TE TUPU NGĀTAHI
SUPPORTING GROWTH

North
Assessment of Transport Effects

August 2023

1.0

WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

Document Status

Responsibility	Name
Author	Michelle Seymour, Joe Phillips, Varshen Pillay
Reviewer	Andrew Murray, Kathleen Bunting
Approver	Kathleen Bunting

Revision Status

Version	Date	Reason for Issue
1.0	31/08/2023	Final for lodgement

Table of Contents

Table of Tables

Table of Figures

Appendices

Glossary of Defined Terms and Acronyms

Acronym/Term	Description
ADT	Average Daily Traffic
AEE	Assessment of Effects on the Environment report
AT	Auckland Transport
ATAP	Auckland Transport Alignment Project
ATCOP	AT Code of Practice
AUP:OP	Auckland Unitary Plan: Operative in Part
CPTED	Crime Prevention through Environmental Design
CTMP	Construction Traffic Management Plan
DBC	Detailed Business Case
DSI	Death and Serious Injury
EPA	Environmental Protection Authority
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
GHG	Greenhouse Gas emissions
GPS	Government Policy Statement
IBC	Indicative Business Case
LGA	Local Government (Auckland Council) Act 2009
MCA	Multi-Criteria Assessment
MHUD	Ministry of Housing and Urban Development
N/A	Not Applicable
NPS	National Policy Statement
NPS:UD	National Policy Statement on Urban Development
NLTF	National Land Transport Fund
NLTP	National Land Transport Programme
NoR	Notice of Requirement
NoR 1	New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway
NoR 2	New Milldale Station and Associated Facilities
NoR 3	New Pine Valley East Station and Associated Facilities
NoR 4	SH1 Improvements (alteration to designations 6761, 6760, 6759, 6751)
NoR 5	New SH1 crossing at Dairy Stream

Acronym/Term	Description
NoR 6	New Connection between Milldale and Grand Drive
NoR 7	Upgrade to Pine Valley Road
NoR 8	Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat
NoR 9	Upgrade to Dairy Flat Highway between Dairy Flat and Albany
NoR 10	Upgrade to Wainui Road
NoR 11	New connection between Dairy Flat Highway and Wilks Road
NoR 12	Upgrade and Extension to Bawden Road
NoR 13	Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange
NZ	New Zealand
NZGTTM	New Zealand Guide to Temporary Traffic Management
PBC	Programme Business Case
RCA	Road Controlling Authority
RLTP	Auckland Regional Land Transport Plan
RMA	Resource Management Act 1991
SH1	State Highway 1
SRP	Stormwater Wetlands
SSTMP	Site-Specific Traffic Management Plan
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth Alliance
TDM	AT's Transport Design Manual: AT Engineering Design Codes – Transport Design Manual
UDEF	Urban Design Evaluation and Framework
ULDMP	Urban and Landscape Design Management Plan
Watercare	Watercare Services Limited
Waka Kotahi	Waka Kotahi New Zealand Transport Agency
Zero Carbon Act	Climate Change Response (Zero Carbon) Amendment Act 2018

Executive Summary

Overview

The North Assessment Package is a network of planned transport infrastructure with the purpose of responding to planned future growth in the Northern growth areas. The transport network is made of 13 Notices of Requirement (NoRs) for Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (WK) as requiring authorities under the Resource Management Act 1991 (RMA). The notices are to designate land for future strategic transport corridors and two rapid transit corridor stations to enable the future construction, operation and maintenance of transport infrastructure in the North area of Auckland. This report comprises an Assessment of Transport Effects of the North Project NoRs.

In addition to the corridors detailed in this assessment, there are other identified projects in the North that form part of the overall network solution for the area. These projects are not specifically included in this package of NORs but interface with the projects within this Assessment of Transport Effects and are discussed in this report.

Methodology

This transport assessment has considered potential effects on the transport system both during construction as well as effects once the projects are operational. The focus of the Te Tupu Ngātahi programme is on long-term route protection of the transport systems required to support the planned growth areas. This means that implementation of the proposed projects is typically not imminent and would be preceded by updated implementation investment and design processes. This focus on longer-term route protection for longer-term implementation means that this assessment has focused less on detailed analysis of the existing environment and more on the likely future (urbanised) environment and potential effects of the proposed projects.

It is also noted that the North network has been designed as an overall integrated system, but in general, individual projects can typically be delivered separately. As such this assessment considers the projects individually – with commentary on interdependencies where appropriate.

Approach to Assessment of Operational Transport Effects

Potential operational transport effects are assessed using:

- Transport planning assessment of expected outcomes and effects.
- Transport modelling to inform demands and network performance.
- Alignment with various policy documents.

In respect to each individual NoR, a separate assessment has been undertaken, and the assessment criteria and methodology is summarised in Table 1-1 below.

Table 1-1: Summary of Assessment Methodology

Network Component	Information Source	Assessment Method
Safety	Crash Analysis (CAS) Database Project design drawings	Assessment to determine alignment with Vision Zero

Network Component	Information Source	Assessment Method
		standards and design compliance with Transport Design Manual
Walking and Cycling	Walking and Cycling Network Plans Proposed Cross Sections	Assessment to determine alignment with walking and cycling strategic documents and design compliance with Transport Design Manual
Public Transport	Transport Model tools (MSM, EMME and SIDRA) Supporting Growth Indicative Future Public Transport Network (Remix)[1]	Assessment to determine alignment with future network provisions and design compliance with the Transport Design Manual
General Traffic	Transport Model tools (MSM, EMME and SIDRA) Project design drawings	Assessment using key model outputs including traffic volumes, levels of service for corridor midblock performance and intersection performance. Assessment of surrounding network connections
Property Access	Engineering Standards	Assessment identifying where there is a potential effect on access in the existing environment
Wider Network Effects	Transport Model tools (MSM, EMME and SIDRA)	Assessment to consider how the corridor interacts with the surrounding road network
Note: A Road Safety and Audit and Safe System assessment with be done as part of the implementation business case/detailed design stage prior to implementation.		

Approach to Assessment of Construction Effects

Based on the indicative construction methodology an assessment of construction effects has been completed for the network sufficient to support each Notice of Requirement. This assessment considers:

- 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).

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.

[1] SGA Remix file provided by Auckland Transport on the draft plan of the bus network to be implemented by 2048

Overall Network

Overall, the North Detailed Business Case identified a network that provides for a comprehensive transport solution that responds to planned growth. This assessment considers the individual projects and the projects combined as a network and has an overall focus on the outcomes for the Northern growth areas. The NORs are all proposed as separate projects and can be implemented progressively in coordination with progressive land use development.

The 13 NoRs identified in this Assessment of Transport Effects are a core component of this network, with the proposed projects supporting the following transport outcomes:

- Long term development of a transport system to support future growth and facilitate mode shift from private vehicles to public transport and active modes.
- Transport corridors to maximise opportunities for walk up catchments to public transport stations and a high frequency local bus network.
- Increased reliability for public transport and additional resilience via new alternative routes and upgraded existing routes.
- Real travel choice with high quality, attractive alternatives to the private vehicle. This includes a continuous, legible active mode network that connects people to key destinations and encourages active mode trips within the compact urban area.
- An area wide focus on safety through a holistic set of measures including Road to Zero safety principles, fully separated cycling facilities, well designed intersections and sufficient space for all modes to interact safely.

North NORs – Individual Effects

The table below provides a summary of the transport effects related to each proposed NOR within the North Package.

There are interfaces between the NOR projects and each of the projects has been designed to integrate with other corridors, were relevant, as well as other key local road corridors. The assessment of operational effects assumes that all these projects are in place. The Projects, as proposed, can therefore be considered the long-term requirement for the corridors.

However, in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

Where necessary, overlapping designations are proposed to enable the interface between these projects to be implemented regardless of the staging of the projects. In addition, there are requirements within the proposed Urban Design and Landscape Plan Condition, and the following standard implementation measures that will be undertaken by Auckland Transport and Waka Kotahi, to enable the appropriate management of any interdependencies such as:

- Auckland Transport and Waka Kotahi statutory requirements
- Implementation Business Case to confirm Project outcomes
- Roads and Streets Framework and One Network reassessment to confirm modal priority for local roads operated by Auckland Transport
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport for local roads operated by Auckland Transport

- Detailed Design commensurate with implementation works
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

In addition, the proposed conditions for all North Projects include the requirement to prepare a Network Integration Management Plan (NIMP), to provide greater transparency and certainty that the necessary assessment to understand the implications of staging and sequencing will be undertaken prior to implementation.

In terms of existing properties, the overarching design philosophy for the Projects has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that detailed design and the outline plan process demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

Where property access is affected, in some cases, new access roads for properties are necessary and can be provided within the designation footprint to enable access to the public road network. Noting that in many cases these properties are within the FUZ, and as such may be provided with access as future development in the FUZ occurs (in advance of the projects being in place). i.e. as the FUZ area develops, it is expected that urban local and collector roads will facilitate vehicle access to the strategic network.

Table 1-2: Summary Effects for North NoRs

NOR	Corridor	Summary of Operational and Construction Effects
1, 2, 3	• New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway • New Milldale Station and Associated Facilities • New Pine Valley East Station and Associated Facilities	The RTC project provides significant positive effects and there are generally no operational adverse effects to mitigate, given the effects on local roads and property access have been addressed through the design of the Project and subsequently provided for by the designation. Several properties on the southern end of Wilson Road will no longer be able to access Bawden Road, once the RTC is in place. However, a new road can be formed within the existing paper road reserve between the southern end of Wilson Road and Ashwood Avenue (which then connects to Awanohi Road). It is recommended that this is completed prior to the construction of the RTC, unless future development within FUZ (following structure planning / plan changes) has already enabled a public road connection to the southern section of Wilson Road.
4	SH1 Improvements (alteration to designations 6761, 6760, 6759, 6751)	The SH1 Improvements will provide significant positive effects and there are generally no operational adverse effects to mitigate, given the effects on local roads and property access have

NOR	Corridor	Summary of Operational and Construction Effects
		been addressed through the design of the Project and hence provided for by the designation. The implementation of the new Wilks Road interchange will likely occur when development of stage 2 of the Silverdale West structure plan occurs, and the new east-west connection is provided between Dairy Flat Highway and Wilks Road. That new connection will include a roundabout at Postman Road, which will enable people turning left out of Aeropark Drive to turnaround and travel east to the interchange or at East Coast Road. It is considered that this would address effects on access for Aeropark Drive. However, if this Postman Road roundabout is not in place, then it is recommended that alternative means of providing access for Aeropark Drive will need to be provided.
5	New SH1 crossing at Dairy Stream	Overall, the Project provides positive transport effects, in particular with improvements to walking and cycling facilities and the ability to cross SH1, and improvements to the wider network.
6	New Connection between Milldale and Grand Drive	Overall, the Project provides positive transport effects, particularly in relation to improved safety and active mode improvements. There are no identified adverse operational effects.
7	Upgrade to Pine Valley Road	Overall, the Project provides positive transport effects, particularly improved safety for active mode users with the provision of walking and cycling facilities. In terms of adverse operational effects, it is identified that turning movements to and from three properties will be impacted by the proposed roundabout at Young Access. Access can be maintained to these properties through rerouting on the wider road network and turning at Argent Lane.
8	Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat	Overall, the Project provides positive transport effects, particularly improved safety and active mode improvements. In terms of adverse operational effects, one property has been identified to have access implications as a result of the bridging to facilitate a crossing of the RTC.

NOR	Corridor	Summary of Operational and Construction Effects
9	Upgrade to Dairy Flat Highway between Dairy Flat and Albany	Overall, the Project provides positive transport effects, particularly improved safety and active mode improvements. In terms of adverse operational effects, six properties have been identified to have access implications as a result of the Project. These driveways will need to be relocated and potentially consolidated to provide safe access. The Project results in right turn movements being restricted to and from properties along the corridor. To maintain access to properties on Dairy Flat Highway, movements will need to be facilitated via the proposed roundabout intersections at Durey Road, Potter Road, Albany Heights Road, Coatesville Riverhead Highway (existing), and The Avenue (outside of Supporting Growth scope).
10	Upgrade to Wainui Road	Overall, the Project provides positive transport effects, in particular improved safety and active mode improvements. There are no identified adverse operational effects.
11	New connection between Dairy Flat Highway and Wilks Road	Overall, the Project provides positive transport effects, in particular improved safety and active mode improvements. There are no identified adverse operational effects.
12	Upgrade and Extension to Bawden Road	Overall, the Project provides positive transport effects, in particular improved safety and active mode improvements. The provision of a 30m corridor enables priority measures to be implemented for buses in the future, connecting to the future town centre at Dairy Flat if required. There are no identified adverse operational effects.
13	Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	Overall, the Project provides positive transport effects, particularly improved safety and active mode improvements. There are no identified adverse operational effects. Consideration will need to be given to providing sufficient access to the cemetery adjacent to the Project.

1 Introduction

This transport assessment has been prepared for Te Tupu Ngātahi Supporting Growth Alliance, North Auckland Projects to support 13 Notices of Requirement (NoRs) for Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (WK) as requiring authorities under the Resource Management Act 1991 (RMA).

The notices are to designate land for future strategic transport corridors and two rapid transit corridor stations to enable the future construction, operation, and maintenance of transport infrastructure in the North area of Auckland. The North area extends from Albany to Ōrewa and via the growth areas of Dairy Flat, Silverdale West, Wainui East, and Redvale (refer Figure 2-1). The North Projects are summarised in Section 2.

This report addresses the transport effects of the North Projects identified in Section 2. Refer to the main Assessment of Effects on the Environment (AEE) for a more detailed project description.

1.1 Purpose and Scope of this Report

This transport assessment forms part of the suite of technical reports prepared to support the AEE for the North Projects. Its purpose is to inform the AEE that accompanies the North NoRs for AT and Waka Kotahi NZ Transport Agency (Waka Kotahi).

This report considers the actual and potential effects associated with the construction, operation and maintenance of the North Projects on the existing and likely future environment as it relates to transport effects and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

The key matters addressed in this report are as follows:

- Identify and describe the transport context of the North Projects;
- Identify and describe the actual and potential transport effects (this includes vehicles, freight, public transport, property, access, walking and cycling) of each Project corridor;
- Recommend measures as appropriate to avoid, remedy or mitigate actual and potential transport effects (including any conditions/management plan required) for each Project corridor; and
- Present an overall conclusion of the level of actual and potential transport effects for each Project corridor after recommended measures are implemented.

1.2 Report Structure

The report is structured as follows:

- A summary of the North Projects in Section 2;
- Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines in Section 3;
- Identification and description of the existing and likely future transport environment in Section 4;
- Description of the actual and potential positive effects on transport of the Projects in Section 5.1
- Description of the actual and potential adverse transport effects of construction of the Projects in Section 5.

- Description of the operational transport effects, project interdependencies and recommended measures to avoid or mitigate potential adverse effects for each of the NoRs can be found in Sections 6 to 16;

This report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works to be authorised for the North Projects as a whole and each NoR, and the typical, indicative construction methodologies that will be used to implement this work.

These have been reviewed by the author of this report and have been considered as part of this assessment of transport effects. As such, they are not repeated here, unless a description of an activity is necessary to understand the potential effects, then it has been included in this report for clarity.

2 North Projects Overview

An overview of the North Projects is provided in Figure 2-1 below, with a brief summary of the North Projects provided in Table 2-1. The scope of the North Projects relates to the arterial and strategic network, which will be supported by a network of collector and local streets developed through spatial planning and developer plan change or consenting processes.

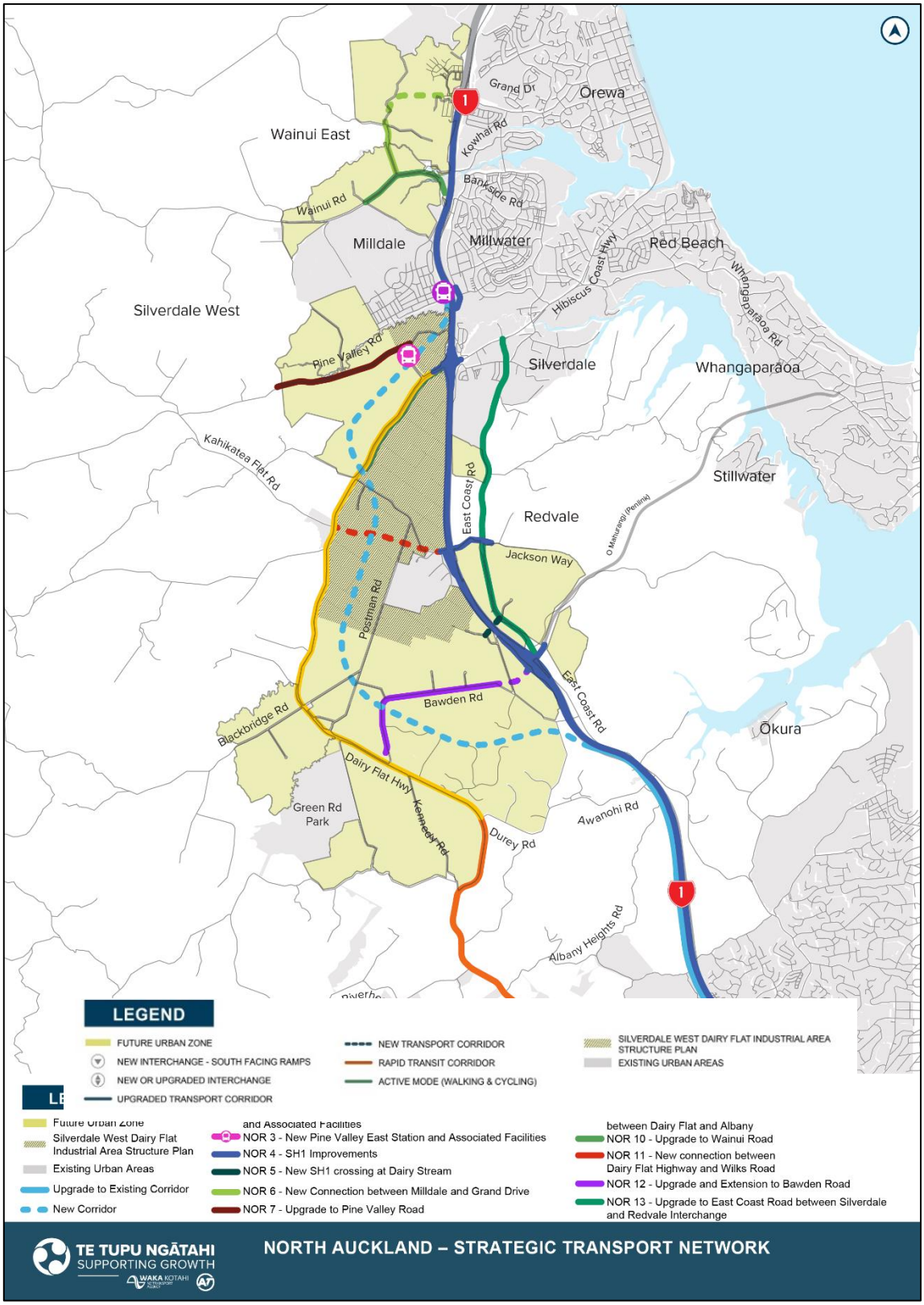


Figure 2-1 Map showing the location of each Project within the North growth area

Table 2-1 North Projects Summary

NoR	Project	Description	Requiring Authority
1	New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway	• A 16km-long RTC corridor for public transport and active mode purposes • An 80km/hr operating speed (other than around stations) • Walking and cycling facilities along some of its length from Bawden Road to the point where the RTC crosses Dairy Flat Highway • Grade separated crossings at intersections with other key transport corridors. The NoR will overlap with the existing motorway designation and SH1 improvements project over some of the length (between Albany and around Bawden Road)	WK
2	New Milldale Station and Associated Facilities	• A new rapid transit station and associated facilities, including • Station building with associated station facilities • Cycle and shared mobility device parking provision • Local bus layover and stop provision • Taxi and ride share drop-off facilities.	WK
3	New Pine Valley East Station and Associated Facilities	• A new rapid transit station and associated facilities, including • Station building with associated station facilities on structure over New Pine Valley Road with associated stairs and lift towers • Cycle and shared mobility device parking provision • Local bus layover and stop provision • Layover facilities for bus based RTC mode • Taxi and ride share drop-off facilities • Park and ride facility (up to 500 car parking spaces) • Upgrade to Old Pine Valley Road along station frontage	WK
4	SH1 Improvements (alteration to designations 6761, 6760, 6759, 6751)	• Widening the SH1 carriageway from two lanes to three lanes in each direction from the Lonely Track Road overbridge to the Silverdale interchange • Upgraded Ō Mahurangi Penlink (Redvale) Interchange (upgrading this proposed interchange to add north facing ramps) • New Wilks Road interchange (south facing ramps only) • Silverdale interchange upgrade for east-west capacity • New walking and cycling path along SH1 – an approximately 16 km long active mode corridor along one side of SH1 from Albany to Grand Drive (starts on east of SH1 at Oteha Valley Road, crosses to west of	WK

NoR	Project	Description	Requiring Authority
		SH1 around Bawden Road and then back to east around Silverdale interchange.) • Silverdale to Highgate Active mode connection – connection from the strategic active mode corridor at Silverdale to Highgate Parkway • Wainui interchange upgrade for active modes – new bridge for active modes across SH1	
5	New SH1 crossing at Dairy Stream	• A new two-lane urban arterial connection and SH1 motorway overbridge between Top Road and East Coast Road near Huruhuru (Dairy Stream) • Active mode facilities on both sides of the carriageway • The overbridge would cross six lanes of motorway, a two-lane link road to the motorway service centre and the new walking and cycling path on SH1 (refer to NoR 4 above)	AT
6	New Connection between Milldale and Grand Drive	• A new two-lane urban arterial with separated walking and cycling facilities on both sides between Wainui Road (Milldale) and the western edge of the Ara Hills development in Ōrewa. This will connect through to Grand Drive at SH1 via a new 30m road corridor to be vested by the Ara Hills developer.	AT
7	Upgrade to Pine Valley Road	• An upgrade to Pine Valley Road (FUZ section) between Poynter Lane and Argent Lane to a two-lane urban arterial with separated walking and cycling facilities on both sides	AT
8	Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat	• An upgrade to a 4-lane urban arterial on sections where FUZ land is located both sides of the road (between Silverdale interchange and Wilks Road and between Richards Road and Durey Road), with separated walking and cycling paths on both sides of the corridor • Upgrade to a 2-lane rural arterial between Wilks Road and Richards Road – with a swale on the west and separated walking and cycling on the east • Upgraded bridge over Huruhuru (Dairy Stream)	AT
9	Upgrade to Dairy Flat Highway between Dairy Flat and Albany	• An upgrade to Dairy Flat Highway between Dairy Flat and Albany for active mode and safety improvements including a central wire rope barrier and side barriers. • The widened road corridor will retain two lanes (one in each direction) and will also retain crawler lanes as currently located	AT

NoR	Project	Description	Requiring Authority
		• Cycle path added on the western side of the carriageway between Durey Road and the Coatesville Riverhead Highway Roundabout and then on the eastern side between the Roundabout and Te Wharau (Albany Village)	
10	Upgrade to Wainui Road	• Upgrade to Wainui Road to a 2-lane urban arterial between Lysnar Road and the new Argent Lane including a widened road corridor to 24 m • Separate, dedicated, walking and cycling facilities on AT both sides of the carriageway • Upgraded bridge over Waterloo Creek (tributary to Ōrewa River)	AT
11	New connection between Dairy Flat Highway and Wilks Road	• Segment 1 (Kahikatea Flat Road to Postman Road Segment) will feature a 2-lane urban arterial (24 m wide corridor) with separated walking and cycling facilities on both sides. • Segment 2 (Postman Road to SH1) features a 4-lane urban arterial (30 m wide corridor) with separated cycling and walking facilities, two lanes of general traffic and two-lanes where priority may given to freight traffic.	AT
12	Upgrade and Extension to Bawden Road	• Upgrade and extension to Bawden Road. This will include a 30m four-lane road corridor with walking and cycling facilities on both sides. Two lanes for general traffic and two lanes for a frequent transit network (likely bus lanes). • Road intersects with the RTC. The road is likely to go under the RTC (grade separated crossing). •	AT
13	Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	• Upgrade to the footpath on the west side and new footpath on east side between Hibiscus Coast Highway and Silverwater Drive. • Segment 1 (from Silverwater Drive to Newman Road) features a two-lane urban arterial upgrade (24 m) with separated walking and cycling facilities on both sides. • Segment 2 (from Newman Road to Jackson Way, where one or both sides is rural) has a shared path to the west only, with no works to the existing carriageway and no swales. • Segment 3 (from Jackson Way to the end of the FUZ) features a 24 m wide cross section with walking and cycling facilities on both sides.	AT

3 Assessment Methodology

Given the long-term nature of the designations being sought by the NoRs, this assessment does not assess the interim staging of individual Projects and development staged over the next three decades, but instead places a greater focus on the 'full build out' of the future urban area in 2048+ to support future communities. Therefore, this assessment focuses on the likely future environment (full build out 2048+) and wider infrastructure upgrades.

To ascertain the long-term effects of the Projects, this assessment considers the transport effects arising from each of the Projects in a future context.

The methodology for the operational and construction transport effects are applicable for each NoR specified within this document. Any nuances are specified throughout the assessment.

The Assessment of Transport Effects has two elements:

- Assessment of operational effects on the transport system once its operational
- Assessment of construction effects on the transport network.

The assessment is targeted at route protection, rather than imminent implementation. As such, it:

- Makes greater use of generic cross-sections and design standards ·
- Focuses more on desired outcomes and footprints
- Takes a longer-term view, with its inherent uncertainties
- Assumes more use of recommended management plans and planning processes (for example future outline plans of works) rather than specific design details to manage potential effects.

A key element of the assessment is the definition of the 'existing/likely future environment', against which the effects are assessed. This is a complex issue as the proposed works are planned to support urban development and will be unlikely to occur without such development. Further information on planning context of this approach please refer to the AEE.

To isolate the effects of the planned works, the baseline or 'Existing Environment' includes the likely future urban development but does not include the planned Projects for which designations are sought. The effects of the Projects are then assessed using the same land use assumptions. Given the long-term perspective of the assessment, the analysis is based on the estimated 'full build out' for the future urban area.

3.1 Approach to Assessment of Operational Transport Effects

This transport assessment has considered potential effects on the transport system once the Projects are operational. The focus of the Te Tupu Ngātahi programme is on long-term route protection of the transport systems required to support the planned growth areas. This means that implementation of the proposed projects is typically not imminent and will be preceded by updated implementation investment decisions. This focus on longer-term route protection for longer-term implementation means that this assessment has focused less on detailed analysis of the existing environment and more on the likely future (urbanised) environment and potential effects of the proposed projects.

It is also noted that the North network has been designed as part of an overall integrated system, but in general can be delivered separately. As such this assessment considers the Projects individually – with commentary on common effects across NORs and interdependencies where appropriate.

Potential operational transport effects are assessed using:

- Transport planning assessment of expected outcomes and effects
- Transport modelling to inform demands and network performance
- Alignment with various policy documents.

In respect to each individual NoR, a separate assessment has been undertaken that provides an assessment of:

- Each mode of transport
- Access for existing properties
- Wider network effects (how each project fits into the wider network).

This section will outline the methodology for these assessments.

3.1.1 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 recommendations about planning the transport network, corridors, and intersections.

The impacts of the Projects on the future transport environment have been 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 public transport (PT) usage. Generally, this model is run using regional assumptions as per recent Auckland Transport Alignment Project (ATAP) planning, but with scenario-specific inputs in the growth areas. It should be noted that the MSM model has superseded the ART model for regional forecasting.
- A local traffic model (EMME). 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 has therefore been informed by modelled estimates of travel and network performance for a future full-build-out scenario[2].

An EMME (North Area) and MSM (Regional) model with forecast year of '2048+' for the wider network was used. The '2048+' forecast includes the regional growth estimated for the year 2048 but with the addition of full build-out in the greenfield growth areas. This is to provide a complete assessment of the transport requirements in response to proposed growth in the North. The EMME model uses the demand outputs from MSM, which includes inputs of the latest land use assumptions (in this instance, referred to as land use scenario i11.6). The modelling includes an overall network of infrastructure identified to support growth in the North area. This means that the assessment assumes that all other

[2] This approach to assessment utilising a full build out scenario is consistent with the approach utilised for recently confirmed designations within the southern growth areas.

North Supporting Growth Programme Projects are implemented and the growth up to 2048+ will progress as planned. All transport Projects assumed in the modelling are outlined in Appendix 3.

3.2 Timing of Growth

The development of the majority of North FUZ land is anticipated to occur over the longer term and has been planned to be sequenced in stages over the next 20+ years as bulk infrastructure capacity allows.

To provide clarity about when the land identified in the AUP: OP will be 'development ready', Auckland Council developed the FULSS to provide for sequenced and accelerated greenfield growth in the future urban areas of Auckland. The FULSS refresh (2017) provides for a staged release of land in the Northern growth area as indicated in Figure 3-1.

The Silverdale West Industrial area is anticipated for development now, with Council in the process of pursuing a Council led plan change for the first stage. The majority of the remaining FUZ land is anticipated to be development ready by 2033-2037.

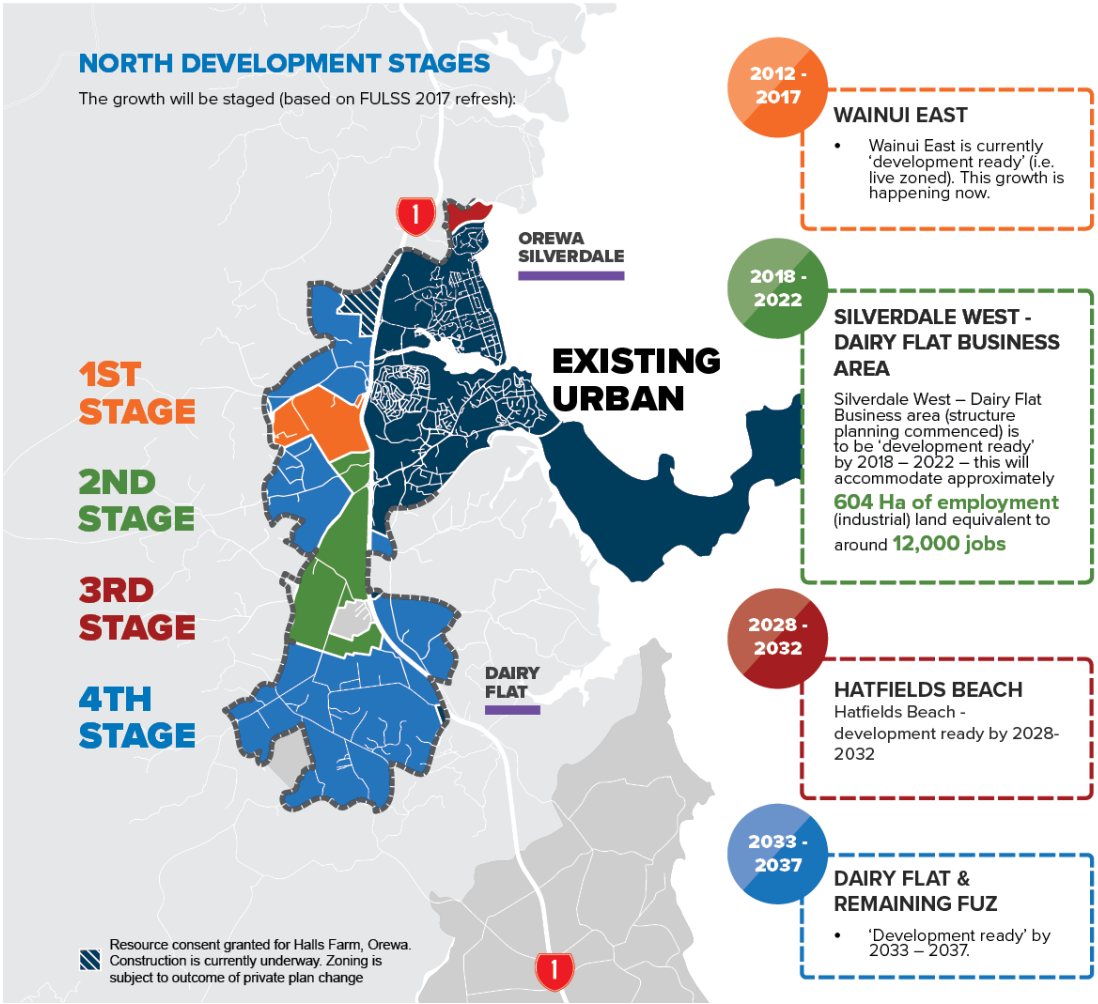


Figure 3-1 North Development Stages

It is acknowledged that due to recent changes to land use policies (such as the Medium Density Residential Standards and the NPS:UD) Auckland Council is currently revisiting the land use strategy which is being completed in parallel to this transport assessment via the 'Future Development Strategy' workstream. This document will set out the Council's desired sequencing of land development in the Auckland region, as discussed in the main AEE.

In addition to the EMME modelling, SIDRA[3] 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.

The LOS reported for each of the intersection assessments (as part of the assessment of effects for each of the NoRs) is based on the SIDRA modelling assessment for LOS, using the Highway Capacity Manual. This is based on the average delay (in seconds) experienced by users at each respective intersection, this also depends on the particular intersection form. The average delay for each of the levels has been noted below:

- **<u>Roundabout Intersection Form (Delay in seconds)</u>**

- LOS A: 0-10s
- LOS B: 10-20s
- LOS C: 20-35s
- LOS D: 35-50s
- LOS E: 50-70s
- LOS F:>70s

[3] SIDRA modelling enables an assessment of individual intersections using inputs from regional models.

- **Signalised Intersection Form (Delay in seconds)**

- LOS A: 0-10s
- LOS B: 10-20s
- LOS C: 20-35s
- LOS D: 35-55s
- LOS E: 55-80s
- LOS F: >80s.

3.2.1 Transport Guidance and Documents

Within this report, the Projects have also been considered against the outcomes and objectives of applicable transport design guidance and policy directives including:

- AT's Transport Design Manual, which sets out outcomes, engineering design and construction requirements for the relevant arterial road Projects including:
  - Engineering Design Code – Urban and Rural Roadway Design.
  - Engineering Design Code – Cycling Infrastructure
- AT's Vision Zero, which adopts a "Safe System" approach to focus on road safety for all road users
- AT's Roads and Streets Framework (**RASF**)[4] was also used to qualitatively assesses the typology (movement and place value) and modal priority for each arterial corridor. A 'mandate' for each arterial road corridor is developed and approved by the Auckland Transport RASF Committee, comprising of senior officers from AT and AC.
- Austroads Guide to Road Design (AGRD):
  - Part 3: Geometric Design (2021).
  - Part 4: Intersection & Crossings – General (2021).
  - Part 4A: Unsignalised and Signalised Intersections (2021).
  - Part 4B: Roundabouts (2021).
  - Part 4C: Interchanges (2015).
- Austroads Guide to Traffic Management (AGTM):
  - Part 6: Intersection, Interchanges and Crossings (2019).
  - Auckland Unitary Plan Operative in part (updated 13 March 2020):
  - Chapter E27 Transport, in relation to driveway access etc.
- State Highway Geometric Design Manual (SHGDM) Draft (2000):
- Traffic Control Devices (TCD) Manual:
  - Part 10: Motorways and expressways, Section 2 Interchanges.
- Waka Kotahi, Busway Planning and Design Manual (December 2002) by McCormick Rankin International.

3.2.2 Assessment Methodology - Transport Mode

Table 3-1 summarises how each mode/element of transport has been assessed in terms of operational effects as a result of the Projects.

[4] https://at.govt.nz/about-us/transport-plans-strategies/roads-and-streets-framework/

Table 3-1: Summary of Assessment Methodology

Network Component	Information Source	Assessment Method
Safety	Crash Analysis (CAS) Database Project design drawings	Assessment to determine alignment with Vision Zero standards and design compliance with Transport Design Manual
Walking and Cycling	Walking and Cycling Network Plans Proposed Cross Sections	Assessment to determine alignment with walking and cycling strategic documents and design compliance with Transport Design Manual
Public Transport	Transport Model tools (MSM, EMME and SIDRA) SGA Remix File[5]	Assessment to determine alignment with future network provisions and design compliance with the Transport Design Manual
General Traffic	Transport Model tools (MSM, EMME and SIDRA) Project design drawings	Assessment using key model outputs including traffic volumes, levels of service for corridor midblock performance and intersection performance. Assessment of surrounding network connections
Property Access	Engineering Standards	Assessment identifying impacts on access for existing and planned properties based on the proposed corridor design
Wider Network Effects	Transport Model tools (MSM, EMME and SIDRA)	Assessment to consider how the corridor interacts with the surrounding road network
Note: A Road Safety and Audit and Safe System assessment with be done as part of the implementation business case/detailed design stage prior to implementation.		

3.2.3 Assessment of Investment Objectives

Each Project in the North has an identified set of investment objectives. From a transport perspective, these objectives are focused predominantly on the themes of supporting growth, safety, urban form, mode shift/choice and connectivity. The assessment of these, and how they align with the Project Objectives are included in the AEE.

3.3 Approach to Assessment of Construction Effects

3.3.1 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.

[5] SGA Remix file provided by Auckland Transport on the draft plan of the bus network to be implemented by 2048

Based on the indicative construction methodology an assessment of construction effects has been completed for the Projects sufficient to support each NoR. This assessment considers:

- 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 detailed designs are available and there is more certainty of surrounding developments.

3.3.2 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. There is a combination of corridor types in the North Projects, including upgrades to existing local corridors that are existing and new roads, a new RTC and stations. In particular, 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.

4 Existing and Future Receiving Environment

4.1 Planning and Land Use Context

The assessment of effects needs to consider both the existing environment and the likely future receiving environment at the time at which effects will likely occur. It is anticipated the North Projects will be constructed between 10 – 30+ years from now, meaning the receiving environment will differ significantly from what is present today.

There are existing rural and urban zonings in the study area, as well as large areas of future urban zoning (FUZ) which will influence the likely receiving environment for assessment purposes. The majority of the North Projects will be constructed and will operate within (or immediately adjacent to) areas currently zoned as FUZ. The remainder will be constructed and operated within the existing urban environment or planned environment (i.e., what can be built under the existing AUP:OP live zones). However, greater intensification is anticipated in the residential zones, centre zones (and future centres), and land adjacent to the proposed RTC stations, in line with the National Policy Statement on Urban Development (NPS:UD) and Medium Density Residential Standards (MDRS) - noting that the policy context may shift prior to construction.

The adopted Silverdale West - Dairy Flat Industrial Area Structure Plan anticipates the development of a large industrial area within an area of FUZ predominantly between Dairy Flat Highway and SH1.

The remaining areas of FUZ, including Upper Ōrewa, Pine Valley and Dairy Flat have not yet been structure planned by Auckland Council. Auckland Council has, however, released some high-level thinking on future land uses in a draft Spatial Land Use Strategy, which broadly suggests:

- A metropolitan / town centre in Dairy Flat, located adjacent to the Rapid Transit Corridor alignment
- The potential for Terrace Housing and Apartment (THAB) zoning for 800m surrounding this metropolitan / town centre
- Two potential local centres in the Pine Valley area.

All areas of FUZ have a high likelihood of change in a planning and land use context. It is anticipated that the likelihood of change in the following areas / zones is low:

- Current residential areas/zones, including Single House, Mixed Housing Suburban, Mixed Housing Urban, Terrace and Apartment Buildings, and Large Lot zones.
- Current business areas/zones, including Light Industry, Mixed Use, General Business, Neighbourhood Centre, Local Centre, Town Centre, Heavy Industrial zones.
- Current open space areas/zones, including Informal Recreation, Community, Sport and Active Recreation, Conservation zones.
- Current rural areas which are not FUZ zoned, including Countryside Living zone.
- Other areas currently within the Special Purpose zone including Special Purpose – Cemetery, Special Purpose – School, and Special Purpose – North Shore Airport.

Please refer to the AEE for further information on the planning and land use context.

4.2 Existing and Future Environment – Transport

4.2.1 Existing Transport Environment

The following table provides a summary of the existing transport network as it relates to the proposed NoRs. Overall, the following conclusions can be made:

- The local road network is predominantly rural in nature, with higher speeds, and limited walking and cycling facilities commensurate with the surrounding rural landuse.
- Intersections are largely priority controlled, reflective of lower transport demands on the network.
- There is limited strategic public transport offerings which is appropriate given the existing population level in the North growth area, and also current land use activities.

Table 4-1: Existing Transport Environment

NoR	Project	Existing Transport Characteristics
1	New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway	• Currently there is no dedicated rapid transit facility to support growth in the North. • Current rapid transit connections can be made from the Hibiscus Coast bus station via State Highway 1, albeit not in a dedicated corridor, connecting to a dedicated busway corridor at Albany Station.

NoR	Project	Existing Transport Characteristics
		• Upon completion of the Ō Mahurangi Penlink project (not a Te Tupu Ngātahi project), express bus services will operate from Whangaparāoa to Albany Station along SH1. • No dedicated walking and cycling paths are available.
2	New Milldale Station and Associated Facilities	• There are currently no station facilities to support growth in the Milldale area.
3	New Pine Valley East Station and Associated Facilities	• There are currently no station facilities to support growth in the Pine Valley Road / Silverdale West area.
4	SH1 Improvements (alteration to designations 6761, 6760, 6759, 6751)	• Currently, there are no walking and cycling paths along the SH1 corridor to provide connection between the North area and Albany. • Upon completion of the Ō Mahurangi Penlink project, there will only be south facing ramps at the Ō Mahurangi Penlink (Redvale) Interchange, without direct connections to the Dairy Flat FUZ from the north, and no dedicated walking and cycling paths across the interchange. • There are no existing motorway ramps at Wilks Road to connect the majority of the planned Silverdale West industrial area directly to SH1, plus there are no dedicated walking and cycling paths on Wilks Road • The Silverdale Interchange has no dedicated walking and cycling paths and there are delays for the express bus services accessing the Hibiscus Coast station.
5	New SH1 crossing at Dairy Stream	• There is currently no connection provided across SH1 at the Huruhuru (Dairy Stream) location.
6	New Connection between Milldale and Grand Drive	• There is currently no connection provided between Milldale and Grand Drive.

7	Upgrade to Pine Valley Road	• Pine Valley Road is currently a two lane rural corridor
		• ONRC classification: Arterial
		• No dedicated walking and cycling facilties.
		• 5,000 - 6,000 AADT[6]
		• Posted speed limit is currently 80 km/hr.
		• Key intersections:
		  ○ Intersection of Pine Valley Road and Young Access – Priority Controlled Intersection
		  ○ Intersection of Pine Valley Road and Old Pine Valley Road – Priority Controlled Intersection

[6] https://maphub.nzta.govt.nz/view/?appid=bf7e94ff577344aaa887ae176aed8387 ONRC Waka Kotahi (All traffic counts within this section have been sourced from this website.)

NoR	Project	Existing Transport Characteristics

8	Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat	• Dairy Flat Highway is currently a two lane rural corridor.
		• ONRC classification: Arterial
		• No dedicated walking and cycling facilties. There is a small section of footpath on the western side of Dairy Flat Highway near the industrial businesses adjacent to Kahikatea Flat Road.
		• 6,500 - 9,000 AADT.
		• The posted speed limit is predominately 80 km/hr. This changes to 60 km/hr along the existing industrial/business area adjacent to Kahikatea Flat Road. Additionally, and there is a 40 km/hr variable speed limit adjacent to Dairy Flat School.
		• Key intersections:
		  ○ Intersection of Dairy Flat Highway and Argent Lane – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Wilks Road – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Horseshoe Bush Road – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Landfill Access Road – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Richards Road – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Blackbridge Road – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Jeffs Road – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Green Road – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Bawden Road – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Kennedy Road – Priority Controlled Intersection
		  ○ Intersection of Dairy Flat Highway and Durey Road – Priority Controlled Intersection

9	Upgrade to Dairy Flat Highway between Dairy Flat and Albany	• Dairy Flat Highway is currently a two lane rural corridor. • ONRC classification: Arterial • No dedicated walking and cycling facilties. There is a small section of footpath and on-road cycling facilities between Stevenson Crescent and The Avenue. • 7,500 - 10,000 AADT. • Posted speed limit is currently 80 km/hr; 50 km/hr between Stevenson Crescent and The Avenue. • Key intersections: ○ Intersection of Dairy Flat Highway and Potter Road – Priority Controlled Intersection

NoR	Project	Existing Transport Characteristics
		○ Intersection of Dairy Flat Highway and Foley Quarry Road – Priority Controlled Intersection ○ Intersection of Dairy Flat Highway and Coatesville-Riverhead Highway – Roundabout ○ Intersection of Dairy Flat Highway and Albany Heights Road – Priority Controlled Intersection ○ Intersection of Dairy Flat Highway and Hobson Road – Priority Controlled Intersection ○ Intersection of Dairy Flat Highway and the Avenue – Priority Controlled Intersection
10	Upgrade to Wainui Road	• Wainui Road is currently a two lane rural corridor. • ONRC classification: Primary Collector • No dedicated walking and cycling facilties. • 2,000 - 4,000 AADT. • Posted speed limit is currently 100 km/hr between Argent Lane and the Wainui Road Bridge. • Key intersections: ○ Intersection of Wainui Road and Argent Lane – Priority Controlled Intersection ○ Intersection of Wainui Road and Upper Ōrewa Road – Priority Controlled Intersection
11	New connection between Dairy Flat Highway and Wilks Road	• There is currently no connection provided between Kahikatea Flat Road and Wilks Road at the eastern end.
12	Upgrade and Extension to Bawden Road	• Bawden Road is currently a two lane rural corridor. • ONRC classification: Secondary Collector • The corridor currently doesn't connect to the proposed Ō Mahurangi Penlink project further east. • No dedicated walking and cycling facilties. • 1,000 AADT. • Posted speed limit is currently 80 km/hr between Dairy Flat Highway and East Coast Road. • Key intersections: ○ Intersection of Dairy Flat Highway and Bawden Road – Priorty Controlled Intersection
13	Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	• East Coast Road is currently a two lane rural corridor. • ONRC classification: Arterial • Provides a single lane in both directions. Noting that there is a crawler lane in the Northbound direction between Worsnop Way and Wilks Road. • No dedicated walking and cycling facilties. There is a small section of footpath and on-road cycling facilities on the western side of the corridor adjacent to the Goldwater development. • 8,000-10,000 AADT.

NoR	Project	Existing Transport Characteristics

		• Posted speed limit is currently 100 km/hr for the majority of the corridor; this reduces to 80 km/hr just after Spur Road to Silverwater Drive. The speed limit then changes to 60 km/hr between Silverwater Drive and Hibiscus Coast Highway.
		• Key intersections:
		  ○ Intersection of East Coast Road and Hibiscus Coast Highway – Signalised Intersection
		  ○ Intersection of East Coast Road and Forge Road – Signalised Intersection
		  ○ Intersection of East Coast Road and Newman Road – Priority Controlled Intersection
		  ○ Intersection of East Coast Road and Spur Road – Priority Controlled Intersection
		  ○ Intersection of East Coast Road and Wilks Road – Priority Controlled Intersection
		  ○ Intersection of East Coast Road and Jackson Way – Priority Controlled Intersection
		  ○ Intersection of East Coast Road and Worsnop Way – Priority Controlled Intersection

Accordingly, the existing transport network is not fit for purpose to accommodate the planned urban development.

- The existing corridors on the network are not fit for purpose to support the planned future urban growth, due to the high-speed environment, narrow carriageway, and significant increase in conflicts between through traffic, accessing/turning movements and vulnerable road users.
- Overall, the current public transport offering in the North provides a poor transport choice for existing and future residents predominately due to the limited catchment it serves.
- As growth increases in the area the current lack of an arterial network will reduce connectivity and result in a heavy reliance on the existing network. Without an arterial network, there will be an increasing reliance on the local and collector network. This will result in longer, less efficient bus networks, and safe cycle connections would be limited. Without providing for through movement functions on arterials, there will likely be an increase in traffic utilising lower order corridors such as local and collector roads, with potential adverse effects on amenity and capacity.
- Access to employment and social amenities via walking and cycling will be compromised, especially for immediately adjacent land uses.

4.2.2 Surrounding Transport Network

Several significant roading infrastructure elements are currently under construction, consented (but yet to be built), or under investigation in the North growth area, as outlined below. These projects are expected to significantly change transport patterns once they are complete. In addition, these projects are due to be built soon i.e. well before the 2048 timeframe.

4.2.2.1 New Pine Valley Road Designation

The purpose of this AT designation is to provide for an ultimate four lane future arterial corridor with a width of 30m and to construct, operate, and maintain a road, cycleways and pedestrian paths, and associated infrastructure.

The designation provides for the upgrade of the existing Pine Valley Road from Dairy Flat Highway to the tie in point with the realigned part of Pine Valley Rd (and Argent Lane), provision for a new intersection at Dairy Flat Highway / Pine Valley Rd, and upgrade of the Dairy Flat Highway to provide an additional eastbound lane between Pine Valley Road and the Silverdale Motorway interchange. The designation covers works from the edge of the Northern Motorway northbound Silverdale offramp, along Dairy Flat Highway; the intersection of Dairy Flat Highway and Pine Valley Road; and along Pine Valley Road to the northern property boundary of 1731 Dairy Flat Highway.

4.2.2.2 Highgate Bridge

Highgate Bridge is a two-lane transport connection proposed by AT from Milldale to Millwater/Highgate Business Park[7]. The connection was consented in 2021 and will be implemented by Fulton Hogan as part of the Milldale development.

4.2.2.3 Ō Mahurangi (Ō Mahurangi Penlink)

The Ō Mahurangi (Ō Mahurangi Penlink)[8] will form a vital transport link in north Auckland as more people live and work in Silverdale, Whangaparāoa and the Hibiscus Coast. The new two-lane road and shared walking and cycling path will provide improved travel times between Whangaparāoa and SH1, connecting at the new Ō Mahurangi Penlink (Redvale) Interchange with south facing ramps. Main construction works will start in late 2023 and the project is expected to be complete in late 2026. The project has been included within the 2048+ future modelling scenario.

[7] https://www.aucklandcouncil.govt.nz/ResourceConsentDocuments/LUC60354771%20-%20Assessment%20of%20Enviornmental%20Effects.pdf (Further information on the Highgate Bridge project)
[8] https://www.nzta.govt.nz/projects/penlink/ (Further information on the Ō Mahurangi Penlink project)

4.2.3 Future Transport Environment without the North Projects

The following sections have been prepared to summarise the transport implications in the case that each respective NOR, and subsequently each Project, does not proceed but urban development does. This also provides some assessment of the interdependencies between the proposed NORs, with additional information provided under each NOR assessment further in this report.

4.2.3.1 Road Safety

The following table provides an assessment of the road safety implications for each corridor should the NOR / Project not proceed. A summary of the crash results (2018-2022) for each of the existing corridors has been included in Appendix 2.

Table 4-2: Road Safety without the NOR for each Project

Proposed NOR	Road Safety if the NOR does not proceed
NOR 1 (NOR 2, NOR3): New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway	Without the RTC, as substantial growth in the North area occurs, more people will continue to use private vehicles to undertake journeys across the North area and beyond, along routes that are currently unsafe (i.e. on-road with no separation from general traffic). In addition, the development of new stations at Milldale and Pine Valley East will assist in the uptake of PT in the North reducing traffic on the road and subsequently the potential for conflicts. Without the provision of a safe and dedicated active mode corridor along the RTC, those choosing to travel by active modes will be required to travel along routes that are currently unsafe (i.e. on-road with no separation from general traffic). With the current sub-standard active mode facilities, safe system principles indicate that as development occurs in the area and the number of active mode users increases, the risk of death or serious injury will also increase.
NOR 4: SH1 Improvements, including new walking and cycling path between Albany and Grand Drive **(alteration to designations 6761, 6760, 6759, 6751)**	SH1 Mainline Improvements, including new walking and cycling facilities • Without the provision of a safe and dedicated active mode corridor, those choosing to travel by active modes will be required to travel along routes that are currently unsafe (i.e. on-road with no separation from general traffic). • With the current sub-standard active mode facilities, safe system principles indicates that as development occurs in the area and the number of active mode users increases the risk of death or serious injury will also increase. Silverdale Interchange Improvements • While there are no deaths and serious injuries recently recorded at this interchange, there is still a significant number of non-injury crashes. With the significant increase in vehicle volumes, there could be a transitioning of these crashes into injury-type crashes. • Therefore, upgrading the Interchange, including providing pedestrian and cycle facilities are vital steps in developing a safe system.

Proposed NOR	Road Safety if the NOR does not proceed
NOR 5: New SH1 crossing at Dairy Stream	The new SH1 crossing at Huruhuru (Dairy Stream) is an extension from Top Road to East Coast Road. From a road safety perspective, without the Project additional pressure will be placed on the existing network, in particular on the Ō Mahurangi Penlink (Redvale) Interchange and Bawden Road. Bawden Road is also proposed to be upgraded to provide for additional public transport capacity and walking and cycling facilities. Without the SH1 crossing, all active mode trips will be required to travel through the Ō Mahurangi Penlink (Redvale) Interchange, exposing pedestrians and cyclists to vehicle movements through the interchange.
NOR 6: New Connection between Milldale and Grand Drive	The new connection between Milldale and Grand Drive connects Wainui Road with the Grand Drive Interchange. From a road safety perspective, without the Project additional pressure will be placed on the existing network, in particular on Wainui Road and adjacent collector roads. The provision of a key spine route for movements north-south will improve road safety on the surrounding collector roads, as without the connection there will be greater potential conflict between through movements and local movements. The expected increase in safety issues resulting from high traffic volumes on local and collector roads will also reduce the attractiveness of walking and cycling.
NOR 7: Upgrade to Pine Valley Road	The existing Pine Valley Road is not fit for purpose to support the planned future urban growth, due to the high-speed environment, narrow carriageway, and significant increase in conflicts between through traffic, accessing/turning movements and vulnerable road users. These increases in conflicts will lead to increases in death and serious injuries (DSIs). The expected increase in safety issues without the project in place is likely to constrain the attractiveness of walking and cycling, further reinforcing use of vehicles with the resulting high-speed conflicts. Although the speed limit could be reduced, as a safety improvement measure, the existing corridor will remain unsafe to safely accommodate future growth due to the type and number of conflicts expected.
NOR 8: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat	The existing Dairy Flat Highway is not fit for purpose to support the planned future urban growth, due to the high-speed environment, narrow carriageway, and significant increase in conflicts between through traffic, accessing/turning movements and vulnerable road users. These increases in conflicts will lead to increases in DSIs. The expected increase in safety issues without the project in place is likely to constrain the attractiveness of walking and cycling, further reinforcing use of vehicles with the resulting high-speed conflicts. This is considered particularly relevant for this corridor given the proximity to employment areas within the Silverdale West-Dairy Flat Industrial area.
NOR 9: Upgrade to Dairy Flat Highway between Dairy Flat and Albany	The existing Dairy Flat Highway is not fit for purpose to support the planned future urban growth, due to the high-speed environment, narrow carriageway, and significant increase in conflicts between through traffic, accessing/turning movements and vulnerable road users. These increases in conflicts will lead to increases in DSIs. The southern section of Dairy Flat Highway is consistent with a high speed rural arterial and in order to support the corridor to function as a low speed rural arterial in the future, infrastructure change is needed in particular to support active modes to travel along the corridor.

Proposed NOR	Road Safety if the NOR does not proceed
	The expected increase in safety issues without the project in place is likely to constrain the attractiveness of walking and cycling, further reinforcing use of vehicles with the resulting high-speed conflicts.
NOR 10: Upgrade to Wainui Road	The existing Wainui Road is not fit for purpose to support the planned future urban growth, due to the high-speed environment, narrow carriageway, and significant increase in conflicts between through traffic, accessing/turning movements and vulnerable road users. These increases in conflicts will lead to increases in DSIs. The expected increase in safety issues without the project in place is likely to constrain the attractiveness of walking and cycling, further reinforcing use of vehicles with the resulting high-speed conflicts. Although the speed limit could be reduced, as a safety improvement measure, the existing corridor would remain unsafe to safely accommodate future growth due to the type and number of conflicts expected.
NOR 11: New connection between Dairy Flat Highway and Wilks Road	The new connection between Dairy Flat Highway and Wilks Road, connects Dairy Flat Highway with the new Wilks Road Interchange. From a road safety perspective, without the Project additional pressure will be placed on the existing network, in particular on Dairy Flat Highway and the adjacent motorway interchanges at Silverdale and Redvale. The increased pressure on these interchanges will increase exposure for pedestrians and cyclists and will result in relatively inhospitable environments for these modes.
NOR 12: Upgrade and Extension to Bawden Road	The existing Bawden Road is not fit for purpose to support the planned future urban growth, due to the high-speed environment, narrow carriageway, and significant increase in conflicts between through traffic, accessing/turning movements and vulnerable road users. These increases in conflicts will lead to increases in DSIs. The expected increase in safety issues without the Project in place is likely to constrain the attractiveness of walking and cycling, further reinforcing use of vehicles with the resulting high-speed conflicts. This is considered particularly relevant for this corridor given the proximity to the future Dairy Flat Town Centre and the proposed future urban growth.
NOR 13: Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	The existing East Coast Road is not fit for purpose to support the planned future urban growth, due to the high-speed environment, narrow carriageway, and significant increase in conflicts between through traffic, accessing/turning movements and vulnerable road users. These increases in conflicts will lead to increases in DSIs. The expected increase in safety issues is also likely to constrain the attractiveness of walking and cycling, further reinforcing use of vehicles with the resulting high-speed conflicts. Although the speed limit could be reduced, as a safety improvement measure, the existing corridor will remain unsafe to safely accommodate future growth due to the type and number of conflicts expected.

4.2.3.2 Walking and Cycling

An assessment of walking and cycling outcomes without each NOR has been provided below in Table 4-3. This assessment considers that the existing facilities form the basis of the 'no project scenario' network. In the case of new transport corridors and strategic projects such as the RTC, the assessment considered existing alternatives that are in place and the outcomes for walking and cycling should alternative corridors be utilised.

Overall, walking and cycling demands are expected to increase as a result of the expected growth. However, these demands are expected to be suppressed in a no project scenario due to the lack of safe and connected active mode facilities.

Table 4-3: Walking and Cycling Effects without the NOR for each Project

Proposed NOR	Existing Active Mode Facilities	Walking and Cycling Effect if the NOR does not proceed
NOR 1: New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway **NOR 2: New Milldale Station and Associated Facilities** **NOR 3: New Pine Valley East Station and Associated Facilities**	None	• Most people in the growth areas in the North, particularly in the Pine Valley, Silverdale West and Dairy Flat FUZ, will live or work beyond a reasonable walk and cycle distance to have convenient access to rapid transit services. • For medium or longer distance cycle trips, people will need to use local facilities that will have longer and less reliable journey times.
SH1 Improvements, including new walking and cycling paths from Albany to Grand Driive **(alteration to designations 6761, 6760, 6759, 6751)**	Currently no walking and cycling facilities	• SH1 Mainline ○ Should no dedicated strategic facility be provided there will be limited travel options for residents living in the North, constraining access to key destinations, and placing a continued reliance on private vehicles. ○ Without the provision of a strategic cycling facility there will be a continuation of the current mode choice trends – specifically single-occupant vehicles. The current growth projections in this area, will place increasing pressure on the local road corridors to perform a key strategic movement function for cyclists. As these rural corridors are

Proposed NOR	Existing Active Mode Facilities	Walking and Cycling Effect if the NOR does not proceed
		not equipped to support walking and cycling there is likely to be a lower response for a mode shift to active modes. ○ There will be increased use of private vehicles resulting in increased vehicle related emissions. • Silverdale, Ō Mahurangi Penlink (Redvale) and Wilks Road Interchanges ○ Demand for travel by all modes is expected to increase in the future as a result of the Silverdale West industrial area and Dairy Flat FUZ. Without improvements to the interchanges, walking and cycling connectivity will be limited between these areas and the adjacent existing and future growth areas. In addition, demand growth will be constrained. ○ Without new facilities or improvements the ability to cross or travel through the interchanges by walking and cycling will be significantly limited. The consequence of this is that those able to make shorter distance trips by active mode or public transport will choose to travel by private vehicle instead as this will continue to be perceived as the more convenient and safer option. ○ There will be increased use of private vehicles resulting in increased vehicle related emissions.
NOR 5: New SH1 crossing at Dairy Stream	None	• Access to employment and social amenities will be compromised, especially for immediately adjacent land uses. In particular this corridor provides a key east-west connection between the proposed future growth on either side of SH1. • Without this corridor in place walking and cycling connectivity will be via the local and collector network and will likely be less direct, resulting in longer travel times for pedestrians and cyclists.

Proposed NOR	Existing Active Mode Facilities	Walking and Cycling Effect if the NOR does not proceed
NOR 6: New Connection between Milldale and Grand Drive	None	• Access to employment and social amenities will be compromised, especially for immediately adjacent land uses. In particular this corridor links to the Ara Hills development and the proposed growth area in Wainui. • Without this corridor in place walking and cycling connectivity will be via the local and collector network and will likely be less direct, resulting in longer travel times for pedestrians and cyclists. • There will be increased use of private vehicles resulting in increased vehicle related emissions.
NOR 7: Upgrade to Pine Valley Road	No dedicated cycling facilities or footpaths along the length of the corridor.	• Access to employment and social amenities will be compromised, especially for immediately adjacent land uses. • In particular this corridor links to the proposed future urban growth within Wainui. • This corridor will provide walking and cycling access to the proposed Pine Valley East Rapid Transit Station along the corridor. Without the connection access to the station will be significantly lower, reducing walking and cycling catchment opportunities. • There will be increased use of private vehicles resulting in increased vehicle related emissions.
NOR 8: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat	No dedicated footpath or cycling facilities along the majority of the corridor. There is a small section of footpath on the western side of Dairy Flat Highway near the industrial businesses adjacent to Kahikatea Flat Road.	• Access to employment and social amenities will be compromised, especially for immediately adjacent land uses. • This corridor will provide walking and cycling access to the proposed Pine Valley East Rapid Transit Station along the corridor. Without the connection access to the station will be significantly lower, reducing walking and cycling catchment opportunities. • There will be increased use of private vehicles resulting in increased vehicle related emissions.
NOR 9: Upgrade to Dairy Flat Highway between Dairy Flat and Albany	No dedicated cycling facilities or footpaths along the length of the corridor assessed. There is a small section of footpath and on-rad cycling facilities	• Access to employment and social amenities will be compromised, especially for immediately adjacent land uses. • In particular this corridor links the growth areas of Dairy Flat and Albany. Without adequate walking and cycling facilities

Proposed NOR	Existing Active Mode Facilities	Walking and Cycling Effect if the NOR does not proceed
	between Stevenson Crescent and The Avenue.	between these two growth areas, access by active modes will be impacted, reinforcing private vehicle mode choice. • There will be increased use of private vehicles resulting in increased vehicle related emissions.
NOR 10: Upgrade to Wainui Road	No dedicated cycling facilities or footpaths along the length of the corridor.	• Access to employment and social amenities will be compromised, especially for immediately adjacent land uses. • In particular this corridor links to the proposed future urban growth within Wainui and the existing Milldale development. • There will be increased use of private vehicles resulting in increased vehicle related emissions.
NOR 11: New connection between Dairy Flat Highway and Wilks Road	None	• Access to employment and social amenities will be compromised, especially for immediately adjacent land uses. In particular this corridor forms a key east-west connection through the Silverdale West-Dairy Flat industrial area. • Without this corridor in place walking and cycling connectivity will be via the local and collector network and will likely be less direct, resulting in longer travel times for pedestrians and cyclists. • This link provides a direct connection between Dairy Flat Highway and the proposed employment zones within the Silverdale West-Dairy Flat industrial area. This corridor will provide a legible, efficient route for pedestrians and cyclists. • There will be increased use of private vehicles resulting in increased vehicle related emissions.
NOR 12: Upgrade and Extension to Bawden Road	No dedicated footpath or cycling facilities along the length of the corridor.	• Access to employment and social amenities will be compromised, especially for immediately adjacent land uses. • In particular this corridor links to the future Dairy Flat Town Centre in the north, which will likely include significant employment, recreational and social infrastructure. • This corridor will provide walking and cycling access to a likely future Rapid Transit Station along the corridor near to or within the town

Proposed NOR	Existing Active Mode Facilities	Walking and Cycling Effect if the NOR does not proceed
		centre. Without the connection, access to the likely future station will be significantly lower, reducing walking and cycling catchment opportunities. • There will be increased use of private vehicles resulting in increased vehicle related emissions.
NOR 13: Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	No dedicated cycling facilities or footpaths along the length of the corridor assessed. There is a small section of footpath and on-road cycling facilities on the western side of the corridor adjacent to the Goldwater Drive development.	• Access to employment and social amenities will be compromised, especially for immediately adjacent land uses. • In particular this corridor links to proposed future urban growth areas on the eastern side of SH1. • The corridor connects to Silverdale town centre and Hibiscus Coast bus station at the northern end and Penlink at the southern end. • There will be increased use of private vehicles resulting in increased vehicle related emissions.

4.2.3.3 Public Transport

In terms of public transport the most significant change to the public transport environment in the North is the provision of the new RTC between Albany and Milldale and the two stations at Milldale and Pine Valley East. There will be additional stations provided along the alignment of the RTN, however the exact location of these stations is still to be confirmed.

Without this NOR in place the following public transport impacts are expected:

- Demand for travel by all modes is expected to increase exponentially in the future as a result of the urbanising environment. Without the provision of appropriate public transport services, access to employment and social opportunities will continue to progressively decrease. In addition, there will be increased use of private vehicles resulting in increased vehicle related emissions.
- Overall, the current public transport offering in the North provides a poor transport choice for existing and future residents predominately due to the limited catchment it serves.
- Research has shown that having PT stations and stops within a 15 min walkable catchment[9] is key to improving PT use. Therefore, without easily accessible PT services travel by PT will not be attractive – further encouraging travel by private vehicle.
- For public transport, studies and experience overseas have consistently shown that patronage growth on urban bus services is directly linked to improvements in reliability.

[9] https://www.nzta.govt.nz/walking-cycling-and-public-transport/public-transport/public-transport-design-guidance/getting-to-and-from-public-transport/walking/

A summary of the expected PT trips in the North is summarised below in Table 4-4.

Table 4-4: Predicted PT Mode Share in North Auckland

% PT Trips without NORs in place	% PT Trips with NORs in Place
25% - for PT	33% - for PT

Further information is provided in Section 6.

4.2.3.4 General Traffic

Table 4-5 provides a summary of the expected traffic volumes on the transport network in 2048+ both without and with the NORs / Projects, together with an assessment of the outcomes expected to arise in the case that each NOR does not proceed.

In the case of new corridors, the traffic effects of a new corridor not being implemented are largely on the existing road network. At an area-level, the growth areas have been assessed to consider the vehicle to capacity ratios. This particular metric is the most appropriate for understanding congestion levels on the network.

At a network-level, it can be seen that the overall the transport network is expected to generally operate efficiently and effectively. These results are summarised below.

Table 4-5: Vehicle KM in Peak Congestion

Vehicle Km Travelled in peak congestion (>90% vehicle to capacity v/c) in AM peak (without NORs) in 2048+	Vehicle Km Travelled in peak congestion (>90% vehicle to capacity v/c) in AM peak (with NORs) in 2048+
22% of vehicle-km travelled in congested conditions	13% of vehicle-km travelled in congested conditions

While the influence of the NORs on general traffic is considered as part of the overall transport effects this also needs to be balanced with broader regional and national outcomes. Auckland Transport and Waka Kotahi (where applicable) will manage the network to achieve and balance these outcomes, including traffic efficiency, user safety (for all modes), and prioritising movement by more sustainable modes, such as public transport and active modes. This shift from a singular focus on traffic delay to broader outcomes and prioritisation of more sustainable movements is ongoing and driven by regional and national policy directives. This includes recent policy direction around reallocating road space to favour these broader outcomes, where practicable. Collectively, this requires a broader assessment of needs and priorities of the transport system than just localised vehicle delays at selected intersections.

Mode shift towards public transport is a key outcome of the overall North network projects, and modal priorities are expected to change with less priority given to general traffic flow. In this regard, the future operating environment is anticipated to tolerate delays and queuing for general traffic, at certain intersections, at certain times. Individual intersection performances are provided for each NoR later in this report.

Table 4-6: General Traffic and Freight Effects without the NOR for each Project

Proposed NOR	Without the NOR in 2048+	With the NORs in 2048+	General Traffic and Freight Effect if the NOR does not proceed

NOR 4: SH1 Improvements
 	
(alteration to designations 6761, 6760, 6759, 6751)
	The forecast Average Daily Traffic (ADT) in 2048 is 115,900 vehicles on SH1 south of Dairy Flat FUZ.	The forecast Average Daily Traffic (ADT) in 2048 is 148,100 vehicles on SH1 south of Dairy Flat FUZ.	• SH1 Mainline
			  • Travel times from the North growth area to Albany will continue to increase and a greater proportion of travel will occur in congested conditions, therefore being less reliable, impacting freight and express bus services utilising SH1.
			  • Without the NOR in 2048, vehicle travel times from Silverdale to Albany, in the AM peak period, will be around 14 minutes longer (31 minutes, instead of 17 minutes).
			  • Without the NOR in 2048, there is a 13% increase in vehicle kilometres travelled in peak congestion (>90% volume to capacity ratio) in the AM peak period, 47% instead of 34%).
			  • The proposed Wilks Road and Ō Mahurangi Penlink (Redvale) interchanges are a key part of the SH1 improvements. The interchanges provide a key connection between the local network and the strategic motorway network.
			  • The changes in daily traffic in SH1 with the NORs are a combination of diverted / re-routed traffic from parallel corridors (Dairy Flat Highway and East Coast), as well as increased trips between the North growth area and the northern North Shore. This includes some people instead choosing to travel from the northern North Shore to more easily accessible jobs in the North growth area, rather than travelling south on SH1.
			• Silverdale Interchange
			  • There are currently significant delays and congestion during peak periods. The predicted traffic volumes are likely to exceed the capacity of the Interchange. The resulting level of congestion will have a significant adverse effect on the reliability of travel times for all modes through the Interchange, impacting freight movement for the Silverdale West Industrial area, as well as bus services.
			  • Demand for travel by all modes is expected to increase in the future as a result of the Silverdale West industrial area. Without significant capacity improvements to the Silverdale Interchange, connectivity will be

Proposed NOR	Without the NOR in 2048+	With the NORs in 2048+	General Traffic and Freight Effect if the NOR does not proceed
			limited between the existing and future growth areas.
NOR 5: New SH1 crossing at Dairy Stream	None	The forecast Average Daily Traffic (ADT) in 2048 is 1,400 vehicles.	As growth increases in the area the current lack of an arterial network will reduce connectivity and result in a heavy reliance on the existing network. Without an arterial network, there will be an increasing reliance on the local and collector network. This will result in longer, less efficient bus networks, and safe cycle connections would be limited. Without providing for through movement functions on arterials, there will likely be an increase in traffic utilising lower order corridors such as local and collector roads, with potential adverse effects on amenity and capacity. Without the new SH1 crossing at Huruhuru (Dairy Stream), east-west trips across SH1 will shift to the adjacent arterials (i.e. Bawden Road, Wilks Road and Silverdale Interchange). This will have an adverse effect on general traffic and freight travelling through these connections due to increased congestion and delays that this re-routing will cause.
NOR 6: New Connection between Milldale and Grand Drive	None	The forecast Average Daily Traffic (ADT) in 2048 is 13,200 vehicles.	As growth increases in the area the current lack of an arterial network will reduce connectivity and result in a heavy reliance on the existing network. Without an arterial network, there will be an increasing reliance on the local and collector network. This will result in longer, less efficient bus networks, and safe cycle connections on desire lines would be limited. Without providing for through movement functions on arterials, there will likely be an increase in traffic utilising lower order corridors such as local and collector roads, with potential adverse effects on amenity and capacity. Without the new connection between Milldale and Grand Drive, there will be an additional 13,200 vehicles using local and collector roads to access the land use within Wainui/Ara Hills. This is expected to cause significant delays and congestion to general traffic and freight using these connections due to the limited capacity on these lower order roads.
NOR 7: Upgrade to Pine Valley Road	The forecast Average Daily Traffic (ADT) in 2048 is 18,800 vehicles.	The forecast Average Daily Traffic (ADT) in 2048 is 16,800 vehicles.	There is little effect from a general traffic outcome perspective should the Project not proceed. Expected traffic volumes with and without the NOR are similar and no additional capacity to that existing is proposed.

Proposed NOR	Without the NOR in 2048+	With the NORs in 2048+	General Traffic and Freight Effect if the NOR does not proceed
NOR 8: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat	The forecast Average Daily Traffic (ADT) in 2048 is 27,200-32,700 vehicles.	The forecast Average Daily Traffic (ADT) in 2048 is 15,700-24,800 vehicles.	Dairy Flat Highway is an existing strategic north-south route in the North. The corridor currently has two vehicle lanes. Traffic volumes are expected to exceed the carrying capacity of a typical two-lane corridor along certain sections. The volumes indicate that without the NOR in place, volumes of 27,200 and 32,700 vehicles per day in a two-lane corridor will result in significant congestion on Dairy Flat Highway. This further reinforces that without the provision for greater capacity on Dairy Flat Highway, significant traffic effects can be expected, along with lower levels of amenity and liveability. The proposed cross section for this corridor is currently shown as a four-lane arterial including room for bus priority lanes along the majority of the corridor. There are certain sections where the proposed cross section drops to two-lanes where traffic volumes are expected to drop. Wider network assumptions include the capacity improvements to SH1. The provision of this strategic motorway upgrade provides additional capacity between Silverdale and Albany. The upgrade enables Dairy Flat Highway to operate as an arterial corridor, supporting local movements – rather than also providing strategic north-south trips. Without these strategic improvements, traffic volumes along Dairy Flat Highway are expected to increase.
NOR 9: Upgrade to Dairy Flat Highway between Dairy Flat and Albany	The forecast Average Daily Traffic (ADT) in 2048 is 21,700 vehicles.	The forecast Average Daily Traffic (ADT) in 2048 is 18,500 vehicles.	There is little effect from a general traffic outcome perspective should the Project not proceed. Expected traffic volumes with and without the NOR are similar and no additional capacity to that existing is proposed.
NOR 10: Upgrade to Wainui Road	The forecast Average Daily Traffic (ADT) in 2048 is 16,500 vehicles.	The forecast Average Daily Traffic (ADT) in 2048 is 13,800 vehicles.	There is little effect from a general traffic outcome should the Project not proceed. Expected traffic volumes with and without the NOR are similar and no additional capacity to that existing is proposed.
NOR 11: New connection	None	The forecast Average Daily Traffic	As growth increases in the area the current lack of an arterial network will reduce connectivity and result in a

Proposed NOR	Without the NOR in 2048+	With the NORs in 2048+	General Traffic and Freight Effect if the NOR does not proceed
between Dairy Flat Highway and Wilks Road		(ADT) in 2048 is 16,000-30,400 vehicles.	heavy reliance on the existing network. Without an arterial network, there will be an increasing reliance on the local and collector network. This will result in longer, less efficient bus networks, and safe cycle connections on desire lines would be limited. Without providing for through movement functions on arterials, there will likely be an increase in traffic utilising lower order corridors such as local and collector roads, with potential adverse effects on amenity and capacity. Without the new connection between Dairy Flat Highway and Wilks Road, there will be no direct route between the Silverdale West – Dairy Flat Industrial area and the strategic motorway network (which would otherwise be provided by the Wilks Road Interchange). Subsequently, freight will be required to travel further along Dairy Flat Highway and connect to SH1 via the Silverdale interchange. This will have an adverse effect on general traffic and freight on these adjacent arterials and interchanges due to increased congestion and delays that this re-routing will cause.
NOR 12: Upgrade and Extension to Bawden Road	The forecast Average Daily Traffic (ADT) in 2048 is 23,100 vehicles.	The forecast Average Daily Traffic (ADT) in 2048 is 35,500 vehicles.	Bawden Road provides an east-west connection between the strategic transport network and the future Dairy Flat town centre, Dairy Flat future urban residential areas and a likely future Rapid Transit station. Traffic volumes in the future are expected to significantly increase (this can be attributed to the extension to the proposed Ō Mahurangi Penlink (Redvale) Interchange and subsequently SH1). The provision of bus lanes along this corridor will enable vehicles to move along the corridor with reduced friction from a high frequency of buses entering and exiting the traffic lane. Without the extension to Bawden Road there will be no direct route between Dairy Flat and the strategic motorway network (which would otherwise be provided by the Ō Mahurangi Penlink (Redvale) Interchange). Subsequently, freight will be required to travel further along Dairy Flat Highway and connect to SH1 via the Silverdale interchange. This will have an adverse effect on general traffic and freight on these adjacent arterials and interchanges due to increased congestion and delays that this re-routing will cause.

Proposed NOR	Without the NOR in 2048+	With the NORs in 2048+	General Traffic and Freight Effect if the NOR does not proceed
NOR 13: Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	The forecast Average Daily Traffic (ADT) in 2048 is 16,300 – 25,500 vehicles.	The forecast Average Daily Traffic (ADT) in 2048 is 9,000-15,500 vehicles.	There is little effect from a general traffic outcome should the Project not proceed. In addition, no additional capacity to that existing is proposed. Wider network assumptions include capacity improvements to SH1 (NOR 4). The provision of this strategic motorway upgrade provides additional capacity between Silverdale and Albany. The upgrade will enable East Coast Road to operate as an arterial corridor, supporting local movements – rather than providing a connection for strategic north-south trips. Without these strategic improvements, traffic volumes along East Coast Road are expected to increase.

Accordingly, should the growth in the North proceed without the support of the proposed Projects, the likely outcomes include:

- Low active mode share;
- High AM peak congestion;
- Poor travel choice due to limited active mode and public transport service and facilities;
- Poor network resilience and reliability; and
- Lack of access to social and economic opportunities.

4.2.4 Future Transport Environment with North Projects

The following table summarises the future transport environment within the North with each of the proposed Projects implemented. This includes a summary of expected bus volumes, traffic volumes, expected walking and cycling facilities and future intersection forms.

Table 4-7 Future Transport Environment with North Projects

NoR	Project	Description
1	New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway	• A 16km-long RTC corridor for public transport and active mode purposes • Dedicated walking and cycling facilities along some of its length from Bawden Road to the point where the RTC crosses Dairy Flat Highway, connecting to the Dairy Flat Highway corridor upgrade, described below • Grade separated crossings where it crosses other key transport corridors, either over or under those roads
2	New Milldale Station and Associated Facilities	• A new rapid transit station and associated facilities, including: o Bus layover area for local bus services o Bus stops for local buses o Cycle parking o Drop-off / pick up areas – kiss and ride
3	New Pine Valley East Station and Associated Facilities	• A new rapid transit station, including: o Bus layover for rapid transit and local bus services o Bus stops for local buses o Cycling parking o Park and ride facilities (Indicative capacity for approximately 500 car park spaces) o Drop-off / pick up areas
4	SH1 Improvements (alteration to designations 6761, 6760, 6759, 6751)	• Widening the SH1 carriageway to consistently provide for three lanes in each direction, from the Lonely Track Road overbridge to the Silverdale interchange • Upgraded Ō Mahurangi Penlink (Redvale) Interchange (upgrading this proposed interchange to add north facing ramps), including new walking and cycling paths across the interchange • New Wilks Road interchange (south facing ramps only) , including new walking and cycling paths across the interchange • Silverdale interchange upgrade for east-west capacity, including new walking and cycling paths across the interchange • An approximately 16 km long active mode corridor along one side of SH1 from Albany to Grand Drive (starts on east of SH1 at Oteha Valley Road, crosses to west of SH1 around Bawden Road and then back to east at Silverdale interchange), including local connections.
5	New SH1 crossing at Dairy Stream	• A new 24m two-lane urban arterial connection and SH1 motorway overbridge between Top Road and East Coast Road near Huruhuru (Dairy Stream)

NoR	Project	Description
		• Active mode facilities on both sides of the carriageway including on the bridge • 50 km/hr posted speed • 6 buses per hour • 1,400 vehicles per day in 2048

6	New Connection between Milldale and Grand Drive	• A new two-lane urban arterial with separated walking and cycling facilities on both sides between Wainui Road (Milldale) and the western edge of the Ara Hills development in Ōrewa.
		• 50 km/hr posted speed
		• 6 buses per hour
		• 13,200 vehicles per day in 2048
		• Intersection upgrades:
		  ○ Intersection of Upper Ōrewa Road and Wainui Road – Roundabout
		  ○ Intersection of Upper Ōrewa Road and Grand Drive Interchange - Roundabout

7	Upgrade to Pine Valley Road	• An upgrade to Pine Valley Road between Poynter Lane and Argent Lane to a two-lane urban arterial with separated walking and cycling facilities on both sides
		• 50 km/hr posted speed
		• 6 buses per hour
		• 16,800 vehicles per day in 2048
		• Intersection upgrades:
		  ○ Intersection of Pine Valley Road and Young Access - Roundabout
		  ○ Intersection of Pine Valley Road and Old Pine Valley Road – Roundabout

8	Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat	• **Segment 1** Upgrade to a 4-lane urban arterial between Silverdale interchange and Wilks Road
		• 50 km/hr posted speed
		• 18 buses per hour
		• 20,200 vehicles per day in 2048
		• Intersection upgrades:
		  ○ Intersection of Dairy Flat Highway and Argent Lane – Signalised Intersection
		  ○ Intersection of Dairy Flat Highway and Wilks Road – Dual-Lane Roundabout
		• **Segment 2** Upgrade to a 2-lane rural arterial between Wilks Road and Richards Road
		• 50 km/hr posted speed
		• 12 buses per hour
		• 15,700 vehicles per day in 2048
		• Intersection upgrades:
		  ○ Intersection of Dairy Flat Highway and Horseshoe Bush Road – Signalised Intersection

NoR	Project	Description
		○ Intersection of Dairy Flat Highway and Landfill Access Road – Single-Lane Roundabout ○ Intersection of Dairy Flat Highway and Richards Road – Single-Lane Roundabout • **Segment 3** Upgrade to a 2-lane urban arterial between Richards Road and Blackbridge Road • 50 km/hr posted speed • 6 buses per hour • 15,700 vehicles per day in 2048 • Intersection upgrades: ○ Intersection of Dairy Flat Highway and Blackbridge Road – Dual-Lane Roundabout • **Segment 4** Upgrade to a 4-lane urban arterial between Blackbridge Road and Durey Road • 50 km/hr posted speed • 20 buses per hour • 24,800 vehicles per day in 2048 • Intersection upgrades: ○ Intersection of Dairy Flat Highway and Jeffs Road – LILO ○ Intersection of Dairy Flat Highway and Green Road – Dual-Lane Roundabout ○ Intersection of Dairy Flat Highway and Bawden Road – Dual-Lane Roundabout ○ Intersection of Dairy Flat Highway and Kennedy Road – Dual-Lane Roundabout ○ Intersection of Dairy Flat Highway and Durey Road – Dual-Lane Roundabout • Upgraded bridge over Huruhuru (Dairy Stream) • Separated walking and cycling paths are provided for on both sides of the corridor between Silverdale and Dairy Flat
9	Upgrade to Dairy Flat Highway between Dairy Flat and Albany	• An upgrade to Dairy Flat Highway between Dairy Flat and Albany with a widened road corridor to provide safety improvements and a cycle path. • Safety improvements include central wire rope barrier and side barriers. • Crawler lanes will be retained as currently located • Cycle path added on the western side of the carriageway between Durey Road and the Coatesville Riverhead Highway Roundabout and then on the eastern side between the Roundabout and Te Wharau (Albany Village). • 60 km/hr posted speed • 12 buses per hour • 18,500 vehicles per day in 2048 • Intersection upgrades: ○ Intersection of Dairy Flat Highway and Potter Road – Roundabout ○ Intersection of Dairy Flat Highway and Foley Quarry Road – Priority Controlled Intersection

NoR	Project	Description
		○ Intersection of Dairy Flat Highway and Coatesville-Riverhead Highway – Roundabout ○ Intersection of Dairy Flat Highway and Albany Heights Road – Roundabout • Intersection of Dairy Flat Highway and Hobson Road – Priority Controlled Intersection • Intersection of Dairy Flat Highway and the Avenue – Roundabout
10	Upgrade to Wainui Road	• Upgrade to Wainui Road including a widened road corridor to 24 m between Lysnar Road and the new Argent Lane • Separate, dedicated, walking and cycling facilities on both sides of the carriageway • Upgraded bridge over Waterloo Creek (tributary to Ōrewa River) • 50 km/hr posted speed • 6 buses per hour • 13,800 vehicles per day in 2048 • Intersection upgrades: ○ Intersection of Wainui Road and Argent Lane - Roundabout ○ Intersection of Wainui Road and Upper Ōrewa Road - Roundabout
11	New connection between Dairy Flat Highway and Wilks Road	• **Segment 1** (Kahikatea Flat Road to Postman Road Segment) will feature a 2-lane urban arterial (24 m wide corridor) with separated walking and cycling facilities on both sides. • 50 km/hr posted speed • 6 buses per hour • 16,000 vehicles per day in 2048 • Intersection upgrades: ○ Intersection of Segment 1 (Industrial Arterial) and Dairy Flat Highway – Signalised Intersection • **Segment 2** (Postman Road to SH1) features a 4-lane urban arterial (30 m wide corridor) with separated cycling and walking facilities, two lanes of general traffic and two-lanes where priority may given to freight traffic. • 50 km/hr posted speed • Unlikely to include bus movements • 30,400 vehicles per day in 2048 • Intersection upgrades: ○ Intersection of Segment 2 (Industrial Arterial) and Postman Road – Dual-lane Roundabout
12	Upgrade and Extension to Bawden Road	• Upgrade and extension to Bawden Road. This will include a 30m four-lane road corridor with walking and cycling facilities on both sides. Two lanes for general traffic and two lanes for a frequent transit network (likely bus lanes). • Road intersects with the RTC. The road is likely to go under the RTC (grade separated crossing). • 50 km/hr posted speed

NoR	Project	Description
		• 30 buses per hour, multiple routes converging along Bawden Road • 35,500 vehicles per day in 2048 • Intersection upgrades ○ Intersection of Dairy Flat Highway and Bawden Road – Dual-lane Roundabout

13	Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	• Upgrade to the footpath on the west side and new footpath on east side between Hibiscus Coast Highway and Silverwater Drive.
		• **Segment 1** features a two-lane urban arterial upgrade (24 m) with walking and cycling facilities on both sides separated from the road.
		• 50 km/hr posted speed
		• 6 buses per hour
		• 14,400 vehicles per day in 2048
		• Intersection upgrades:
		  ○ Intersection of East Coast Road and Hibiscus Coast Highway – Signalised Intersection
		  ○ Intersection of East Coast Road and Forge Road – Signalised Intersection
		  ○ Intersection of East Coast Road and Newman Road – Priority Controlled Intersection
		• **Segment 2** Shared path to the west only, with no works to the existing carriageway and no swales.
		• 60 km/hr posted speed
		• 6 buses per hour
		• 15,500 vehicles per day in 2048
		• Intersection upgrades:
		  ○ Intersection of East Coast Road and Spur Road – Roundabout
		  ○ Intersection of East Coast Road and Wilks Road – Roundabout
		  ○ Intersection of East Coast Road and Jackson Way – Priority Controlled Intersection
		• **Segment 3** features a 24 m wide cross section with walking and cycling facilities on both sides.
		• 50 km/hr posted speed
		• 6 buses per hour
		• 9,000 vehicles per day in 2048
		• Intersection upgrades:
		  ○ Intersection of East Coast Road and Worsnop Way – Priority Controlled Intersection
		  ○ Intersection of East Coast Road and Ō Mahurangi Penlink – Roundabout

5 North NoRs Overall Network

This section assesses common or general transport matters across the overall North Project i.e. the combination of existing road upgrades, new corridors, active mode facilities and strategic public transport facilities. This section also recommends measures to avoid, remedy, or mitigate actual or potential adverse effects for the overall network.

Matters unique or specific to each NOR are in subsequent chapters, in particular Sections 6 to 16.

5.1 Assessment of Positive Effects

Overall it is considered that the North Projects of corridors and stations provide positive transport effects.

Te Tupu Ngātahi has identified a network that provides for a comprehensive transport solution that responds to planned growth in the North. This network has then been used as the foundation for the NORs identified in this Assessment of Transport Effects. It is also noted that this assessment considers these projects as a network, and similar to the North DBC, has an overall focus on the outcomes for the North area. Notwithstanding this, the NORs are all proposed as separate projects and are seeking to enable the projects to be implemented progressively in future, in coordination with progressive land use development.

The 13 NORs identified in this Assessment of Transport Effects are a core component of this North network, with the proposed projects supporting the following transport outcomes:

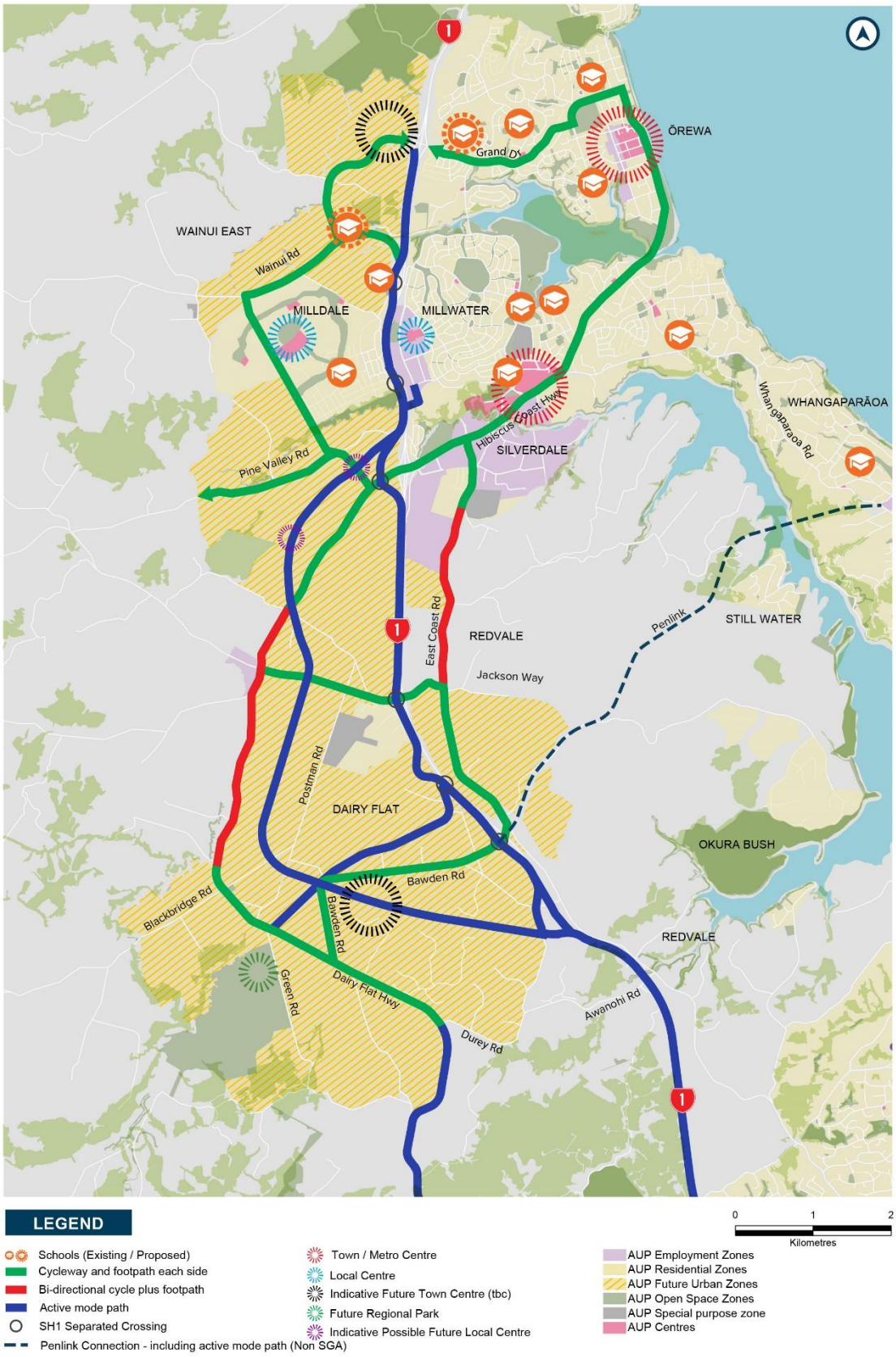
- Long term development of a transport system to support future growth and facilitate mode shift from private vehicles to public transport and active modes.
- Long term mode shift to more sustainable modes of transport reducing VKT and vehicle related emissions.
- Transport corridors to maximise opportunities for walk up catchments to public transport interchanges and a high frequency local bus network.
- Increased reliability for public transport and additional resilience via urbanised alternative routes.
- Real travel choice with high quality, attractive alternatives to the private vehicle. This includes a contiguous, legible active mode network that connects people to key destinations and encourages active mode trips within the compact urban area.
- An area wide focus on safety through a holistic set of measures including Road to Zero safety principles, fully separated cycling facilities, well designed intersections and sufficient space for all modes to interact safely.

5.1.1 Walking and Cycling

The North network includes several strategic walking and cycling paths and connections (as shown in Figure 5-1 below). Those within this NOR Projects include:

- A new walking and cycling path along SH1 (SH1 Walking and Cycling Path) – part of NOR 4
- A new walking and cycling path along the rapid transit corridor (RTC Walking and Cycling Path) - part of NOR 1
- Upgrades to the Wainui Interchange for Active Modes - part of NOR 4
- Silverdale to Highgate active mode connection - part of NOR 4.

Figure 5-1: Indicative North Walking, Cycling and Micro-mobility network



In addition to this, all proposed arterial road upgrades include some form of walking and cycling provision. The majority of the local projects indicatively propose separated walking and cycling facilities on both sides of the corridor, which connect with expected future adjacent facilities. There are some corridors where uni-directional facilities on both sides of the road are not proposed, and these include:

- Dairy Flat Highway (between Silverdale and Dairy Flat) – The portion of Dairy Flat Highway between Wilks Road and Richards Road is proposed to have walking and cycling facilities on one side of the corridor. This will include a 2.0m footpath and 3.5m bidirectional cycleway. This is primarily to respond to the proposed urban context on the eastern side of the corridor, and rural on the western side.
- Dairy Flat Highway (between Dairy Flat and Albany) – The portion of Dairy Flat Highway between Dairy Flat and Albany is proposed to have walking and cycling facilities on one side of the corridor. This will include a 4.0m shared path. This is due to a complex engineering environment and environmental constraints.
- East Coast Road – The portion of East Coast Road between Newman Road and Jackson Way is proposed to have walking and cycling facilities on one side of the corridor. This will include a 4.0m shared path. This is primarily to respond to the proposed rural environment while connecting two urban areas.

These variations remain consistent with the objectives of Auckland Transport Vision Zero and comply with AT Transport Design Manual Standards.

The proposed walking and cycling facilities have been designed in accordance with relevant AT standards and policies as summarised in Table 5-1.

Table 5-1: Walking and Cycling AT Standards and Policies for the Walking and Cycling Facilities

Policy/Standard	Network Component	Assessment
Auckland Transport Vision Zero9	Segregated walking and cycling facilities	Segregated walking and cycling facilities are proposed to provide a safe modal choice in the future environment. Vision Zero specifies that indicative proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on the corridors are proposed to be 50-60km/hr, therefore the indicative proposed design of the walking and cycling facilities is considered to be appropriate for these standards.
AT Transport Design Manual10	Segregated walking and cycling facilities	A 1.8m footpath has been allowed for on all corridors and a 2.0m cycle path. The total width of 6.8m is provided from carriageway to road boundary. This is in accordance with the AT TDM requirements.
	Shared path	Sections of Dairy Flat Highway and East Coast Road are proposed to include a shared path that is indicatively 4.0m wide. This complies with the AT TDM requirements.
	Bidirectional cycle facilities	A rural section of Dairy Flat Highway between Dairy Flat and Albany is indicatively proposed to have bidirectional cycle facilities. This are

		indicatively shown as approximately 3.5m wide. This complies with the AT TDM requirements.

Exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided by Vision Zero guidance. The walking and cycling components of the Projects will have significant positive effects in that they will:

- Significantly reduce the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and across the corridor.
- Improve integration with the future walking and cycling network, resulting in improved east-west and north-south walking and cycling connectivity.
- Lead to environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
- Support growth adjacent to the corridor and significantly improve safety and access to employment and social amenities.

5.1.2 Public Transport

Overall, it is anticipated that the expected growth in the North will be supported by incremental improvements in public transport services. This includes the provision of new public transport routes, and increased frequency on existing routes. This improved public transport offering is necessary to support a shift to alternative modes and increase the attractiveness of public transport as a mode choice. This is illustrated in Figure 5-2 below.

The increased public transport services are predominantly operational; however for NoR 8 and 12, there are specific components of the designation that enable infrastructure-based measures in the carriageway such as bus lanes and bus priority measures at intersections. Sufficient berm space has also been allocated along the corridors to facilitate bus shelters and bus stops.

NoR 1: New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway – includes a 16km long RTC corridor for public transport which enables PT priority - this is discussed further in Section 6.

NoR 4: SH1 Improvements - Widening the SH1 carriageway from two lanes to three lanes each direction from the Lonely Track Road overbridge to the Silverdale interchange. This provides the opportunity for bus shoulders from Albany to Silverdale in the short-medium term – this is further discussed in Section 7 and provides opportunity to enable long-term bus, high occupancy or freight lanes.

A summary of the anticipated increased service frequencies in 2048 is provided below in Table 5-2. These are indicative only.

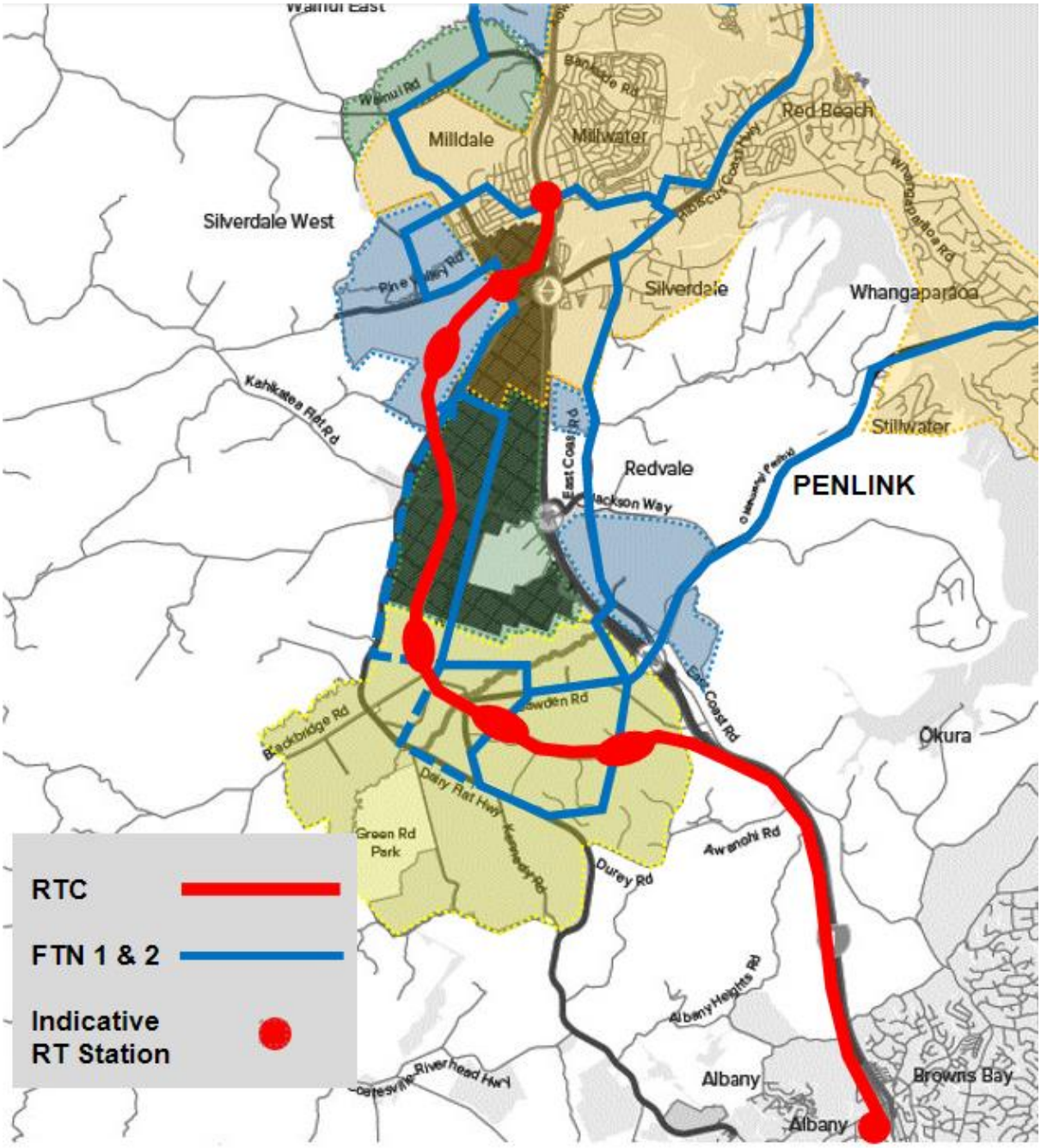
Table 5-2: Future Public Transport Services (indicative)[10]

NoR	Corridor	Proposed Bus Service Levels
1	New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway	See Section 6 for more details
2	New Milldale Station and Associated Facilities	See Section 6 for more details
3	New Pine Valley East Station and Associated Facilities	See Section 6 for more details
4	SH1 Improvements (alteration to designations 6761, 6760, 6759, 6751)	See Section 7 for more details
5	New SH1 crossing at Dairy Stream	For future public transport services, there is one core proposed frequent bus service. This includes the: • 986, which is forecast to operate every 10 minutes during the peak and every 20 minutes outside of the peak period.
6	New Connection between Milldale and Grand Drive	For future public transport services, there is one core proposed frequent bus service. This includes the: • 983, which is forecast to operate every 10 minutes during the peak and every 20 minutes outside of the peak period.
7	Upgrade to Pine Valley Road	No core proposed frequent bus routes proposed under indicative 2048 AT bus network along the corridor. However, the cross-section will provide adequate spacing to facilitate public transport and associated bus stops if bus services are proposed in the future.
8	Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat	For future public transport services, there are three core proposed frequent bus services. This includes the: • 985, which is forecast to operate every 10 minutes during the peak and every 20 minutes outside of the peak period. • 983, which is forecast to operate every 10 minutes during the peak and every 20 minutes outside of the peak period.

[10] https://platform.remix.com/project/2ec8c132?latlng=-36.64704,174.67739,11.899

NoR	Corridor	Proposed Bus Service Levels
		• 89, which is forecast to operate every 5 minutes during the peak and every 10 minutes outside of the peak period.
9	Upgrade to Dairy Flat Highway between Dairy Flat and Albany	For future public transport services, there are two core proposed frequent bus services. This includes the: • 988, which is forecast to operate every 15 minutes during the peak and every 30 minutes outside of the peak period. • 989, which is forecast to operate every 7 minutes during the peak and every 10 minutes outside of the peak period.
10	Upgrade to Wainui Road	For future public transport services, there is one core proposed frequent bus service. This includes the: • 983, which is forecast to operate every 10 minutes during the peak and every 20 minutes outside of the peak period.
11	New connection between Dairy Flat Highway and Wilks Road	For future public transport services, there is one core proposed frequent bus service. This includes the: • 983, which is forecast to operate every 10 minutes during the peak and every 20 minutes outside of the peak period.
12	Upgrade and Extension to Bawden Road	For future public transport services, there are a number of indicative core frequent bus services. This includes the: • 986, which is forecast to operate every10 minutes during the peak and every 20 minutes outside of the peak period. • 99, which is forecast to operate 5 minutes during the peak and every 10 minutes outside of the peak period. • 89, which is forecast to operate 5 minutes during the peak and every 10 minutes outside of the peak period. • 988, which is forecast to operate evert 15 minutes during the peak and 15 minutes outside of the peak period. • 983, which is forecast to operate every 10 minutes during the peak and every 20 minutes outside of the peak period. • 989, which is forecast to operate every 7 minutes during the peak and every 10 minutes outside of the peak period. • 985, which is forecast to operate every 10 minutes during the peak and every 20 minutes outside of the peak period.
13	Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	For future public transport services, there is one core proposed frequent bus service. This includes the: • 986, which is forecast to operate every10 minutes during the peak and every 20 minutes outside of the peak period.

Figure 5-2: North PT Strategy Map



The proposed indicative cross-sections provide adequate spacing to facilitate public transport and associated bus stops. The exact location of bus stops will be identified as part of detailed design for the project. Once greater certainty is available on the location of key land use activities, more certainty on high demand locations for bus stops can be determined, i.e. around centres and schools for example.

The positive operational effects on public transport for the above corridors are:

- Improved accessibility for future frequent public transport network
- Improved integration with the future public transport network and improved east-west connectivity, as well as improved access to employment and social amenities.
- Increased attractiveness and uptake of public transport trips which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.

5.1.3 Safety

The designs of all Projects have been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The new and upgraded corridors are expected to result in positive effects on safety due to the:

- New, walking and cycling facilities (including separation), resulting in improved protection for vulnerable road users.
- New, walking and cycling crossing facilities (crossing the arterials/motorway) and at key intersections, resulting in a significantly safer environment for all road users.
- Appropriate urban speeds (e.g. 50km/h) for arterials and consequential reductions in the risk of Death or Serious Injuries (DSIs).

It is anticipated that walking and cycling demands will increase significantly as the area urbanises and develops. Given the expected traffic volumes along the corridors, there will be a safety risk for active mode users travelling along the corridors without appropriate facilities. Therefore, the projects have been designed to 50-60km/h posted speeds and provide segregated walking and cycling facilities to reduce the likelihood and severity in the event of a crash.

Existing crash records have been provided in Appendix 2.

Overall, the indicative proposed designs are well aligned with the transport safety principles from AT and Waka Kotahi. They will provide safe transport corridors and reduce the risk of DSIs occurring, resulting in positive effects for all road users. It is noted that prior to implementation of the Projects, further detailed design will be completed to confirm how the Projects will be provided.

Safety considerations for the strategic projects can be found in Section 4.2.3.1.

5.2 Assessment of Construction Effects

5.2.1 Construction effects – relating to all NoRs

It is anticipated that the larger part of works required for the North Projects will likely be adjacent to 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 bridges/viaducts, 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. These temporary activities are expected to be managed via the New Zealand Temporary Traffic Management Guide (NZTTMG).

The effects of temporary road closures 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 for each Project on the basis of the current traffic environment. This will take into account the level of growth and activities that has occurred in the area, the availability of the alternative routes, and any additional sensitive land use activities.

In particular, construction works along SH1 to provide for the SH1 Improvements (including new and upgraded interchanges) will be disruptive to users of SH1 and the transport network around the interchanges. In addition, construction works along SH1 to provide for the RTC will cause disruption for users of SH1. This will, in particular, require careful planning and implementation, but many similar construction works of this scale have been carried out across the Auckland region previously.

Special consideration will need to be given to how the SH1 improvements tie into the Penlink Interchange. This connection has been discussed with the Penlink team to ensure that the proposed design aligns with the current Penlink Interchange plans.

The construction of the Projects will each likely require significant 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 the increase of traffic volume on construction routes used during the construction period of each of the Projects.

5.2.1.1 Traffic Routing

Given the construction timing and staging of the package has yet to be determined, there is 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. Although, we have identified some locations on the designation plans.
- 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.

It is noted that the access to compound sites/laydown areas and construction zones for construction vehicles, plant and materials will be via site access points identified as part of future 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/SH1 and intersections with the provision of adequate vehicle tracking.

The specific CTMPs will need to consider the suitability and effects prior to the use of those other road corridors and may require specific mitigation, such as restrictions on the number or time of day / week that construction vehicles could utilise those corridors.

Other key considerations relating to the construction traffic and transport effects of the Strategic corridors are discussed below, such as speed limits, pedestrians and cyclists, property access and parking, on-street and public parking, as well as parallel construction of projects.

5.2.1.1 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.

5.2.1.2 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, when a greater level of detail is available about surrounding facilities and land use activities prior to construction, a CTMP will be prepared for each Stage of Work. 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.

5.2.1.3 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 expected that the contractor will 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. As such, confirmation of traffic management controls will be required immediately prior to works to reflect the land use considerations at that time.

5.2.1.4 On-street and public parking

During the time of construction, the works or associated temporary traffic management controls may result in existing on-street parking or public parking not being available. It is anticipated that the contractor will undertake a detailed assessment of any affected parking and, if necessary, provide alternatives, particularly for mobility parking or loading spaces. The loss of any general public parking will need to consider the duration of effects and the impact on specific businesses. Where temporary alternatives are necessary, this should ensure the ability for the public to safely access these spaces. These requirements should be captured in the CTMP or SSTMP, if required.

5.2.1.5 Parallel construction of projects

It has currently been assumed that each of the strategic corridors (NORs 1 to 4) will be constructed separately, i.e. not constructed in parallel with each other. The anticipated timing of the Projects vary and will depend on when land is released for development, hence there is the opportunity to provide separation between the construction of the corridors, whilst funding and implementation decisions are made.

There is the potential that some of the corridors may be constructed at the same time (depending on later implementation decisions); however, it is considered that this would most likely affect the amount of construction traffic on the transport network. Where necessary, it is considered that this could be adequately managed, through CTMPs to be prepared for each Stage of Work and more detailed staging of construction works at that time through the well-established CTMP processes of Waka Kotahi and Auckland Transport.

The construction of Projects in parallel, could potentially also provide the opportunity for efficiencies in the construction process by enabling combined compound sites/laydown areas or reducing the transport of spoil (with further efficiencies in cut and fill transport across multiple sites).

5.2.1.6 Land use activities that will need further consideration in the CTMP

The following table provides a summary of the key land use or activities that are located adjacent to the corridors and will need specific consideration during the development of the CTMPs. This could include restricted truck movements during school pick up and drop off, or additional controls at key access locations. The below is not a final or complete list, with land use changes likely, this list will change over time.

Table 5-3: Sites for Consideration within future CTMP

NoR	Corridor	Sites for Specific Consideration
1	New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path between Bawden Road and Dairy Flat Highway	• Business premises located along the corridor • New Zealand Equestrian Association
2	New Milldale Station and Associated Facilities	• Highgate business park area • Milldale residential area

NoR	Corridor	Sites for Specific Consideration
3	New Pine Valley East Station and Associated Facilities	• No specific site identified
4	SH1 Improvements, including new walking and cycling path between Albany and Grand Drive (alteration to designations 6761, 6760, 6759, 6751)	• Business premises located along the corridor • Fairview Lifestyle Village • SH1 Northbound Motorway Service Centre • Meraki Montessori Primary School
5	New SH1 crossing at Dairy Stream	• No specific site identified
6	New Connection between Milldale and Grand Drive	• Future school to be located near the intersection of Upper Ōrewa Road and Wainui Road
7	Upgrade to Pine Valley Road	• No specific site identified
8	Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat	• Dairy Flat Primary School • Commercial properties at Kahikatea Flat Road intersection • Dairy Flat Community Hall
9	Upgrade to Dairy Flat Highway between Dairy Flat and Albany	• No specific site identified
10	Upgrade to Wainui Road	• No specific sites identified
11	New connection between Dairy Flat Highway and Wilks Road	• Airport Precinct
12	Upgrade and Extension to Bawden Road	• No specific site identified
13	Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	• Auckland Memorial Park and Cemetery • Local business premises

5.2.2 Temporary Traffic Management Effects Assessment

It is considered that temporary effects from the construction activities on the network can be adequately managed through the implementation of a CTMP during the construction phase of each Project (or Stage of Work). The purpose of the CTMP is to ensure the construction of each Project is managed in such a way that enables safe and efficient movement of local traffic throughout the

construction period and to minimise disruption to road users, particularly the adjacent properties and local activities.

Further detail of more specific effects identified at this time are provided for each Strategic corridor below. It is noted that, where it is considered that the transport (or other) effects (either construction or operational) on affected properties are unlikely to be adequately managed or mitigated, those properties have already been identified to be included within the Project designation.

The outcomes of this assessment and later more detailed assessments, at the time these corridors proceed to implementation, will inform the development of detailed CTMPs. It is considered that a CTMP will appropriately manage potential traffic / transport effects at that time, acknowledging that projects on the scale of those like the RTC and SH1 Improvements will inevitably result in disruption and inconvenience for the public and road users, at their interfaces with existing strategic transport networks and local road corridors.

The CTMP will also provide for ongoing monitoring and iterative improvements to management of temporary traffic effects where necessary.

5.2.3 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

It is considered that the potential construction traffic effects can be accommodated and managed appropriately via a CTMP.

The construction of the corridors will have more localised transport effects, such as access, for individual properties or activities. The potential transport effects have been reviewed and for these reasons (also considering the operational phase effects), some properties have been identified to be included in the proposed designation. For other properties, appropriate mitigation (during the construction phase) can be provided, such as re-grading existing driveways, re-forming / re-locating driveways or providing new private access roads, which can be implemented through a CTMP to be prepared prior to the start of construction.

Based on the assessment of transport construction effects, it is recommended a CTMP be prepared prior to the start of construction for each stage of work for each of the North Projects. Any potential construction traffic effects will be taken into account by the CMTP taking into account the specific construction methodology and traffic / transport environment at the time of construction. It is considered that the objectives and associated conditions for the CTMP, identified in the AEE, will enable the adverse transport effects to be appropriately managed.

Those objectives and conditions will address the following matters recommended through the assessment of transport construction effects:

1) A CTMP shall be prepared prior to the Start of Construction for a Stage of Work.
2) 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:
    a) Methods to manage the effects of temporary traffic management activities on traffic;
    b) Measures to ensure the safety of all transport users;
    c) 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;

d) Site access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors;
e) Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
f) Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;
g) The management approach to loads on heavy construction 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;
h) Methods that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

3) Auditing, monitoring and reporting requirements relating to traffic management activities shall be undertaken in accordance with Waka Kotahi's New Guide to Temporary Traffic Management.

6 NoR1, NoR2, NoR3: New Rapid Transit Corridor (RTC) between Albany and Milldale, including new walking and cycling path, plus new Milldale and Pine Valley East Stations

6.1 Overview and description of works

The proposed RTC is a new corridor which aims to complete a safe and frequent rapid transit system connecting the North growth area with Albany and beyond to the City Centre. The RTC will extend the existing Northern Busway from Albany to Milldale, and/or connect to future RT options being considered by the WHC project (a non-Te Tupu Ngātahi project).

The RTC initially traverses along the western side of the SH1 corridor, predominantly through rural land outside of the FUZ for just under 6km of its total length of just under 17km, with just under 11km being within the North FUZ areas through to Milldale. The RTC will operate in an uninterrupted free flowing manner with all road crossings grade separated along its length.

For the purposes of assessment, the RTC is assumed to be bus-based as this requires the biggest footprint. However, the corridor design and footprint are also future proofed for light rail. The RTC corridor will generally be at grade, except at key sections to pass over local and arterial roads. An overview of the proposed design is provided in Figure 7-1 below.

The associated walking and cycling path is a segregated walking and cycling corridor that is located adjacent to the RTC alignment through the Dairy Flat FUZ from Bawden Road to Dairy Flat Highway. The corridor is co-located and integrated with the RTC in this section and both projects are proposed to be route-protected as a single NoR. The segregated corridor provides the opportunity for a long-term cycling corridor, connecting key areas within the North FUZ and to the proposed SH1 walking and cycling corridor, which is part of the SH1 Improvements project (part of NoR 4), which will connect the North growth area to Albany.

In order to serve the existing urban and FUZ areas in the North, the RTC NoR is supported by NoRs for the Milldale and Pine Valley East Stations (NoRs 2 and 3). The proposed station locations are illustrated on Figure 6-2 below. These stations are being route protected, given the current and imminent development in these locations. This is further discussed in the AEE.

The Milldale Station will be accessed by active modes and feeder bus services forms the terminus of the RTC corridor. Given the site constraints, a Park and Ride facility is not considered appropriate at this station and the layover for bus rapid transit vehicles cannot be accommodated. The Pine Valley East Station will include Park and Ride facilities with allowance currently enabled for up to 500 car parking spaces. This station is also supported by active modes and local PT access, with the proposed designations for both stations providing space for bus interchange and active mode facilities. The Pine Valley East Station will provide the layover of the bus rapid transit vehicles.

Figure 6-1: RTC Overview

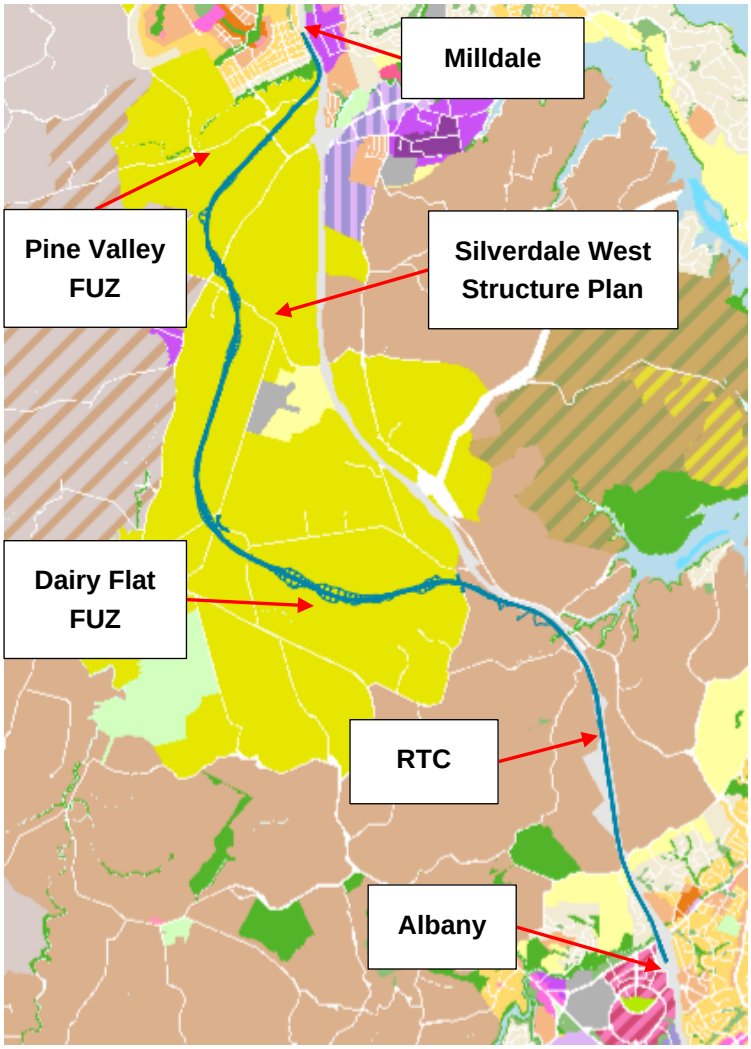
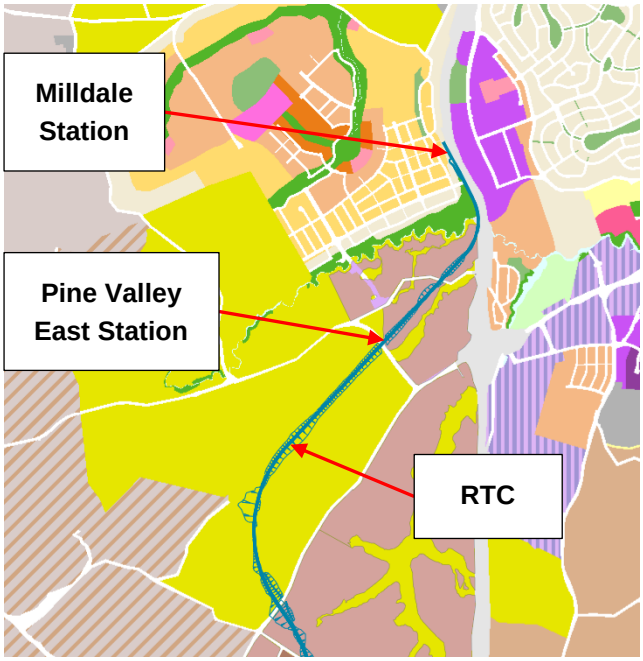


Figure 6-2: RTC Stations Overview



The Project was developed as part of network planning for the wider area and concurrently with the early spatial planning and structure planning undertaken by the Council. The wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the identified problems. As such, the Project is part of a wider integrated network planned for the area.

Enabling grade separation of the RTC from local roads will significantly improve the efficiency and reliability of the RTC and provide safer and more efficient local active mode and bus connections at those locations, such as Argent Lane, Dairy Flat Highway, Postman Road, Bawden Road, Oteha Valley Road and Station Road.

Feeder bus services are critical to supporting the RTC as part of an overall public transport system. Te Tupu Ngātahi has worked closely with AT specialists to understand how feeder services can be configured to support the RTC, albeit this will be subject to future network planning at the time of implementation.

The development of the strategic corridor design and its interfaces with the local road network has included the use of the relevant transport guidance and documents, as described in Section 3.2.1. Key aspects of the network and corridor design are summarised below.

The RTC is completely segregated with a cross-section width of 20m, including the walking and cycling facilities. There are two lanes (one in each direction) and it has high-speed characteristics. RTC stations/stops are not provided in the rural section to maintain the high-speed environment and there is grade separation at local rural roads. The indicative cross section is shown in Figure 7-3.

Figure 6-3: RTC Potential Cross-Section

The form and function for Milldale and Pine Valley East Stations has been subject to extensive discussion with Waka Kotahi and AT to determine the appropriate footprint and provide some flexibility for future detailed design.

In this regard, the following provisions have been included for each station.

- Milldale RTC Station
    - Station building with associated station facilities
    - Cycle and shared mobility device parking provision
    - Local bus layover and stop provision
    - Taxi and Ride Share drop-off facilities.
- Pine Valley East RTC Station
    - Station building with associated station facilities on structure over New Pine Valley Road with associated stairs and lift towers connecting to New Pine Valley Road
    - Cycle and shared mobility device parking provision
    - Local bus layover and stop provision
    - Layover facilities for bus based RTC mode
    - Taxi and Ride Share drop-off facilities
    - Park and Ride facility (up to 500 car parking spaces)
    - Upgrade to Old Pine Valley Road.

6.2 Assessment of Operational Transport Effects

6.2.1 Positive effects

Overall, the key features and outcomes of the RTC, plus walking and cycling path, together with the associated Milldale and Pine Valley East RTC Stations, include the following (it should be noted that the outcomes mentioned below are relative to a do-minimum/'no project' scenario):

- RTC, plus walking and cycling path
    - The RTC supports mode shift for the North growth area and surrounding communities in the North through the provision of a safe, high-quality, frequent, and reliable public transport system that connects the North with Albany, the North Shore and Auckland city centre.
    - The RTC operates within a dedicated, separated corridor that will be grade separated from all local and strategic corridors, which provides for reliable journey times on both the RTC and those other local and strategic corridors.
    - The RTC supports land use and transport integration.
    - The RTC enables a mode shift by providing alternatives to private vehicles.
    - The RTC supports stations at Milldale and Pine Valley East, as well as unlocking access to economic and social opportunities in the Northern growth area.
    - With the RTC there is predicted to be increased access to employment by PT within 15, 30 and 45 minutes for the Northern growth area in the weekday AM peak period. The proportion of jobs accessible by PT increases in each of these time intervals is predicted to increase by around 6,000 (or 21%) to around 34,800 jobs and over 100% within 30 minutes (around 75,400 compared to 36,400 jobs) and 45 minutes (around 304,000 compared to 71,100 jobs) with the RTC in place in 2048+.

  - The RTC is predicted to reduce the average PT journey time in weekday AM peak period to City Centre from the North growth area from around 82 minutes to 68 minutes with the RTC in place in 2048+.
  - The RTC is predicted to increase the proportion of PT trips for all non-local trips (outside North) in the weekday AM peak period from 25 to 33% with the RTC in place in 2048+.
  - The associated RTC walking and cycling path provides a key strategic corridor for walking and cycling that connects through the North FUZ areas and to the SH1 Improvements walking and cycling path, connecting to Albany.
  - The walking and cycling path provides a segregated facility that maximises safety for active modes and provides a direct link with limited vehicle conflicts. The 7.5km of RTC walking and cycling path is predicted to have around 978 trips a day.
  - With the RTC walking and cycling path, there will be approximately 1,920 jobs within 2km of the facility, compared to a network without the facility.
  - Additionally, the RTC walking and cycling path allows access to approximately 577 hectares of FUZ land use (approximately 18% of the total FUZ within the North) within 400m of the corridor, compared to a network without the facility.
- Milldale and Pine Valley East RTC Stations
  - Support appropriate transit-oriented development around the RTC stations and will be integrated with bus, walking, and cycling networks to promote travel choice.
  - The RTC patronage for the Milldale and Pine Valley East Stations results in a total of just over 5,000 passengers that travel south from those stations in the weekday AM peak period (2 hour peak). The stations will enable passengers to board within close proximity to their place of residence and connect to frequent bus routes across the rest of the North area.
- The Milldale RTC Station more specifically:
  - Enables access to the adjacent residential and employment areas.
  - Supports access for broader northern catchment in the North, via local bus services and active modes using the identified active modes network.
- The Pine Valley East RTC Station more specifically:
  - Supports access for the surrounding Pine Valley FUZ catchment and adjacent Silverdale West employment area, which could be enhanced by local connections to the east and north via future structure planning processes.
  - Enables access for Park and Ride for the broader North rural catchment, such as across Kahikatea Flats, as well as a terminus for bus services from Warkworth.

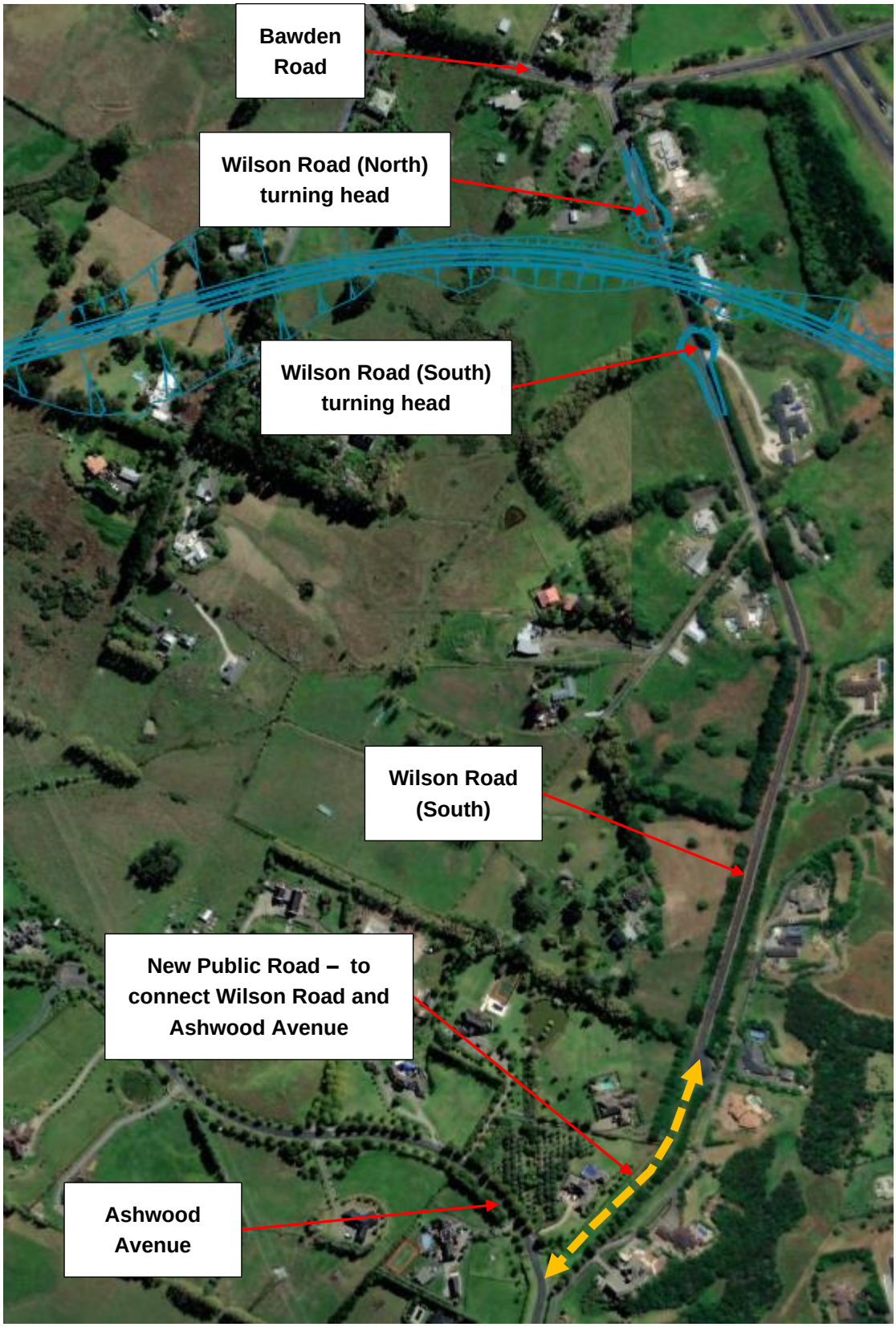
6.2.2 General Traffic and Freight

The RTC is generally grade separated from local roads, so once operational, will not affect the movements of general traffic or freight along any of the roads it traverses.

At Wilson Road, the geometrics requirements for the RTC coupled with the adjacent topography, mean it is not possible for the RTC to pass over or under Wilson Road. Hence, as illustrated on Figure 7-4 below, Wilson Road will need to close in the vicinity of No. 29 Wilson Road.

The properties (Nos. 4 and 7) to the north of the closure will retain access off Bawden Road with a turning head provided at the southern end of the northern section of Wilson Road, as shown in the figure below.

Figure 6-4: RTC Crossing at Wilson Road



For other properties, to the south of the closure and not included in the RTC or SH1 Improvements designations, a new road could be formed within the existing paper road reserve between the southern end of Wilson Road and Ashwood Avenue (which then connects to Awanohi Road). A

turning head will be provided at the northern end of the southern section of Wilson Road. As such, public road access to Wilson Road can be retained and it is recommended this in place prior to the construction of the RTC, unless future development within the FUZ (following structure planning / plan changes) has already enabled a public road connection to the southern section of Wilson Road.

In relation to the Pine Valley East station, the proposed designation provides for the upgrade of Old Pine Valley Road along the station frontage. However, public road access will be retained, once the Pine Valley East station is in place.

In relation to the Milldale Station, the proposed designation includes sections of Ahutoetoe Road to the north and south of John Fair Drive. This is to enable access to the future station to be integrated with the adjacent road network. Along the section of Ahutoetoe Road to the south of John Fair Drive, it may be necessary to close access along the section of road between No.108 Ahutoetoe Road and John Fair Drive this is to be confirmed during future detailed design. A turning head would be provided at the end of the road. However, if this is necessary, public road access to all properties along Ahutoetoe Road can still be provided to John Fair Drive via three other road connections further to the west.

6.2.3 Property Access

Where the RTC runs along the western edge of SH1 from Albany to the Dairy Flat FUZ, it will have little impact on property access during operation. Once, the RTC enters the Dairy Flat FUZ, there are several properties where new access roads will need to be provided as noted below.

However, the future development in the FUZ may have already enabled appropriate alternative access arrangements for these properties, in advance of the RTC being in place. i.e. as the FUZ area develops, it is expected that urban local and collector roads will facilitate vehicle access to the strategic network. If the RTC designation is confirmed, it will likely form part of the future environment to guide future structure planning and plan changes.

The collector network is expected to be indicatively identified by the Auckland Council during subsequent structure planning processes and these will then likely be refined and confirmed by developers as they progress these connections through plan changes. These will be assessed by standard planning and approval processes through Council.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that future detailed design and the outline plan process demonstrates how safe access will be provided, unless otherwise agreed with the affected landowner.

There are no specific properties that have been included within the designation for this purpose.

However, new access roads will need to be provided for the following properties, based on the current RTC design and designation footprint requirements (and has therefore been enabled through the designation). The following outlines the affected properties and how such access roads will indicatively be provided:

- Redvale Rise – A new access road can be provided from East Coast Road under the RTC and SH1 Improvements corridor to retain access to all properties on Redvale Rise, where these are retained and not otherwise within the proposed designation/s.
- 356, 400, 404, 408 Bawden Rd off Follies Way – A new access road can be provided to the southern section of Wilson Rd, which will have public road access to Ashwood Avenue (as discussed above).
- 61 and 63 Follies Way - A new access road can be provided to the southern section of Wilson Rd, which will have public road access to Ashwood Avenue (as discussed above).
- 88, 90, 91, 93 Grace Hill Drive – A new access road can be provided within the designation to connect with Bawden Road.
- 69 Crossbridge Road – A new access road can be provided within the designation to connect with Bawden Road.
- 86b Bawden Road – A new access road can be provided within the designation to connect with Bawden Road.
- 53 Dairy Stream Road – A new access road can be provided within the designation to connect with Jeffs Road.
- 93 Postman Road - A new access road can be provided within the designation to connect with Postman Road (which would also allow access for 8 Postman Road).
- 1350 Dairy Flat Highway (rear section only) – A new access road can be provided within the designation to connect with the part of this property that retains access to Dairy Flat Highway.
- 98A Wilks Road – A new access road can be provided within the designation to connect with either Dairy Flat Highway or Wilks Road.
- 42, 2/44, 44A Wilks Road – A new access road can be provided within the designation to connect with Wilks Road.
- 1549, 1559 Dairy Flat Highway – A new access road can be provided within the designation to connect with Dairy Flat Highway.
- Lot 2 DP 71373, 49 Wilks Road – A new access road can be provided within the designation to connect with Wilks Road.
- 1546 Dairy Flat Highway – A new access road can be provided within the designation to connect with Dairy Flat Highway.
- 1587, 1591, 1595, 1599, 1603 Dairy Flat Highway – A new access road can be provided within the designation to connect with Dairy Flat Highway. 1595, 1599, 1603 Dairy Flat Highway may be able to obtain access to Pine Valley Road, if legal access could be obtained via 209 Pine Valley Road.
- 175, 193, 207 Pine Valley Road – A new access road can be provided within the designation to connect with Pine Valley Road.
- 46 Old Pine Valley Road – A new access road can be provided within the designation to connect with Dairy Flat Highway.

6.2.4 Wider Network Effects

As discussed previously, the new RTC and associated walking and cycling path provides a key strategic corridor through the planned urban growth that connects the North area with the wider strategic public transport and cycling network at Albany.

The corridor provides the main spine for these networks with key connections to the local public transport network (bus services) provided at the Milldale and Pine Valley East Station, as well as future stations that will be identified in parallel with structure planning of the Dairy Flat FUZ. An indicative network of future local bus routes has been developed in liaison with AT as part of the business cases that have preceded this NOR.

In terms of walking and cycling, the Project provides the main spine for the cycle network through the FUZ areas in the North, that will connect with the local network at the identified stations, as well as at other locations along the route, such as at Dairy Flat Highway, Argent Lane and Bawden / Wilson Road. It is expected that the future structure planning for the Dairy Flat FUZ will be able to take account of the identified corridor to provide additional connections.

For freight and general traffic, the proposed corridor has a positive network effect by enabling greater mode shift to public transport, walking and cycling, reducing the future demands on the road network associated with private vehicle travel, both within the North area and along SH1.

6.3 Project Interdependencies

6.3.1 Northern Busway and WHC Project

The RTC will connect with the wider regional rapid transit network at Albany, just north of the existing Albany busway station.

The proposed RTC will be able to integrate with the existing busway station on the western side of SH1 should this continue to be served by express bus services to the south using the Northern Busway.

The WHC project is currently investigating future options for rapid transit across Te Waitemata and on the North Shore. This may change the form of rapid transit operating to the south of the Albany station. A recent Government announcement indicated that, in the long-term, both an enhanced busway and light rail could be extended to the Albany station. However, the future design of the Albany station is part of the WHC project and the proposed NoR is considered to be able to integrate with the identified future location of the Albany station on the western side of SH1 and the identified RT modes at this station.

A key dependency for the RTC is that there is sufficient capacity on the RT network south of Albany to accommodate the demand generated by the RTC extension. The WHC project will consider the forecast land use of the North growth area in determining the appropriate interventions for the North Shore and the wider Northern Growth area, such that this can be provided for. This would also be further considered as part of an Implementation Business Case for the RTC at a later stage and, notwithstanding that, Waka Kotahi has statutory requirements to contribute to "*an effective, efficient,*

and safe (Auckland) land transport system in the public interest"[11], which would be considered prior to implementation.

In addition, the proposed conditions for all North Projects include the requirement to prepare a Network Integration Management Plan (NIMP), to provide greater transparency and certainty that the necessary assessment to understand the implications of staging and sequencing will be undertaken prior to implementation.

6.3.2 SH1 Improvements

The RTC will run along the western side of SH1 between Albany and the Dairy Flat FUZ, entering the FUZ near Bawden Road. To enable the construction of the RTC, it would be necessary to implement the SH1 Improvements (NOR 4) from just south of Lonely Track Road to around 0.5km south of Awanohi Road That will include moving the motorway lanes over to the east and widening the existing SH1 designation.

Implementing the SH1 Improvements through this section enables the opportunity to provide dedicated bus lanes on SH1 for the current express bus services operating between the Hibiscus Coast bus station and Albany, i.e., one dedicated bus / high occupancy vehicle lane and two general traffic lanes in each direction.

6.3.3 Other North Corridors

The RTC corridor has interfaces with other transport corridors within the North Projects, specifically:

- Upgrade and Extension of Bawden Road (NOR 12)
- New Connection from Dairy Flat Highway to Wilks Road (NOR 11)
- Upgrade to Dairy Flat Highway (NOR 8).

The RTC has been designed to integrate with these corridors, as well as other key local road corridors, such as Argent Lane and Postman Road. The assessment of operational effects assumes that all these projects are in place. The Project as proposed can therefore be considered the long-term requirement for the corridor.

However, in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

Where necessary, overlapping designations are proposed to enable the interface between these projects (i.e. new bridge structure over or under the RTC) to be implemented regardless of the staging of the projects.

In addition to the overlapping designations and the requirements of the proposed Urban Design and Landscape Plan Condition, the following standard implementation measures will be undertaken by Waka Kotahi, in liaison with Auckland Transport, to assist in the management of any interdependencies:

- Waka Kotahi statutory requirements to contribute to "*an effective, efficient, and safe (Auckland) land transport system in the public interest"*[12]

[11] https://www.legislation.govt.nz/act/public/2003/0118/latest/DLM226236.html
[12] https://www.legislation.govt.nz/act/public/2003/0118/latest/DLM226236.html

- Implementation Business Case to confirm Project outcomes
- Detailed Design commensurate with implementation works
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

In addition, the proposed conditions for all North Projects include the requirement to prepare a Network Integration Management Plan (NIMP), to provide greater transparency and certainty that the necessary assessment to understand the implications of staging and sequencing will be undertaken prior to implementation.

6.4 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The RTC project provides significant positive effects and there are generally no operational adverse effects to mitigate, given the effects on local roads and property access have been addressed through the design of the Project and subsequently provided for by the designation.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the corridor/stations with the road environment and surrounding environment at the time of implementation.

A key dependency for the RTC is that there is sufficient capacity on the RT network south of Albany to accommodate the demand generated by the RTC extension. The WHC project will consider the forecast land use of the North growth area in determining the appropriate interventions for the North Shore and the wider Northern Growth area, such that this can be provided for. This would also be further considered as part of an Implementation Business Case for the RTC at a later stage and, notwithstanding that, Waka Kotahi has statutory requirements to contribute to "*an effective, efficient, and safe (Auckland) land transport system in the public interest*"[13], which would be considered prior to implementation.

In addition, the proposed conditions for all North Projects include the requirement to prepare a Network Integration Management Plan (NIMP), to provide greater transparency and certainty that the necessary assessment to understand the implications of staging and sequencing will be undertaken prior to implementation.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that the future detailed design and the outline plan processes demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

Where property access is affected, in some cases, new access roads for properties are necessary and can be provided within the designation footprint to enable access to the public road network. Noting that, the majority of these properties are within the FUZ and may be provided with access as future development in the FUZ occurs (in advance of the RTC being in place). As the FUZ area develops, it is expected that urban local and collector roads will facilitate vehicle access to the strategic network.

[13] https://www.legislation.govt.nz/act/public/2003/0118/latest/DLM226236.html

Several properties on the southern end of Wilson Road will no longer be able to access Bawden Road, once the RTC is in place. However, a new road can be formed within the existing paper road reserve between the southern end of Wilson Road and Ashwood Avenue (which then connects to Awanohi Road). It is recommended that this is completed prior to the construction of the RTC, unless future development within FUZ (following structure planning / plan changes) has already enabled a public road connection to the southern section of Wilson Road.

7 NoR4: SH1 Improvements (alteration to designations 6761, 6760, 6759, 6751)

7.1 Overview and description of works

The SH1 Improvements extend from around the Oteha Valley Road Interchange to Grand Drive, and include several Projects that make up alterations to the existing SH1 designations:

- Upgrades to SH1 - SH1 widening to enable three lanes to be provided continuously northbound and southbound between Lonely Track Road and the Silverdale Interchange. This will provide an opportunity for interim bus shoulders and long-term managed lanes (bus, high occupancy vehicle, freight lane).
- A walking and cycling path along SH1 from just south of the Oteha Valley Road Interchange (connecting to the Northern Corridor facilities) to Grand Drive
- North-facing ramps at the Ō Mahurangi Penlink (Redvale) Interchange, as well as walking and cycling connections separated from vehicle movements through the Interchange (both north-south and east-west)
- New south-facing ramps at the Wilks Road Interchange, as well as walking and cycling connections separated from vehicle movements through the Interchange (both north-south and east-west)
- Upgrades at the Silverdale Interchange to provide two eastbound and westbound vehicle lanes across SH1, as well as walking and cycling connections separated from vehicle movements through the Interchange (both north-south and east-west)
- Walking and cycling connections separated from vehicle movements through the existing Wainui Interchange, including a new pedestrian and cycle bridge to connect Millwater Parkway (on the east side) with Wainui Road (on the west side).

An overview of the proposed SH1 Improvements is provided in Figure 8-1 below.

The Upgrades to Ō Mahurangi Penlink (Redvale) Interchange are shown in Figure 8-2 below. The north-facing ramps will add to the interchange design currently under construction by the Ō Mahurangi (Penlink) project. This will require changes to the interchange layout, including the roundabouts at the interchange and a realignment of East Coast Road. To the north of the new interchange, a new access road will be provided along the western side of SH1 to enable continued access to the existing Motorway Service Centre (MSC), which will require changes to the access for the MSC. The pedestrian and cycle facilities will be separated from vehicle movements, as illustrated on Figure 8-2, and connect with the facilities on Bawden Road, as well as on the southern side of the Ō Mahurangi (Penlink) project.

The new access road on the western side of SH1 will also provide access to the northbound off ramp at the new Wilks Road Interchange, which is illustrated on Figure 8-3 below. The pedestrian and cycle facilities will be separated from vehicle movements as illustrated on Figure 8-3 and connect with the facilities on Wilks Road and to East Coast Road.

Figure 7-1: Overview of the SH1 Improvements

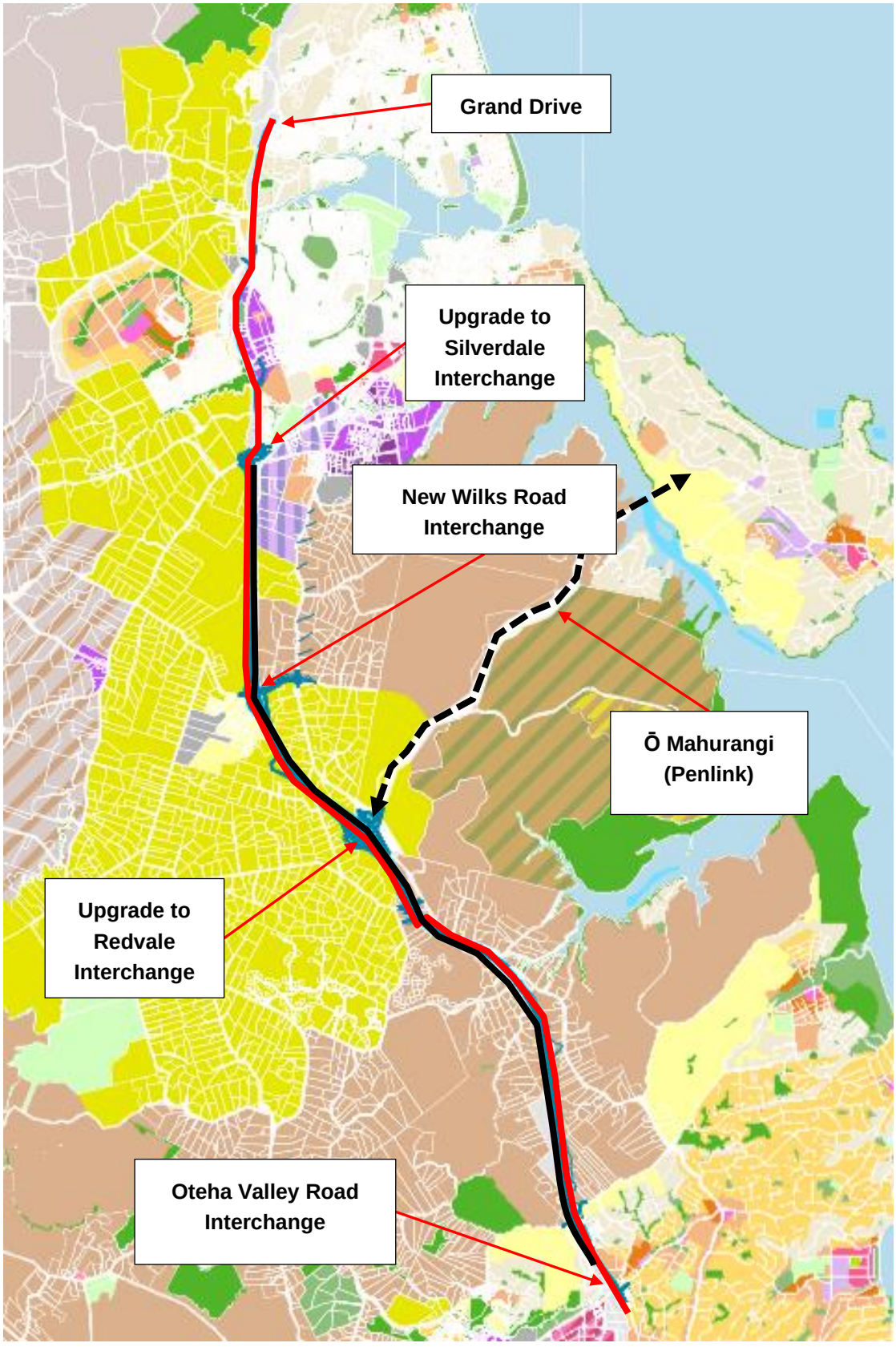


Figure 7-2: Indicative Ō Mahurangi Penlink (Redvale) Interchange arrangement

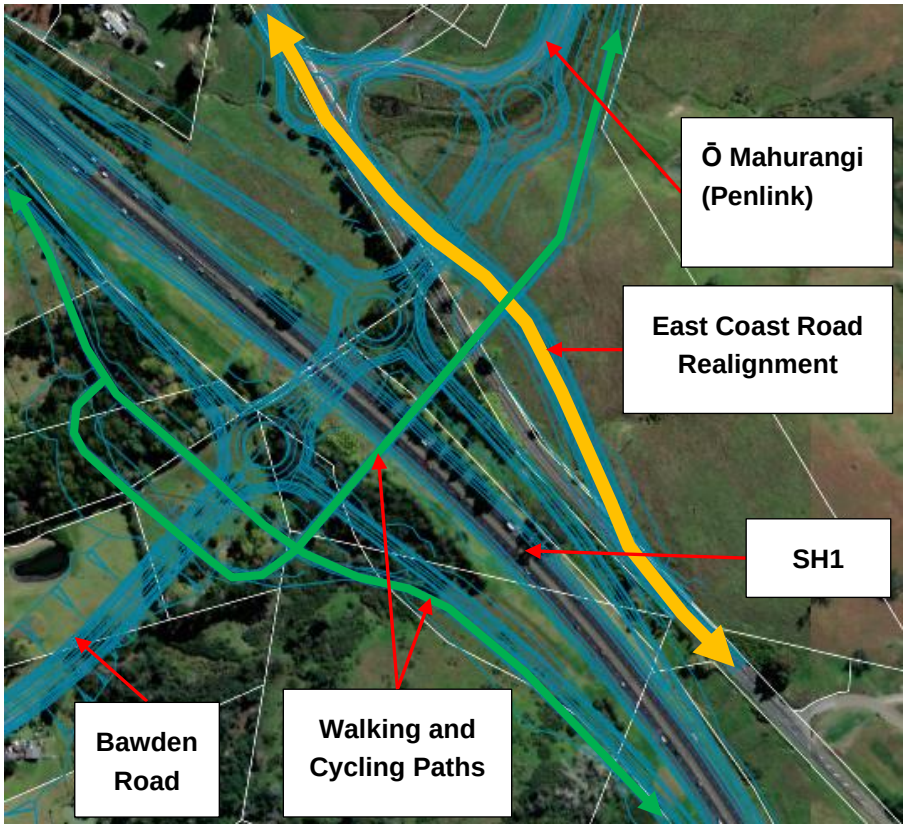


Figure 7-3: Indicative Wilks Road Interchange arrangement

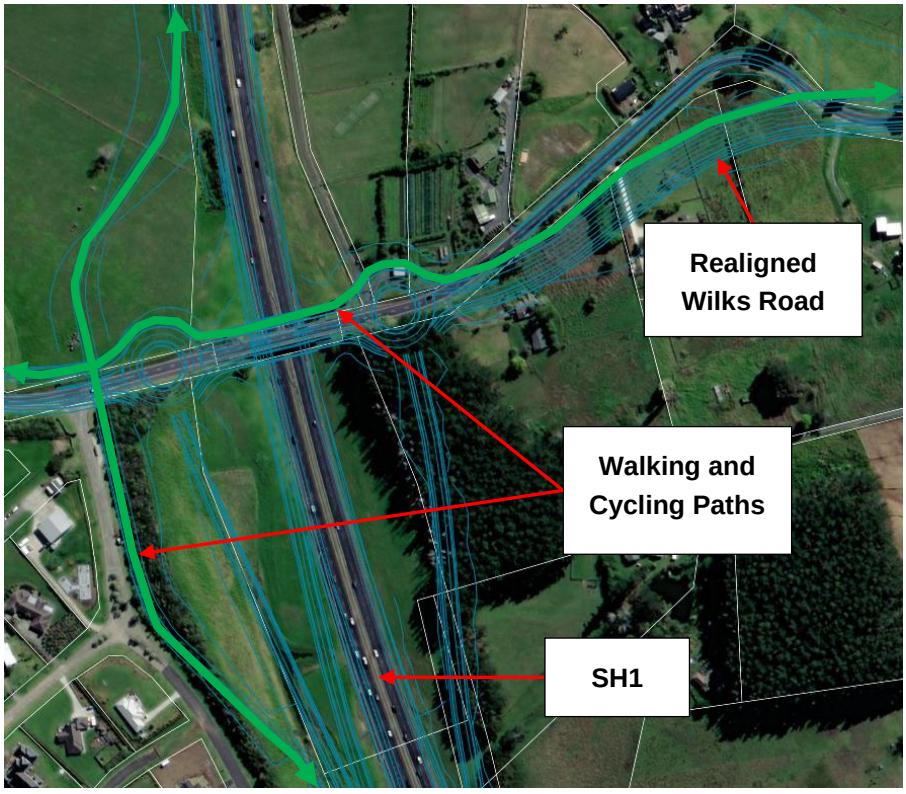
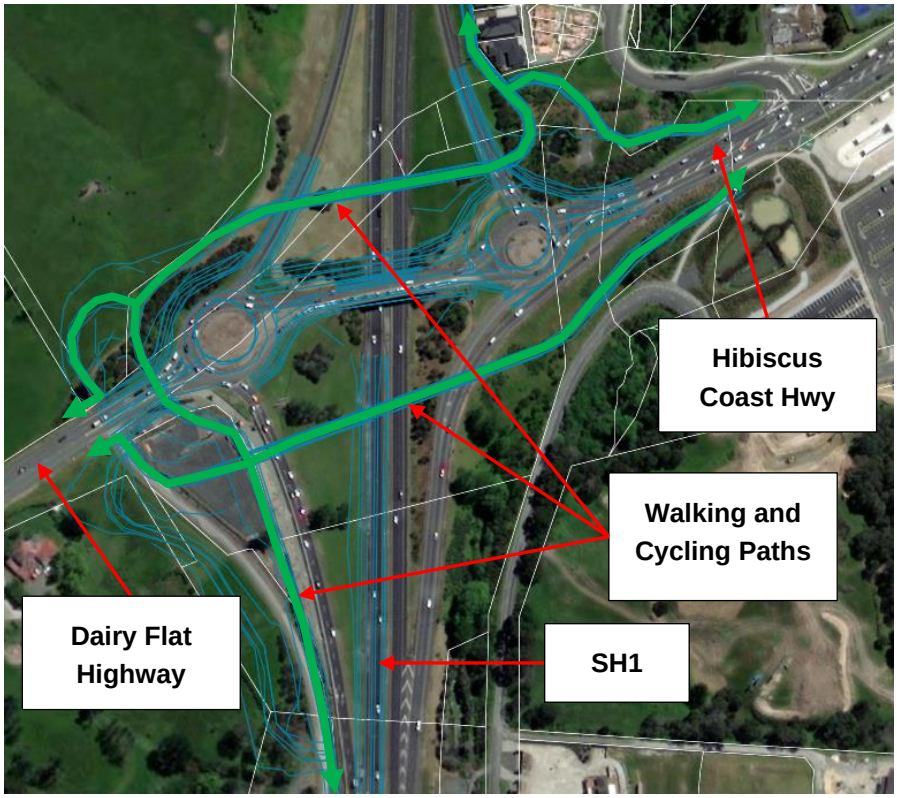


Figure 7-4: Indicative Silverdale Interchange arrangement



At the Silverdale Interchange, the pedestrian and cycle facilities will be separated from vehicle movements as illustrated on Figure 7-4 and connect with the facilities on Dairy Flat Highway and to the east on Hibiscus Coast Highway. The pedestrian and cycle facilities continuing along SH1 cross from the western to eastern side on the north side of Silverdale Interchange, as per Figure 7-4.

The Projects were developed as part of network planning for the wider North area. The wider networks were developed through the business case process that considered the key problems, benefits, outcomes and range of options to address the identified problems. As such, the Projects are part of a wider long-term integrated network planned for the area.

The development of the strategic corridor design and its interfaces with the local road network has included the use of the relevant transport guidance and documents, as described in Section 3.2.1. Key aspects of the network and corridor design are summarised below.

The form and function for the SH1 Improvements is described in Table 7-1 below. The typical cross section includes an active mode corridor with central and side barriers (see Figure 7-5 below). The allocation of the proposed three northbound and southbound lanes will be decided upon prior to implementation, but the additional capacity could be used for interim public transport facilities for express bus services prior to the RTC implementation and/or managed lanes (high occupancy / freight vehicles).

Table 7-1: SH1 Improvements – form and function

Segment	Comments
SH1 Oteha Valley Road to Silverdale Interchange	• The design consists of a 6-lane dual carriageway with central and side barrier systems from Lonely Track Road to Silverdale Interchange • All local roads remain grade separated • Under the ONRC Class 1 with no direct access and grade separation at all local roads / intersections, Safe and Appropriate Speed is 110 km/hr • No at-grade access • Separated walking and cycling path on eastern side from Oteha Valley Road to Bawden Road, the western side from Bawden Road to Silverdale Interchange
Ō Mahurangi Penlink (Redvale) Interchange	• Grade separated interchange retained • Separates higher speed state highway trips from local trips, including walking, cycling and public transport • Maintains northbound off ramp access to MSC • Separation of SH1 and local east-west walking and cycling movements from state highway and local traffic • Supports safe access to Dairy Flat and Redvale FUZ
Wilks Road Interchange	• Grade separated interchange • Separates higher speed state highway trips from local trips, including walking, cycling and public transport • Maintains northbound on ramp access from MSC • Separation of SH1 and local east-west walking and cycling movements from state highway and local traffic • Supports safe access to Silverdale West industrial area and Redvale FUZ • Supports convenient freight access to Silverdale West industrial area
Silverdale Interchange	• Existing grade separated interchange retained • New east-west walking and cycling facilities • Separates higher speed state highway trips from local trips, including walking, cycling and public transport • Separation of SH1 and local east-west walking and cycling movements from state highway and local traffic • Supports safe access to Silverdale West industrial area, Milldale and Silverdale • Supports convenient freight access to Silverdale West industrial area
SH1 Silverdale Interchange to Grand Drive	• Separated walking and cycling path on eastern side, including connection to the Highgate business park / Milldale
Wainui Interchange	• Separation of SH1 and local east-west walking and cycling movements from state highway and local traffic • Supports safe access to Millwater, Milldale and Wainui FUZ

Figure 7-5: Indicative SH1 cross section – North of Lonely Track Road

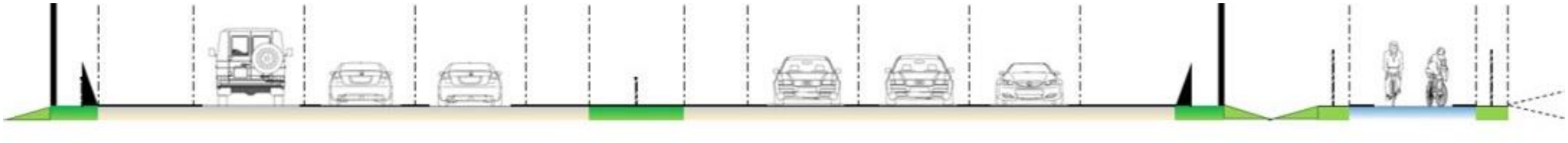
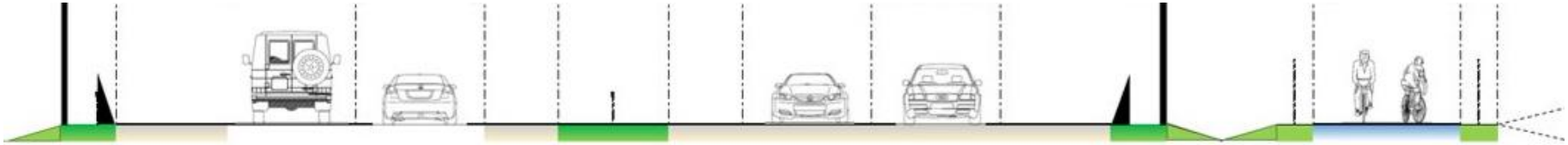


Figure 7-6: Indicative SH1 cross section – North of Silverdale Interchange



7.2 Assessment of Operational Transport Effects

7.2.1 Positive effects

Overall, the key features and outcomes of the SH1 Improvements, including the walking and cycling path, together with the new and upgraded interchanges include the following:

- The SH1 improvements enable improved journey time reliability for SH1 trips through the North area from Silverdale to Oteha Valley Road Interchanges across the day, including freight trips
- The SH1 Improvements will provide an opportunity for interim bus lanes and long-term managed lanes, whilst maintaining an appropriate level of service for other strategic trips along the corridor
- The SH1 Improvements at the Wilks Road Interchange will provide direct and convenient access for freight to the Silverdale West industrial area, avoiding these trips travelling through the Dairy Flat FUZ, which is predominantly residential
- The SH1 Improvements at the Silverdale Interchange will improve the reliability of east-west connections, particularly for local bus services, as well as access between the Silverdale West industrial area and SH1
- The SH1 Improvements at the Redvale, Wilks and Silverdale Interchanges will provide safe and attractive east-west walking and cycling connections between existing and future communities, including local access to jobs
- The walking and cycling improvements along SH1 will connect the North area with the Northern Corridor Improvements project to the east of SH1 at Albany, providing a high-quality strategic route that will promote longer distance travel and future-proof for changes in technology
- The walking and cycling improvements along SH1 also provide a highly attractive and safe facility with physical separation from local vehicle traffic providing significant benefits in connecting employment sites and centres with residential areas.

As part of the North network, the SH1 Improvements projects are expected to achieve (it should be noted that the outcomes mentioned below are relative to a do-minimum/'no project' scenario):

- Improvement in accessibility to employment with the proportion of employment accessible by private vehicles increasing, such that within 15 minutes there are around 63,700 jobs with the project in 2048+, compared to around 50,100, in the weekday AM peak period. The equivalent number of jobs that can be accessible by private vehicle within 30 minutes, only increases slightly from around 178,700 jobs from around 175,100.
- The travel time for all vehicles including freight and bus services travelling between Silverdale and Albany on SH1 improves with the Projects in the weekday AM peak period in 2048 by 14 minutes, reducing from 31 to 17 minutes.
- A reduction in the percentage of vehicle kilometres travelled in peak congestion (>90% volume to capacity ratio) in the weekday AM peak period from 47% without the projects to 34% with the projects in place.
- Without adequate interchange connections, the Silverdale West industrial area will be isolated from the strategic motorway network with the limited accessibility, particularly for heavy vehicles, potentially compromising the viability of the area.
- Capacity improvements at the Silverdale Interchange, alongside the provision of dedicated separated active mode facilities shows an improvement in the efficient operation of the interchange with the degree of saturation reducing from 0.85 to 0.73 of its theoretical capacity during the weekday AM peak period.

- With the project, the SH1 walking and cycling path allows access to approximately 20,785 jobs within 2km of the SH1 walking and cycling path, compared to a network without this facility.
- The SH1 walking and cycling path allows access to approximately 363 hectares of FUZ land use (12% of the total FUZ within the North) within 400m of the SH1 walking and cycling path, compared to a network without this facility.
- The 17km of SH1 walking and cycling path is predicted to have around 410 trips a day. The path is a fully separated, high-quality, high-speed facility that allows users the ability to travel away from vehicles and other safety hazards otherwise present on a typical road carriageway.

7.2.2 General Traffic

The SH1 Improvements provide for the continued efficient and reliable operation of SH1 for longer distance regional and sub-regional connections. The additional lanes will between Albany and Silverdale will help retain the strategic function of SH1 for people and goods movement in light of higher local demand from adjacent North growth areas. The additional capacity can be managed in the long-term to deliver on targets for mode share and urban form, such as through high occupancy lanes, including for public transport, or freight lanes. Enabling efficient and reliable operation of SH1 will reduce the potential for longer distance regional and sub-regional traffic to utilise local roads, supporting growth and improving land use integration in the adjacent FUZ and existing urban areas.

The SH1 Improvements include a three lane dual-lane carriageway with central and side barrier systems. There will continue to be no direct access onto SH1 supporting the efficiency and reliability for inter-regional trips, as well as intra-regional to locations such as Northport and Northland. It will also reduce reliance on existing unsuitable rural roads to accommodate future traffic demand, which are not designed for those volumes of traffic and will also lead to safety issues.

The intersections at the interchanges along the SH1 Improvements corridor have been assessed and shown to provide sufficient capacity to accommodate the anticipated future traffic demands with the growth in the existing and future urban areas in the longer-term. The 2048+ scenario traffic modelling results for the intersections associated with the SH1 Improvements are provided in Table 8-2 below.

Table 7-2: SH1 Improvements – Intersection Performance at Interchanges

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Ō Mahurangi Penlink (Redvale) Interchange Southbound Ramps Intersection (Dual lane roundabout)	AM	A	0.58	36
	PM	A	0.68	43
Ō Mahurangi Penlink (Redvale) Interchange Northbound Ramps Intersection (Dual lane roundabout)	AM	A	0.51	19
	PM	A	0.83	66

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Wilks Road Interchange Southbound Ramps Intersection (Dual lane roundabout)	AM	A	0.66	38
	PM	A	0.87	98
Wilks Road Interchange Northbound Ramps Intersection (Dual lane roundabout)	AM	A	0.71	42
	PM	A	0.88	118
Silverdale Interchange Southbound Ramps Intersection (Dual lane roundabout)	AM	A	0.58	41
	PM	A	0.50	19
Silverdale Interchange Northbound Ramps Intersection (Dual lane roundabout)	AM	A	0.73	40
	PM	A	0.97	121

There is the potential that upon completion of the SH1 improvements, there could initially be upstream or downstream delays at some locations, due to the improved operation along this route. However, it is expected that the overall traffic patterns would soon stabilise, as people adjust their journeys to the overall network conditions. In relation to more permanent effects associated with the improvements to the corridor, it is considered that the additional capacity (that may otherwise exacerbate downstream congestion on SH1) can be managed to deliver on targets for mode share and urban form, such as through high occupancy lanes, including for public transport, or freight lanes. This would be further considered in the context of wider regional and national policies at the time of implementation. In particular, this could include the relationship between the managed lanes on this section of the corridor with the adjacent section of SH1. This would be further considered as part of an Implementation Business Case at a later stage, and, notwithstanding that, Waka Kotahi has statutory requirements to contribute to "*an effective, efficient, and safe (Auckland) land transport system in the public interest*"[14], which would be considered prior to implementation.

In addition, the proposed conditions for all North Projects include the requirement to prepare a Network Integration Management Plan (NIMP), to provide greater transparency and certainty that the necessary assessment to understand the implications of staging and sequencing will be undertaken prior to implementation.

[14] https://www.legislation.govt.nz/act/public/2003/0118/latest/DLM226236.html

The SH1 Improvements are generally grade separated from local roads, so once operational, will not affect the movements of general traffic or freight along any of the roads they traverse.

At the new Wilks Road Interchange, the proximity of Aeropark Drive to the western roundabout at the interchange, together with the proposed SH1 walking and cycling path, result in a slight realignment of Aeropark Drive. This can be accommodated within the proposed SH1 Improvements designation, but access to and from Aeropark Drive will be restricted to left-in / left-out only movements, due to its proximity to the interchange roundabout.

Figure 7-7 and Figure 7-8 below illustrate how movements to and from Aeropark Drive can be provided respectively.

Figure 7-7: SH1 Improvements at Wilks Road Interchange – Aeropark Drive Access – Exit Movements

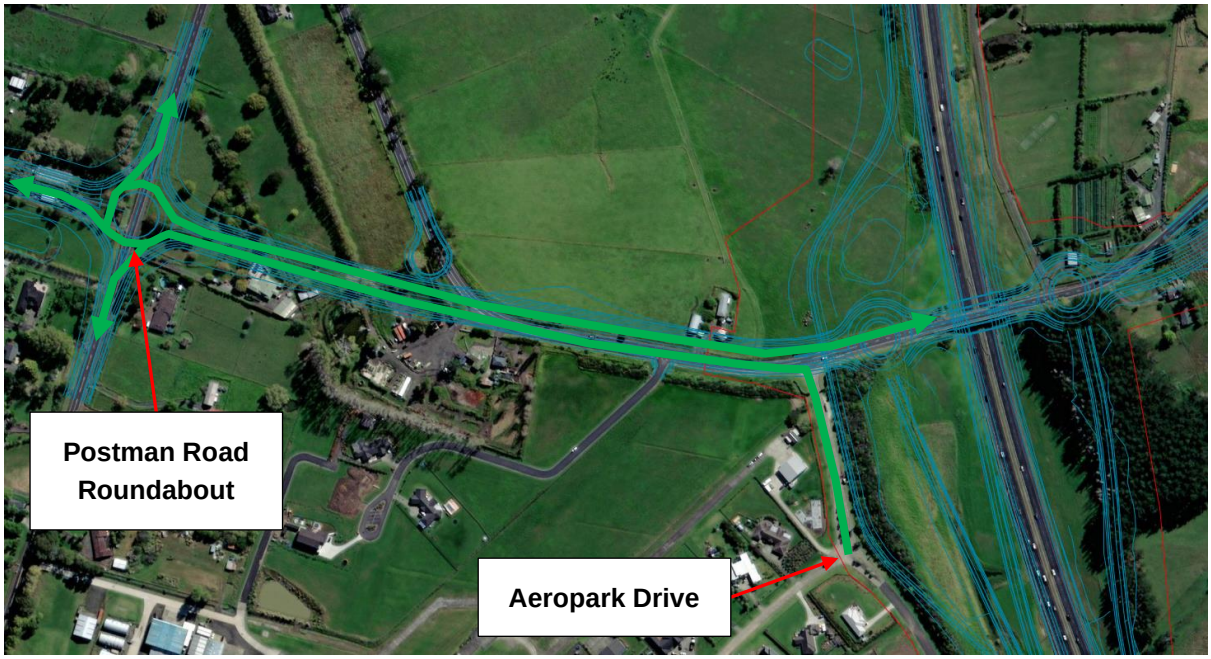
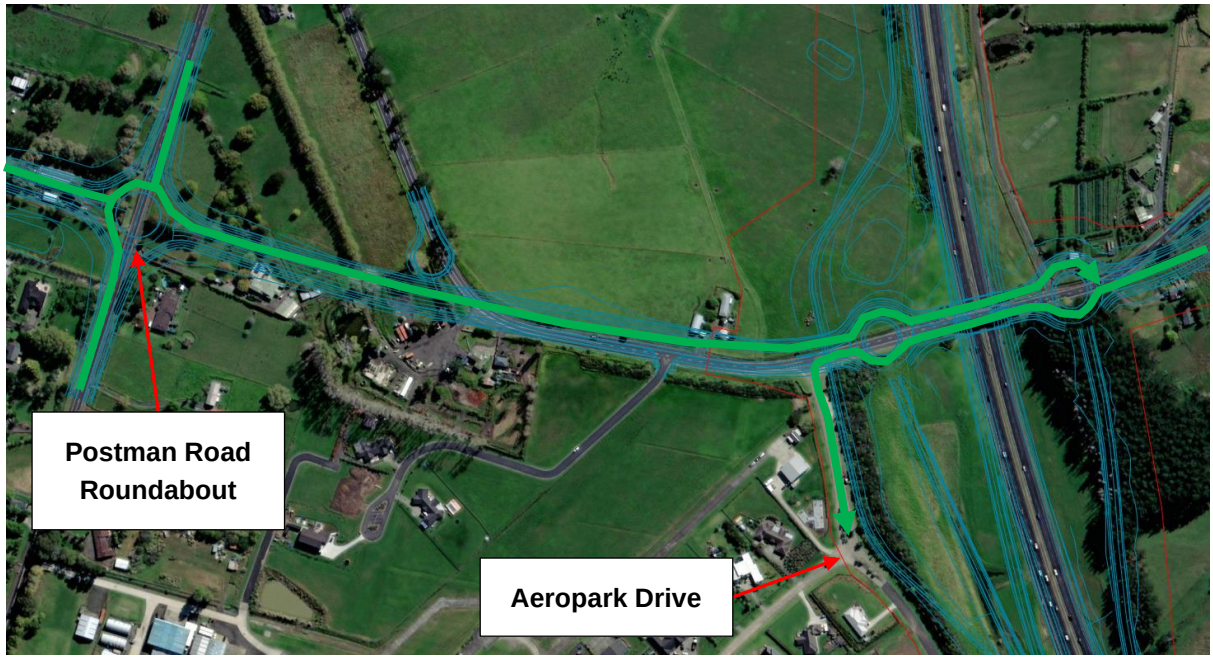


Figure 7-8: SH1 Improvements at Wilks Road Interchange – Aeropark Drive Access – Entry Movements



The implementation of the new interchange will likely occur when development of stage 2 of the Silverdale West structure plan occurs and the new east-west connection is provided between Dairy Flat Highway and Wilks Road (as included in the North Projects, NoR11). That new connection will likely include a roundabout at Postman Road, which will enable people turning left out of Aeropark Drive to turnaround and travel east to the interchange and East Coast Road.

This is a relatively minor diversion of only up to 1.2km, when the exiting distance (600m each way) to travel east, going to and from the Postman Road roundabout is considered. This is around two minutes additional journey time, assuming a conservatively low 30kph vehicle speed, accounting for turning at the roundabout.

On the basis of the above, it is considered that the effects on access for Aeropark Drive, in terms of the minor additional journey time are acceptable, in the context of providing for the safe movement to / from Aeropark Drive, as well as at the eastern roundabout at the Wilks Road Interchange. Noting also, that with the development of the Dairy Flat FUZ to the south of Aeropark Drive, alternative access could be available in the future via or an extension / urbanisation of Top Road or other new urban roads. However, it is recommended, when the interchange is implemented, that consideration be given to whether the Postman Road roundabout is in place or whether other alternatives for access from Aeropark Drive to travel east are required.

7.2.3 Property Access

As the SH1 Improvements are an extension of the existing SH1 designations, they will generally have little impact on property access. The impacts on property access generally relate to the areas where new bridge structures are required and at the new / upgraded Interchanges.

In some cases, the future development in the FUZ may have already enabled appropriate alternative access arrangements for these properties, in advance of the SH1 Improvements being implemented. i.e. as the FUZ area develops, it is expected that urban local and collector roads will facilitate vehicle access to the strategic network.

The collector network is expected to be indicatively identified by the Auckland Council during subsequent structure planning processes and these will then likely be refined and confirmed by developers as they progress these connections through plan changes. These will be assessed by standard planning and approval processes through Council.

In terms of existing properties, the overarching design philosophy for the Projects has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that future detailed design and the outline plan process demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

There are no specific properties that have been included within the designation for this purpose.

However, new access roads will need to be provided for the following properties, based on the current SH1 Improvements design and designation footprint requirements. The following outlines the affected properties and how such access roads will indicatively be provided:

- 152, 158 Lonely Track Road – A new access road can be provided within the designation to connect with Lonely Track Road via 148 and 154 Lonely Track Road.

- Motorway Services Centre – To accommodate the new access road on the western side of SH1 between the Ō Mahurangi Penlink (Redvale) and Wilks Interchanges, as well as the associated northbound on and off ramps for the MSC, changes to the MSC access to and from these ramps will be necessary and are provided for within the designation.
- 211, 213, 235, 241, 243, 251 Wilks Road – A new access road can be provided within the designation via the existing Wilks Road alignment to connect with the new Wilks Road alignment.
- 1744, 1748, 1748A Dairy Flat Highway – A new access road can be provided within the designation to connect with Dairy Flat Highway.

7.2.4 Freight

The improved corridor capacity as a result of the SH1 Improvements will result in improved journey times and reliability for existing and future freight. The corridor will be able to better accommodate freight movements with minimal interfaces with the local network, other than at key locations, improving freight reliability. In addition, the potential for long-term managed freight lanes as part of the SH1 improvements will also improve freight reliability along the corridor, which would need to be further considered in the context of wider regional and national policies at the time of implementation. This would be further considered as part of an Implementation Business Case at a later stage, and, notwithstanding that, Waka Kotahi has statutory requirements to contribute to "*an effective, efficient, and safe (Auckland) land transport system in the public interest"*[15], which would be considered prior to implementation.

In addition, the proposed conditions for all North Projects include the requirement to prepare a Network Integration Management Plan (NIMP), to provide greater transparency and certainty that the necessary assessment to understand the implications of staging and sequencing will be undertaken prior to implementation.

The ability of the SH1 Improvements to accommodate local, inter- and intra-regional freight trips. The SH1 Improvements include new and upgraded interchanges at Wilks Road and Silverdale respectively. These interchanges provide a direct connection between SH1 and the future employment areas in the Silverdale West industrial area. This will reduce freight using local roads through residential areas.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the realisation/ implementation of individual corridor upgrades in the future.

7.2.5 Wider Network Effects

In terms of wider network effects, as discussed above, the proposed corridor has a positive network effect by enabling greater reliability, resilience and productivity for the movement of people and goods between Silverdale and Albany, as part of the intra- and inter-regional strategic network. The SH1 walking and cycling path also supports greater mode shift to walking and cycling, reducing the future demands on the state highway and local road network associated with private vehicle travel, both within the North area, and along SH1 to Albany.

There is the potential that upon completion of the corridor, there could initially be upstream or downstream delays at some locations, due to the improved operation along this route. However, it is

[15] https://www.legislation.govt.nz/act/public/2003/0118/latest/DLM226236.html

expected that the overall traffic patterns would soon stabilise, as people adjust their journeys to the overall network conditions. In relation to more permanent effects associated with the improvements to the corridor, it is considered that the additional capacity (that may otherwise exacerbate downstream congestion on SH1) can be managed, such as through high occupancy lanes, including for public transport, or freight lanes. This would be further considered in the context of wider regional and national policies at the time of implementation. In particular, this could include the relationship between the managed lanes on this section of the corridor with the adjacent section of SH1. This would be further considered as part of an Implementation Business Case at a later stage, and, notwithstanding that, Waka Kotahi has statutory requirements to contribute to "*an effective, efficient, and safe (Auckland) land transport system in the public interest"*[16], which would be considered prior to implementation.

In addition, the proposed conditions for all North Projects include the requirement to prepare a Network Integration Management Plan (NIMP), to provide greater transparency and certainty that the necessary assessment to understand the implications of staging and sequencing will be undertaken prior to implementation.

7.3 Project Interdependencies

7.3.1 Ō Mahurangi (Penlink) Project

The SH1 Improvements will modify the Ō Mahurangi Penlink (Redvale) Interchange currently being constructed by the Ō Mahurangi project. In addition to the south facing ramps being constructed as part of the Ō Mahurangi project, the proposed SH1 Improvements will add north facing ramps and connect with the new Bawden Road connection to the west.

During the preparation of the design that has informed the proposed designation, Te Tupu Ngātahi has liaised with the Ō Mahurangi project team to enable a design that minimises the changes to the Ō Mahurangi Penlink (Redvale) Interchange that is currently under construction. The proposed interchange with the SH1 Improvements will therefore integrate with the Ō Mahurangi project, including providing walking and cycling connections to the shared path on the southern side of the Ō Mahurangi corridor.

7.3.2 RTC

The SH1 Improvements include extending the current motorway corridor along the eastern side of SH1, facilitating the construction of the RTC between Albany and the Dairy Flat FUZ, where the RTC enters the FUZ near Bawden Road. To enable the construction of the RTC, it would be necessary to implement the SH1 Improvements from just south of Lonely Track Road to around 0.5km south of Awanohi Road, that will include moving the motorway lanes over to the east and widening the existing SH1 designation.

Implementing the SH1 Improvements through this section enables the opportunity to provide dedicated bus lanes on SH1 for the current express bus services operating between the Hibiscus Coast bus station and Albany.

[16] https://www.legislation.govt.nz/act/public/2003/0118/latest/DLM226236.html

7.3.3 Other North Corridors

The SH1 Improvements corridor has interfaces with other transport corridors within the North Projects, specifically:

- Upgrade and Extension to Bawden Road – at the Ō Mahurangi Penlink (Redvale) Interchange (NOR 12)
- New SH1 Crossing at Dairy Stream (NOR 5)
- New Dairy Flat Highway to Wilks Road Connection – at the Wilks Road Interchange (NOR 11)
- Upgrade to East Coast Road – at the Wilks Road Interchange (NOR 13)
- Upgrade to Dairy Flat Highway – at the Silverdale Interchange (NOR 8)
- Wainui Road Upgrade – with the SH1 walking and cycling path at the Wainui Interchange (NOR 10).

The SH1 Improvements have been designed to integrate with these corridors, as well as other key local road corridors, such as Oteha Valley Road, Hibiscus Coast Highway and Grand Drive. The assessment of operational effects assumes that all these projects are in place, consistent with the overall methodology of this report. The projects as proposed can therefore be considered the long-term requirement for the corridor.

It is noted, however, that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation, the SH1 Improvements Projects should demonstrate how they will integrate with the prevailing urban form and surrounding road network.

Where necessary, overlapping designations are proposed to enable the interface between these projects (such as at intersections at the interchanges, where necessary) to be implemented regardless of the staging of the projects.

In addition to the overlapping designations and the requirements of the proposed Urban Design and Landscape Plan Condition, the following standard implementation measures will be undertaken by Waka Kotahi, in liaison with Auckland Transport, to assist in the management of any interdependencies:

- Waka Kotahi statutory requirements to contribute to "*an effective, efficient, and safe (Auckland) land transport system in the public interest*"[17]
- Implementation Business Case to confirm Project outcomes
- Roads and Streets Framework and One Network reassessment to confirm modal priority for interfacing local roads operated by Auckland Transport
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport for interfacing local roads operated by Auckland Transport
- Detailed Design commensurate with implementation works
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

In addition, the proposed conditions for all North Projects include the requirement to prepare a Network Integration Management Plan (NIMP), to provide greater transparency and certainty that the

[17] https://www.legislation.govt.nz/act/public/2003/0118/latest/DLM226236.html

necessary assessment to understand the implications of staging and sequencing will be undertaken prior to implementation.

7.4 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The SH1 Improvements will provide significant positive effects and there are generally no operational adverse effects to mitigate, given the effects on local roads and property access have been addressed through the design of the Project and hence provided for by the designation.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the corridor with the road environment and surrounding environment at the time of implementation.

There is the potential that upon completion of the corridor improvements, there could initially be upstream or downstream delays at some locations, due to the improved operation along this route. However, it is expected that the overall traffic patterns would soon stabilise, as people adjust their journeys to the overall network conditions. In relation to more permanent effects associated with the improvements to the corridor, it is considered that the additional capacity can be managed, such as through high occupancy lanes, including for public transport, or freight lanes. This would be further considered in the context of wider regional and national policies at the time of implementation. In particular, this could include the relationship between the managed lanes on this section of the corridor with the adjacent section of SH1. This would be further considered as part of an Implementation Business Case at a later stage, and, notwithstanding that, Waka Kotahi has statutory requirements to contribute to "*an effective, efficient, and safe (Auckland) land transport system in the public interest*"[18], which would be considered prior to implementation.

In addition, the proposed conditions for all North Projects include the requirement to prepare a Network Integration Management Plan (NIMP), to provide greater transparency and certainty that the necessary assessment to understand the implications of staging and sequencing will be undertaken prior to implementation.

In terms of existing properties, the overarching design philosophy for the Projects has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that detailed design and the outline plan process demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

Where property access is affected, in some cases, new access roads for properties are necessary and can be provided within the designation footprint to enable access to the public road network. Noting that, many of these properties are within the FUZ, so in any event, may be provided with access as future development in the FUZ occurs (in advance of the SH1 Improvements being in place). i.e. as the FUZ area develops, it is expected that urban local and collector roads will facilitate vehicle access to the strategic network.

The implementation of the new Wilks Road interchange will likely occur when development of stage 2 of the Silverdale West structure plan occurs, and the new east-west connection is provided between

[18] https://www.legislation.govt.nz/act/public/2003/0118/latest/DLM226236.html

Dairy Flat Highway and Wilks Road. That new connection will include a roundabout at Postman Road, which will enable people turning left out of Aeropark Drive to turnaround and travel east to the interchange or at East Coast Road. It is considered that this would address effects on access for Aeropark Drive. However, if this Postman Road roundabout is not in place, then it is recommended that alternative means of providing access for Aeropark Drive will need to be provided.

8 NoR5: New SH1 crossing at Dairy Stream

This section assesses specific transport matters relating to NoR 5 – New SH1 crossing at Dairy Stream.

8.1 Overview and description of works

The New SH1 crossing at Huruhuru (Dairy Stream) is a proposed connection in the North transport network. The proposed connection will connect Top Road with East Coast Road, providing an east-west connection across SH1 linking the future growth on either side of the motorway.

It is proposed that the new corridor will accommodate an indicative 24m urban arterial cross section with separated cycle lanes and footpaths on both sides of the corridor. It includes new intersections at Top Road and East Coast Road.

The indicative proposed design includes two general vehicle lanes and new facilities for walking and cycling as shown in Figure 8-1.

Figure 8-1: New SH1 crossing at Dairy Stream Indicative Design

Key features of the proposed new corridor include the following:

- A new road corridor with a 24m two-lane cross section, including separated cycle lanes and footpaths on both sides of the corridor.
- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor and associated cut and fill activities (earthworks).
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

8.2 Assessment of Operational Transport Effects

8.2.1 Positive effects

Overall, NoR5 provides positive transport effects. This corridor provides:

- New safe and attractive walking and cycling facilities on both sides of the corridor, improving safety for active modes.
- Opportunity for all modes to cross SH1 without being required to interface with strategic access to the State Highway network via an interchange.
- Reduce VKT and vehicle related emissions.
- Reduced severance for all transport modes, enabling improved east – west connectivity.

The positive effects of this corridor are also discussed in Section 5.1 at a network level.

8.2.2 General Traffic

The theoretical capacity of a single lane with uninterrupted flow conditions is generally within the range of 1,500 to 2,400 vehicles per hour, noting these can be lower when considered at a corridor level due to various control features in the corridor (such as intersections, crossings etc). The peak period is generally accepted as 10% of the daily flow (vehicles per day (vpd)) of a corridor. The Transport Design Manual also provides indicative lane capacity for vehicles at 1,800 vehicles per hour. These considerations have been taken into account in the assessment provided below.

As identified above, the 2048 ADT (Average Daily Traffic) for the corridor is 1,400 vehicles per day (two-way). Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 140 vehicles. A two-lane corridor can efficiently accommodate 1,400 vehicles and therefore the proposed corridor design meets the forecast needs.

Intersection Performance

The performance of the road network with the Project has been assessed using inputs from EMME to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 8-1. It should be noted that due to the macro level of EMME, turning counts are only available for key intersections on the North network. Subsequently, these intersections have been modelled in Sidra. For this corridor this is presented below.

Table 8-1: New SH1 Crossing at Dairy Stream Intersection Performances

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
New SH1 Crossing at Dairy Stream/ East Coast Road – Single-Lane Roundabout	AM	A	0.29	16
	PM	A	0.43	28

Overall, the proposed intersection is predicted to perform at an excellent level during the peak periods under a 2048+ scenario.

8.2.3 Property Access

The new connection is expected to be a controlled access corridor in the future. As the area develops, it is expected that future vehicle access to the network will be facilitated by collector road networks within the urbanised area adjacent to the road. Walking and cycling access will be provided to the corridor where practicable.

The collector network is expected to be indicatively identified by the Auckland Council during subsequent structure planning processes and these will then likely be refined and confirmed by developers as they progress these connections through plan changes or resource consents. These will be assessed by standard planning and approval processes through Council.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that future detailed design and the outline plan process demonstrates how safe access will be provided, unless otherwise agreed with the affected landowner.

There are no specific properties that have been included within the designation for this purpose and all existing driveways are expected to be able to be reinstated.

8.2.4 Freight

The new crossing is not expected to be a key strategic freight route in the future. However, the new corridor will facilitate access to the future urban land use adjacent to the corridor.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi, Auckland Transport and relevant stakeholder groups in alignment with the implementation of individual corridor upgrades and further land use certainty in the future.

8.2.5 Wider Network Effects

The new crossing at Huruhuru (Dairy Stream) provides a key link for all modes to access the planned growth on either side of SH1 without the need to travel through the adjacent motorway interchanges.

In terms of walking and cycling the Project provides improved network options for active modes, through the provision of dedicated facilities. The facilities along this corridor will allow access between the urban growth on either side of SH1. It also will provide a connection that is uninterrupted by State Highway interchange movements, making this a safer connection point for active modes.

In addition, the corridor will connect with adjacent active mode facilities along East Coast Road and Bawden Road. In combination, these connections will provide a complete, legible active mode network within Dairy Flat. This will allow improved accessibility for those travelling by active modes to local amenities and employment opportunities. Therefore, the development of this new connection will have an overall positive network effect on walking and cycling.

For freight, general traffic and PT, the location of the corridor has a positive network effect by facilitating access to the land use adjacent to the new crossing. However, there are no specific measures within this upgrade that provides additional priority for these modes.

8.2.6 Project Interdependencies

The New SH1 crossing at Huruhuru (Dairy Stream) has been designed to integrate with several other key projects within the North transport network. The assessment of operational effects assumes that these projects are in place. The Project as proposed therefore can be considered the long-term requirement for the corridor.

It is noted however that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

The key projects that integrate with the new crossing include the upgrades to Bawden Road (NOR 12) and East Coast Road (NOR 13). In particular the connection at Top Road will need to be considered within the context of the surrounding road network. The connection is unlikely to be implemented prior to certainty of the surrounding road network and the collector network.

In order to address this uncertainty, an Urban Design and Landscape Plan Condition is proposed to ensure that consideration is given to the prevailing environment at the time of implementation. In addition to this, the following standard implementation measures will be undertaken by Auckland Transport to assist in the management of any interdependencies:

- Roads and Streets Framework and One Network reassessment to confirm modal priority.
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport.
- Detailed Design commensurate with implementation works.
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

8.3 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the Project provides positive transport effects, in particular with improvements to walking and cycling facilities and the ability to cross SH1, and improvements to the wider network.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the crossing with the road environment and surrounding environment at the time of implementation.

9 NoR6: New Connection between Milldale and Grand Drive

This section assesses specific transport matters relating to NoR 6 – New Connection between Milldale and Grand Drive.

9.1 Overview and description of works

The New Connection between Milldale and Grand Drive is a new arterial corridor in the North transport network. The proposed corridor will connect Wainui Road with Grand Drive. It is proposed that the new corridor will accommodate an indicative 24m urban arterial cross section with separated cycle lanes and footpaths on both sides of the corridor. It includes upgrades to the existing intersection at Wainui Road. The proposed alignment of the corridor will be through currently undeveloped greenfields within the growth area of Wainui.

The indicative proposed design includes two general vehicle lanes and new facilities for walking and cycling as shown in Figure 9-1.

Figure 9-1: New Connection between Milldale and Grand Dive Indicative Design

Key features of the proposed new corridor include the following:

- A new road corridor with a 24m two-lane cross section, including separated cycle lanes and footpaths on both sides of the corridor.
- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

9.2 Assessment of Operational Transport Effects

9.2.1 Positive effects

Overall, NoR6 provides positive transport effects. This corridor provides:

- New safe and attractive walking and cycling facilities on both sides of the corridor, improving safety for active modes.
- Reduce VKT and vehicle related emissions.
- Sufficient vehicle capacity to efficiently accommodate private vehicles, freight and public transport.

The positive effects of this corridor are also discussed in Section 5.1 at a network level.

9.2.2 General Traffic

The theoretical capacity of a single lane with uninterrupted flow conditions is generally within the range of 1,500 to 2,400 vehicles per hour, noting these can be lower when considered at a corridor level due to various control features in the corridor (such as intersections, crossings etc). The peak period is generally accepted as 10% of the daily flow (vehicles per day (vpd)) of a corridor. The Transport Design Manual also provides indicative lane capacity for vehicles at 1,800 vehicles per hour. These considerations have been taken into account in the assessment provided below.

As identified above, the 2048 ADT for the corridor is 13,200 vehicles per day (two-way). Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 1,320 vehicles. A two-lane corridor can efficiently accommodate 13,200 vehicles and therefore the proposed corridor design meets the forecasted needs.

Intersection Performance

The performance of the road network with the Project has been assessed using inputs from EMME to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 9-1. It should be noted that due to the macro level of EMME, turning counts are only available for key intersections on the North network. Subsequently, these intersections have been modelled in Sidra. For this corridor this is presented below.

Table 9-1: New Connection between Milldale and Grand Drive Intersection Performances

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
New Connection between Milldale and Grand Drive / Wainui Road – Single-lane roundabout	AM	A	0.48	30
	PM	A	0.58	42

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
New Connection between Milldale and Grand Drive– Single lane roundabout	AM	B	0.90	127
	PM	B	0.72	54

Overall, the proposed intersections are predicted to perform at an excellent level during the peak periods under a 2048+ scenario.

9.2.3 Property Access

The new connection is expected to be a controlled access corridor in the future. It should be noted that the Ministry of Education (MOE) is proposing a large school adjacent to this new connection. The development is expected to cater for early childhood, primary and secondary education. As the area develops, it is expected that future vehicle access to the network will be facilitated by collector road networks within the urbanised area adjacent to the road. Walking and cycling access will be provided to the corridor where practicable.

The collector network is expected to be indicatively identified by Auckland Council during subsequent structure planning processes, and these will likely be refined by developers as they progress these connections through the plan change process. These will be assessed by standard planning and approval processes through Council.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that future detailed design and the outline plan process demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

There are no specific properties that have been included within the designation for this purpose and all existing driveways are expected to be able to be reinstated.

9.2.4 Freight

Given the expected residential growth adjacent to the corridor, the New Connection between Milldale and Grand Drive is not expected to be a key strategic freight route in the future.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the implementation of individual corridor upgrades and further land use certainty in the future.

9.2.5 Wider Network Effects

The New connection between Milldale and Grand Drive provides a connection for all modes to access the planned growth within Wainui. In terms of walking and cycling the Project provides improved

network options for active modes, through the provision of dedicated facilities. The facilities along this corridor will allow access to the planned residential growth within Wainui.

In addition, the corridor will connect with adjacent active mode facilities along Wainui Road and across the Grand Drive Interchange. In combination, these connections will provide a complete, legible active mode network within Wainui. This will allow improved accessibility for those travelling by active modes to local amenities and employment opportunities. Therefore, the development of this new connection will have an overall positive network effect on walking and cycling.

For freight, general traffic and PT, the location of the corridor has a positive network effect by facilitating access to the land use adjacent to the corridor as well as rural settlements further west. However, there are no specific measures within this upgrade that provides additional priority for these modes.

9.2.6 Project Interdependencies

The New Connection between Milldale and Grand Drive has been designed to integrate with several other key projects within the North transport network. The assessment of operational effects assumes that these projects are in place. The Project as proposed therefore can be considered the long-term requirement for the corridor.

It is noted however that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

The key projects that integrate with this Project include the upgrade to Wainui Road (NOR 10) and the development at Ara Hills adjacent to the Grand Drive Interchange. The connection to the Grand Drive Interchange will be provided by developers currently constructing this connection. As such the designation does not extend the full distance to the interchange.

Overlapping designations are also proposed at the Wainui Road intersection with the New connection between Milldale and Grand Drive. This will enable the intersection form to be implemented regardless of the staging of the two projects.

In addition to the overlapping designation at the intersections and the requirements of the proposed Urban Design and Landscape Plan Condition, the following standard implementation measures will be undertaken by Auckland Transport to assist in the management of any interdependencies:

- Roads and Streets Framework and One Network reassessment to confirm modal priority.
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport.
- Detailed Design commensurate with implementation works.
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

9.3 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the Project provides positive transport effects, particularly in relation to improved safety and active mode improvements. There are no identified adverse operational effects.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the corridor with the road environment and surrounding environment at the time of implementation.

10 NoR7: Upgrade to Pine Valley Road

This section assessed specific transport matters relating to NoR7 – Pine Valley Road.

10.1 Overview and description of works

Pine Valley Road is an existing arterial corridor on the North transport network. The corridor forms an east-west connection for all modes between Kahikatea Flat Road and the new Argent Lane connection that runs through Milldale. Additionally, the corridor connects to the rural towns of Helensville and Kaukapakapa. It is proposed that the existing rural corridor be upgraded to accommodate an indicative 24m urban arterial cross section with separated cycle lanes and footpaths on both sides of the corridor. It includes upgrades to the intersections at Young Access and Old Pine Valley Road.

The indicative proposed design includes two general vehicle lanes and new facilities for walking and cycling as shown in Figure 10-1.

Figure 10-1: Upgrade to Pine Valley Road Indicative Design

Key features of the proposed new corridor include the following:

- A new road corridor with a 24m two-lane cross section, including separated cycle lanes and footpaths on both sides of the corridor.
- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

10.2 Assessment of Operational Transport Effects

10.2.1 Positive effects

Overall, NoR7 provides positive transport effects. This corridor provides:

- New safe and attractive walking and cycling facilities on both sides of the corridor, improving safety for active modes.
- Reduce VKT and vehicle related emissions.
- Sufficient vehicle capacity to efficiently accommodate private vehicles, freight, and public transport.

The positive effects of this corridor are also discussed in Section 5.1 at a network level.

10.2.2 General Traffic

The theoretical capacity of a single lane with uninterrupted flow conditions is generally within the range of 1,500 to 2,400 vehicles per hour, noting these can be lower when considered at a corridor level due to various control features in the corridor (such as intersections, crossings etc). The peak period is generally accepted as 10% of the daily flow (vehicles per day (vpd)) of a corridor. The Transport Design Manual also provides indicative lane capacity for vehicles at 1,800 vehicles per hour. These considerations have been taken into account in the assessment provided below.

As identified above, the 2048 ADT for the corridor is 16,800 vehicles per day (two-way). Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 1,680 vehicles. A two-lane corridor can efficiently accommodate 16,800 vehicles and therefore the proposed corridor design meets the forecasted needs.

Intersection Performance

The performance of the road network with the Project has been assessed using inputs from EMME to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 10-1. It should be noted that due to the macro level of EMME, turning counts are only available for key intersections on the North network. Subsequently, these intersections have been modelled in Sidra. For this corridor this is presented below.

Table 10-1: Upgrade to Pine Valley Road Intersection Performances

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Pine Valley Road/ Argent Lane – Dual-lane roundabout	AM	A	0.88	132
	PM	A	0.72	64

Overall, the proposed intersections are predicted to perform at an excellent level during the peak periods under a 2048+ scenario.

10.2.3 Property Access

Pine Valley Road is expected to be a conrolled access corridor in the future. As the area develops, it is expected that future vehicle access to the network will be facilitated by collector road networks within the urbanised area adjacent to the road. Walking and cycling access will be provided to the corridor where practicable.

The collector network is expected to be indicatively identified by the Auckland Council during subsequent structure planning processes, and these will likely be refined by developers as they progress these connections through the plan change process. These will be assessed by standard planning and approval processes through Council.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that AT demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

Access to properties at 223, 225 and 227 Pine Valley Road are likely to be impacted by the implementation of the proposed roundabout at Young Access. The location of the roundabout will prevent right turn movements both in and out of the existing driveways. As an alternative, vehicles wishing to turn right into the properties will need to continue west to the roundabout at Argent Lane and turn at this location. This is an additional distance of some 2km, which at 50km/hr is approximately an additional 2mins. In regard to turning right out of the properties, this can be facilitated by use of the proposed intersection at Young Access.

Overall, this expected increase in travel time is considered to minor within the context of an upgraded urban corridor. It is also noted that land adjacent to the Pine Valley Road is expected to undergo significant change and urbanisation. In the longer term this will afford the opportunity for access locations to be relocated and potentially other collector road connections as roundabouts between Young Road and Argent Lane.

10.2.4 Freight

Given the expected residential growth adjacent to the corridor, Pine Valley Road is not expected to be a key strategic freight route in the future. However, as the corridor is the main connection to rural settlements (i.e. Helensville and Kaukapakapa) further west, a small proportion of freight will continue to travel along the corridor. However, it is expected that these freight numbers do not warrant any specific freight provisions in the future.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the implementation of individual corridor upgrades and further land use certainty in the future.

10.2.5 Wider Network Effects

Pine Valley Road provides a connection for all modes to access the planned growth within Wainui. In terms of walking and cycling the project provides improved network options for active modes, through the provision of dedicated facilities. In addition, the corridor will connect with adjacent active mode facilities along Argent Lane and NOR 8 - Dairy Flat Highway. In combination, these connections will provide a complete, legible active mode network within Wainui. This will allow improved accessibility

for those travelling by active modes to local amenities and employment opportunities. Therefore, the upgrade to Pine Valley Road will have an overall positive network effect on walking and cycling.

For freight, general traffic and PT, the location of the corridor has a positive network effect by facilitating access to the land use adjacent to the corridor as well as rural settlements further west. However, there are no specific measures within this upgrade that provides additional priority for these modes.

10.2.6 Project Interdependencies

Pine Valley Road has been designed to integrate with several other key projects within the North transport network. The assessment of operational effects assumes that these projects are in place. The Project as proposed therefore can be considered the long-term requirement for the corridor.

It is noted however that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

The key projects that integrate with this project include the upgrade to Argent Lane and New Pine Valley and NOR 8 – Upgrade to Dairy Flat Highway. While the upgrade to Pine Valley Road could be implemented prior to the delivery of these adjacent upgrades with no adverse effect, the full network benefits, particularly for walking and cycling within Wainui, will not be realised until all of these projects are completed.

In addition to the overlapping designation at the intersections and the requirements of the proposed Urban Design and Landscape Plan Condition, the following standard implementation measures will be undertaken by Auckland Transport to assist in the management of any interdependencies:

- Roads and Streets Framework and One Network reassessment to confirm modal priority.
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport.
- Detailed Design commensurate with implementation works.
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

10.3 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the Project provides positive transport effects, particularly improved safety for active mode users within the provision of walking and cycling facilities. In terms of adverse operational effects, it is identified that turning movements to and from three properties will be impacted by the proposed roundabout at Young Access. Access can be maintained to these properties through rerouting on the wider road network and turning at Argent Lane.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the corridor with the road environment and surrounding environment at the time of implementation.

11 NoR8: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat

This section assesses specific transport matters relating to NoR 8 – Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat.

11.1 Overview and description of works

Dairy Flat Highway forms an important north-south connection on the North network. The corridor forms the boundary of the western portion of the FUZ and Silverdale West - Dairy Flat Industrial Area. Additionally, the connection provides a high level of resilience to the rest of the network, as it can be used as an alternative to SH1 in the case of emergency events. It is proposed that the existing rural corridor be upgraded to accommodate various urban and rural cross-sections with separated cycle lanes and footpaths, dependent on the anticipant adjacent land use.

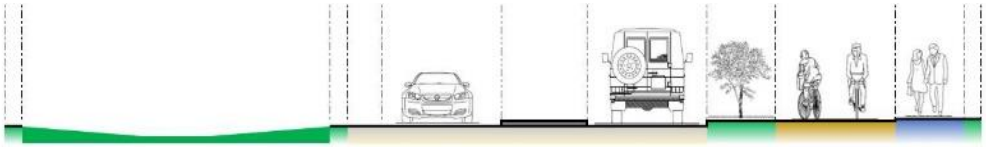
These cross sections include:

Segment 1: Upgrade to a 4-lane urban arterial between Silverdale interchange and Wilks Road

Figure 11-1: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat (Segment 1)

Segment 2: Upgrade to a 2-lane rural arterial between Wilks Road and Richards Road

Figure 11-2: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat (Segment 2)



Segment 3: Upgrade to a 2-lane urban arterial between Richards Road and Blackbridge Road

Figure 11-3: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat (Segment 3)

Segment 4: Upgrade to a 4-lane urban arterial between Blackbridge Road and Durey Road

Figure 11-4: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat (Segment 4)

Key features of the proposed new corridor include the following:

- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

11.2 Assessment of Operational Transport Effects

11.2.1 Positive Effects

Overall, NoR8 provides positive transport effects. This corridor provides:

- New safe and attractive walking and cycling facilities on both sides of the corridor, improving safety for active modes.
- Reduce VKT and vehicle related emissions.
- Sufficient vehicle capacity to efficiently accommodate private vehicles, freight, and public transport.

The positive effects of this corridor are also discussed in Section 5.1 at a network level.

11.2.2 General Traffic

The theoretical capacity of a single lane with uninterrupted flow conditions is generally within the range of 1,500 to 2,400 vehicles per hour, noting these can be lower when considered at a corridor level due to various control features in the corridor (such as intersections, crossings etc). The peak period is generally accepted as 10% of the daily flow (vehicles per day (vpd)) of a corridor. The Transport Design Manual also provides indicative lane capacity for vehicles at 1,800 vehicles per hour. These considerations have been taken into account in the assessment provided below.

The 2048 ADT for each of the segments along the corridor is as follows:

- **Segment 1**: 20,200 ADT in 2048 (two-way), it is anticipated that the vehicle volume during the peak hours will be in the order of 2,020 vehicles. A four-lane corridor can efficiently accommodate 20,200 vehicles and therefore the proposed corridor design meets the forecasted needs. Within the four-lane arrangement, two lanes will be for general traffic, with the remaining two lanes dedicated for buses.
- **Segment 2**: 15,700 ADT in 2048 (two-way), it is anticipated that the vehicle volume during the peak hours will be in the order of 1,570 vehicles. A two-lane corridor can efficiently accommodate 15,700 vehicles and therefore the proposed corridor design meets the forecasted needs.
- **Segment 3**: 15,700 ADT in 2048 (two-way), it is anticipated that the vehicle volume during the peak hours will be in the order of 1,570 vehicles. A two-lane corridor can efficiently accommodate 15,700 vehicles and therefore the proposed corridor design meets the forecasted needs.
- **Segment 4**: 24,800 ADT in 2048 (two-way), it is anticipated that the vehicle volume during the peak hours will be in the order of 2,480 vehicles. A four-lane corridor can efficiently accommodate 24,800 vehicles and therefore the proposed corridor design meets the forecasted needs. Within the four-lane arrangement, two lanes will be for general traffic, with the remaining two lanes dedicated for buses.

Intersection Performance

The performance of the road network with the Project has been assessed using inputs from EMME to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 11-1. It should be noted that due to the macro level of EMME, turning counts are only available for key intersections on the North network.

Subsequently, these intersections have been modelled in Sidra. For this corridor this is presented below.

Table 11-1: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat Intersection Performances

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Dairy Flat Highway/Pine Valley – Signalised Intersection	AM	D	0.71	134
	PM	D	0.92	223
Dairy Flat Highway/Wilks Road – Dual-lane Roundabout	AM	A	0.41	17
	PM	A	0.71	53
Dairy Flat Highway/ New Connection between Dairy Flat Highway and Wilks Road/ – Dual-lane Roundabout	AM	D	0.80	175
	PM	D	0.92	305
Dairy Flat Highway/Horseshoe Bush Road – Signalised Intersection	AM	B	0.51	117
	PM	B	0.71	179
Dairy Flat Highway/Blackbridge Road – Dual-lane Roundabout	AM	A	0.41	17
	PM	A	0.38	18
Dairy Flat Highway/ Green Road – Dual-lane Roundabout	AM	A	0.64	39
	PM	A	0.53	29
Dairy Flat Highway/Bawden Road – Dual-lane Roundabout	AM	A	0.68	51
	PM	C	1.02	415
Dairy Flat Highway/ Kennedy Road – Dual-lane Roundabout	AM	A	0.85	159
	PM	A	0.74	72
	AM	A	0.85	134

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Dairy Flat Highway/Durey Road – Single-lane Roundabout	PM	A	0.80	102

Overall, the majority of the proposed intersections are predicted to perform at a satisfactory level during the peak periods under a 2048+ scenario. The performance of the intersections at Pine Valley Road and the New Connection between Dairy Flat Highway and Wilks Road, perform at an acceptable level based on the location of each of the intersections adjacent to the potential future Pine Valley local centre and Silverdale West – Dairy Flat industrial area respectively. These locations are expected to have high traffic volumes during peak periods as people commute to and from employment. Similarly, the performance of the intersection of Dairy Flat Highway and Bawden Road is considered acceptable based on the location of the intersection adjacent to the Dairy Flat town centre. The performance of this intersection is not expected to affect the high frequency buses travelling along the corridor due to the priority provided through bus lanes if they are implemented in the future.

11.2.3 Public Transport

The indicative cross section for Dairy Flat Highway allows for a 30m cross section within Segment 1 and Segment 4. This will enable these corridors to provide bus or high occupancy vehicles with additional capacity and reliability if required in the future. Traffic volumes on these sections of Dairy Flat Highway are expected to be some 2,000 – 2,480 vehicles an hour in 2048, this is on the upper end of the theoretical capacity of a single lane. Therefore, without bus lanes, buses are likely to experience delays as they share traffic with general traffic.

In addition to this, without dedicated bus lanes, buses will need to navigate traffic and also re-enter traffic following boarding and alighting. These movements are difficult on a heavily trafficked route and will also impact on vehicle movements along the corridor.

Reliable connectivity to the future Dairy Flat town centre and the rapid transit network stations in the future provides an attractive transport choice for North commuters. Without priority measures, commuters will find limited value in travelling by public transport.

11.2.4 Property Access

Dairy Flat Highway is expected to be a controlled access corridor in the future. As the area develops, it is expected that future vehicle access to the network will be facilitated by collector road networks within the urbanised area adjacent to the road. Walking and cycling access will be provided to the corridor where practicable.

The collector network has been indicatively identified by the Auckland Council through the Silverdale West – Dairy Flat Industrial Structure Plan; however, it is expected that these will be subject to change as developers and/or Council progress these connections through the plan change process. These will be assessed by standard planning and approval processes through Council. For the areas

outside of the Structure Plan area, these collector network will be developed as part of future structure planning.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that the detailed design and outline plan process demonstrates how safe access will be provided, unless otherwise agreed with the affected landowner.

With regard to property access, one property has been identified to have access implications as a result of the bridging to facilitate a crossing of the RTC. This property at 1546 Dairy Flat Highway is discussed below under Project interdependencies.

11.2.5 Parking for Commercial Properties

At the intersection of Dairy Flat Highway and Kahikatea Flat Road there is an area of existing commercial development. These facilities currently provide road side parking on Dairy Flat Highway and Kahikatea Flat Road. While it is noted that this parking is currently partially within the road reserve, the designation does cover the entire parking area on Dairy Flat Highway and is on the property boundary on Kahikatea Flat Road.

11.2.6 Freight

It is noted that with the planned industrial land use adjacent to the corridor (Silverdale West – Dairy Flat Industrial Area), the northern portion of Dairy Flat Highway between Silverdale Interchange and Richards Road is expected to be a strategic freight route in the future. The southern portion of the corridor between Richards Road and Durey Road is not expected to carry any significant freight movements due to the location of the proposed Dairy Flat town centre. The level of freight expected along the northern portion of the corridor is unlikely to warrant any specific freight provisions in the future and heavy vehicles can be accommodated within the capacity of the corridor.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the implementation of individual corridor upgrades and further land use certainty in the future.

11.2.7 Wider Network Effects

Dairy Flat Highway provides an important north-south connection within the Northern transport network for all modes within Silverdale West, Pine Valley and Dairy Flat. In terms of walking and cycling the Project provides improved network options for active modes, through the provision of dedicated facilities. The facilities along this corridor will connect several key areas such as the industrial land use along the northern portion and Dairy Flat town centre within the southern segment. In addition, the corridor connects to strategic active mode corridors along the RTC and SH1.

In addition, the corridor will connect with several adjacent east-west arterials such as Pine Valley Road (NOR 7), Bawden Road (NOR 12) and the New connection between Dairy Flat Highway and Wilks Road (NOR 11). In combination, these connections will provide a complete, legible active mode network within the North. This will allow improved accessibility for those travelling by active modes to local amenities and employment opportunities Therefore, the upgrade to Dairy Flat Highway will have an overall positive network effect on walking and cycling.

For freight, general traffic and PT, the upgrade of the corridor has a positive network effect by facilitating access to Silverdale West, Pine Valley and Dairy Flat.

11.2.8 Project Interdependencies

The upgrade to Dairy Flat Highway has been designed to integrate with several other key projects within the North transport network. The assessment of operational effects assumes that these projects are in place. The Project as proposed therefore can be considered the long-term requirement for the corridor.

It is noted however that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation, the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

The Dairy Flat Highway upgrade connects with several adjacent east-west arterials within the North network. This includes new upgrades to Pine Valley Road (NOR 7) ,Bawden Road (NOR 12) and the portion of Dairy Flat Highway between Dairy Flat and Albany (NOR 9) as well as a new connection between Dairy Flat Highway and Wilks Road (NOR 11). This new connection is critical as it facilitates access onto SH1 via the new Wilks Road Interchange.

The upgrade to Dairy Flat Highway could be implemented prior to the delivery of the connecting corridors with no adverse effect. However the full network benefits particularly for walking and cycling within Silverdale West, Pine Valley and Dairy Flat will not be realised until all of these projects are completed. The connection points have been enabled with overlapping designations to support a range of staging outcomes.

In addition to the overlapping designation at the intersections and the requirements of the proposed Urban Design and Landscape Plan Condition, the following standard implementation measures will be undertaken by Auckland Transport to assist in the management of any interdependencies:

- Roads and Streets Framework and One Network reassessment to confirm modal priority.
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport.
- Detailed Design commensurate with implementation works.
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

11.2.8.1 Rapid Transit Corridor (NoR1)

The Rapid Transit Corridor has a key interface with the Dairy Flat Highway project and crosses under the Dairy Flat Highway in Segment 1 to the north of the Wilks Road intersection. This requires the corridor to provide a bridge over the RTC corridor. This results in the following staging implications:

- Should the upgrade of Dairy Flat Highway be implemented without provision for the RTC, access to the property at 1546 Dairy Flat Road will be maintained.
- Should a bridge be provided to future proof for the RTC, then access design will need to be considered at detailed design to confirm bridge levels.

It is noted that the property will be significantly impacted by the RTC, and should the RTC be delivered first, then all access considerations will no longer be relevant.

11.3 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the Project provides positive transport effects, particularly improved safety and active mode improvements. In terms of adverse operational effects, it is identified that one property has been identified to have access implications as a result of the bridging to facilitate a crossing of the RTC.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the corridor with the road environment and surrounding environment at the time of implementation.

12 NoR9: Upgrade to Dairy Flat Highway between Dairy Flat and Albany

This section assessed specific transport matters relating to NoR9 – Upgrade to Dairy Flat Highway between Dairy Flat and Albany.

12.1 Overview and description of works

Dairy Flat Highway is an existing arterial corridor on the North transport network. The upgrade looks to improve safety and provide walking and cycling facilities. The corridor will provide an important north south connection for active modes traveling between future centres (less than 5km). It is proposed that the existing rural corridor be upgraded to accommodate an indicative 19.1m (for constrained sections) and 25m (for unconstrained sections) rural two lane arterial. It includes upgrades to the intersections at Durey Road, Potter Road, Foley Quarry Road, Coatesville-Riverhead Highway, Albany Heights Road and Hobson Road.

The indicative proposed design includes two general vehicle lanes and new facilities for walking and cycling as shown in Figure 12-1 and Figure 12-2.

Figure 12-1: Upgrade to Dairy Flat Highway between Dairy Flat and Albany Indicative Design (19.1m constrained cross section)

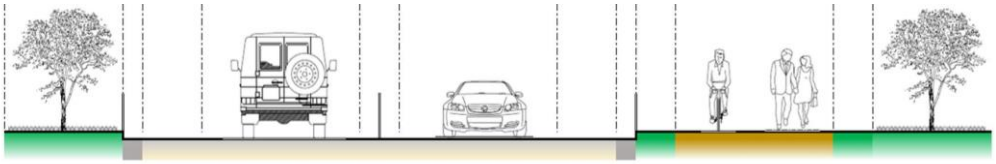
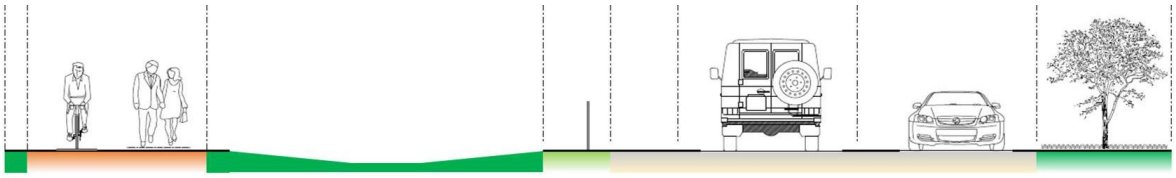


Figure 12-2: Upgrade to Dairy Flat Highway between Dairy Flat and Albany Indicative Design (25m unconstrained cross section)



Key features of the proposed new corridor include the following:

- Wire Rope central and side barriers
- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

12.2 Assessment of Operational Transport Effects

12.2.1 Positive Effects

Overall, NoR9 provides positive transport effects. This corridor provides:

- New safe and attractive walking and cycling facilities on one side of the corridor, improving safety for active modes.
- Reduce VKT and vehicle related emissions.
- Sufficient vehicle capacity to efficiently accommodate private vehicles, freight, and public transport.
- Safety improvements including the provision of a wire rope median and side medians to reduce crash risks.

The positive effects of this corridor are also discussed in Section 5.1 at a network level.

12.2.2 General Traffic

The theoretical capacity of a single lane with uninterrupted flow conditions is generally within the range of 1,500 to 2,400 vehicles per hour, noting these can be lower when considered at a corridor level due to various control features in the corridor (such as intersections, crossings etc). The peak period is generally accepted as 10% of the daily flow (vehicles per day (vpd)) of a corridor. The Transport Design Manual also provides indicative lane capacity for vehicles at 1,800 vehicles per hour. These considerations have been taken into account in the assessment provided below.

As identified above, the 2048 ADT for the corridor is 18,500 vehicles per day (two-way). Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 1,850 vehicles. A two-lane corridor can efficiently accommodate 18,500 vehicles and therefore the proposed corridor design meets the forecast needs. In the case of this corridor, while this at the higher end of the capacity provisions there is expected to be low friction levels due to the central wire rope median, increasing throughput of the corridor.

Intersection Performance

The performance of the road network with the Project has been assessed using inputs from EMME to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 12-1.

Table 12-1: Upgrade to Dairy Flat Highway between Dairy Flat and Albany Intersection Performances

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Dairy Flat Highway/Potter Road – Single-lane Roundabout	AM	A	0.25	11
	PM	A	0.25	13
	AM	B	0.95	224

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Dairy Flat Highway/Coatesville-Riverhead Highway – Single-lane Roundabout	PM	B	0.81	93
Dairy Flat Highway/Albany Heights Road – Single-lane Roundabout	AM	A	0.68	63
	PM	A	0.79	102
Dairy Flat Highway/Hobson Road – Single-lane Roundabout	AM	A	0.70	75
	PM	A	0.66	50

Overall, the proposed intersections are predicted to perform at an excellent level during the peak periods under a 2048+ scenario.

12.2.3 Safety

The proposed cross section of NoR9 includes the indicative provision of a wire rope median and side barriers. This cross section is reflective of the rural nature and higher speed environment likely to remain on Dairy Flat Highway. The existing safety record on this section of road has resulted in the corridor being identified as second ranked safety deficiency within Auckland Transport Future Connect[19].

Research indicates that the provision of wire medians and associated barriers can lead to a 30% reduction in injury crashes[20]. This is due to reduced uncontrolled turning movements, reduced ability to cross the centre line and to run off the road. Given this, significant safety improvements on this section of Dairy Flat Highway can be expected.

12.2.4 Property Access

Dairy Flat Highway is expected to be a controlled access corridor in the future. The area adjacent to the majority of this corridor is expected to have limited change, with a rural zoning. To the west of the corridor between Durey Road and Potter Road this area is future urban and is expected to be urbanised.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that detailed design and the outline plan process demonstrates how safe access will be provided, unless otherwise agreed with the affected landowner.

[19] https://at.govt.nz/about-us/transport-plans-strategies/future-connect-auckland-transports-network-plan/
[20] High Risk Rural Road Guide, Waka Kotahi, September 2011

Given the significant typographical challenges of the corridor there are a number of driveways that will need to be relocated or potentially consolidated to provide safe access. These include:

- 430,438,442,444,448 and 452 Dairy Flat Highway

The design for these accessways will be considered prior to implementation and as part of the detailed design processes. This will also be managed via the Urban Design and Landscape Management Plan.

As shown above, the proposed cross section for this corridor results in right turn movements being restricted to and from properties along the corridor due to the central wire-rope barrier. To maintain access to properties on Dairy Flat Highway, movements will need to be facilitated via the proposed roundabout intersections at Durey Road, Potter Road, Albany Heights Road, Coatesville Riverhead Highway (existing), and The Avenue (outside of Supporting Growth scope). Given the frequency these roundabouts are located along the corridor, this means that these movements can be made quite easily and readily for residents entering/leaving their properties. Accordingly, the effect on overall travel times for these residents is minimal.

12.2.5 Freight

Given the adjacent rural land use, the corridor is not expected to be a key strategic freight route in the future. The majority of freight from the Silverdale West- Dairy Flat Industrial area will use SH1 to travel south from Dairy Flat. Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the implementation of individual corridor upgrades and further land use certainty in the future.

12.2.6 Wider Network Effects

Th upgrade to this part of Dairy Flat Highway will provide a connection for all modes to access the planned growth within Dairy Flat. In terms of walking and cycling the Project provides improved network options for active modes, through the provision of dedicated facilities. In addition, the corridor will connect with adjacent active mode facilities along the northern portion of Dairy Flat Highway and through Te Wharau (Albany village). In combination, these connections will provide a complete, legible active mode network between Dairy Flat and Albany. This will allow improved accessibility for those travelling by active modes to local amenities and employment opportunities. Therefore, the upgrade to Dairy Flat Highway will have an overall positive network effect on walking and cycling.

For freight, general traffic and PT, the location of the corridor has a positive network effect by facilitating access to the land use adjacent to the corridor. However, there are no specific measures within this upgrade that provide additional priority for these modes.

12.2.7 Project Interdependencies

The upgrade to Dairy Flat Highway has been designed to integrate with several other key projects within the North transport network. The assessment of operational effects assumes that these projects are in place. The Project as proposed therefore can be considered the long-term requirement for the corridor.

It is noted however that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of

implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

The key project that this project integrates with is the upgrade to Dairy Flat Highway between Silverdale Interchange and Dairy Flat (NOR 8). This forms a continuous active mode connection between Dairy Flat and Albany. While the upgrade to this portion of Dairy Flat Highway could be implemented prior to the northern portion of the corridor with no adverse effect, the full network benefits particularly for walking and cycling within Dairy Flat will not be realised until all of these projects are completed.

In addition to the requirements of the proposed Urban Design and Landscape Plan Condition, the following standard implementation measures will be undertaken by Auckland Transport to assist in the management of any interdependencies:

- Roads and Streets Framework and One Network reassessment to confirm modal priority.
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport.
- Detailed Design commensurate with implementation works.
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

12.2.8 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the Project provides positive transport effects, particularly improved safety and active mode improvements. In terms of adverse operational effects, six properties have been identified to have access implications as a result of the Project. These driveways will need to be relocated to potentially consolidated to provide safe access.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the corridor with the road environment and surrounding environment at the time of implementation.

The Project results in right turn movements being restricted to and from properties along the corridor. To maintain access to properties on Dairy Flat Highway, movements will need to be facilitated via the proposed roundabout intersections at Durey Road, Potter Road, Albany Heights Road, Coatesville Riverhead Highway (existing), and The Avenue (outside of Supporting Growth scope).

13 NoR10: Upgrade to Wainui Road

This section assessed specific transport matters relating to NoR10 – Wainui Road.

13.1 Overview and description of works

Wainui Road is an existing arterial corridor on the North transport network. The corridor forms an important east-west connection for all modes on the edge of the proposed Milldale town centre. Additionally, the corridor connects to SH1 and the growth area of Millwater. It is proposed that the existing rural corridor be upgraded to accommodate an indicative 24m urban arterial cross section with separated cycle lanes and footpaths on both sides of the corridor. It includes upgrades to the intersections at Lysnar Road, Upper Ōrewa Road and Kowhai Road.

The indicative proposed design includes two general vehicle lanes and new facilities for walking and cycling as shown in Figure 13-1.

Figure 13-1: Upgrade to Wainui Road Indicative Design

Key features of the proposed new corridor include the following:

- A new road corridor with a 24m two-lane cross section, including separated cycle lanes and footpaths on both sides of the corridor.
- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

13.2 Assessment of Operational Transport Effects

13.2.1 Positive Effects

Overall, NoR10 provides positive transport effects. This corridor provides:

- New safe and attractive walking and cycling facilities on both sides of the corridor, improving safety for active modes.
- Reduce VKT and vehicle related emissions.
- Sufficient vehicle capacity to efficiently accommodate private vehicles, freight, and public transport.

The positive effects of this corridor are also discussed in Section 5.1 at a network level.

13.2.2 General Traffic

The theoretical capacity of a single lane with uninterrupted flow conditions is generally within the range of 1,500 to 2,400 vehicles per hour, noting these can be lower when considered at a corridor level due to various control features in the corridor (such as intersections, crossings etc). The peak period is generally accepted as 10% of the daily flow (vehicles per day (vpd)) of a corridor. The Transport Design Manual also provides indicative lane capacity for vehicles at 1,800 vehicles per hour. These considerations have been taken into account in the assessment provided below.

As identified above, the 2048 ADT for the corridor is 13,800 vehicles per day (two-way). Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 1,380 vehicles. A two-lane corridor can efficiently accommodate 13,800 vehicles and therefore the proposed corridor design meets the forecast needs.

Intersection Performance

The performance of the road network with the Project has been assessed using inputs from EMME to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 13-1. It should be noted that due to the macro level of EMME, turning counts are only available for key intersections on the North network. Subsequently, these intersections have been modelled in Sidra. For this corridor this is presented below.

Table 13-1: Upgrade to Wainui Road Intersection Performances

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Wainui Road/ New connection between Milldale and Grand Drive – Single-lane Roundabout	AM	A	0.48	30
	PM	A	0.58	42

Overall, the proposed intersection is predicted to perform at an excellent level during the peak periods under a 2048+ scenario.

13.2.3 Property Access

Wainui Road is expected to be a controlled access corridor in the future. As the area develops, it is expected that future vehicle access to the network will be facilitated by collector road networks within the urbanised area adjacent to the road. Walking and cycling access will be provided to the corridor where practicable.

The majority of the collector network has been indicatively identified by the Wainui Precinct Plan; however it is expected that these will be subject to change as developers progress these connections through the plan change process. These will be assessed by standard planning and approval processes through Council.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that detailed design and outline plan process demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

There are no specific properties that have been included within the designation for this purpose and all existing driveways are expected to be able to be reinstated.

13.2.4 Freight

Given the expected residential growth adjacent to the corridor, Wainui Road is not expected to be a key strategic freight route in the future.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the implementation of individual corridor upgrades and further land use certainty in the future.

13.2.5 Wider Network Effects

Wainui Road provides a connection for all modes to access the planned growth within Wainui. In terms of walking and cycling the Project provides improved network options for active modes, through the provision of dedicated facilities. In addition, the corridor will connect with adjacent active mode facilities along Argent Lane and the New Connection between Milldale and Grand Drive as well as the developer led upgrade of Wainui Road west of Lysnar Road. In combination, these connections will provide a complete, legible active mode network within Wainui. This will allow improved accessibility for those travelling by active modes to local amenities and employment opportunities. Therefore, the upgrade to Wainui Road will have an overall positive network effect on walking and cycling.

For freight, general traffic and PT, the location of the corridor has a positive network effect by facilitating access to the land use adjacent to the corridor. However, there are no specific measures within this upgrade that provides additional priority for these modes.

13.2.6 Project Interdependencies

Wainui Road has been designed to integrate with several other key projects within the North transport network. The assessment of operational effects assumes that these projects are in place. The Project as proposed therefore can be considered the long-term requirement for the corridor.

It is noted however that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

The key projects that integrate with this Project include the upgrade to Argent Lane (which is already designated by AT) and the New Connection between Milldale and Grand Drive (NOR 6). Additionally, the project integrates with the SH1 improvements, specifically the upgraded active mode crossing at Wainui Interchange (NOR 4). While the upgrade to Wainui Road could be implemented prior to the delivery of the new connection with no adverse effect, the full network benefits particularly for walking and cycling within Wainui will not be realised until all of these projects are completed (including the developer led upgrade west of Lysnar Road).

Overlapping designations at key intersections will be provided to provide flexible staging for implementation. In addition to the requirements of the Urban Design and Landscape Condition, the following standard implementation measures will be undertaken by Auckland Transport to assist in the management of any interdependencies:

- Roads and Streets Framework and One Network reassessment to confirm modal priority.
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport.
- Detailed Design commensurate with implementation works.
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

13.3 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the Project provides positive transport effects, particular improved safety and active mode improvements. There are no identified adverse operational effects.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the corridor with the road environment and surrounding environment at the time of implementation.

14 NoR11: New connection between Dairy Flat Highway and Wilks Road

This section assesses specific transport matters relating to NoR 11 – New connection between Dairy Flat Highway and Wilks Road

14.1 Overview and description of works

The New connection between Dairy Flat Highway and Wilks Road is a new arterial corridor on the North transport network. The corridor provides an east-west connection through the centre of the Silverdale West - Dairy Flat Industrial Area and forms an important link between the future Industrial Area and SH1.

It is proposed that the new corridor will accommodate an indicative 24m urban arterial cross section between Dairy Flat Highway and Postman Road and a 30m urban arterial cross section between Postman Road and the new Wilks Road Interchange. Both cross sections include separated cycle lanes and footpaths on both sides of the corridor. The development of the new connection will include new intersections at Dairy Flat Highway and Postman Road as well as the new Wilks Road Interchange.

The indicative design for the new connection is shown below in Figure 14-1 and Figure 14-2.

Figure 14-1: New Connection between Dairy Flat Highway and Wilks Road Indicative Design between Dairy Flat Highway and Postman Road

Figure 14-2: New Connection between Dairy Flat Highway and Wilks Road Indicative Design between Dairy Flat Highway and Postman Road

Key features of the proposed new corridor include the following:

- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

14.2 Assessment of Operational Transport Effects

14.2.1 Positive Effects

Overall, NoR11 provides positive transport effects. This corridor provides:

- New safe and attractive walking and cycling facilities on both sides of the corridor, improving safety for active modes.
- Reduce VKT and vehicle related emissions.
- Sufficient vehicle capacity to efficiently accommodate private vehicles, freight, and public transport.

The positive effects of this corridor are also discussed in Section 5.1 at a network level.

14.2.2 General Traffic

The theoretical capacity of a single lane with uninterrupted flow conditions is generally within the range of 1,500 to 2,400 vehicles per hour, noting these can be lower when considered at a corridor level due to various control features in the corridor (such as intersections, crossings etc). The peak period is generally accepted as 10% of the daily flow (vehicles per day (vpd)) of a corridor. The Transport Design Manual also provides indicative lane capacity for vehicles at 1,800 vehicles per hour. These considerations have been taken into account in the assessment provided below.

The 2048 ADT for each of the segments along the corridor is as follows:

- **Segment 1**: 16,000 ADT in 2048 (two-way), it is anticipated that the vehicle volume during the peak hours will be in the order of 1,600 vehicles. A two-lane corridor can efficiently accommodate 15,400 vehicles and therefore the proposed corridor design meets the forecasted needs.
- **Segment 2**: 30,400 ADT in 2048 (two-way), it is anticipated that the vehicle volume during the peak hours will be in the order of 3,040 vehicles. This is slightly above the theoretical capacity of a single lane, however, the exact lane allocation for private vehicles, freight and buses will be confirmed at time of implementation.

Intersection Performance

The performance of the road network with the Project has been assessed using inputs from EMME to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 14-1. It should be noted that due to the macro level of EMME, turning counts are only available for key intersections on the North network. Subsequently, these intersections have been modelled in Sidra. For this corridor this is presented below.

Table 14-1: New Connection between Dairy Flat Highway and Wilks Road Intersection Performances

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
New Connection between Dairy Flat Highway and Wilks Road/ Dairy Flat Highway – Dual-lane Roundabout	AM	D	0.80	175
	PM	D	0.92	305
New Connection between Dairy Flat Highway and Wilks Road/ Postman Road – Dual-lane Roundabout	AM	A	0.54	34
	PM	A	0.62	46

Overall, the proposed intersections are predicted to perform at a satisfactory level during the peak periods under a 2048+ scenario. The performance of the intersection at Wilks Road is acceptable as the intersection includes Dairy Flat Highway, which is expected to be a highly trafficked corridor on the North network due to its function as the main north-south arterial spine within Dairy Flat.

14.2.3 Property Access

The new connection is expected to be a controlled access corridor in the future. As the area develops, it is expected that future vehicle access to the network will be facilitated by collector road networks within the urbanised area adjacent to the road. Walking and cycling access will be provided to the corridor where practicable.

The collector network has been indicatively identified by the Silverdale West – Dairy Flat Industrial area; however it is expected that these will be subject to change as developers progress these connections through the plan change process. These will be assessed by standard planning and approval processes through Council.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that detailed design and the outline plan process demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

With regard to property access, one property has been identified to have access implications as a result of the bridging to facilitate a crossing of the RTC. This property at 98A Wilks Road is discussed below under Project interdependencies.

14.2.4 Freight

It is noted that with the planned industrial land use adjacent to the corridor, the new connection is expected to be a strategic freight route in the future. Given that the traffic volumes along the corridor will increase significantly between Postman Road and the Wilks Road Interchange, there is potential for specific freight provisions (i.e. freight lanes) to be implemented to allow freight to travel easily between the industrial land use and State Highway network. This section is proposed to be a four-

lane 30m urban arterial, therefore there is sufficient width to accommodate these lanes if deemed necessary during the time of implementation.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the implementation of individual corridor upgrades and further land use certainty in the future.

14.2.5 Wider Network Effects

The new connection provides a new link for all modes to access the planned growth within the Silverdale West – Dairy Flat area. In terms of walking and cycling the Project provides improved network options for active modes, through the provision of dedicated facilities. The facilities along this corridor will allow access to the employment opportunities within the industrial land use adjacent to the corridor.

In addition, the corridor will connect with adjacent active mode facilities along Dairy Flat Highway (NOR 8) and the Wilks Road Interchange (part of NOR 4). In combination, these connections will provide a complete, legible active mode network within the Silverdale West – Dairy Flat area growth area. This will allow improved accessibility for those travelling by active modes to local amenities and employment opportunities. Therefore, the development of this new connection will have an overall positive network effect on walking and cycling.

For freight, general traffic and PT, the location of the corridor has a positive network effect by facilitating access to social and employment opportunities within the Silverdale West – Dairy Flat industrial area. In addition, this new connection connects the proposed industrial area with SH1 and East Coast Road via the Wilks Road Interchange (NOR 4).

14.2.6 Project Interdependencies

The New Connection between Dairy Flat Highway and Wilks Road has been designed to integrate with several other key projects within the North transport network. The assessment of operational effects assumes that these projects are in place. The Project as proposed therefore can be considered the long-term requirement for the corridor.

It is noted however that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

The new connection is also linked to the development of the proposed Wilks Road Interchange (part of NOR 4). It is considered that the new connection can be implemented in such a way that it does not preclude the provision of an interchange in the longer term. The Wilks Road Interchange, however, will not be able to be provided until such time that the new connection is in place, to provide access to the interchange.

In addition to the requirements of the proposed Urban Design and Landscape Plan Condition, the following standard implementation measures will be undertaken by Auckland Transport to assist in the management of any interdependencies:

- Roads and Streets Framework and One Network reassessment to confirm modal priority.

- Integration with the Network Operating Plan as per standard procedures by Auckland Transport.
- Detailed Design commensurate with implementation works.
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

14.2.6.1 Rapid Transit Corridor (NoR1)

The Rapid Transit Corridor has a key interface with the New Connection between Dairy Flat Highway and Wilks Road project and crosses under this corridor to the west of Postman Road. This requires the corridor to provide a bridge over the RTC corridor. This results in the following staging implications:

- Should the provision of the New Connection between Dairy Flat and Wilks Road be implemented without provision for the RTC, access to the property at 98A Wilks Road will be maintained.
- Should a bridge be provided to future proof for the RTC, then access design will need to be considered at detailed design to confirm bridge levels and potentially relocate the access.

It is noted that this property will be significantly impacted by the RTC, and should the RTC be delivered first, then all access considerations will no longer be relevant.

14.3 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the Project provides positive transport effects, particular improved safety and active mode improvements. There are no identified adverse operational effects.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the crossing with the road environment and surrounding environment at the time of implementation.

15 NoR12: Upgrade and Extension to Bawden Road

This section assesses specific transport matters relating to NoR 12 – Upgrade and Extension to Bawden Road.

15.1 Overview and description of works

Bawden Road is an existing arterial corridor on the North transport network. The corridor provides an east-west connection between the strategic transport network and the future Dairy Flat town centre, Dairy Flat residential and a likely future Rapid Transit station. It is proposed that the existing rural corridor be upgraded and extended across to connect to the Ō Mahurangi Penlink (Redvale) Interchange to accommodate an indicative 30m urban arterial cross section with separated cycle lanes and footpaths on both sides of the corridor. It includes upgrades to the intersections at Dairy Flat Highway and Top Road.

The indicative proposed design includes four vehicle lanes and new facilities for walking and cycling as shown in Figure 15-1.

Figure 15-1: Upgrade and Extension Bawden Road Indicative Design

Key features of the proposed new corridor include the following:

- A new road corridor with a 30m four-lane cross section, including separated cycle lanes and footpaths on both sides of the corridor.
- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

15.2 Assessment of Operational Transport Effects

15.2.1 Positive Effects

Overall, NoR12 provides positive transport effects. This corridor provides:

- New safe and attractive walking and cycling facilities on both sides of the corridor, improving safety for active modes.
- Reduce VKT and vehicle related emissions.
- Sufficient vehicle capacity to efficiently accommodate private vehicles, freight, and public transport.

The positive effects of this corridor are also discussed in Section 5.1 at a network level.

15.2.2 General Traffic

The theoretical capacity of a single lane with uninterrupted flow conditions is generally within the range of 1,500 to 2,400 vehicles per hour, noting these can be lower when considered at a corridor level due to various control features in the corridor (such as intersections, crossings etc). The peak period is generally accepted as 10% of the daily flow (vehicles per day (vpd)) of a corridor. The Transport Design Manual also provides indicative lane capacity for vehicles at 1,800 vehicles per hour. These considerations have been taken into account in the assessment provided below.

As identified above, the 2048 ADT for the corridor is 23,700 vehicles per day (two-way). Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 2,370 vehicles. A four-lane corridor can efficiently accommodate 23,700 vehicles and therefore the proposed corridor design meets the forecasted needs. Within the four-lane arrangement, two lanes will be for general traffic, with the remaining two lanes dedicated for buses.

Intersection Performance

The performance of the road network with the Project has been assessed using inputs from EMME to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 15-1. It should be noted that due to the macro level of EMME, turning counts are only available for key intersections on the North network. Subsequently, these intersections have been modelled in Sidra. For this corridor this is presented below.

Table 15-1: Upgrade and Extension to Bawden Road Intersection Performances

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Bawden Road/ Dairy Flat Highway – Dual-lane Roundabout	AM	A	0.68	51
	PM	C	1.02	415

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Bawden Road/Top Road– Dual-lane Roundabout	AM	A	0.35	18
	PM	A	0.44	25

Overall, the proposed intersections are predicted to perform at a satisfactory level during the peak periods under a 2048+ scenario.

15.2.3 Public Transport

The indicative cross section for Bawden Road allows for a 30m cross section. This will enable this corridor to provide bus or high occupancy vehicles with additional capacity and reliability if required in the future. Traffic volumes on these sections of Bawden Road are expected to be some 2,370 vehicles an hour. This is on the upper end of the theoretical capacity of a single lane. Therefore, without bus lanes, buses are likely to experience delays as they share traffic with general traffic.

In addition to this, without dedicated bus lanes, buses will need to navigate traffic and also re-enter traffic following boarding and alighting. These movements are difficult on a heavily trafficked route and will also impact on vehicle movements along the corridor.

Reliable connectivity to the future Dairy Flat centre and the rapid transit network stations in the future provides an attractive transport choice for North commuters. Without priority measures, commuters will find limited value in travelling by public transport.

15.2.4 Property Access

Bawden Road is expected to be a controlled access corridor in the future. As the area develops, it is expected that future vehicle access to the network will be facilitated by collector road networks within the urbanised area adjacent to the road. Walking and cycling access will be provided to the corridor where practicable.

The collector network is expected to be indicatively identified by the Auckland Council; however it is expected that these networks will be subject to change and refinement as developers progress these connections through the plan change process. These will then be assessed by standard planning and approval processes through Council.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that the detailed design and outline plan process demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

There are no specific properties that have been included within the designation for this purpose and all existing driveways are expected to be able to be reinstated.

15.2.5 Freight

Given the expected residential growth and likely future Dairy Flat town centre adjacent to the corridor, Bawden Road is not expected to be a key strategic freight route in the future.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the implementation of individual corridor upgrades and further land use certainty in the future.

15.2.6 Wider Network Effects

Bawden Road provides a connection for all modes to access the planned growth within Dairy Flat. In terms of walking and cycling the Project provides improved network options for active modes, through the provision of dedicated facilities. In addition, the corridor will connect with adjacent active mode facilities along Dairy Flat Highway and with wider strategic active mode connections such as the Huruhuru (Dairy Stream), SH1 and Rapid Transit connections.

In combination, these connections will provide a complete, legible active mode network within Dairy Flat. This will allow improved accessibility for those travelling by active modes to local amenities and employment opportunities. Therefore, the upgrade to Bawden Road will have an overall positive network effect on walking and cycling.

For general traffic and PT, the location of the corridor has a positive network effect by facilitating access to the land use adjacent to the corridor as well as the strategic motorway network via the Ō Mahurangi Penlink (Redvale) Interchange located at the eastern end of Bawden Road. However, there are no specific measures within this upgrade that provides additional priority for these modes.

15.2.7 Project Interdependencies

Bawden Road has been designed to integrate with several other key projects within the North transport network. The assessment of operational effects assumes that these projects are in place. The Project as proposed therefore can be considered the long-term requirement for the corridor.

It is noted however that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

The key projects that integrate with this project include the upgrade to Dairy Flat Highway (NOR 8), a new connection across SH1 (NOR 5) and several active mode connections such as the Dairy Stream active mode connection (part of North network but not being route protected), SH1 improvements (NOR 4) and Rapid Transit (NOR 1) connections. The upgrade to Bawden Road could be implemented prior to the delivery of the upgrade and new connections with no adverse effect. However, the full network benefits particularly for walking and cycling within Dairy Flat will not be realised until all of these projects are completed. To manage these effect overlapping designations are proposed for these key intersections.

The Bawden Road upgrade is also linked to the development of the proposed Ō Mahurangi Penlink (Redvale) Interchange (part of NOR 4). It is considered that the Bawden Road upgrade can be implemented in such a way that does not preclude the provision of an interchange in the longer term. The Ō Mahurangi Penlink (Redvale) Interchange, however, will not be able to be provided until such

time that the Bawden Road upgrade is in place, to provide sufficient access and traffic capacity to the interchange.

In addition to the overlapping designation at the intersections and the requirements of the proposed Urban Design and Landscape Plan Condition, the following standard implementation measures will be undertaken by Auckland Transport to assist in the management of any interdependencies:

- Roads and Streets Framework and One Network reassessment to confirm modal priority.
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport.
- Detailed Design commensurate with implementation works.
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

15.3 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the Project provides positive transport effects, particular improved safety and active mode improvements. The provision of a 30m corridor enables priority measures to be implemented for buses in the future, connecting to the future town centre at Dairy Flat if required. There are no identified adverse operational effects.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the corridor with the road environment and surrounding environment at the time of implementation.

16 NoR13: Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange

This section assesses specific transport matters relating to NoR 13 – Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange.

16.1 Overview and description of works

East Coast Road is an existing arterial corridor on the North transport network. The corridor is an important north-south connection for all modes between the growth areas of Silverdale and Redvale. In addition, the corridor provides an alternative connection between these two growth areas without the need to travel via SH1.

It is proposed that the new corridor will accommodate an indicative 24m urban arterial cross section (with separated cycle lanes and footpaths on both sides of the corridor) and a 29m rural arterial cross section (with cycle lanes and footpaths on one side of the corridor). The upgrade to East Coast Road includes upgraded intersections at Hibiscus Coast Highway, Forge Road, Newman Road, Spur Road, Wilks Road, Jackson Way, Worsnop Way and Ō Mahurangi Penlink.

The indicative design for the upgrade is shown in the below in Figure 16-1, Figure 16-2 and Figure 16-3.

Figure 16-1: Upgrade to East Road between Hibiscus Coast Highway and Newman Road

Figure 16-2: Upgrade to East Coast Road between Newman Road and Jackson Way

Figure 16-3: Upgrade to East Coast Road between Jackson Way and Ō Mahurangi Penlink Interchange

Key features of the proposed new corridor include the following:

- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

16.2 Assessment of Operational Transport Effects

16.2.1 Positive Effects

Overall, NoR13 provides positive transport effects. This corridor provides:

- New safe and attractive walking and cycling facilities on one side of the corridor, improving safety for active modes within the rural section.
- New safe and attractive walking and cycling facilities on both sides of the corridor in the urbans section, improving safety for active modes.
- Reduce VKT and vehicle related emissions.
- Sufficient vehicle capacity to efficiently accommodate private vehicles, freight, and public transport.

The positive effects of this corridor are also discussed in Section 5.1 at a network level.

16.2.2 General Traffic

The theoretical capacity of a single lane with uninterrupted flow conditions is generally within the range of 1,500 to 2,400 vehicles per hour, noting these can be lower when considered at a corridor level due to various control features in the corridor (such as intersections, crossings etc). The peak period is generally accepted as 10% of the daily flow (vehicles per day (vpd)) of a corridor. The Transport Design Manual also provides indicative lane capacity for vehicles at 1,800 vehicles per hour. These considerations have been taken into account in the assessment provided below.

The 2048 ADT for each of the segments along the corridor is as follows:

- **Segment 1**: 14,400 ADT in 2048 (two-way), it is anticipated that the vehicle volume during the peak hours will be in the order of 1,440 vehicles. A two-lane corridor can efficiently

accommodate 14,400 vehicles and therefore the proposed corridor design meets the forecasted needs.

- **Segment 2**: 15,500 ADT in 2048 (two-way), it is anticipated that the vehicle volume during the peak hours will be in the order of 1,550 vehicles. A two-lane corridor can efficiently accommodate 15,500 vehicles and therefore the proposed corridor design meets the forecasted needs.
- **Segment 3**: 9,000 ADT in 2048 (two-way), it is anticipated that the vehicle volume during the peak hours will be in the order of 900 vehicles. A two-lane corridor can efficiently accommodate 9,000 vehicles and therefore the proposed corridor design meets the forecasted needs.

Intersection Performance

The performance of the road network with the Project has been assessed using inputs from EMME to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Figure 16-1. It should be noted that due to the macro level of EMME, turning counts are only available for key intersections on the North network. Subsequently, these intersections have been modelled in Sidra. For this corridor this is presented below.

Table 16-1: Upgrade to East Coast Road Intersection Performances

Intersection (Intersection Control)	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
East Coast Road/ Forge Road – Signalised Intersection	AM	D	0.73	112
	PM	D	0.92	177
East Coast Road/ Spur Road – Single-lane Roundabout	AM	A	0.42	28
	PM	A	0.66	68
East Coast Road/ Wilks Road – Dual-lane Roundabout	AM	A	0.32	14
	PM	A	0.60	38
East Coast Road/ Ō Mahurangi Penlink – Single-lane Roundabout	AM	A	0.72	70
	PM	A	0.64	49

Overall, the proposed intersections are predicted to perform at a satisfactory level during the peak periods under a 2048+ scenario. The performance of the intersection at Forge Road performs at an acceptable level based on the location of each of the intersection which is adjacent to several local businesses and industrial lots. These locations are expected to have high traffic volumes during peak periods as people commute to and from employment.

16.2.3 Property Access

East Coast Road is expected to be a controlled access corridor in the future. As the area develops, it is expected that future vehicle access to the network will be facilitated by collector road networks within the urbanised area adjacent to the road. Walking and cycling access will be provided to the corridor where practicable.

The collector network is expected to be indicatively identified by the Auckland Council through structure planning; and it is expected that these will be subject to change and refinement as developers progress these connections through plan change process. These will be assessed by standard planning and approval processes through Council.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land for access purposes other than where necessary to re-instate driveways. It is recommended that at the later implementation stage, that detailed design and the outline plan process demonstrate how safe access will be provided, unless otherwise agreed with the affected landowner.

There are no specific properties that have been included within the designation for this purpose and all existing driveways are expected to be able to be reinstated.

16.2.4 Freight

Given the predominately rural land use adjacent to the corridor, East Coast Road is not expected to be a key strategic freight route in the future. There may be a small proportion of freight that travels to the pockets of future urban land use along the corridor, however, the level of freight expected along the corridor is unlikely to warrant any specific freight provisions in the future.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the implementation of individual corridor upgrades and further land use certainty in the future.

16.2.5 Wider Network Effects

East Coast Road provides a connection for all modes to access the planned growth within Silverdale and Redvale. In terms of walking and cycling the project provides improved network options for active modes, through the provision of dedicated facilities. In addition, the corridor will connect with adjacent active mode facilities along Hibiscus Coast Highway and with east-west active mode connections through the interchanges at Wilks Road and Redvale.

In combination, these connections will provide a complete, legible active mode network within Silverdale and Redvale. This will allow improved accessibility for those travelling by active modes to local amenities and employment opportunities. Therefore, the upgrade to East Coast Road will have an overall positive network effect on walking and cycling.

For freight, general traffic and PT, the location of the corridor has a positive network effect by facilitating access to the land use adjacent to the corridor as well as the strategic motorway network via the Ō Mahurangi Penlink (Redvale) Interchange located at the southern end of East Coast Road. However, there are no specific measures within this upgrade that provides additional priority for these modes.

16.2.6 Project Interdependencies

East Coast Road has been designed to integrate with several other key projects within the North transport network. The assessment of operational effects assumes that these projects are in place. The Project as proposed therefore can be considered the long-term requirement for the corridor.

It is noted however that in the interim, the rate and sequencing of land use growth, wider growth pressures and timing of individual projects will change and evolve. As such, at the time of implementation the Project should demonstrate how it will integrate with the prevailing urban form and surrounding road network.

The key projects that integrate with this project include the upgrades to Hibiscus Coast Highway (part of the North network but not proposed for route protection) and the new motorway interchanges at Wilks Road and Ō Mahurangi Penlink (Redvale) (part of NOR 4); and the new connection across SH1 (NOR 5). The upgrade to East Coast Road could be implemented prior to the delivery of the upgrade and new connections with no adverse effect. However the full network benefits particularly for walking and cycling within Dairy Flat will not be realised until all of these projects are completed.

In addition to the requirements of the proposed Urban Design and Landscape Plan Condition, the following standard implementation measures will be undertaken by Auckland Transport to assist in the management of any interdependencies:

- Roads and Streets Framework and One Network reassessment to confirm modal priority.
- Integration with the Network Operating Plan as per standard procedures by Auckland Transport.
- Detailed Design commensurate with implementation works.
- Road Safety Audits to ensure appropriate and safe tie ins for all modes.

16.3 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the Project provides positive transport effects, particularly improved safety and active mode improvements. There are no identified adverse operational effects. Consideration will need to be given to providing sufficient access to the cemetery adjacent to the Project.

Prior to implementation, an Urban Design and Landscape Management Plan is recommended as per the proposed conditions appended to the main AEE. This will enable further consideration of the integration of the corridor with the road environment and surrounding environment at the time of implementation.

17 APPENDICES

1 Roads and Streets Framework Assessment

The development of the corridor design has included the use of AT's Roads and Streets Framework (RASF), which qualitatively assesses the typology (movement and place value) and modal priority. The intent of that framework is to classify the expected movement and place functions from a consistent regional context and identify the likely priority applied to each mode.

The framework itself does not directly dictate a specific corridor design but provides context and guidance regarding the intended function of the corridor, that will be used to inform future development and operation of the corridor. For integrated land use and transport classification purposes, land use context uses Place Value (ranking from P1 'low' to P3 'high' importance) and for transport context uses Movement Value (ranking from M1 'low' to M3 'high' importance).

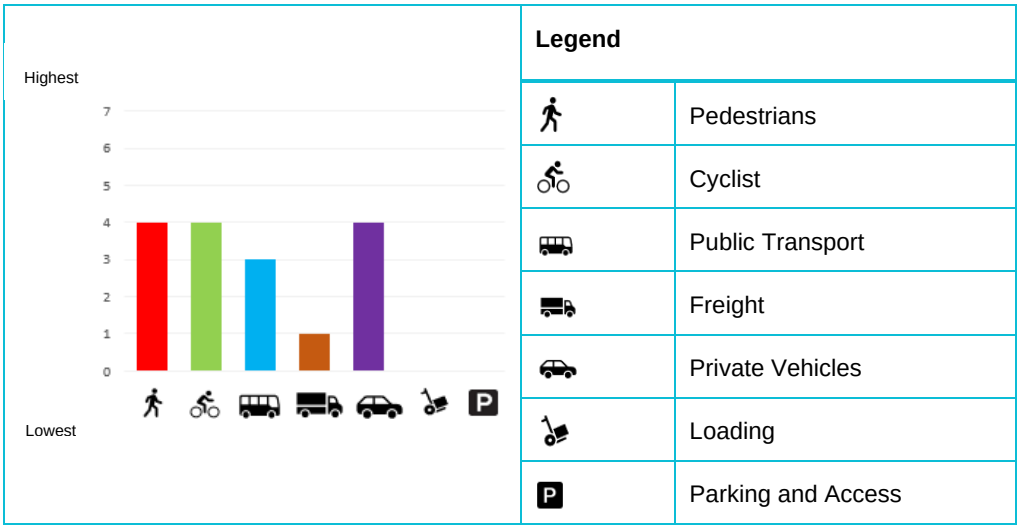
1.1 New SH1 crossing at Dairy Stream (NoR 5)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P1 (low place significance) long term
- Movement function – M2 (medium strategic network function) long term

The following Figure 17-1 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-1: New SH1 crossing at Dairy Stream Future Modal Priorities



1.2 New connection between Milldale and Grand Drive (NoR 6)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M2 (medium strategic network function) long term

The following Figure 17-2 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-2: New connection between Milldale and Grand Drive Future Modal Priorities

Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

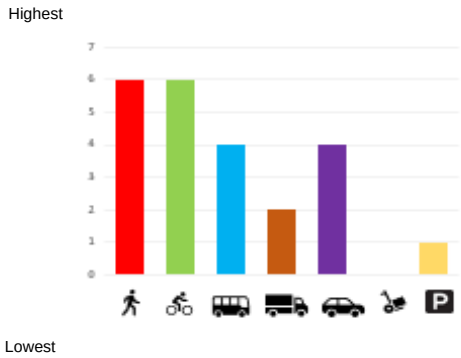
1.3 Upgrade to Pine Valley Road (NoR 7)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-3 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-3: Upgrade to Pine Valley Road Future Modal Priorities



Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

1.4 Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat (Segment 1) (NoR 8)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P1 (low place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-4 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-4: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat Future Modal Priorities

Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

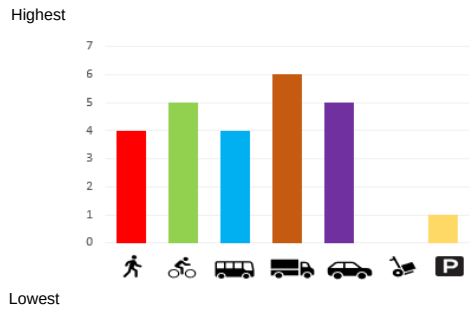
1.5 Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat (Segment 2) (NoR 8)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P1 (low place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-5 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-5: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat Future Modal Priorities



Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

1.6 Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat (Segment 3) (NoR 8)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P1 (low place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-6 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-6: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat Future Modal Priorities

Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

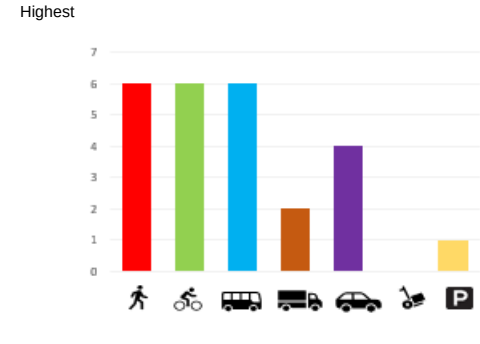
1.7 Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat (Segment 4) (NoR 8)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-7 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-7: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat Future Modal Priorities



Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

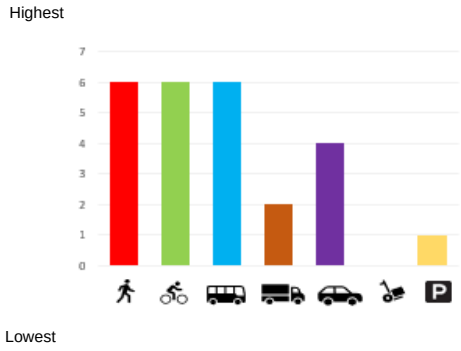
1.8 Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat (Segment 5) (NoR 8)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-8 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-8: Upgrade to Dairy Flat Highway between Silverdale and Dairy Flat Future Modal Priorities



Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

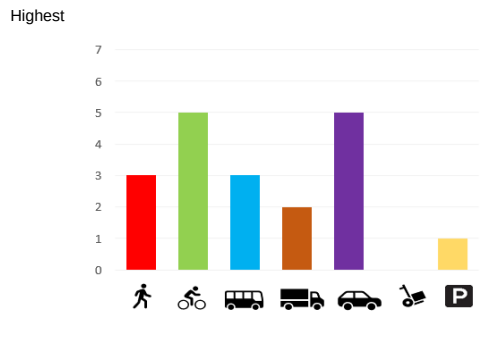
1.9 Upgrade to Dairy Flat Highway between Dairy Flat and Albany (NoR 9)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P1 (low place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-9 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-9: Upgrade to Dairy Flat Highway between Dairy Flat and Albany Future Modal Priorities



Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

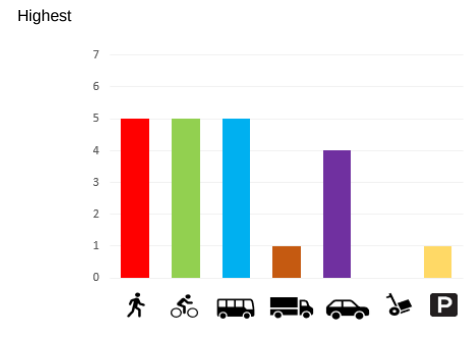
1.10 Upgrade to Wainui Road (NoR 10)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-10 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-10: Upgrade to Wainui Road Future Modal Priorities



Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

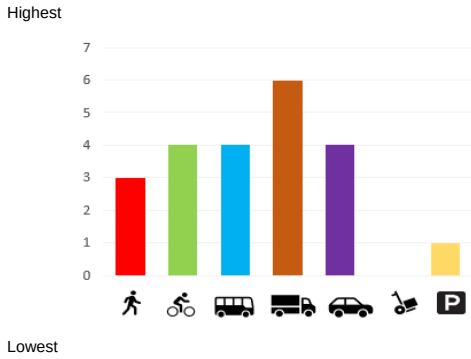
1.11 New connection between Dairy Flat Highway and Wilks Road (Segment 1) (NoR 11)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-11 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-11: New connection between Dairy Flat Highway and Wilks Road Future Modal Priorities



Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

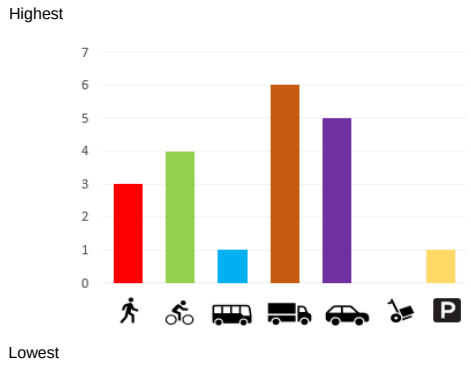
1.12 New connection between Dairy Flat Highway and Wilks Road (Segment 2) (NoR 11)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-12 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-12: New connection between Dairy Flat Highway and Wilks Road Future Modal Priorities



Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

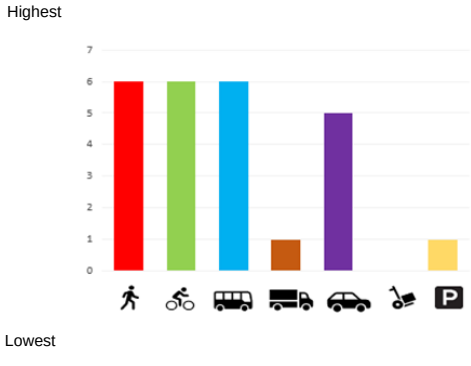
1.13 Upgrade and Extension to Bawden Road (NoR 12)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-13 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-13: Upgrade and Extension to Bawden Road Future Modal Priorities



Legend	
	Pedestrians
	Cyclist
	Public Transport
	Freight
	Private Vehicles
	Loading
P	Parking and Access

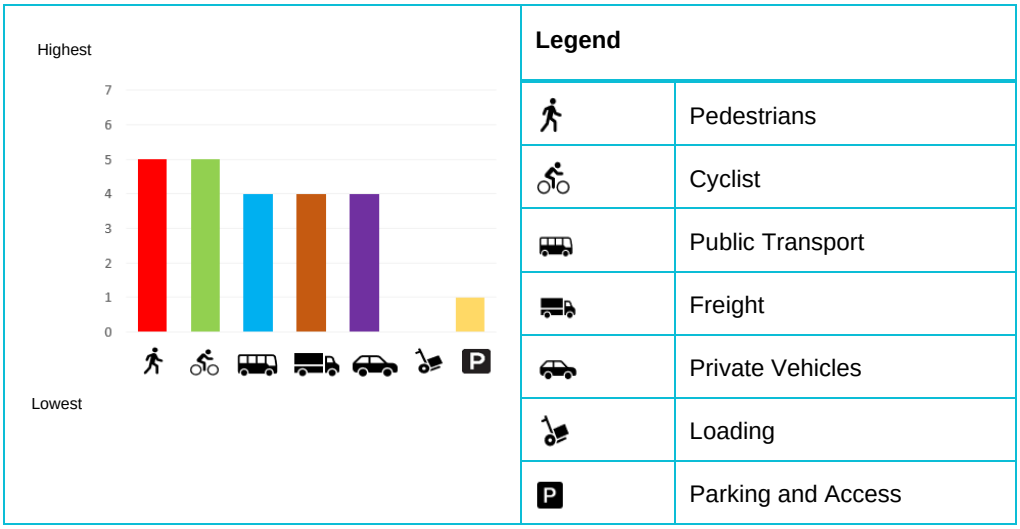
1.14 Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange (Segment 1) (NoR 13)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-14 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-14: Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange Future Modal Priorities



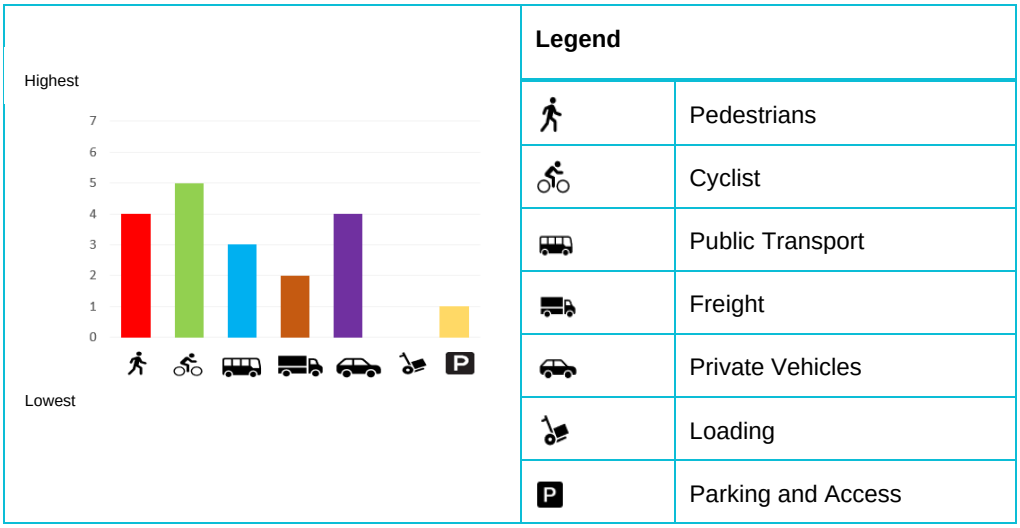
1.15 Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange (Segment 2) (NoR 13)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P1 (low place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-15 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-15: Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange Future Modal Priorities



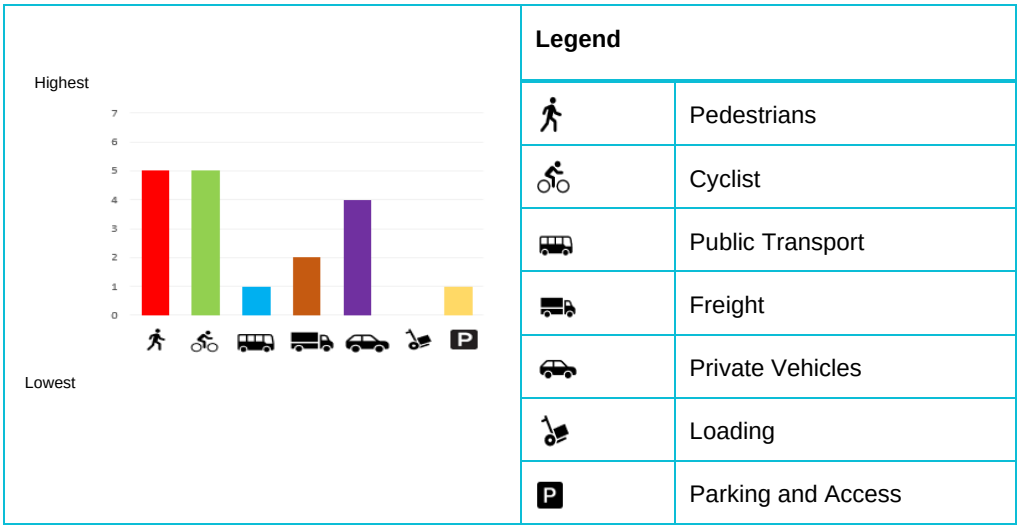
1.16 Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange (Segment 3) (NoR 13)

The corridor is assessed to have the following RASF typology in the future:

- Place function – P2 (medium place significance) long term
- Movement function – M3 (high strategic network function) long term

The following Figure 17-16 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to active modes and public transport.

Figure 17-16: Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange Future Modal Priorities



2 Existing Crash Records

The tables below provide a summary of reported crashes on the existing road network subject to the North NoRs. These results are based on a search of the Waka Kotahi Crash Analysis System (CAS) between 2018 and 2022. These results should be considered within the context of several factors including:

- The CAS results are based only on reported crashes, and does not include any crashes that are not reported to the relevant authorities
- Crashes are reflective of the existing road environment, and the relevance within the context of an urban environment with greater traffic volumes, pedestrian and cyclist volumes, and lower speeds may be limited.
- Significant changes to traffic patterns and associated crash rates may be present in 2020 and 2021 as a result of COVID-19 lockdown periods resulting in reduced travel movements.

	Vehicle Crashes per year						Mid-Block (Total over 5 years)				Intersection (Total over 5 years)				Total DSI's
	2018	2019	2020	2021	2022	Total	F	S	M	N	F	S	M	N	
Bawden Road	0	2	0	4	1	**7**	0	1	1	3	0	0	1	2	**1**
Pine Valley Road	1	2	2	1	0	1	0	0	3	2	0	0	1	0	**0**
Wainui Road	4	6	4	1	2	**17**	0	3	3	8	0	0	2	1	**3**

Dairy Flat Highway between Silverdale and Dairy Flat	16	3	8	6	5	**38**	0	2	13	17	0	5	11	15	**7**
Dairy Flat Highway between Dairy Flat and Albany	29	19	17	12	8	**85**	2	2	13	18	0	1	15	34	**5**
East Coast Road	9	9	9	4	5	**36**	0	0	5	14	0	2	11	4	**2**
Silverdale Interchange	6	3	3	1	3	**16**	0	0	0	0	0	0	2	14	**0**
SH1 (Grand Drive Interchange to Albany)	38	31	17	19	21	**126**	0	2	30	80	1	1	3	9	**2**
SH1 (Grand Drive	38	31	17	19	21	**126**	0	2	30	80	1	1	3	9	**2**

Interchange to Albany)															

	Vulnerable Road User Crashes per year						Pedestrian (Total over 5 years)				Cyclist (Total over 5 years)				Motorcyclist (Total over 5 years)				Total DSI's
	2018	2019	2020	2021	2022	Total	F	S	M	N	F	S	M	N	F	S	M	N	0
Bawden Road	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pine Valley Road	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Wainui Road	0	0	0	0	0	**0**	0	0	0	0	0	0	0	0	0	0	0	0	**3**
Dairy Flat Highway between Silverdale and Dairy Flat	0	0	1	0	0	**1**	0	0	0	0	0	0	0	0	0	3	1	0	**2**
Dairy Flat Highway between Dairy Flat and Albany	4	0	4	1	1	**10**	0	0	0	0	1	0	1	0	1	0	2	5	**0**
East Coast Road	0	2	0	0	1	**3**	0	0	0	0	0	0	0	0	0	1	1	1	**1**

	Vulnerable Road User Crashes per year						Pedestrian (Total over 5 years)				Cyclist (Total over 5 years)				Motorcyclist (Total over 5 years)				Total DSI's
Silverdale Interchange	1	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	1	**0**
SH1 (Grand Drive Interchange to Albany)	0	0	1	2	1	**4**	0	0	0	0	0	0	0	0	0	0	4	0	**0**
SH1 (Grand Drive Interchange to Albany)	0	0	1	2	1	**4**	0	0	0	0	0	0	0	0	0	0	4	0	**0**

3 Specific Transport Modelling Background

The Macro Strategic Model (MSM) is a region-wide model which analyses the forecast land use and informs trip generation, trip distribution and mode choice at regional level. The MSM model responds to the network assumptions, forecasted land use and regional economic policy inputs to predict regional traffic patterns and PT patronages. The outputs from the MSM model are used as:

- Demand inputs for the traffic simulation model SATURN, which analyses them at a mesoscopic level
- PT Patronage inputs for the MPT model, which analyses these at a strategic level
- Active mode inputs for the SAMM model, which analyses these at a mesoscopic level

The MSM is a four-step multi-modal model. This model was originally developed based on extensive data collected in 2006. Using observed data, and a full model validation exercise it was recently updated to reflect 2016 inputs and data. The MSM produces demands for five periods of the day, and separate assignment models exist for the morning (AM) and evening (PM) peak and weekday interpeak (IP) periods.

The model itself comprises of the following key modules:

- Trip generation: This is where the number of person-trips are estimated as a function of the land use data (population, employment, school roll etc.)
- Mode Choice: This is where the choice of recommended travel mode is determined, based on the relative costs of the various modes. The MSM modes for mode choice are car (driver and passenger combined) and passenger transport. Trips by car are converted into vehicle trips later in the model. The model also estimates the number of active mode trips, such as walking and cycling, although these are not fully modelled through to link flows.
- Trip Distribution: This is where the trips produced in each zone (generally by households), are matched to a recommended destination. This distribution is predicted as a function of the relative attractiveness for each destination zone and the travel costs to reach each destination.
- Time of Day: This is where the proportion of daily trip making occurring in each period is calculated. These proportions change in response to changes in travel costs to represent peak spreading.
- Trip Assignment: This is where the resulting travel demand, in the form of origin to destination trip tables, are loaded to the road and public transport networks. For the road assignment, an iterative process is used to firstly identify the lowest-cost route between each origin and destination followed by an estimation of the speeds and delays on each route between origin and destination, followed by an estimation of speeds and delays on each route associated with the predicted traffic flows on the route.

3.1 General Network Assumptions

The following general network assumption have been made in the MSM model:

- All committed developments and respective infrastructure upgrades planned as outlined in the ATAP (Auckland Transport Alignment Project) 2.0 and RLTP (Regional Land Transport Plan) have been coded in the future MSM model

- The access points (MSM zone connectors) for each model option scenarios in the North Detailed business case areas were reviewed and refined accordingly to reflect the future infrastructure upgrades
- The future local bus services for each model option scenarios, were updated based on inputs from the AT Metro, specifically related to routes, frequencies, bus capacities and bus speeds.

The proposed North DBC projects and improvements have been identified in order to support growth in North and unlock the future land use. In addition to these projects, there are several key strategic projects that integrate with this network including:
The proposed North DBC projects and improvements have been identified in order to support growth in the North and unlock the future land use. In addition to these projects, there are several key strategic projects that integrate with this network including:

- Argent Lane Extension – Two lane arterial road which has been implemented in part
- Milldale / Highgate Bridge
- Ō Mahurangi Penlink

It is the combination of these projects and the proposed Te Tupu Ngātahi projects that will enable the key transport and land use integration outcomes for the community.

The inclusion of the key inter-dependent strategic projects in the Do-minimum network is to account for the fact that those projects are being developed by Waka Kotahi, so are not included as part of the Te Tupu Ngātahi improvements package.

For each of the projects in the North the following changes between the Do-minimum and recommended transport networks are noted in below.

Table 17-1: Project differences between the Do-min and Recommended Network

Project	Do minimum	Recommended network
A new Rapid Transit corridor between Albany and Milldale	No RTC corridor. Buses use SH1 and existing HBC station.	RTC provided between Albany and Milldale.
Upgrades to SH1 between Albany and Silverdale with a new interchange at Wilks Road and upgraded interchange at Ō Mahurangi Penlink (Redvale)	Ō Mahurangi Penlink assumed in place, no capacity improvements or bus priority provided on SH1.	Improved capacity and bus priority provided on SH1, three lanes on SH1 between Albany and Silverdale
Improvements to the existing Silverdale Interchange	No improvements to the existing layout at the Silverdale Interchange. No walking and cycling facilities currently.	Walking and cycling facilities provided. Change from dual-lane roundabout form to gyratory interchange layout.

Project	Do minimum	Recommended network
A new walking and cycling path along SH1 (SH1 Walking and Cycling Path)	Not included.	Provided within the Recommended Option.
A new walking and cycling path along the rapid transit corridor (RTC Walking and Cycling Path)	Not included.	Provided within the Recommended Option.
Upgrade to Wainui Road	Two-lane rural arterial, no walking and cycling facilities provided.	Two-lane urban arterial, walking and cycling facilities provided.
Upgrade to Pine Valley Road	Two-lane rural arterial, no walking and cycling facilities provided.	Two-lane urban arterial, walking and cycling facilities provided.
Upgrade to Dairy Flat Highway between Dairy Flat and Albany	Two-lane rural arterial, no walking and cycling facilities provided.	Two-lane rural arterial, walking and cycling facilities provided.
Upgrade to Dairy Flat Highway between Silverdale Interchange and Dairy Flat	Two-lane rural arterial, no walking and cycling facilities provided.	Four/Two-lane predominately urban arterial, walking and cycling facilities provided and bus priority lanes provided.
New connection between Dairy Flat Highway and Wilks Road (New Link Road)	Not Included.	Four/Two-lane urban arterial, walking and cycling facilities provided and bus priority lanes provided.
Upgrade to East Coast Road between Silverdale and Ō Mahurangi Penlink (Redvale) Interchange	Two-lane rural arterial, no walking and cycling facilities provided.	Two-lane predominately urban arterial, walking and cycling facilities provided.
Upgrade and extension to Bawden Road	Two-lane rural arterial, no walking and cycling facilities provided.	Four lane urban arterial, walking and cycling facilities with bus priority lanes provided.
New Connection between Milldale and Grand Drive	Not Included.	Two-lane urban arterial, walking and cycling facilities provided.

Project	Do minimum	Recommended network
(Upper Ōrewa Extension):		
Upgrade of Hibiscus Coast Highway and Grand Drive for public transport and active modes:	Two-lane urban arterial, limited walking and cycling facilities.	Two-lane urban arterial, walking and cycling facilities with bus priority lanes provided.
A new SH1 crossing at Dairy Steam (Dairy Stream Motorway Crossing):	Not Included.	New connection for all modes provided across SH1.
New Argent Lane and new Pine Valley Road:	Two-lane urban arterial, walking and cycling facilities provided.	Four-lane urban arterial, walking and cycling facilities with bus priority lanes provided.
Upgrade to the Wainui Interchange for Active Modes:	Not Included.	Walking and cycling connection provided.
A new active mode connection along the Dairy Stream	Not Included.	Walking and cycling connection provided.
Silverdale to Highgate active mode connection	Not Included.	Walking and cycling connection provided.

3.2 MSM Outputs

There are a number of outputs from the transport modelling, including:

- Demand patterns (Origin-Destination travel) and facility usage (flows)
- Network performance
- Travel times and costs (real and perceived) for economic analysis
- Delays, queues and Level of Service (LoS) for design and assessment
- Aggregate travel statistics on travel such as Vehicle Kilometres Travelled (VKT), Passenger Kilometres Travelled (PKT) and total travel costs
- Flow and performance for environmental analysis
- Inputs to vehicle emissions models
- Inputs to noise analysis

3.3 EMME

- This uses the traffic demands from MSM on a more detailed representation of the road network, and much disintegrated zone system
- The traffic model in Emme is developed from the MSM network by adding more details to the network from traffic perspective

3.4 SIDRA

Signalised (and unsignalised) Intersection Design and Research Aid (SIDRA) is a micro-analytical tool used for evaluating intersection performance. It has a comprehensive, lane-based network modelling approach applicable to all types on intersections-signal, priority or sign control and roundabouts. SIDRA allows the modelling of various movement classes (Light vehicle, Heavy vehicle, Buses, Bicycle, Large Trucks, Light Rail/ Trams) with distinctive vehicle features to be assigned to designated lanes, segments and signal phases.

The Te Tupu Ngātahi SIDRA model is used to analyse the form and function of proposed intersections along strategic corridors. Based on the demand flow outputs from the SATURN Model, the intersection turning flows are determined.

The performance measures of the intersection in terms of capacity, delay, Level of Service (LOS), queue length on approach lanes and optimum vehicle-pedestrian signal phasing is calculated.

It is noted that the SIDRA model is reliant on outputs from the SATURN model, with traffic distribution based on the network provided in SATURN. A finer grain network that includes all collectors and local roads is not provided in SATURN, and as such it can considered that intersection modelling in SIDRA results in a conservative assumption of performance.