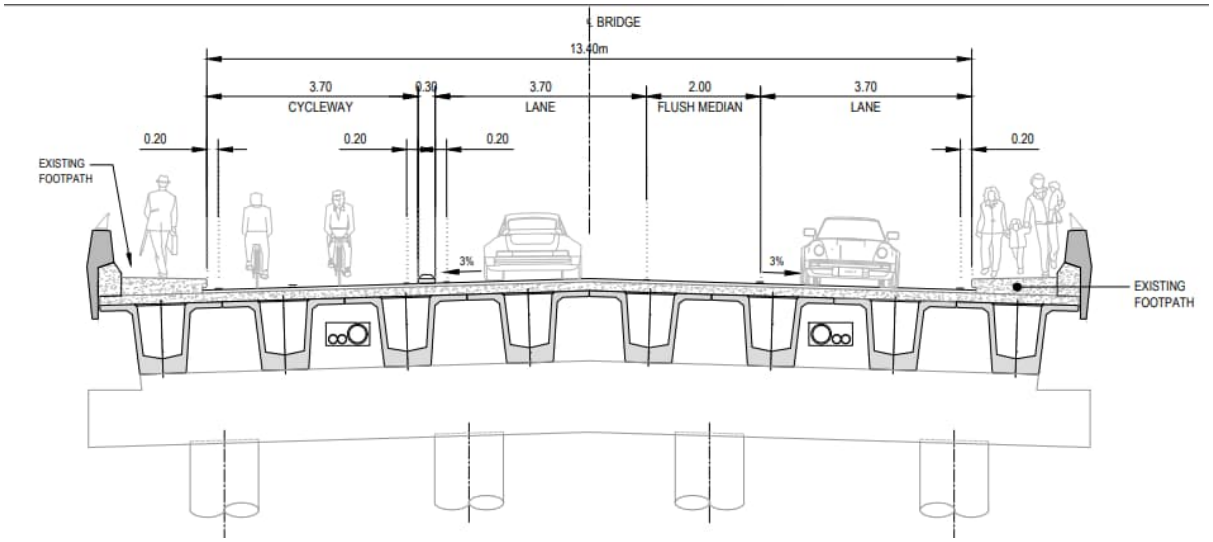
SH18 eastbound on-ramp and westbound off-ramps are located on the eastern side of Trig Road. Given this, careful design consideration has been given to the interaction between the ramps and cyclists. The Project accordingly provides for an unsignalised crossing point south on the interchange, moving cyclists to the western side of Trig Road and over the bridge. This is shown below in Figure 7.

Figure 7: Proposed Cycle Crossing on Trig Road



The facilities on the bridge will be provided through the reallocation of the space on the existing bridge. This will result in the cross section shown below in Figure 8.

Figure 8: Proposed Cross Section on Trig Road Bridge



6.2 Road Safety

The design of the Project has been undertaken cognisant of AT's Vision Zero, transport safety approach. As detailed below, this has resulted in the proposed corridors being designed to support lower vehicle speeds and with separate facilities for pedestrians and cyclists to reduce potential conflicts between road users and complement the future urbanisation of the surrounding land uses.

Given that the Project changes the form and function of the intersections, historical crash records do not provide significant insight into predicting future trends. The Project will address existing safety matters, including the rural nature of the corridor within an urbanising environment.

6.2.1 Alignment with Vision Zero

AT have adopted Vision Zero[8], an ethics-based transport safety approach, which is focused on all elements of road safety for all road users. The underlying premise of AT's Vision Zero is that no death or serious injury is acceptable.

As part of AT's Vision Zero response, a Transport Safety Strategy and Action Plan to 2030 has been implemented. This strategy identifies a suite of actions that will be undertaken to support a Vision Zero approach. The Project supports this suite of actions by:

- Providing for protected walking and cycling facilities on all corridors, where necessary, supporting facilities for vulnerable road users
- Safe intersection design based on AT standards and provision of crossing facilities for vulnerable users, where necessary
- Vehicle lane widths and corridor widths minimised, as much as practicable, to support a lower speed environment.

Overall, the Project is well aligned with the principles of AT's Vision Zero. It is noted that detailed design refinements will be completed to further support safety outcomes at a subsequent stage prior to construction.

6.2.2 Effect on Current Roading Environment

The current intersection forms at Trig Road and Luckens Road with Hobsonville Road were designed for a low-volume rural environment.

It is noted that the existing intersections currently provide:

- Wide radius curves at the intersections that enable turning at greater speeds than would be expected or required in an urban environment
- Acceleration lanes for left turning vehicles from both Trig Road and Luckens Road to enable vehicles to increase speeds to match through movement vehicles
- Left turn slip lanes approaching the intersections to allow for deceleration.

While these intersections may have been appropriate in the past, these will be less appropriate as urbanisation occurs. A speed environment of 50kph is more appropriate in an urban context and consequently there is a need to reform these intersections in a way that supports walking and cycling and encourages a slower speed environment.

Moreover, the current posted speed limit on Trig Road is 50kph near Hobsonville Road, increasing to 80kph further north adjacent to Ryans Road. Given that the proposed works are to support an urban environment, and will include facilities to encourage walking and cycling, it is recommended that the 50kph speed limit on Trig Road be extended to the north of the SH18 interchange. This can be facilitated by a change to the existing by-law utilising the Setting of Speed Limits Rule (NZ Govt 2017).

[8] https://at.govt.nz/projects-roadworks/vision-zero-for-the-greater-good/

6.3 Access

Hobsonville Road is currently classified as an 'Arterial' corridor. Under the AUP:OP, vehicle access to and from sites is restricted or managed to provide for the movement of people and goods on the network[9]. As such it is expected that arterial corridors will not actively provide for new direct property access in the longer term and any new access will need to be assessed as part any consenting process for future developments. Being arterial corridors, the core purpose of these corridors is to facilitate safe and efficient movement along the corridor for connection between key destinations, rather than property access. Existing property access will need to be maintained; however some movement controls or impacts may be required for safety or efficiency reasons.

Trig Road is not currently shown as an arterial in the AUP:OP, however it is shown as an arterial in the WSP. It is expected to perform as an arterial road in the future network in Whenuapai and be re-classified as such in the future.

Future access to the land adjacent to the Trig Road corridor will be provided by collector roads through the subdivision process. These collector roads and the intersections to Trig Road will be provided by developers at the time of urbanisation. As such, this section primarily addresses where existing property access will be affected by the Project.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land other than where necessary to re-instate driveways.

There are several existing properties where it has been identified that a replacement driveway will not be possible to implement with the Project in place, primarily due to changes to road levels and incursion of the corridor into the front of properties. These properties have been included within the proposed designation boundary.

6.3.1 Implications on Access Movements

As part of the design of the signalised intersections a raised traffic island has been proposed to separate traffic at the intersection approaches. The provision of the raised island has been provided as a safety measure to prevent crashes between vehicles at the intersection.

The additional lanes provided on Hobsonville Road result in right turning vehicles needing to cross up to three traffic lanes. This movement is considered to have safety implications and accordingly the design includes a raised median on Hobsonville Road between Luckens Road and Trig Road.

The implication of these raised islands is that several existing property accesses between 72 to 78 Hobsonville Road and 87 to 111 Hobsonville Road will no longer be able to turn right and will in effect be a left-in left-out access.

For these properties, it is expected that vehicles will be able to make left-in and left-out movements only. To safely travel in a direction that would have required a right turn movement, vehicles can travel using the wider network. If requiring a right turn from the property, they can turn left from the property and travel down Cyril Crescent, Elizabeth Drive, Moire Road to Luckens Road – and turn right from the signalised intersection. This route would result in between 1.5 km to 1.7 km of additional

[9] Chapter E27: Transport, E27.3 Policy 21

travel for the most eastern property (111 Hobsonville Road). If approaching from the west and requiring a right turn into the property, vehicles may turn at Cyril Crescent and complete the journey as described above. If they are approaching from SH16, vehicles may choose to exit at Royal Road and travel via Moire Road which is a similar distance to if they approached the properties on Hobsonville Road.

It is expected that in the future with development within the future urban area there may also be a finer grain network of collectors to enable other possible routes for these properties.

Within the context of significantly improved walking, cycling and bus facilities, the effects in terms of additional travel time to complete these vehicle access movements, are considered to be minor.

6.4 Public Transport Network

6.4.1 Design Philosophy

Currently there are no dedicated public transport facilities within the Project extents. The Project proposes to improve bus travel time and reliability through the following infrastructure:

- Provide ‘bus only’ through movements in the left turn lanes on Hobsonville Road at the intersections of Luckens Road and Trig Road;
- Provide a dedicated kerb-side lane on both sides of Hobsonville Road; and
- Provide a right-turn bus advance lane on Trig Road.

This infrastructure will allow buses travelling on Hobsonville Road to avoid intersection queuing, reducing delay at intersections and improving travel time reliability. These benefits for buses will help to encourage a shift away from private vehicles to reliable bus services. The ability for buses to avoid queuing creates a direct incentive to use public transport.

The Project also proposes to remove the indented bus bays on Hobsonville Road, west of Trig Road. These bus stops will be remarked in the same location. The bus stops on Luckens Road will be remarked in the same location. Where the buses will stop in the traffic lane, such as Hobsonville Road to the west of Trig Road, this will provide buses with increased reliability and improved ability to re-enter the traffic flow with minimal impact on general traffic.

The bus stop on Hobsonville Road east of Luckens Road will be relocated to be centrally located between the two signalised intersections (within the bus lanes). These will support safe crossing for pedestrians at the signalised intersections.

In terms of new bus stops on Trig Road or potentially the relocation of stops on Hobsonville Road, the proposed road berm in the indicative corridor cross section can accommodate potential new bus shelters. It is expected that the exact location of bus stops will be confirmed when there is more certainty in the adjacent land uses and the location of the collector network.

6.4.2 Alignment with Regional Strategy and Planning

Overall, the Project is well aligned with the RPTP. Specifically, the provision of bus priority, at the intersection of Trig Road and Hobsonville Road and along Hobsonville Road, is consistent with long-term intentions for public transport facilities in this area, as identified in the RPTP and ATAP.

In the shorter term, the intersection design provides increased reliability and reduced delay for buses travelling along Hobsonville Road.

Hobsonville Road will play an increasingly important role as part of the Frequent Transport Network and will support staged growth in Whenuapai. As such the intersection of the Trig Road and Hobsonville Road, and Luckens Road with Hobsonville Road have been designed to accommodate both existing and future bus movements and, in particular, enable buses travelling along Hobsonville Road to gain priority in the kerb-side lane (shared with left turning vehicles).

6.5 General Traffic

The performance of the road network within the Project has been assessed using inputs from SATURN and a small Paramics model to understand intersection performance. Due to the proximity of the two intersections on Hobsonville Road, it is appropriate that a localised Paramics model is used to assess intersection performance.

6.5.1 Intersection Performance

The Paramics model developed is based on the following peak periods:

- Morning Peak: 6:30am to 9:30am, with the peak hour being 8:00am to 9:00am
- Evening Peak: 3:30pm to 6:30pm, with the peak hour being 5:00pm to 6:00pm

Traffic demands included in the Paramics model are based on traffic demand cordons sourced from the 2046 North West Supporting Growth SATURN Model.

Cordon traffic demands for both the morning and evening peak hour have been extracted from the SATURN model period (one hour), with the hourly traffic demands then being factored to create three-hour demands using traffic profiles derived from SCATS[10] and manual traffic surveys obtained in 2015.

The predicted traffic volumes, intersection delays and LoS at the Trig Road/Hobsonville Road and Luckens Road/Hobsonville Road intersections for the 2046 peak period are summarised below in Table 8 and Table 9.

Table 8: Proposed Intersection Performance: Morning Peak Hour 2048

Intersection	Approach	Movement (left/right/through)	Number of Vehicles	Delays (sec)	LoS	AM Peak Queue (m)	
						Avg	95%le
Trig Road/ Hobsonville Rd	Trig Rd	L	520	26	C	89	136
		R	489	45	D		
	Hobsonville Rd W	L	215	11	B	48	74
		T	465	34	C		

[10] Sydney Coordinated Adaptive Traffic System manages the timing of signal phases using sensors at traffic signals to detect vehicle presence in each lane and pedestrians waiting to cross. The vehicle sensors are generally inductive loops installed within the road pavement.

Intersection	Approach	Movement (left/right/through)	Number of Vehicles	Delays (sec)	LoS	AM Peak Queue (m)	
	Hobsonville Rd E	T	591	5	A	63	106
		R	364	32	C		
Luckens Road/ Hobsonville Rd	Hobsonville Rd W	T	662	19	B	59	98
		R	318	40	D		
	Luckens Rd	L	437	13	B	61	89
		R	384	35	C		
	Hobsonville Rd E	L	116	16	B	61	154
		T	516	33	C		

Table 9: Intersection Performance: Evening Peak Hour 2048

Intersection	Approach	Movement	Volume	Delays (Seconds)	LoS	PM Peak Queue (m)	
						Avg	95%le
Trig Road/ Hobsonville Rd	Trig Rd	L	415	11	B	55	83
		R	309	39	D		
	Hobsonville Rd W	L	388	17	B	64	83
		T	392	35	C		
	Hobsonville Rd E	T	546	6	A	55	93
		R	507	27	C		
Luckens Road/ Hobsonville Rd	Hobsonville Rd W	T	456	7	A	54	88
		R	351	27	C		
	Luckens Rd	L	437	13	B	94	164
		R	359	33	C		
	Hobsonville Rd E	L	223	32	C	46	71
		T	614	54	D		

The results in the above tables demonstrate that the intersections, as modelled with 2048 traffic volumes, operate well. Both intersections are predicted to operate within the theoretical capacities in both the morning and evening periods, with an overall LoS C or D at the intersections. With a predicted LoS C or D, this means that delay at the intersections will be generally within an acceptable level. Based on the Highway Capacity Manual standards, a LoS D suggests that occasionally a driver may have to wait through more than one signal cycle before proceeding. This is not uncommon in peak periods in urban environments and overall, not a significant level of delay.

These queue lengths demonstrate that for most approaches and times, there is sufficient stacking space allowed. In the PM peak period, the 95th percentile queue for the Hobsonville Road approach may exceed the distance between intersections, however the provision of bus lanes between the

intersections will limit the impact this would otherwise have had on bus reliability, and may encourage mode shift from private vehicles to public transport.

Should the intersections remain as existing in the future, movements on Hobsonville Road would remain largely uninterrupted, however turning movements and delay associated with these movements would become greater and increasingly variable with increased traffic volumes. In comparison, the provision of signalised intersections will result in lower peak period delays for side roads, and greater delays for Hobsonville Road movements. However, within the urbanising context and in light of the increased outcomes for pedestrians and cycling this is considered to be an acceptable effect.

In comparison to the existing intersections, which provide priority to through movement on Hobsonville Road, the provision of signalised intersections along Hobsonville Road will result in delays to vehicles travelling down Hobsonville Road. The delay experienced travelling through two signalised intersections is typical of travelling by vehicle in an urban environment and therefore would not be unexpected within the context of the rapidly urbanising surrounding area. This delay to private vehicles is considered minor when compared to the increased amenity and crossing facilities provided to other users by the Project improvements (particularly pedestrians and cyclists).

Travel time along Trig Road is expected to increase slightly as a result of the lower speed urban environment. The reduced speed limit of 50 kph is a more appropriate speed for an urban environment with increasing vehicles, pedestrian and cyclists. Overall, a reduced speed limit over approximately 600 m of corridor would result in an increased travel time of some 10 seconds.

It is also acknowledged that the provision of bus priority at the intersections and the connecting bus lanes will mean that bus services will be provided with additional facilities. This is consistent with the Project Objectives to provide for different modes and encourage mode shift.

6.6 Surrounding Network Connections

The collector road network as in the WSP is not provided for by the Project as the alignment and delivery of these will be the responsibility of developers at the time of urbanisation. The design does not preclude these intersections being provided by developers at a later time. Additional land that may be necessary to deliver the intersections for collector roads will be vested by developers at the time of development. The median also facilitates the opportunity for future pedestrian/cycle crossing points along Trig Road, as the urbanisation on both sides of the corridor occurs.

The location of these collector intersections will also need to be integrated with the bus stop locations and pedestrian crossing facilities. The Project does not preclude these facilities being provided at a future stage of design or after construction by other parties.

6.7 Roads and Streets Framework Assessment

The Roads and Streets Framework describes, balances and integrates the intended strategic and local place and movement functions of roads and streets, as well as the levels of service for all transport modes.

Based on the future land use and the surrounding road network a draft assessment has been completed for Trig Road. This identifies a categorisation of Place (1) and a Movement (2). This recognises that the adjacent land use has a primarily local function, with a small catchment of users, while a Movement 2 category recognises that the network function is of medium strategic significance with increasing volumes of users. Trig Road provides a connection to a strategic route – SH18 and connects to Hobsonville Road a key east west arterial link.

The provision of dedicated walking and cycling facilities, and public transport priority at the intersections of Luckens Road and Trig Road is consistent with road corridors of this nature.

6.8 Overall Assessment against Project Objectives

From a transport perspective the Project Objectives are focused on the themes of connectivity, safe travel choice and mode shift, and supporting planned urban growth. The above assessments have detailed the expected outcomes that the Project will provide, and overall, the Project achieves these outcomes. Without the Project, the walking and cycling facilities on these roads are substandard for an urban context and are not attractive for travel by these modes. The current road environment including the intersections of Trig Road and Luckens Road supports higher vehicle speeds, which further results in a reduced attractiveness for walking and cycling and safety implications for all transport modes. The overall impact of this is increased levels of private car use as the preferred transport choice.

The Project addresses these outcomes in the following ways:

- In terms of connectivity, the upgrade of Trig Road and Hobsonville Road will improve connectivity between the future growth areas in Whenuapai and the Metropolitan centre at Westgate. In particular, connectivity by foot, cycle and public transport will be significantly improved for both local and regional travel.
- The upgraded corridors within the Project will include the provision of safe walking and cycling facilities to enable attractive travel choices for residents in the Project area and enable connections to the existing and/or future active networks. The Project also includes the upgrade of intersections with the existing arterial network, providing safe crossing for pedestrians and cyclists. Specifically, the provision of a bi-directional cycle way on Trig Road will provide a high quality of service for cyclists that will connect with Hobsonville Road.
- Improved public transport facilities at the intersection of Trig Road and Hobsonville Road will provide for improved reliability for bus travel times, thereby increasing the efficiency and attractiveness of public transport travel to future rapid transport networks.
- The upgrade of Trig Road and Hobsonville Road is consistent with the future urban environment planned for within the WSP. It provides for urban arterials that accommodate movements by foot, by bike and bus, and by private vehicles.

Overall, the Project provides safe, attractive arterial roads that supports future travel choice and will sufficiently provide for increased connectivity in the Whenuapai area.

6.9 Assessment of Construction Effects

Given the construction timing and staging of the package has yet to be determined, there is a degree of uncertainty associated with any predicted construction methodology and associated traffic routes. This means:

- The routes that will be used by construction vehicles will depend on the location of quarries and disposal sites which are not yet certain
- The exact location and extent of compound sites/lay down areas has yet to be determined
- The timing of construction of other projects could impact on likely construction vehicle routes

Notwithstanding this, it is considered that with available connectivity to the strategic network and available capacity in the network, construction traffic will be able to be readily accommodated.

The construction of the Project will require earthworks. Final cut and fill volumes will be confirmed following detailed design prior to construction. The construction traffic movements to accommodate the earthworks will likely result in an increase of traffic volumes on construction routes used during the construction period of the Projects.

It is noted that the access to compound sites/laydown areas and construction zone for construction vehicles, plant and materials will be via site access points identified as part of detailed CTMPs.

Details of the routes and time restrictions will need to be updated and refined as part of the CTMP process. It is anticipated that the routes for construction traffic will likely be limited to arterial corridors and intersections with the provision of adequate vehicle tracking.

Speed Limits

In order to maintain the safety of all road users, it is recommended to implement a safe and appropriate temporary speed limit during the construction period on the network within the extent of works, and along the construction routes if needed. This should be in accordance with the latest traffic management standards at the time of construction. These recommended measures and other measures highlighted in the CTMP are expected to reduce the potential safety risks that may be associated with construction traffic.

Pedestrians and cyclists

The existing provision for pedestrian and cyclists is variable across the network. It is likely that the demand for these modes will increase if urbanisation occurs prior to construction, but future parallel collectors could also be used as alternative routes. Therefore, effects should be assessed again when a greater level of detail is available about surrounding facilities and land use activities prior to construction. However, it is recommended that residents and stakeholders be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity be used to inform appropriate traffic management measures in the CTMP.

Property access for residents and businesses

During the time of construction, there will be temporary traffic management controls such as temporary concrete or steel barriers. Existing driveways that remain during construction will be required to have temporary access provision. It is anticipated that the contractor should undertake a property specific assessment of any affected driveways and provide temporary access arrangements

if required. The temporary access should ensure the ability for residents to safely access and exit the property. These requirements should be captured in the CTMP or SSTMP, if required. Confirmation of traffic management controls will be required immediately prior to works to reflect the land use considerations at that time.

Land use activities that will need further consideration in the CTMP

At the time of this report, no specific land use or activities have been identified as requiring specific consideration during the development of the CTMP. Overall, it is considered that expected construction effects can be managed via the use to the CTMP or SSTMP prior to implementation.

6.9.1 Temporary Traffic Management

It is anticipated that the works required for this project will likely be delivered online or in the live carriageway, which means that temporary traffic management will be required. The scale of temporary traffic management to delineate live traffic away from the construction zones is largely dependent on the various stages and requirements of the construction activities. It is expected that short term temporary road closure for nights or weekends may be required for some specific activities, such as road surfacing, traffic switches and gas relocation. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work.

The effect of temporary road closure or other traffic management methods to existing traffic on the specific corridor and adjacent road network should be confirmed in the future as part of the CTMP and on the basis of the current traffic environment.

A CTMP is proposed to be required as a condition of the NoR. It is expected that the objective of the CTMP would be to manage the traffic effects during construction of the Project so that safe and adequate facilities for movements by all transport modes are maintained throughout the construction period. The CTMP would set out methods and measures to do this and would typically include:

- Identification of measures related to the interface with the existing road network at the extents on the Project; and
- Any specific temporary traffic management measures to maintain property access during construction.

The CTMP would be submitted to Auckland Council for information prior to construction. The CTMP would identify potential road closures, property access impacts any capacity reductions on key corridors through lane closure, and any other ancillary effects such as shoulder closures. The implementation of such measures would be addressed through a SSTMP, which would be part of a separate approval process by AT as road controlling authority.

7 Managing Effects and Achieving Project Outcomes

7.1 Managing Operational Effects

Table 10 below summarises the proposed measures to manage the identified effects of the Project and help to ensure that the positive effects of the Project are achieved.

Table 10: Summary of Proposed Measures

Operational Transport Effects	Proposed Measures
Walking and Cycling Effects	In order to provide safe and attractive walking and cycling facilities to appropriate standards that are integrated with the wider network an Outline Plan should specify: • The type of walking and cycling infrastructure to be provided within the corridor including confirmation of the proposed dimensions. • Details on the integration proposed for walking and cycling facilities between the extent of the works and any existing facilities.
Safety Effects	All transport design in New Zealand is subject to a Road Safety Audit at the detailed design stage. Once through that audit, the design will form part of the Outline Plan process. Given the change in the road form from rural to urban, a speed reduction from 80kph to 50kph is recommended for the extent of the Project on Trig Road and reflects the future urban environment. The standard process for undertaking a speed reduction Setting Speed Limits 2017 Land Transport Rule 54001/2017 (outside the RMA process) should be completed prior to the works being completed.
Access Effects	It is recommended that a detailed access assessment is completed by a suitably qualified traffic engineer and/or transport planner that considers property access implications and identifies appropriate mitigation where driveway access compliant with AUP:OP cannot be provided.

7.2 Managing Construction Traffic Effects

It is considered that the potential construction traffic effects can be accommodated and managed appropriately via a CTMP. Based on the assessment of transport construction effects, it is recommended:

- A CTMP shall be prepared prior to the Start of Construction for a Stage of Work.
- The objective of the CTMP is to avoid, remedy or mitigate, as far as practicable, adverse construction traffic effects. To achieve this objective, the CTMP shall include:
  - methods to manage the effects of temporary traffic management activities on traffic;
  - measures to ensure the safety of all transport users;
  - the estimated numbers, frequencies, routes and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near schools or to manage traffic congestion;

- site access routes and access points for heavy vehicles, the size and location of parking areas for plant, construction vehicles and the vehicles of workers and visitors;
- identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
- methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;
- the management approach to loads on heavy vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads;
- methods that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services).

8 Conclusion

The assessment of transport effects has identified that the Project provides safe and appropriate urban arterial corridors that support future travel choice and provides for increased connectivity for the current and future communities in Whenuapai.

Without the Project, the walking and cycling facilities on these roads are substandard for an urban context and are not attractive for travel by these modes. The current road environment, including the intersections of Trig Road and Luckens Road, support higher vehicle speeds, which further results in a reduced attractiveness for walking and cycling and safety implications for all transport modes. The expected traffic volume increases in the future will result in increasing delays and greater levels of delay variability at the intersections for vehicles on Luckens Road and Trig Road.

The potential outcomes are significantly improved by the Project and will include:

- Connectivity between the future growth areas in Whenuapai and the Metropolitan centre at Westgate and in particular, connectivity by foot, cycle and public transport.
- The level of provision for safe walking and cycling to enable attractive travel choices for residents in the Project area.
- Connections to the arterial network through the upgrade of intersections providing safe crossing for pedestrians and cyclists and reducing turning delay for traffic on Luckens Road and Trig Road.
- Public transport facilities at the intersection of Trig Road and Hobsonville Road and provide for improved reliability for bus travel times, thereby increasing the efficiency and attractiveness of public transport travel to future rapid transport networks.

In terms of adverse effects, the Project will result in restrictions on right turn movements from properties located between Luckens Road intersection and Trig Road intersection, as a result of the introduction of a central median (for safety). This will result in some inconvenience for these properties and potentially slightly longer travel times to reach their destinations. Overall, these adverse effects are considered to be minor, given that that there are alternatives routes available within the wider network routes, and lower order roads where u- turns can be safely undertaken.

Overall, the Project provides safe, attractive arterial roads that supports future travel choice and will sufficiently provide for increased connectivity in the Whenuapai area.

Appendix 1 - Transport Modelling Context

Transport Modelling Assumptions

Within the SATURN model (refer Section 5.1.1) there are a series of assumptions included within each forecast year. The below table summarises the assumptions regarding related projects and their likely impacts on Trig Road if they do not occur. Assumptions have been made about the implementation years of these projects, which have in turn informed the years in which the projects have been included in the transport model.

Table A1: Infrastructure Assumptions and Potential Impacts

Project	Model Years included			Potential impacts on Trig Road
	2028	2038	2048	
SH16/18				
Squadron Drive Ramps	Y	Y	Y	Limited Impact on Trig Road. Proposed Squadron Ramps are west facing, creating a full interchange Trig Road ramps are east facing as are existing east facing ramps at Squadron Drive.
SH16/18 Connections	-	Y	Y	Significant Impact on Trig Road. Reduces expected traffic volumes on Trig Road. Removes traffic from north of Brigham Creek travelling to SH18.
SH16 Brigham Creek Interchange	-	Y	Y	Northside Drive (and south facing ramps) component enables movement from Trig Road to Westgate. Potentially and increase in Movements on Trig Road to access Northside Drive ramps (City Bound).
SH18 Brigham Creek Interchange	-	-	Y	Enables public transport access for local services from Westgate to Trig Road.
City Centre to North West RTN				
Interim Bus Solution	Y	-	-	N/A
To Westgate	Y	Y	Y	Enables Westgate to operate with a public transport hub. Local services still required to use Northside Drive, Trig Road and Hobsonville Road to access Whenuapai.
To Kumeu		Y	Y	Limited Impact
Other Projects				
SH18 RTN	-	Y	Y	Significant impact. Bus services able to utilise SH18 RTN to travel rather than Northside Drive and Trig Road to access strategic network. Local services will continue to operate on Trig Road.
Kumeu Alternative Corridor	-	Y	Y	Limited Impact

Rawiri Road Bridge and Connections	-	Y	Y	Moderate impact. Implementation reduces traffic flows on Trig Road. Without the connections, daily flows on Trig Road are projected to be higher.