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Drury Arterial Network Assessment of Transport Effects

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1.0 Table of Contents

2.0 Glossary of acronyms and defined terms x

3.0 Executive Summary 1

4.0 Introduction 8

4.1 Background 10

4.2 Drury Package 10

4.3 Wider Network 10

4.4 Purpose and Scope of this Report 12

4.5 Report Structure 12

4.6 Preparation for this Report 12

5.0 Assessment Methodology 14

5.1 Assessment Methodology for all Notices of Requirement 15

5.1.1 Approach to Assessment of Operational Transport Effects 16

5.1.2 Transport Modelling 16

5.1.3 Transport Guidance and Documents 17

5.1.4 Assessment Methodology – Transport Mode 18

5.1.5 Assessment of Project Objectives 18

5.2 Approach to Assessment of Construction Transport Effects 19

5.2.1 Construction Traffic Effects 19

5.2.2 Temporary Traffic Management 19

6.0 NoR D1: Alteration to Designation 6707 - State Highway 22 Upgrade 20

6.1.1 Project Overview 21

6.1.2 Network and Corridor Design 23

6.2 Existing and Likely Future Environment 27

6.2.1 Existing Environment 27

6.2.2 Likely Future Environment (Without Project) 31

6.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects 38

6.3.1 Assessment of Operational Effects 38

6.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects 47

6.3.3 Assessment of Transport Construction Effects 47

6.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects 52

6.4 Summary of Effects (SH22 Upgrade) 54

6.5 Conclusion (NoR D1) 55

7.0 NoR D2: Jesmond to Waihoehoe West FTN Upgrade 57

7.1 Project Description 58

7.1.1 Network and Corridor Design 60

7.1.2 Jesmond Road FTN Upgrade Section 62

7.1.3 Bremner Road FTN Upgrade section 65

7.1.4 Waihoehoe Road West FTN Upgrade section 67

7.2 Existing and Likely Future Environment 69

7.2.1 Existing Environment 69

7.2.2 Likely future environment (Without Project) 75

7.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects 81

7.3.1 Assessment of Operational Effects 81

7.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects 93

7.3.3 Assessment of Transport Construction Effects 93

7.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects – NoR D2 110

7.4 Summary of Effects (NoR D2) 111

7.5 Conclusion (NOR D2) 113

8.0 NoR D3: Waihoehoe Road East Upgrade 115

8.1 Project Description 116

8.1.1 Project Overview 116

8.1.2 Network and Corridor Design 117

8.2 Existing and Likely Future Environment 119

8.2.1 Existing Environment 119

8.2.2 Likely Future Environment (without Project) 123

8.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects 129

8.3.1 Assessment of Operational Effects 129

8.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects 135

8.3.3 Assessment of Transport Construction Effects 135

8.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects 140

8.4 Summary of Effects (NoR D3) 141

8.5 Conclusion (NoR D3) 143

9.0 NoR D4: Ōpāheke North-South FTN Arterial 144

9.1 Project Description 145

9.1.1 Project Overview 145

9.1.2 Network and Corridor Design 147

9.2 Existing and Likely Future Environment 150

9.2.1 Existing Environment 150

9.2.2 Likely Future Environment (without Project) 156

9.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects 161

9.3.1 Assessment of Operational Effects 161

9.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects 170

9.3.3 Assessment of Transport Construction Effects 170

9.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects 177

9.3.5 Summary of effects (NoR D4) 178

9.4 Conclusion (NoR D4) 179

10.0 NoR D5: Ponga and Ōpāheke Road Upgrade 181

10.1 Project Description 182

10.1.1 Network and Corridor Design 184

10.1.2 Ponga Road Upgrade Section 185

10.1.3 Ōpāheke Road Rural Upgrade section 187

10.1.4 Ōpāheke Road Urban Upgrade section 189

10.2 Existing and Likely Future Environment 191

10.2.1 Existing Environment 191

10.2.2 Likely Future Environment (without Project) 196

10.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects 202

10.3.1 Assessment of Operational Effects 202

10.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects 210

10.3.3 Assessment of Construction Effects 210

10.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects 222

10.3.5 Summary of Effects (NoR D5) 222

10.4 Conclusion (NoR D5) 224

Tables

Table 4-1 Drury Package: Notices of Requirement and Projects 8
Table 5-1: Summary of Assessment Methodology 18
Table 6-1: Transport infrastructure transition pressures triggered by growth 25
Table 6-2: Intersection Summary for SH 22 (NoR D1) 26
Table 6-3: Existing Traffic Volumes on and adjacent SH 22 29
Table 6-4: East-West Traffic Growth 33
Table 6-5: Journey Times Benefits of SH 22 Upgrade (2048+) 40
Table 6-6:Summary of intersection performance 2048+ 42
Table 6-7:Summary of Mid-Block VoC Performance 2048+ 43
Table 6-8: SH 22 upgrade AT standards and policy assessment for walking and cycling facilities 44
Table 6-9: Daily Walking and Cycling Predicted Movements (2048+) 44
Table 6-10: Expected Daily Traffic Movements from Construction Works 50
Table 6-11: Assessment of Effects Summary for NoR D1 54
Table 7-1: Intersection Summary for Jesmond Road FTN Upgrade/FTN (NoR D2) 68
Table 7-2: Existing Traffic Volumes on Jesmond Road, Bremner Road and Waihoehoe Road 73
Table 7-3: Existing and Likely Future ADT Traffic Volumes 78
Table 7-4: ADT average summary for NoR D2 84
Table 7-5: Summary of intersection performance 2048+ (with NoR D2) 85
Table 7-6: Summary of mid-block performance Existing and2048+ with NoR D2 86
Table 7-7: NoR D2 AT Standards and Assessment for Walking and Cycling Facilities 88
Table 7-8: Daily walking and cycling predicted people movements (2048+) 89
Table 7-9: Public transport flows and journey times for NoR D2 (2048+) 91
Table 7-10: Expected daily traffic movements from construction works – Jesmond Road FTN 96
Table 7-11: Expected Daily Traffic Movements from Construction Works – Bremner Road FTN 103
Table 7-12: Expected daily traffic movements from construction works – Waihoehoe Road West FTN 108
Table 7-13: Assessment of Effects Summary for NoR D2 111
Table 8-1: Existing Traffic Volumes on Waihoehoe Road East 122
Table 8-2: Existing and likely future daily traffic volumes 125
Table 8-3: Intersection summary for Waihoehoe Road East upgrade (NoR D3) 131
Table 8-4: Summary of intersection performance 2048+ (with Drury) 131
Table 8-5:Summary of mid-block performance 2048+ 132
Table 8-6: Waihoehoe Road East AT standards and policy assessment for walking and cycling facilities 133
Table 8-7: Daily walking and cycling predicted movements (2048+) 133
Table 8-8: Expected daily traffic movements from construction works – Waihoehoe Road East 139
Table 8-9: Assessment of Effects Summary for NoR D3 141
Table 9-1: Intersection summary for the Ōpāheke North-South FTN Arterial (NoR D4) 149
Table 9-2: Existing Traffic Volumes 153
Table 9-3: North-South Average Daily Traffic 158
Table 9-4: Summary of intersection performance 2048+ (with Drury Package) 164
Table 9-5: Summary of Mid-Block Performance 2048+ 164
Table 9-6: Ōpāheke North-South FTN Arterial AT standards and policy assessment for walking and cycling facilities 166
Table 9-7: Daily walking and cycling predicted movements (2048+) 167
Table 9-8: Public Transport flows and Journey Times 169
Table 9-9: Expected daily traffic movements from construction works – Ōpāheke North-South FTN Arterial 175
Table 9-10: Assessment of Effects Summary for NoR D4 178
Table 10-1: Existing traffic volumes 195
Table 10-2: Existing and Likely Future Daily Traffic Volumes 199
Table 10-3: ADT average summary for Ponga Road and Ōpāheke Road 204

Table 10-4: Intersection summary for the Ōpāheke North-South FTN Arterial (NoR D4) 204
Table 10-5: Summary of intersection performance 2048+ (with Project) 205
Table 10-6:Summary of mid-block performance 2048+ 205
Table 10-7: NoR D5 AT standards and Policy assessment for walking and cycling facilities 206
Table 10-8: Daily walking and cycling predicted movements (2048+) 207
Table 10-9: Expected daily traffic movements from construction works – Ponga Road 214
Table 10-10: Expected daily traffic movements from construction works – Ōpāheke Road[39] 220
Table 10-11: Assessment of Effects Summary for NoR D5 223
Table 10-12: Modelling assumptions 226
Table 10-13: Interdependencies with Te Tupu Ngātahi Projects 227
Table 10-14: Interdependencies with other Transport Projects 230
Table 10-15: Crash History Summary (2010 - 2019) 232
Table 10-16: Crash History on SH22- NoRD1 233
Table 10-17: Crashes History on Jesmond Road- NoRD2 233
Table 10-18: Crash History on Bremner Road- NoRD2 234
Table 10-19: Crash History on Waihoehoe Road West- NoRD2 234
Table 10-20: Crash History on Waihoehoe Road East- NoRD3 234
Table 10-21: Crash History on Sutton Road- NoRD4 235
Table 10-22: Crash History on Ponga Road- NoRD5 235
Table 10-23: Crash History on Ōpāheke Road- NoRD5 235

Figures

Figure 4-1 Drury Package Projects and Notices of Requirement 9
Figure 4-2: South Auckland Indicative Strategic Transport Network 11
Figure 6-1 Overview of SH 22 Upgrade 22
Figure 6-2: Indicative future corridor design 23
Figure 6-3: Existing modal priority for SH 22 24
Figure 6-4: Future modal priority in 2048+ for SH 22 Upgrade 24
Figure 6-5: State Highway 22 typical cross section (indicative) 26
Figure 6-6: Current land use environment on SH 22Existing Transport Network 27
Figure 6-7 : Location of crashes along SH 22 28
Figure 6-8: Future transport and land use adjacent to SH 22 31
Figure 6-9: Future Walking and Cycling Movements on SH 22 34
Figure 6-10: Future Public Transport Network (2048+) 36
Figure 6-11: SH 22 Future Network Connections 39
Figure 6-12: SH 22 Daily Traffic Flow Forecast (With and Without Pukekohe Expressway) 40
Figure 6-13: 2038 Traffic rerouting with and without SH22 upgrade 41
Figure 6-14: 2038 Rerouting Effect Without Pukekohe Expressway 42
Figure 6-15: Construction Zones – State Highway 22 upgrade 47
Figure 6-16: Potential construction routes for SH 22 upgrade project 49
Figure 6-17: Current speed limits on SH 22 51
Figure 7-1 Overview of NoR D2 59
Figure 7-2: Jesmond to Waihoehoe West FTN Upgrade (NoR D2) future corridor design 60
Figure 7-3: Assessment of Topology for the proposed section 61
Figure 7-4: NoR D2 Typical Cross Section (indicative) 62
Figure 7-5 Overview of Jesmond Road FTN Upgrade Section 64
Figure 7-6 Overview of Bremner Road FTN Upgrade Section 66
Figure 7-7 Overview of Waihoehoe Road West FTN Upgrade Section 67
Figure 7-8: Current land use surrounding Jesmond Road, Bremner Road and Waihoehoe Road West 69
Figure 7-9: Location of crashes along Jesmond Road 71
Figure 7-10: Location of Crashes along Bremner Road 72

Figure 7-11: Location of Crashes along Waihoehoe Road West 72
Figure 7-12: Future Transport and Land Use 76
Figure 7-13: Future walking and cycling network (2048+) 79
Figure 7-14: Future Public Transport Network (2048+) 80
Figure 7-15: NoR D2 Future Network Connections, IBC recommended network 83
Figure 7-16: 2048+ Daily Rerouting Effect of NoR D2 84
Figure 7-17: Future public transport network (2048+) 90
Figure 7-18: Construction zone – Jesmond Road FTN Upgrade 93
Figure 7-19: Potential construction routes for Jesmond Road FTN Upgrade project 95
Figure 7-20: Construction zones - Bremner Road FTN Upgrade 98
Figure 7-21: Potential detour route for SH1 closure 100
Figure 7-22: Potential Construction Routes for Bremner FTN Upgrade project 102
Figure 7-23: Extent of works - Waihoehoe Road West FTN Upgrade 105
Figure 7-24: Potential construction routes for Waihoehoe Road West 107
Figure 8-1 Overview of Waihoehoe Road East Upgrade 116
Figure 8-2: Indicative future corridor design - Waihoehoe Road East 117
Figure 8-3: Future modal priority in 2048+ for Waihoehoe Road East 118
Figure 8-4: Waihoehoe East Typical Cross Section (indicative) 119
Figure 8-5: Current land uses surrounding Waihoehoe Road East 120
Figure 8-6: Location of Crashes along Waihoehoe Road East 121
Figure 8-7: Future Transport and Land Use adjacent to NoR D3 124
Figure 8-8: Future walking and cycling movements on Waihoehoe Road East 126
Figure 8-9: Future public transport network (2048+) 128
Figure 8-10: Future Network Connections 130
Figure 8-11 : Extent of works - Waihoehoe Road East Upgrade 136
Figure 8-12: Potential construction routes for Waihoehoe Road East Upgrade project 138
Figure 9-1 Overview of Ōpāheke N-S FTN Arterial Upgrade 146
Figure 9-2: Ōpāheke North-South FTN arterial (NoR D4) future corridor design 147
Figure 9-3: Future modal priority in 2048+ for Ōpāheke North-South FTN Arterial 148
Figure 9-4: Ōpāheke North-South typical cross section (indicative) 149
Figure 9-5: Current land use environment 151
Figure 9-6: Location of crashes along Sutton Road and intersections 152
Figure 9-7: North-South connectivity for walking and cycling 155
Figure 9-8: Future transport and Land Use adjacent to NoR D4 156
Figure 9-9: Future Walking and Cycling Movements on North South arterial 159
Figure 9-10: Ōpāheke North-South FTN Arterial and future network connections 162
Figure 9-11: 2048+ daily rerouting effect of NoR D4 163
Figure 9-12: Future public transport network (2048+) 168
Figure 9-13: Construction zones – Ōpāheke N-S FTN Arterial 171
Figure 9-14: Potential construction routes for Ōpāheke N-S FTN Arterial project 174
Figure 10-1 Overview of NoR D5 183
Figure 10-2: Indicative Future Corridor Design – Ōpāheke Road and Ponga Road 184
Figure 10-3: Future Modal Priority in 2048+ for Ponga Road and Ōpāheke Road 185
Figure 10-4 Overview of Ponga Road Upgrade Section 186
Figure 10-5: Ponga Road typical cross section (indicative) 187
Figure 10-6 Overview of Ōpāheke Road Rural Upgrade Section 188
Figure 10-7: Ōpāheke Road (Rural) typical cross section (indicative) 189
Figure 10-8 Overview of Ōpāheke Road Urban Section 190
Figure 10-9: Ōpāheke Road (Urban Section) typical cross section (indicative) 191
Figure 10-10: Current land uses environment surrounding Ponga Road and Ōpāheke Road 192
Figure 10-11: Location of Crashes along Ponga Road 193
Figure 10-12: Location of Crashes along Ōpāheke Road 194
Figure 10-13: Future transport and Land Use adjacent to Ponga Road and Ōpāheke Road 197
Figure 10-14: Proposed transport network surrounding Ponga Road and Ōpāheke Road 200
Figure 10-15: Future public transport network surrounding Ponga Road and Ōpāheke Road 201

Figure 10-16: Future network connections 203
Figure 10-17. New link between Walker Road and Ōpāheke Road (Aerial imagery source: Auckland Council GeoMaps) 209
Figure 10-18: Extent of works - Ponga Road upgrade 211
Figure 10-19: Potential construction routes for Ponga Road upgrade project 213
Figure 10-20: Extent of works - Ōpāheke Road Upgrade (rural and urban) 216
Figure 10-21: Potential construction routes for Ōpāheke Road Rural and Urban upgrade 219

Appendices

Appendix 1. Modelling assumptions

Appendix 2. Interdependencies with other projects

Appendix 3. CAS Data

Appendix 4. Existing Road Traffic Network

Appendix 5. Existing Intersections

2.0 Glossary of acronyms and defined terms

Table 1: Glossary of technical terms / acronyms

Acronym	Term
AADT	Average Annual Daily Traffic
AEE	Assessment of Effects on the Environment
ASM	Auckland System Management
AT	Auckland Transport
AUPOIP	Auckland Unitary Plan Operative in Part
CoPTTM	Code of Practice for Temporary Traffic Management
DSI	Deaths and Serious Injuries
FTN	Frequent Transit Network
FUZ	Future Urban Zone
NIMT	North Island Main Trunk
NoR	Notice of Requirement (under the Resource Management Act 1991)
NZUP	New Zealand Upgrade Programme
ONRC	One Network Road Classification
RCAs	Road Controlling Authorities
SH1	State Highway 1
SH 22	State Highway 22
Waka Kotahi	Waka Kotahi NZ Transport Agency
ADT	Average Daily Traffic
HCV	Heavy Commercial Vehicle
VoC	Volume over Capacity Ratio
CAS	Crash Analysis System

Table 2: Glossary of defined terms

Term	Meaning
Auckland Council	Means the unitary authority in the Auckland Region.
Drury Package	Five Notices of Requirement for the Drury Arterial Network for Auckland Transport and Waka Kotahi NZ Transport Agency.

3.0 Executive Summary

The Drury Arterial Network (Drury Package) consists of several new or upgraded strategic transport corridors identified as part of the Supporting Growth Programme to enable the planned growth future communities in the southern growth area of Drury/Ōpāheke. These upgraded and new corridors are grouped into five projects, and a Notice of Requirement (NoR) is being lodged for each project to protect for the future construction and operation of those corridors.

This assessment report considers the operational and construction transport effects arising from each of the five Projects that comprise the Drury Package to support the Assessment of Environmental Effects (AEE).

For the purposes of this assessment, the proposed projects in the Drury Package are assessed against a future scenario which includes the planned urban development (as contemplated by the Auckland Unitary Plan and the wider Drury, Ōpāheke and Paerata Structure Plans) without the Drury Package.

This assessment considers the planned place function and its associated movement effects on key elements of the transport system, including safety, walking and cycling, public transport, freight and property access. It includes an assessment against network planning and design guidance. However, an assessment against objectives and policies of the AUPOIP (or other statutory documents) is addressed in the AEE for the Drury Package rather than via this report.

This assessment is targeted at informing a decision to proceed with Route Protection. This means the assessment does not assess the interim staging of individual projects and development staged over the next three decades but instead place a greater focus on the 'full build out' of the future urban area in 2048+ to support future communities. Therefore, this assessment focusses on the likely future environment (full build out 2048+) and wider infrastructure upgrades. To ascertain the long-term effects of the projects, this assessment assesses the transport effects arising from each of the five Projects that comprise the Drury Package in a future context.

Results of assessment and recommended measures

The existing strategic transport corridors (SH 1, SH22 and Great South Road) servicing the Drury-Ōpāheke area are operating near or at capacity, with limited opportunity to accommodate growth. The local transport network in and surrounding Drury reflects a rural environment with poor east-west and north-south connectivity and substandard facilities for an urban context. The current facilities consist of high-speed rural roads, with direct property access and non-existent or poor public transport, walking and cycling facilities.

The wider Drury, Ōpāheke, Pukekohe and Paerata areas in the south of Auckland have been signalled to undergo significant urban growth in the Auckland Unitary Plan (AUPOIP[1]) and Auckland Council have approved the Structure Plan in 2019 and recently received private plan changes to zone these areas. The Drury – Ōpāheke structure plan area over 30 years is estimated to provide about 22,000 houses and about 12,000 jobs with a population growth of about 60,000. This scale of growth will place significant stress on the existing substandard rural transport environment.

[1] The current zones and rules for properties are set out in the Auckland Unitary Plan Operative in part (AUPOIP).

The likely future transport environment (without the Projects) is not fit for purpose to support the planned future urban growth, with unattractive and unsafe travel by walking and cycling, inefficient and unreliable public transport services and unreliable and unsafe travel by private car. There are wider adverse effects that will flow from poor transport systems if future growth progresses and existing infrastructure remains the same.

The Drury Package was developed as part of strategic network planning for the wider area and concurrently with the structure planning undertaken by Auckland Council to deliver the desired place and movement outcomes for existing and future communities. Those wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the problems.

The assessment of operational effects (post-construction) overall concludes that the Drury Package has significant positive effects. The Drury Package provides a safe and reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and improve access to employment and social amenities.

The summary below provide an overview of the operational effects for each NoR within the Drury Package, detailing how the effects of the Projects translate to each element of the transport system.

NoR	***Safety***	***General Traffic***	***Walking***	***Cycling***	***Public Transport***	***Freight***	***Access***
D1	√√√*	√√√*	√√√	√√√	√√	√√*	√√
D2	√√√	√	√√√	√√√	√√√	√√√	√√
D3	√√√	√	√√√	√√√	√	√	√√
D4	√√√	√√√	√√√	√√√	√√√	√√√	√
D5	√√√	√	√√√	√√√	√	√	√√

minor positive effect (√) moderate positive effect (√√) significant positive effect (√√√) regional effect (*)

The individual project summaries below provide an overview of the operational and potential construction effects for each NoR within the Drury Package separately.

NoR D1: Alteration to Designation 6707 - State Highway 22 Upgrade

The existing SH 22 (without the Project) is not fit for purpose to support the planned future urban growth. The crash history shows that there was a total of 78 crashes recorded in the 10-year period between 2010 to 2019. These included two fatal crashes which involved pedestrians, and 11 serious injury crashes which were due to vehicles turning/crossing, being rear ended or losing control/involved in a head on collision.

The existing daily flow already exceeds LoS E (22,000 vpd), and the growth of east-west traffic is in the area is expected to grow from 24,400vpd to 65,300vpd (2048+). Also, there are currently no dedicated pedestrian or cycle facilities on SH 22, and the road shoulder does not provide any protection for vulnerable users for both east-west and north-south future demand. The existing SH 22 does not have enough capacity to cater for the planned future urban growth in the area. Furthermore, to treat safety-related adverse effects expected if future growth progresses, the intersection controls along SH 22 will need to be changed to provide a safe environment for east-west and north-south travel. As a result, this will significantly reduce east-west capacity for general traffic and freight. This will lead to more east-west congestion and result in strategic traffic rerouting to existing unsafe rural roads and future neighbourhoods north and south of SH 22.

There are significant adverse effects expected if future growth progresses and the existing SH 22 corridor remains the same. The adverse effects are increased safety risk and severance for all users, decreased journey time reliability for general traffic and public transport. All the above will then lead to further undesirable transport and land use integration outcomes.

The Project will have significant positive effects on the operation of SH 22 and to service future growth in Drury. The Project provides a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improve access to employment and social amenities.

The Project will significantly improve all transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport. It improves corridor capacity, resulting in improved journey times and reliability for future freight and public transport demand. The journey time benefits for general traffic is expected to be largest in the morning peak (8min 32s), followed by the inter peak (1min 24s) and evening peak (5min 43s), when compared with the likely future environment without the project.

The upgrade will also significantly improve safety for vulnerable users (with the provision of additional segregated walking and cycling facilities) and will significantly reduce the risk of DSIs for the predicted demand (east-west and north-south) for walking (9,900 daily) and cycling (2,900 daily). The upgrade will integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project. Some existing properties will face a minor diversion impact on the main network given that limited direct property access (left-in and left-out only) but the significant safety benefits will offset effects.

In terms of construction effects, the are several potential adverse effects mainly linked to temporary traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). It is recommended the impact of any construction traffic effects is reassessed when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through conditions relating to Construction Traffic Management Plans and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that the Project will have significant positive operational effects.

NoR D2: Jesmond to Waihoehoe West FTN Upgrade

The existing roads within NoR D2 are not fit for purpose to support the planned future urban growth.

The current environment is a medium to high-speed environment, with poor east-west connectivity for public transport, general traffic, and active modes with limited or no walking and cycling facilities to protect vulnerable users. Also, Norrie Road has a severe capacity (one-lane capacity) and width restriction at Norrie Road Bridge, limiting east-west movement, and it is unable to accommodate large vehicles and public transport. Furthermore, there are no public transport facilities or intersections to support or prioritise public transport usage.

The existing daily traffic flow is relatively low, but it is expected to grow significantly (from 6600vpd to 41,800vpd) as a result of the planned growth and is expected to operate near general traffic capacity. NoR D2 forms an integral part of the future public transport network, providing a primary east-west and north-south function for future planned services, and serving as a gateway to key destinations in Drury (including new planned rail stations, centres and the strategic north-south PT network). Without adequate facilities for public transport, access to employment and social amenities will be compromised by congested, unreliable and unattractive east-west public transport connectivity.

The scale of growth will trigger effects on all elements of the transport system. There are significant adverse effects expected if future growth progresses and existing infrastructure remains the same. These adverse effects will compromise safety, wellbeing, liveability and lead to several undesirable transport and land use integration outcomes as detailed in section 7.2.2.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project provides a safe, reliable multi-modal arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improve access to employment and social amenities in and around the Drury-Ōpāheke area.

The Project will significantly improve the transport facilities for all modes, resulting in improved safety for those that travel by car, active modes or public transport as well as the movement of goods and services. The dedicated FTN facilities will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for future public transport users. The journey time benefits for public transport are expected to be largest in the morning peak (12 min), followed by the inter peak (over 4 min) and evening peak (over 6 min)

The Project will also significantly improve safety for vulnerable users (with the provision of additional segregated walking and cycling facilities) and will significantly reduce the risk of DSIs.

The upgrade will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

The Project will also significantly improve reliability, resilience and productivity for all road users travelling between Drury East and West.

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project. Some existing properties will face a minor diversion impact on the main network given that limited direct property access (left-in and left-out only) but the significant safety benefits will offset effects.

In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through conditions relating to CTMPs and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes, the Project will have significant positive effects and the potential adverse effects arising during construction can be appropriately mitigated.

NoR D3: Waihoehoe Road East Upgrade

The existing Waihoehoe Road East is not fit for purpose to support the planned future urban growth. Significant adverse effects are expected if future growth progresses and the existing Waihoehoe Road East infrastructure remains the same. The adverse effects are increased safety risk for all users, encourage a hostile and unsafe environment for active modes, decreased reliability for general traffic and would lead to several undesirable transport and land use integration outcomes.

The Project proposes that the function of Waihoehoe Road East will change from an existing rural two-lane collector road to an urban two-lane arterial catering for general traffic and active modes to combat the expected undesirable outcomes. The proposed design includes separated walking and cycling facilities on both sides of the road, and a central median (either flush or raised) to separate the two directions of traffic movements.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improves access to employment and social amenities. The Project will significantly improve transport facilities, resulting in improved safety for those that travel by car and active modes.

The Project will serve as a key enabler to achieve mode shift targets and will provide a critical east-west walking and cycling connection to the proposed Mill Road corridor for longer inter-regional routes and to the proposed Drury Central Station and the town centre. It will also result in significant improvements to safety for vulnerable users (with the provision of additional segregated walking and cycling facilities) and will significantly reduce the risk for DSI's.

The Project will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

In terms of construction effects, there are several potential temporary adverse effects mainly associated traffic management (construction traffic routes, partial or full road closures, construction traffic, speed limits, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through condition(s) relating to a CTMP and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that operationally the Project will have significant positive effects and potential construction traffic effects can be appropriately mitigated.

NoR D4: Ōpāheke North-South FTN Arterial

The existing transport environment between Drury and Papakura has poor connectivity and is not fit for purpose to support the planned future urban growth. The average north-south traffic flows are expected to increase up to 138,000 veh/day by 2048, which is approximately three times the existing traffic in the area. The absence of direct connectivity and the scale of growth will trigger effects on all modes. There are significant adverse effects expected if future growth progresses and existing infrastructure remains the same. The adverse effects are increased safety risk for all users, significantly increase journey times for general traffic and public transport, network severance of north-south connectivity and lead to several undesirable transport and land use integration outcomes.

The proposed Ōpāheke N-S FTN Arterial corridor is a new 3.2 km long 4-lane urban arterial through existing greenfield areas, including public transport, walking and cycling facilities.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project will provide a safe, reliable north-south multi-modal arterial network that supports growth, enables sustainable travel choice and combats safety concerns and improve access to employment and social amenities.

The Project will significantly improve transport facilities for all modes in the Drury-Ōpāheke area, resulting in improved north-south connectivity for those that travel by car, active mode and public transport, as well as the movement of goods and services.

It will significantly improve north-south movement between Drury and Papakura and will reduce vehicle kilometres travelled daily as a result of the Project. The Project will also significantly improve safety for vulnerable users (providing new segregated north-south walking and cycling spine) and will significantly reduce the risk for DSIs. The Project will also significantly improve north-south capacity and resilience, with a more direct local connection that enables local traffic and freight to rely less on congested SH 1, Great South Road and the proposed Mill Road (which will be the only north-south alternatives in future).

The Project will improve north-south connectivity in the Drury-Ōpāheke area and will form an integral part to the future public transport network, providing access to east-west connections and north-south FTN corridors and serving as a gateway to key destinations in Drury and Ōpāheke (including new planned rail stations, centres and the strategic north-south PT network)

The Project will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project.

In terms of construction effects, there are several potential adverse effects, mainly linked to staging of projects, traffic management (construction traffic routes, partial or full road closures, construction traffic, speed limits, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through Construction Traffic Management Plan conditions and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that operationally, the Project will have significant positive effects and potential adverse effects arising during construction of the Project can be appropriately mitigated

NoR D5: Ponga and Ōpāheke Road Upgrade

The existing Ponga Road and Ōpāheke Road is not fit for purpose to support the planned future urban growth.

There are significant adverse effects expected if future growth progresses and existing transport infrastructure remains the same. The adverse effects are increased safety risk for all users, hostile and unsafe environment for active modes, decreased reliability for general traffic and public transport and would lead to several undesirable transport and land use integration outcomes. The existing high-speed environment coupled with the increase in traffic as a result of the growth and lack of dedicated walking and cycling facilities will create a hostile environment for vulnerable road users.

The Project proposes that the function of Ponga Road and Ōpāheke Road (Rural and Urban section) change from an existing rural/urban two-lane collector road to an urban two-lane arterial catering for vehicles, public transport and active modes. The proposed design includes dedicated walking and cycling facilities on both sides of the road, and central median (either flush or raised) for Ponga Road and Ōpāheke Road rural section to separate the two directions of traffic movements and include grade separation of the NIMT with Ōpāheke Road. The Ōpāheke Road (Urban section) also includes an upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout with separated walking and cycling facilities, including crossing facilities and the re-grade of nine driveways.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and improves access to employment and social amenities.

The Project will significantly improve transport facilities for all modes, resulting in improved safety for those that travel by car, active mode and public transport. The upgrade will also unlock safe and sustainable east-west mode choices and connects to future strategic North-South corridors (Mill Rd and the Ōpāheke North-South FTN Arterial, and to Papakura township. It will significantly improve safety for vulnerable users (additional segregated walking and cycling provision) and significantly reduce the risk for DSI's. The grade separation of the NIMT with Ōpāheke Road will eliminate any crash risk and general traffic delay between road users and any existing and future rail services.

The increased safety measures for vulnerable road users will significantly reduce the risk for DSIs for the predicted demand for walking (2200 daily) and cycling (400 daily). The upgrade integrates well with surrounding land use and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

No adverse operational effects on the transport system were identified that required mitigation

In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when greater level of details is available for construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through Construction Traffic Management Plan conditions and what should be included to remedy or mitigate potential adverse effects

Overall, the assessment concludes that operationally, the Project will have significant positive effects and potential adverse effects arising during construction of the Project can be appropriately mitigated

Conclusion

(i) The existing environment (without the projects) is not fit for purpose to support the planned future urban growth.

(ii) The likely future transport environment (with the Drury Package) has significant positive effects, through provision of a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and improve access to employment and social amenities.

(iii) It is proposed to remedy and manage the potential adverse effects through Construction Traffic Management Plan conditions and what should be included to remedy or mitigate potential adverse effects.

4.0 Introduction

This report has been prepared for the Drury Arterial Network Notices of Requirement (NoRs) for Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (Waka Kotahi) (the "Drury Package"). The NoRs are to designate land for future strategic transport corridors as part of the Supporting Growth Programme to enable the future construction, operation and maintenance of transport infrastructure in the Drury-Ōpāheke area of Auckland.

The Auckland Council Drury-Ōpāheke structure plan area is expected to grow over the next 30 years and is estimated to provide about 22,000 houses and about 12,000 jobs with an additional population growth of about 60,000. The Drury Package will provide route protection for the local arterials, which include walking, cycling and public transport (including the Frequent Transit Network (FTN), needed to support the expected growth in Drury. This report considers the planned growth and associated future place function and the transport effects of the Projects, that together comprise the Drury Package, as shown in Figure 4-1.

Table 4-1 Drury Package: Notices of Requirement and Projects

Notice	Project
NoR D1	Alteration to NZ Transport Agency designation 6707 - State Highway 22 (SH22) Upgrade
NoR D2	Jesmond to Waihoehoe West FTN Upgrade
NoR D3	Waihoehoe Road East Upgrade
NoR D4	Ōpāheke North-South FTN Arterial
NoR D5	Ponga Road and Ōpāheke Road Upgrade

The Drury Package has been developed through an alternatives assessment. Corridor alternatives and route refinements were assessed by a multi-disciplinary team against a programme wide Multi-Criteria Assessment. This assessment phase was completed in February 2020, and further design changes have been adopted through the Assessment of Environmental Effects (AEE) process for the Drury Package, in response to a range of construction and environmental considerations.

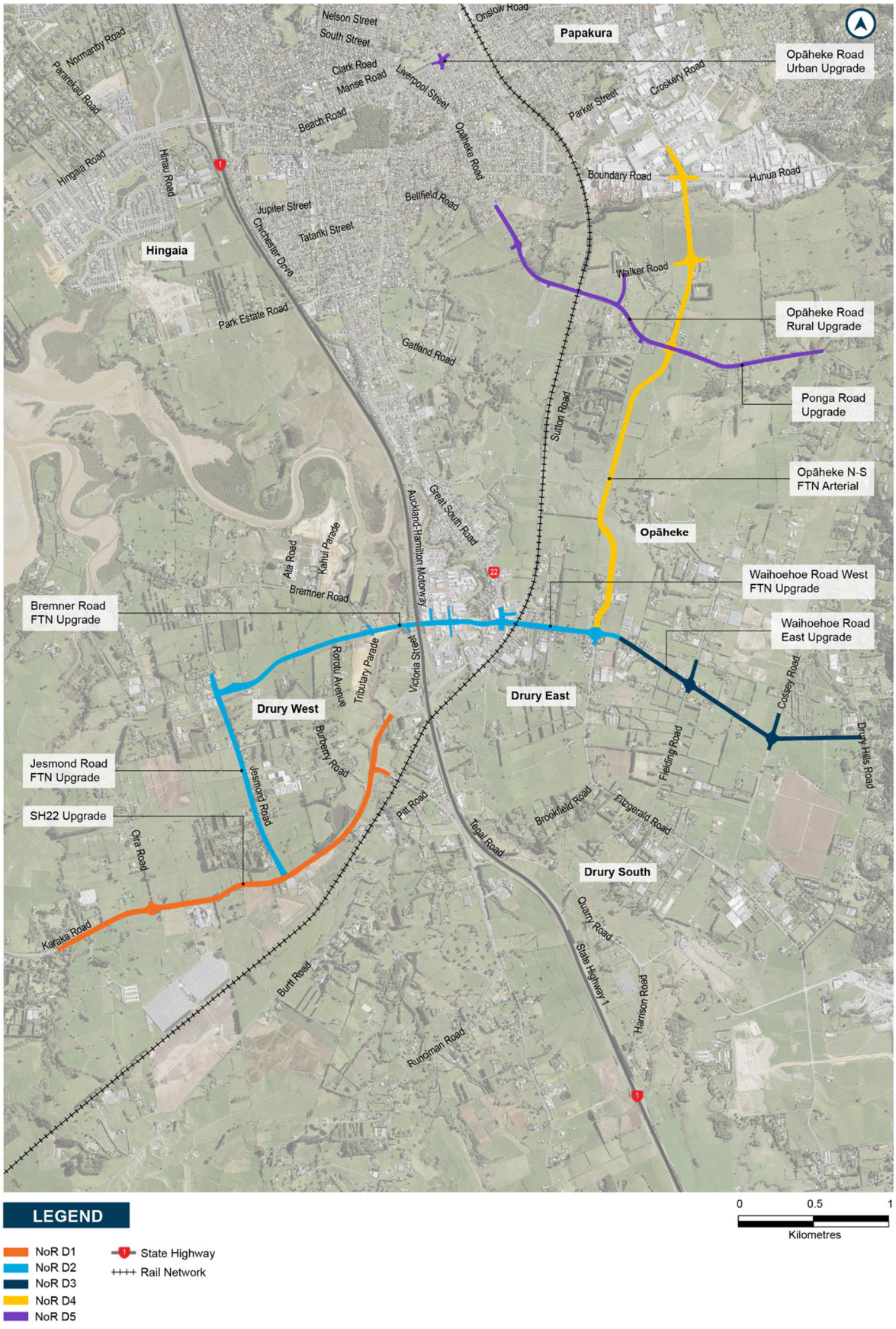


Figure 4-1 Drury Package Projects and Notices of Requirement

4.1 Background

Auckland is New Zealand's largest city, home to approximately 1.65 million people. In 2017, Auckland attracted 36,800 new residents; more than the rest of the country combined. The Auckland Plan 2050 – Development Strategy signals that Auckland could grow by 720,000 people to reach 2.4 million over the next 30 years. This will generate demand for more than 400,000 additional homes and require land for 270,000 more jobs.[2] Most of this growth will go into existing urban areas. However, around a third will go into future urban zone (FUZ) as identified in the Auckland Unitary Plan: Operative in Part (AUPOIP). The FUZ areas are "greenfields", that is, generally rural land identified to be urbanised over time.

The Supporting Growth Programme is a collaboration between AT and Waka Kotahi to plan transport investment in Auckland's future urban zoned areas over the next 10 to 30 years. AT and Waka Kotahi have partnered with Auckland Council, Manawhenua and KiwiRail Holdings Limited (KiwiRail) and are working closely with stakeholders and the community to develop the strategic transport network to support Auckland's growth areas.

The key objective of the Supporting Growth Programme is to protect land for future implementation of the required strategic transport corridors/infrastructure. As a form of route protection, designations will identify and appropriately protect the land necessary to enable the future construction, operation and maintenance of these required transport corridors/infrastructure. A designation is important as it provides certainty for the Requiring Authority that it can implement the work. It also provides property owners, businesses and the community with increased certainty regarding future infrastructure, so they can make informed decisions (if confirmed it will be identified in the AUPOIP). It can also significantly reduce long-term costs for local and central government and enable more effective land use and transport outcomes.

4.2 Drury Package

The Drury Package proposes an arterial network to support the expected future growth in Drury-Ōpāheke. The Drury Package comprises five separate projects which together form the Drury Arterial Network. The network includes provision for general traffic, walking and cycling, and frequent public transport. Overall, the Drury Package aims to improve connectivity within and through the Drury-Ōpāheke area to achieve optimum transport and land use outcomes, providing high quality, safe and attractive transport environments. Each Project within the Drury Package will be designated separately as shown in Table 4-1 and Figure 4-1.

4.3 Wider Network

The Drury Package was developed as part of a wider programme of transport initiatives needed to support the growth in the southern part of Auckland. Those other projects have been designed to be complementary to the Drury Package and operate as an integrated network. That wider programme includes projects such as the Drury and Paerata train stations, and the Pukekohe Expressway and Mill Road corridors, as shown in Figure 4-2.

[2] Draft Auckland Plan 2050 Development Strategy: https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/auckland-plan/development-strategy/future-auckland/Pages/what-auckland-look-like-future.aspx

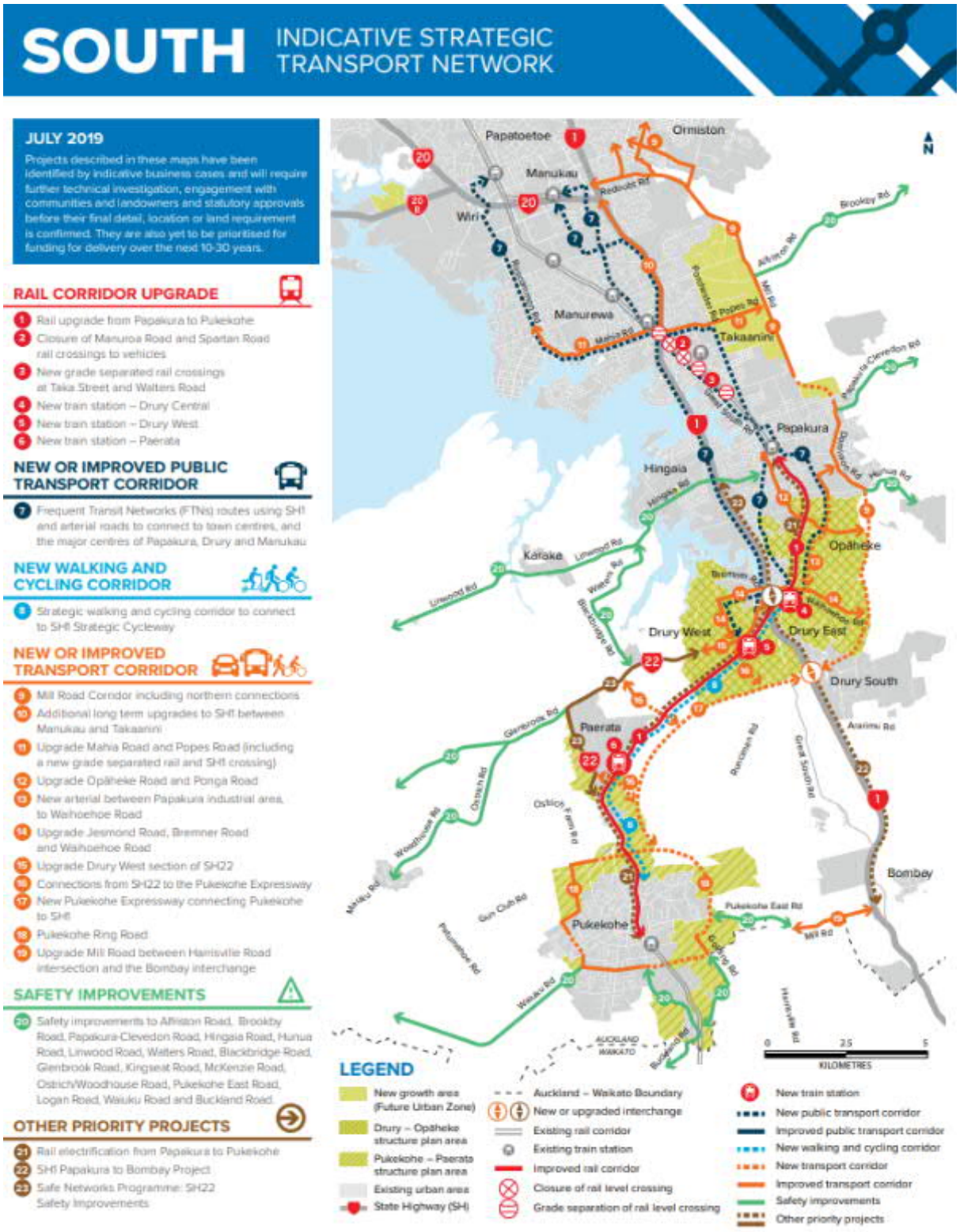


Figure 4-2: South Auckland Indicative Strategic Transport Network

4.4 Purpose and Scope of this Report

This report provides an assessment of transport effects associated with the construction, operation and maintenance of the Drury Package. This assessment has been prepared to inform the AEE for the NoRs.

The purpose of this report is to:

- Identify and describe the existing and likely future transport environment without the Projects;
- Identify and describe the actual and potential transport effects of the Projects;
- Recommend measures as appropriate to avoid, remedy or mitigate potential adverse transport effects (including any conditions/management plan required); and
- Present an overall conclusion of the level of transport effects of each of the Projects after recommended measures are implemented.

The key matters addressed in this report are as follows:

- Description of the Projects as they relate to transport;
- Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines;
- Identification and description of the existing and likely future transport environment without each project;
- Description of the actual and potential transport effects of each project, in terms of construction and operation of each project;
- Recommended measures to avoid, remedy or mitigate potential adverse transport effects (including any conditions/management plan required); and
- Overall conclusion of the level of potential transport effects of each of the projects after recommended measures are implemented.

4.5 Report Structure

This report is structured to provide a summary of the methodology used to assess the transport effects, then each NoR Project is assessed in separate chapters. A high-level summary of the assessment is presented at the start of each chapter, with more detailed conclusions at the end.

4.6 Preparation for this Report

In preparation for this report, several resources were used to support the assessment of transport effects. A Construction Method Statement has been provided by construction specialists for each NoR (summarised in the AEE), which was used to assess the actual and potential transport effects of the construction of each project. In terms of operational effects, the inputs used for modelling purposes are discussed in greater detail in the assessment methodology.

In addition, a site visit with other specialists working on the Projects was undertaken on 3rd March 2020. A site visit was also undertaken on 11 March 2020 with Auckland Council representatives.

A series of Business Cases and public engagement (including Drury Package) have been undertaken over the past four years as part of a wider programme of transport initiatives needed to support the growth in this southern part of Auckland. These include:

- Transport for Future Urban Growth Programme Business Case (2016)
- South Indicative Business Case (IBC) (2018)
- Integrated Transport Assessment Report (2019), which fed into the Auckland Council Drury-Ōpāheke Structure Plan

5.0 Assessment Methodology

Chapter Summary

This summary provides an overview of the methodology used to assess the transport effects for the proposed Drury Package. The assessment includes operational effects, construction effects and alignment with project objectives.

In terms of **operational effects**, the following assessment methods have been adopted:

Network and Corridor design

- Brief description for network components in context of wider network
- Assessment of alignment with AT's Roads and Streets Framework

Walking and Cycling

- Assessment of alignment with Waka Kotahi's and AT's walking and cycling strategic documents, design compliance with AT's Transport Design Manual and the agreed Waka Kotahi's and AT's Design Framework for supporting growth.

Safety

- Assessment of alignment with AT's Vision Zero and Waka Kotahi's Road to Zero outcomes
- Assessment of potential safety risk based on a Crash Analysis Assessment

Public Transport

- Assessment of alignment with project objectives, AT's strategic public transport documents, and design compliance with AT's Transport Design Manual as appropriate for application of the agreed generic cross-sections.
- Assessment of future transport demands using traffic modelling tools

Access

- Assessment of potential effects on property access

Freight

- Assessment on freight network and alignment with Waka Kotahi's and AT's strategic freight network documents, design compliance with AT's Transport Design Manual, and consideration of New Zealand Heavy Haulage Association design guidance.

General Traffic

- Assessment of surrounding network connectivity
- Assessment of corridor midblock and intersection performance utilising traffic modelling tools

In term of **construction effects**, the following assessment methods have been adopted:

- Assessment of potential conflict areas with vulnerable road users, such as pedestrians and cyclists
- Assessment of expected additional traffic volumes and existing capacity on the indicative haulage routes identified

- Assessment of the impact on surrounding network during full or partial closure of existing roads during construction

In terms of alignment with project objectives:

- Assessment of how each project aligns with the Project Objectives and contributes to the wider transport system.

5.1 Assessment Methodology for all Notices of Requirement

This assessment is targeted at informing a decision to proceed with Route Protection. This means the assessment does not assess the interim staging of individual projects and development staged over the next three decades but instead place a greater focus on the 'full build out' of the future urban area in 2048+ to support future communities. Therefore, this assessment focusses on the likely future environment (full build out 2048+) and wider infrastructure upgrades. To ascertain the long-term effects of the projects, this assessment assesses the transport effects arising from each of the five Projects that comprise the Drury Package 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 Transport Assessment (TA) has two elements:

- Assessment of operational effects on the transport system
- 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 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. Additionally, the source of the potential effects (such as people and vehicle movement), is generally from that urban development itself, rather than from the planned infrastructure. To isolate the effects of the planned works, the 'Existing Environment' includes the likely future urban development, but doesn't 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. This is based on development yield estimates provided by Auckland Council through the Drury-Ōpāheke Structure Plan process.

5.1.1 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

This section will outline the methodology of the:

- Assessment for each mode of transport;
- Assessment of access for existing properties; and
- Assessment of themes specified by the Project Objectives.

5.1.2 Transport Modelling

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

- The regional multi-modal model (MSM) - creates estimates of car, truck and PT movements at a regional level based on land use, network and policy inputs. This model is the primary tool to estimate future PT usage. Generally, this model is run using regional assumptions as per recent ATAP planning, but with scenario-specific inputs in the growth areas.
- A local traffic model (SATURN). This uses the traffic demands from MSM on a more detailed representation of the road network.
- A strategic active model (walk/cycling) model (SAMM). This tool gives strategic-level estimates of walking and cycling demands.
- A SGA-specific 'station access' tool that estimates a range of scenarios of people accessing stations. This uses combined station-access estimates from MSM and re-estimates potential shift to sub-modes such as walking/cycling, park and ride, bus, based on relative travel costs and levels of service. This tool is only used to provide estimates of walking and cycling to major stations.

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

A SATURN (South 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. The SATURN model uses the demand outputs from MSM, which includes inputs of the latest land use (in this instance, referred to as scenario i11.5). The modelling includes an overall network of infrastructure identified to support growth in the South area. This means that the assessment assumes that all other Southern 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 1.

In addition to the SATURN modelling, SIDRA 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.

Crash Analysis System (CAS) data was extracted to determine crash rates over the past 10 years on any existing alignments. The purpose of extracting this data was to assess trends in the existing environment and signify the importance of change required to mitigate any existing patterns.

For traffic modelling reference, Level of service (LOS) metric are used throughout the assessment and it refers to a qualitative measure used to relate the quality of motor vehicle traffic service. LOS is used to analyse roadways and intersections by categorising traffic flow and assigning quality levels of traffic based on performance measure ranging from A to F and can be summarised as follows:

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

5.1.3 Transport Guidance and Documents

Assessment of the Projects against the relevant objectives and policies of the AUPOIP is contained in the AEE. 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 Projects
- AT's Vision Zero, which adopts a "Safe System" approach to focus on road safety for all road users
- Austroads Guide to Road Design (multiple parts) which are the Waka Kotahi's current design standards and thus particularly relevant to the SH22 Upgrade (NoR D1)
- Waka Kotahi's Road to Zero: A New Road Safety Strategy for NZ (issued by the Ministry of Transport).

AT's Roads and Streets Framework (RASF) was also used to qualitatively assesses the typology (movement and place value) and modal priority for each corridor. A 'mandate' for each road corridor is developed and approved by the RASF Committee, comprising of senior officers from AT and AC.

5.1.4 Assessment Methodology – Transport Mode

Table 5-1 summarises how each mode/element of transport has been assessed in terms of operational effects as a result of the Projects.

Table 5-1: Summary of Assessment Methodology

Network Component	Information sources	Assessment Method
Safety	Crash Analysis System (CAS) database Project design drawings	Assessment of potential safety risk based on design features Assessment to determine alignment with Vision Zero standards
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. Assessment using SAMM model outputs.
Public Transport	Transport Model Tools (MSM, SATURN and SIDRA) SGA Remix file[3]	Assessment of public transport infrastructure such as stop locations, bus stop infrastructure requirements – in accordance with the Transport Design Manual.
General Traffic	Transport Model Tools (SATURN Model 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.
Access	Typical travel speeds Engineering Standards	Assessment identifying where there is a potential effect on access in the existing environment.
Note: A Road Safety Audit and Safe System assessments will be done as part of the implementation business case / detailed design stage prior to implementation.		

5.1.5 Assessment of Project Objectives

Each project included in the Drury Package has an identified set of project 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 main AEE.

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

5.2 Approach to Assessment of Construction Transport Effects

5.2.1 Construction Traffic Effects

In order to assess the potential construction traffic effects, an indicative construction methodology has identified the following key elements:

- The expected number of movements related to construction vehicles to and from the potential site access points
- Potential haulage routes noting the cut and fill requirements of the site and potential closures

Based on the above, the following assessment methodology has been adopted:

- Identification of any locations where the additional volumes are expected to exceed the available capacity on the network and identify any mitigation measures, if necessary
- Identification of any works that should not occur at the same time

Other additional qualitative assessments include:

- 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).

5.2.2 Temporary Traffic Management

The impact of any temporary traffic management measures implemented to undertake the Projects will be 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' (NoR D1, NoR D2, NoR D3 and NoR D5) and those delivered 'offline' (NoR D4).

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.

6.0 NoR D1: Alteration to Designation 6707 - State Highway 22 Upgrade

Chapter Summary

The existing SH 22 (without the Project) is not fit for purpose to support the planned future urban growth. The crash history shows that there was a total of 78 crashes recorded in the 10-year period between 2010 to 2019. These included two fatal crashes which involved pedestrians, and 11 serious injury crashes which were due to vehicles turning/crossing, being rear ended or losing control/involved in a head on collision.

The existing daily flow already exceeds LoS E (22,000 vpd), and the growth of east-west traffic is in the area is expected to grow from 24,400vpd to 65,300vpd (2048+). Also, there are currently no dedicated pedestrian or cycle facilities on SH 22, and the road shoulder does not provide any protection for vulnerable users for both east-west and north-south future demand. The existing SH 22 does not have enough capacity to cater for the planned future urban growth in the area. Furthermore, to treat safety-related adverse effects expected if future growth progresses, the intersection controls along SH 22 will need to be changed to provide a safe environment for east-west and north-south travel. As a result, this will significantly reduce east-west capacity for general traffic and freight. This will lead to more east-west congestion and result in strategic traffic rerouting to existing unsafe rural roads and future neighbourhoods north and south of SH 22.

There are significant adverse effects expected if future growth progresses and the existing SH 22 corridor remains the same. The adverse effects are increased safety risk and severance for all users, decreased journey time reliability for general traffic and public transport. All the above will then lead to further undesirable transport and land use integration outcomes.

The Project will have significant positive effects on the operation of SH 22 and to service future growth in Drury. The Project provides a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improve access to employment and social amenities.

The Project will significantly improve all transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport. It improves corridor capacity, resulting in improved journey times and reliability for future freight and public transport demand. The journey time benefits for general traffic is expected to be largest in the morning peak (8min 32s), followed by the inter peak (1min 24s) and evening peak (5min 43s), when compared with the likely future environment without the project.

The upgrade will also significantly improve safety for vulnerable users (with the provision of additional segregated walking and cycling facilities) and will significantly reduce the risk of DSIs for the predicted demand (east-west and north-south) for walking (9,900 daily) and cycling (2,900 daily). The upgrade will integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project. Some existing properties will face a minor diversion impact on the main network given that limited direct property access (left-in and left-out only) but the significant safety benefits will offset effects.

In terms of construction effects, the are several potential adverse effects mainly linked to temporary traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended the impact of any construction traffic effects is reassessed when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through conditions relating to Construction Traffic Management Plans and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that the Project will have significant positive operational effects.

6.1.1 Project Overview

The State Highway 22 (SH22) Upgrade (NoR D1) consists of the widening of SH22 to a four-lane arterial with separated walking and cycling facilities. The Project extends approximately 3.08km from the State Highway 1 (SH1) Drury Interchange in the east, to the extent of the future urban area (as defined by the FUZ), between Woodlyn Drive and Oira Road in the west. The intersections at Jesmond Road and Great South Road will be signalised and a roundabout is proposed at Oira Road. An overview of the concept design is provided in Figure 6-1.

As the surrounding area is urbanised over time and alternative routes are implemented (particularly the proposed Pukekohe Expressway, collectors through local development, cycleway alongside rail and rail capacity improvements), the function of SH22 will change from a rural state highway to provide an appropriate urban arterial connecting the growth areas of Drury West to the wider network and centres, including providing a frequent transport bus network. This is likely to include a reduction in the speed limit to 50kph (currently a combination of 60kph and 80kph though that section). SH22 will improve future connectivity to the proposed Drury West train station which forms part of a separate New Zealand Upgrade Programme (NZUP) project.

The indicative alignment has been prepared for assessment purposes, and to indicate what the final design of the Project may look like. The final alignment will be refined and confirmed at the detailed design stage. Key features of the proposed upgrade include the following:

- Widening of SH22 from its current general width of 20m to 30m to enable development of 4-lane road / PT route with separated walking and cycling facilities
- Localised widening around the existing intersections to accommodate for vehicle stacking and tie-ins and walking and cycling facilities/crossings
- Demolition and reconstruction of the existing Ngakoroa Stream Bridge
- Proposed new and extended culverts
- Three proposed stormwater wetlands
- Batter slopes and retaining to enable widening of the corridor, and associated cut and fill activities
- Vegetation removal along the existing road corridor
- Areas identified for construction related activities including site compounds, construction laydown, bridge works area, the re-grade of driveways and construction traffic manoeuvring

Figure 6-1 Overview of SH 22 Upgrade

6.1.2 Network and Corridor Design

The Project was developed as part of network planning for the wider area and concurrently with the 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.

The Project proposes that the function of SH 22 (an existing Waka Kotahi designation) will change from an existing rural two-lane state highway to a lower-speed urban four-lane arterial (using AT standards) with mixed components for vehicles, PT, active modes and freight.

The proposed design includes more general traffic lanes and new facilities for walking and cycling to accommodate and encourage the higher demand anticipated as shown in Figure 6-2.

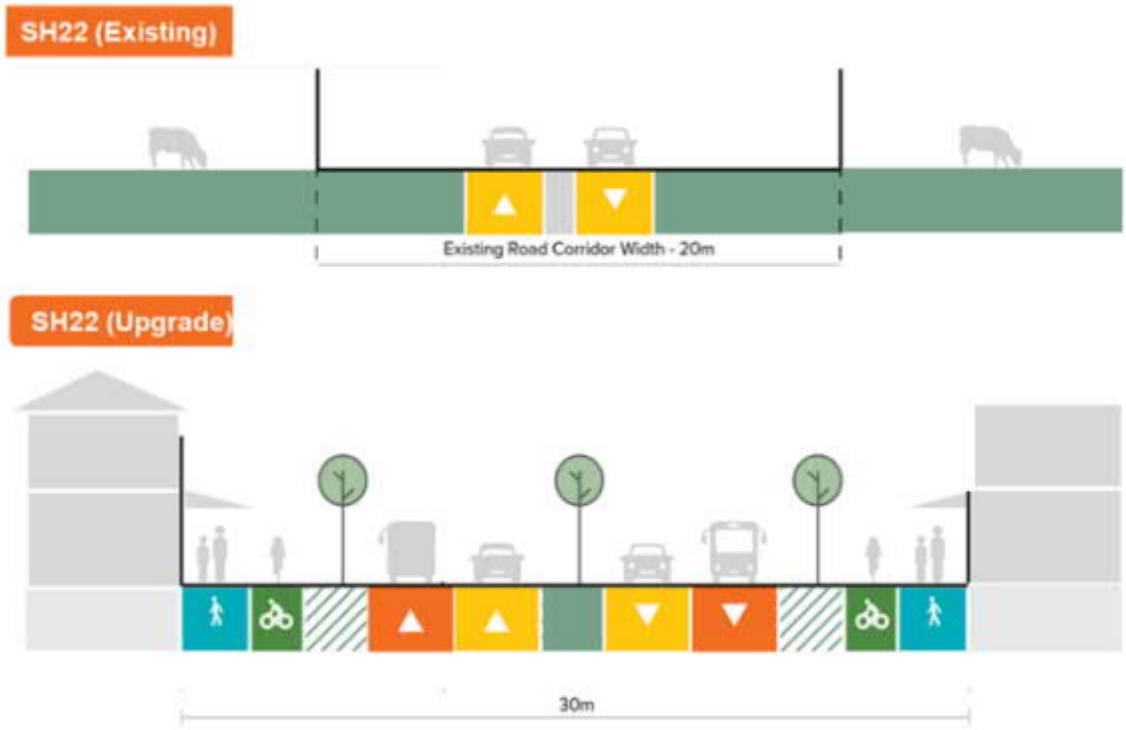


Figure 6-2: Indicative future corridor design

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).

In the medium term, the movement function of the upgraded SH 22 will likely remain high within its state highway role, providing through movements to the sub-regions. In the long term, the future corridor movement function of the upgraded SH 22 will reduce to a medium strategic significance in terms of movement function as the future Pukekohe Expressway Corridor becomes the key strategic route connecting Pukekohe to SH1 rather than SH 22. Public transport, walking and cycling will likely have increasing priority in this section of SH 22 in the future.

The corridor is therefore assessed to have the following RASF typology:

- Place function - transitioning from P1 (rural) to P2 (mixed urban) long term
- Movement function - transitioning from M3 (high strategic movement) to M3/M2 (high local movement) long term

The place function of SH 22 will likely transition from a low to medium significance as the areas adjacent to SH 22 are urbanised over time. This transition of both movement and place functions will create some potential conflict/tension between the movement and place functions until the Pukekohe Expressway is implemented. The corridor form proposed as part of the Project provides the ability to manage those conflicts over time, via separation of vulnerable modes, reduced speed environment (enhancements to place), priority for buses and the capacity (enhancements to movement) to accommodate the high movement function. Longer term as the place function increases it is expected that the corridor could be optimised to provide space for priority vehicles, such as buses or high-occupancy vehicles, and/or with additional controlled intersections to further support crossing and accessing movements. The following Figure 6-2 and Figure 6-3 indicates the existing and likely long-term modal priorities for the corridor will transition over time. In the shorter term, the demand for general traffic and freight will likely be higher.

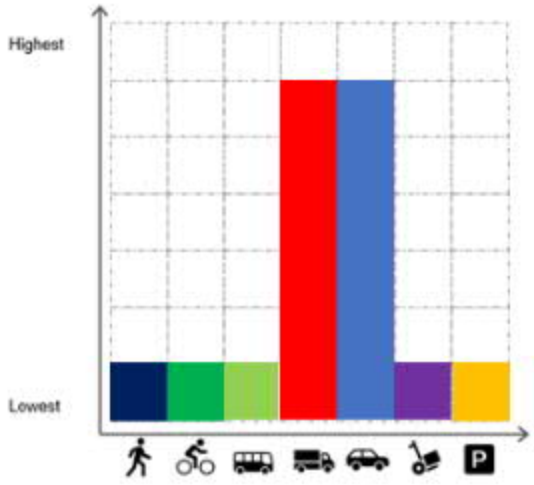


Figure 6-3: Existing modal priority for SH 22

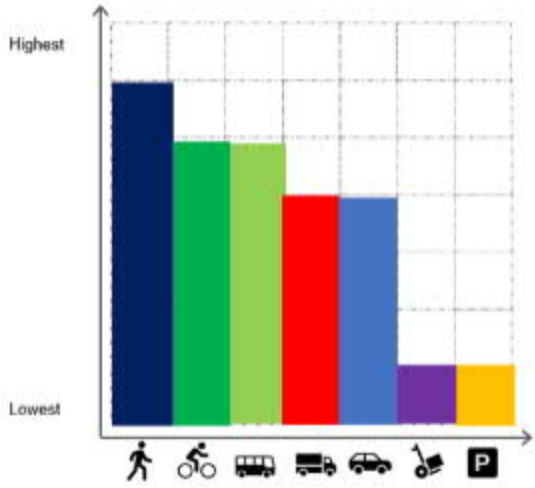


Figure 6-4: Future modal priority in 2048+ for SH 22 Upgrade

Table 6-1 provides context about how transition pressures triggered by growth will require treatment throughout the transition.

Table 6-1: Transport infrastructure transition pressures triggered by growth

Transport infrastructure transition	Adverse Effects	Positive Effects
Do Nothing (as existing)	– significantly increase north-south severance triggered by future growth – significantly increase DSI's for all road users crossings and traveling along SH22 – very poor transport and land use integration – very poor integration with public transport (FTN and Rail Station)	
Do Minimum (minor safety improvements – limited controlled intersections)	– significantly increase DSI's for active modes traveling along SH22 – significantly increase east-west congestion (exceed capacity) and increase rerouting to surrounding unsafe rural roads – poor transport and land use integration – poor public transport connectivity	– improve walking and cycling crossing facilities
Do Project (NoR D1)	– east-west traffic along SH 22 would operate near or at capacity along SH22 until Pukekohe Expressway is complete	– improve walking and cycling facilities along SH 22 – improve public transport connectivity and capacity – improve transport and land use integration – improve east-west congestion and limit rerouting to unsafe rural roads and future neighbourhoods – improve safety by reducing speed to 50km/h – reduced likelihood of head-on crashes by providing raised medians to separate the two directions of traffic
Do Project (NoR D1) with future Pukekohe Expressway		– reroute strategic trips from SH 22 to Pukekohe Expressway which will enable public transport to operation more efficiently and reduce congestion – unlock ability to be formally reclassify SH 22 as an urban arterial

For SH22, this indicates a desire for a higher priority to walking, cycling and public transport with a median priority for freight and general traffic but with a lesser need for specific loading, servicing and parking priority. The proposed upgrade is therefore considered to support the assessed typology and modal priorities for this corridor.

The key transport features within this Project include an upgrade to the existing road corridor with:

- A four-lane arterial standard road (30m cross section) between the SH1 interchange and Woodlyn Drive (covering the extent of the FUZ between Woodlyn Drive and Oira Road)
- 1.8m footpaths on both sides of the road
- 2.0m separated cycle lanes on both sides of the road

The generic cross-section for the corridor is shown in Figure 6-5. This cross-section has been used to identify the expected general form and footprint of the corridor. however, it is noted that the exact form and dimensions will be subject to future detailed design at the time of implementation.

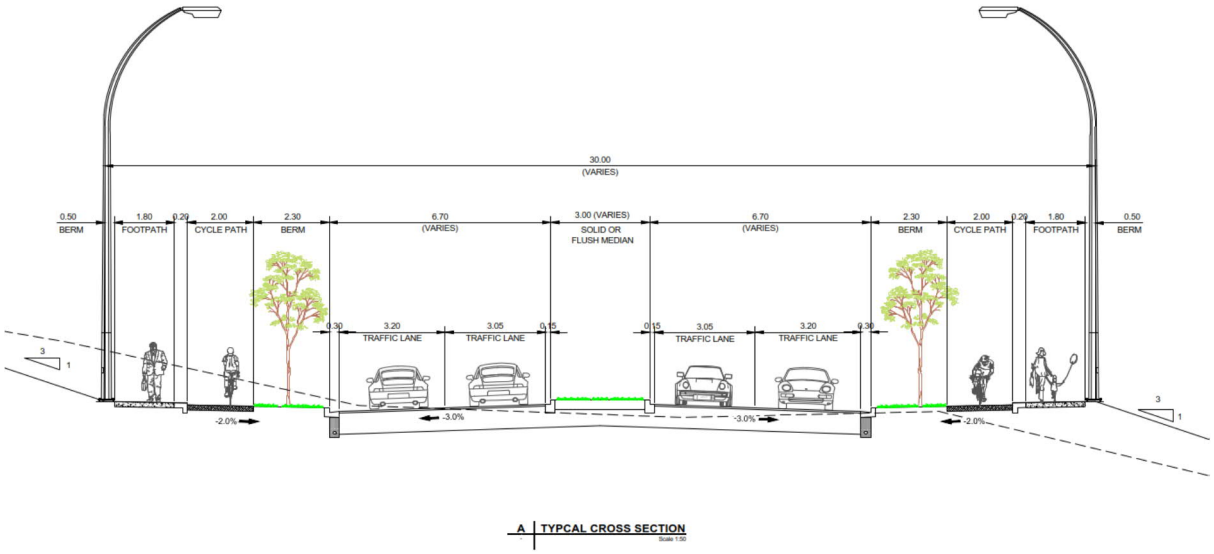


Figure 6-5: State Highway 22 typical cross section (indicative)

Table 6-2 provides a summary of the proposed intersections and the key improvements.

Table 6-2: Intersection Summary for SH 22 (NoR D1)

Intersection	Current Form	Proposed Form	Key Outcomes
Oira Road/SH 22	Priority	Roundabout	Multi-lane roundabout with protected walking and cycling facilities
Jesmond Road/SH 22/SH 22 North Connection	Priority	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Great South Road/SH 22	Priority	Signals	Multi-lane signalised intersection with protected walking and cycling facilities

The intent of this Project from a transport perspective is to provide an arterial road appropriate for the future urban growth and anticipated urban development (as indicated in the zoning pattern in the

Council's Structure Plan), whilst retaining its strategic access function for the rural areas to the west and to the Pukekohe township. This will require provision of additional corridor width to provide safe and efficient movement for all road users. At present, SH 22 provides sub-regional and strategic movements. This State Highway high movement function will need to be maintained until it can be transferred to the Pukekohe Expressway[4].

6.2 Existing and Likely Future Environment

This section describes the current and likely future environment without the Project. The subsequent section describes the effect of the Project on that likely future environment. Because the current environment is expected to change significantly (i.e. urbanise), the key focus of this assessment is the likely future environment, with the current environment described mostly for context.

6.2.1 Existing Environment

The current land use surrounding SH 22 is largely greenfield land, low-density rural zones with agriculture, rural lifestyle blocks, and some local businesses. Figure 6-6 shows an aerial photo of the current rural land use environment along SH 22.

Figure 6-6: Current land use environment on SH 22Existing Transport Network

[4] The Pukekohe Expressway is a project included within SGA, but is not included in the Drury Local package

The existing transport network on and surrounding SH 22 can be summarised as follows:

- Two-lane two-way limited access rural state highway, with sealed shoulders on both sides of the carriageway
- Large volume of mixed traffic with significant through movement (east-west) between SH1 interchange and urban areas of Pukekohe, Glenbrook and Paerata
- 60kph speed limit east of the intersection with Burberry Road and 80kph speed limit west of the intersection with Burberry Road
- High proportion of heavy vehicles and part of the over-dimension route and partially overweight route (the SH22 section between Great South Road and Victoria Street)
- The intersection controls along SH 22 at Oira Road, Jesmond Road, Great South Road, Burberry Road and McPherson Road are priority controlled, and prioritises east-west general traffic with no walking and cycling facilities (adjacent and crossing SH 22) to protect vulnerable users
- There are no public transport facilities (along and crossing SH 22) to prioritise transit.

Appendix 4 and Appendix 5 provide more detail on the key characteristics of the existing road network.

6.2.1.1 Road Safety

Crash history for the NoR D1 area has been obtained from the Waka Kotahi Crash Analysis System (CAS) to provide a high-level understanding of the crash patterns and safety concerns. The crash data extracted considers a ten-year period from January 2010 to December 2019 (inclusive).

Figure 6-7 shows the indicative location of crashes which have occurred on the SH 22 section within the project extent during the period of 2010 to 2019.

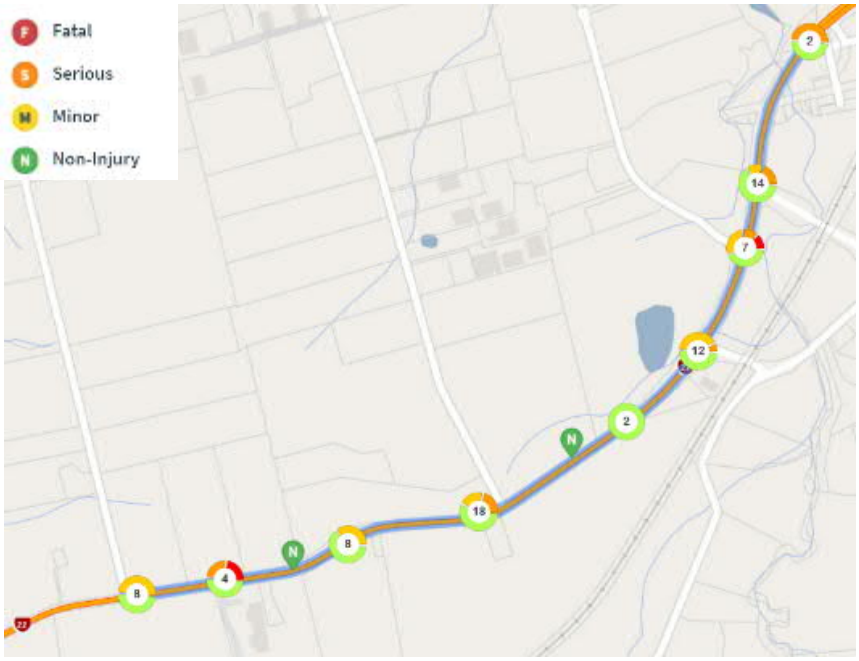


Figure 6-7 : Location of crashes along SH 22

The crash history shows that there was a total of 78 crashes recorded in the 10-year period. This included two fatal crashes involving pedestrians, 11 serious injury crashes as a result of vehicles turning/crossing, being rear ended and/or losing control/head on accidents. Refer to Appendix 3 for the crash report of the fatal and serious injury c rashes.

These crash statistics indicate that this section of SH 22 has significant safety issues associated with protection for vulnerable road users and general traffic. The high-speed, high-volume and form of the intersection controls are contributing factors causing these crashes. Although of a generally high standard for a rural road, the very high volumes of traffic mean that significantly improved safety will not be achieved without a change in the speed environment and appropriate form of facilities to support the existing traffic volumes, including segregating vulnerable road users such as pedestrians and cyclists. As part of the Safe Network Programme, Waka Kotahi implemented new speed limits to improve safety on SH22 between Drury interchange and Paerata.

6.2.1.2 General Traffic

Table 6-3 summarises current road classification from One Network Road Classification (ONRC) and the average daily traffic (ADT) with the percentage of heavy vehicles on each road. Survey dates can be actual or estimated – referred as “est” in the below table.

The existing daily flow is 22,000 vehicles per day (vpd), which is at or close to the maximum typically able to be accommodated on this type of 2-lane rural road. The generalised daily service volumes[5] between 14,000 to 19,900 vpd for a 2-lane road are considered LoS E.

This suggests that the existing daily flow already exceeds LoS E. Given that it’s already close to maximum capacity for the size and type of road and it barely manages to operate safely given the current conflicts in movement (strategic and local access). The current state of traffic congestion is not fit for purpose to accommodate additional growth in this area will likely lead to increased congestion, poor safety outcomes as traffic diversions to lower-standard alternative rural roads.

Table 6-3: Existing Traffic Volumes on and adjacent SH 22[6]

Road Name	Road Classification	Survey Date	5 Day ADT	% HCV
SH 22 between Great South Road and Oira Road	Regional	December 2019 (actual)	22,000	5
Jesmond Road	Secondary Collector	June 2018 (est)	240	5
Great South Road	Arterial	June 2019 (est)	3,060	23
Oira Road	Secondary Collector	June 2018 (est)	280	5

[5] HCM2010 HIGHWAY CAPACITY MANUAL

[6] The existing traffic volumes on SH 22 and other adjacent roads have been retrieved from Mobile Road in April 2020. The volumes are either estimated or used actual data available from the State Highway New Zealand database and local council databases. Mobile Road: https://mobileroad.org/desktop.html

Road Name	Road Classification	Survey Date	5 Day ADT	% HCV
Burberry Road	Access	June 2018 (est)	100	5
McPherson Road	Primary Collector	June 2018 (est)	1,120	5

6.2.1.3 Walking and Cycling

The current SH 22 environment is a high-speed rural highway with no walking and cycling facilities, resulting in high conflict and unsafe conditions between general traffic and vulnerable road users. Although cycling can occur on the road shoulders, this is an unsafe and hostile environment for cyclists, especially with vehicles travelling at high speeds and often using the road shoulder on the curvilinear alignment.

Also, no pedestrian and cyclist crossing facilities are provided at any of the intersections along SH 22. The surrounding land use suggests that the existing walking and cycling demand is low, however even with low demand, there have been two fatal incidents involving pedestrians crossing SH 22 in 2011 and 2012. Any future growth (particularly urban growth) surrounding SH 22 will increase safety risk and exposure.

The current environment is therefore not suitable for walking and cycling, especially for the planned future urban growth.

6.2.1.4 Public Transport

Based on the existing AT public transport network, there is no public transport provision (services and facilities) on SH 22 and the adjacent local roads. The closest public bus service is bus service 376 connecting Drury and Papakura Station. The bus stop is located near the Great South Road/Waihoehoe Road intersection, that is 1km east from the eastern most extent of the Project. The key public transport facility servicing this area is the (currently limited) rail service, running generally parallel to SH 22. However, the closest rail station is Papakura Station, located 7km away from the project.

The existing roads and roadside facilities are not likely to provide a quality, attractive provision for public transport along this section of SH 22 due to high speed, lack of protected walking facilities and current state highway design standard not being appropriate for urban roadside public transport facilities.

6.2.1.5 Access

SH 22 has a limited access road, some existing properties adjacent to SH 22 have access either to side roads connected to SH 22, or direct access onto SH 22. Given the current land use is more commercial / rural use than lifestyle, the number of access points to SH 22 is limited. Although the access frequency is low, the high-speed and high traffic flow on SH 22 makes the crash exposure for existing properties and commercial properties with direct access high. The commercial properties present a higher risk due to high traffic movements entering and exiting. Any future growth surrounding SH 22 will increase safety risk and exposure, whilst also increasing the demand for access points.

6.2.1.6 Freight

The existing SH 22 corridor also has a critical east-west freight function for rural/vegetable-growing areas, Glenbrook, Dairy factories, Paerata and the northern part of Pukekohe. Furthermore, based on the current Waka Kotahi over-dimension vehicle route and overweight route map, it is anticipated that the over-dimension and overweight vehicles are likely to use SH 22 as part of their route to connect into Great South Road just further north of Drury.

6.2.2 Likely Future Environment (Without Project)

This section describes the likely future environment with the expected and planned growth and development, but without the Project.

6.2.2.1 Future Transport Network and Land Use

The wider Drury, Ōpāheke, Pukekohe and Paerata areas in the south of Auckland have been signalled to undergo significant urban growth in the AUPOIP and the Council have approved the Structure Plan in 2019 and recently received private plan changes to zone these areas.

The Drury – Ōpāheke structure plan area is estimated to provide about 22,000 houses and about 12,000 jobs with a population growth of about 60,000 over a 30-year period. The Ōpāheke-Drury growth area is shown in Figure 6-8 and also indicates where SH 22 is relative to growth areas.

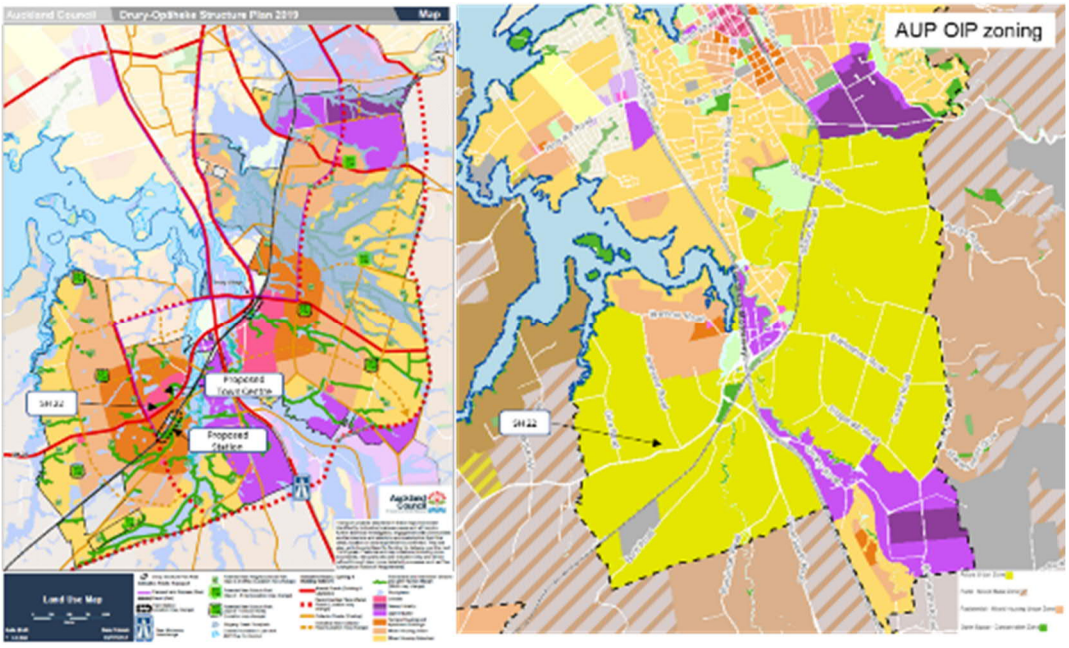


Figure 6-8: Future transport and land use adjacent to SH 22

The Drury – Ōpāheke Structure Plan, is shown in Figure 6-8, indicating both the expected pattern of urban development and the future transport projects (subject to planning and funding approvals) surrounding SH 22 that have been developed to support the growth in and adjacent to this area.

The proposed future urban development surrounding SH 22 (north and south) is signalled to transition from rural to urban with a proposed a town centre, terraced housing and apartment buildings, mixed urban housing, mixed suburban housing and light industry. A number of developers are seeking

private plan changes to rezone the land in Drury east and west. The proposed land use sought by developers is generally consistent with that of the Drury-Ōpāheke Structure Plan.

The future transport projects southern growth areas are:

- New rail stations at Drury Central, Drury West, and associated park and ride facilities*
- New Mill Road Corridor - a strategic alternative route from Manukau to Drury in the long term, running parallel and to the east of State Highway 1 (SH1) *
- SH 1 Papakura-to-Bombay Upgrade providing more north-south regional capacity**
- SH 22 Drury-to-Paerata (Safe Network Programme which proposes short term safety upgrades)**
- Additional rail capacity between Pukekohe and Papakura (4 tracking, electrification and associated grade separations at road/rail crossings)**
- Regional north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH 1 and the NIMT***
- New rail stations at Paerata, and associated park and ride facilities***
- New Pukekohe Expressway – an alternative route to SH 22 between SH 1 (east of the proposed Drury South interchange) and Pukekohe (to the north-eastern connection to Pukekohe Ring Road) and connections between Pukekohe Expressway to SH22***
- Jesmond to Waihoehoe West FTN Upgrade (NoR D2) ***
- Waihoehoe Road East Upgrade (NoR D3) ***
- Ōpāheke North-South FTN Arterial (NoR D4) ***
- Ponga Road and Ōpāheke Road Upgrade (NoR D5) ***
- The future collector roads indicated in the Drury – Ōpāheke Structure Plan are expected to develop through developer contributions as areas get urbanised. ***

Note: funding approved*, funding partially approved** and subject to planning and funding approvals*** (as at the date of this report).

6.2.2.2 Road Safety

As identified in section 6.2.1.1 above, the existing SH 22 is not fit for purpose to support the planned future urban growth. There are significant safety-related adverse effects expected if future growth progresses and the existing SH 22 corridor remains the same. These include:

- The high-speed, high-volume traffic environment along SH 22 and the lack of safe intersection controls for all users will significantly increase the risk for DSI's
- Existing crash history indicates that SH 22 has significant safety issues associated with protection of vulnerable road users and the future growth anticipated will significantly increase crash exposure
- SH 22 in its existing form will not have sufficient additional capacity to cater for demand from future growth. This may lead to strategic traffic rerouting to existing unsafe rural roads and future neighbourhoods north and south of SH 22.

Although low-scale targeted safety improvements are planned or likely (such as speed limit reductions), the magnitude of increased traffic flow, access movement and demand for safe walking

and cycling associated with the planned urban growth means that the current form of road corridor is unsuitable to safely accommodate the likely future environment.

6.2.2.3 General Traffic

The SH 22 corridor forms an integral part of the general traffic and freight network, providing a primary east-west function between Drury and Pukekohe, and serving as a key connection for Paerata / Drury to the SH1 (north-south strategic road network linking to major centres such as Manukau and Auckland City Centre and other districts such as Hamilton).).

The existing SH 22 does not have enough capacity to cater for future growth. In addition, to treat safety-related adverse effects expected if future growth progresses, the intersection controls along SH 22 will need to be changed to provide a safe environment for east-west and north-south travel. As a result, this will significantly reduce east-west capacity for general traffic and freight. This will lead to excessive east-west congestion and result in strategic traffic re-routing to existing unsafe rural roads and future neighbourhoods north and south of SH22.

The future Pukekohe Expressway (connection between Pukekohe and Drury) is expected to reroute strategic traffic from SH 22 to Pukekohe Expressway and enable SH 22 to function as urban arterial in the longer term. However, it is subject to planning and funding approvals and it is unlikely that it will be completed in the next two decades. Therefore, there will be an over-reliance on SH 22 to accommodate higher east-west and north-south demand, to provide safe crossing facilities to integrate with proposed Drury West rail station and cater for existing and imminent future growth.

Refer to Table 6-4 for context about the average daily east-west traffic growth predictions as a result of the future growth.

Table 6-4: East-West Traffic Growth

Year	Total Daily East-West Traffic (ADT)
2016	24,400
2038	54,400
2048+	65,300

*Includes SH 22, Burtt Road, Runciman Road and Pukekohe Expressway (only 2038 and 2048+)

The following undesirable outcomes are predicted to occur if future growth progresses at the anticipated rates, and existing SH 22 infrastructure remains the same:

- The reliance on the existing form of SH 22 (the only east-west strategic traffic route until Pukekohe Expressway is complete) will create increased congestion, stop-start conditions and unpredictable and unreliable travel times on the SH 22 route, as well as increased conflicting movements. This will compromise reliability, resilience and safety for all road users.
- Based on the predicted ADT volumes, the existing SH 22 corridor will not have enough capacity to cater for future growth, which will lead to strategic traffic rerouting to existing substandard rural roads (Burtt Road, Runciman Road) and future neighbourhoods north and south of SH 22.

6.2.2.4 Walking and Cycling

SH 22 will form an integral part of the future walking and cycling network, providing a primary east-west function and north-south function to enable safe pedestrian and cyclist crossing facilities as shown in Figure 6-9.

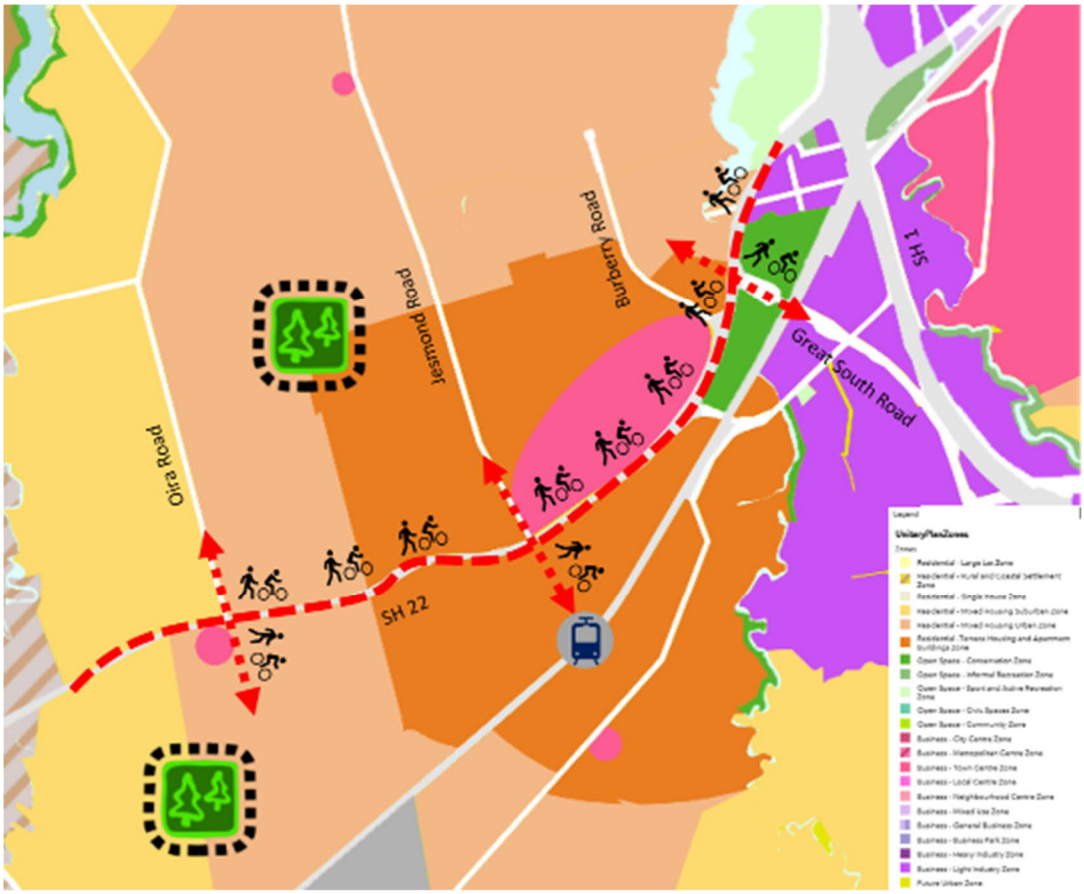


Figure 6-9: Future Walking and Cycling Movements on SH 22

As previously discussed, there are currently no dedicated pedestrian or cycle facilities on SH 22, and the road shoulder does not provide any protection for vulnerable users for both east-west and north-south movements.

Walking and cycling are key components of the future environment surrounding SH 22. There are several key attractors which mean that walking and cycling will significantly increase as growth progresses in the Drury area, these include:

- The proposed future land use zoning are a proposed town centre, terraced housing and apartment buildings, mixed urban housing, mixed suburban housing and light industry. This high density and attractors imply a mixture of modal movements ranging from local to strategic.
- A new rail station at Drury West is proposed to be built south of SH 22 and connections along and across SH 22 will become critical for active travel.
- SH 22 is a key gateway for localised trips (incl. rail stations, centre and strategic east-west movement) and key connection to SH1 cycleway.

The following undesirable outcomes are likely to occur if future growth progresses and the existing SH 22 infrastructure remains the same:

- Access to employment and social amenities will be compromised, especially for immediately adjacent land uses
- Walking and cycling network severance between the land use north and south of SH 22 if safe crossing facilities are not provided
- Poor integration with the proposed wider walking and cycling network (SH1 cycleway and the cycleway along rail corridor)
- Existing safety-related issues and crash exposure to vulnerable road users will increase significantly as demand for walking and cycling facilities increases as a result of the growth in the area
- Significantly increased risk for DSIs of vulnerable users
- The ability to contribute to sustainable mode shift will be compromised if additional provision for sustainable travel choices are not provided. As a consequence, the limitations on mode choice will result in increased emissions from continuation of car-based travel and lead to adverse environmental and health effects.
- The congested, unreliable conditions without walking/cycle facilities will constrain access to the proposed Drury West Station for all road users, undermining the effectiveness of the station and desired mode shift outcomes.
- The high-speed, high-volume traffic environment along SH 22 and the lack of intersection controls will create severance between the future urban areas north and south of SH 22.

6.2.2.5 Public Transport

In the longer term, Drury will have a number of public transport facilities such as rail, additional bus routes and a frequent transit network (FTN). These facilities are proposed to connect Drury both inter-regionally to places such as the Auckland City Centre, Manukau and Auckland Airport, and local links to surrounding town centres. Related projects include:

- Proposed rail stations in Drury West and Drury Central. These rail stations are included in the New Zealand Upgrade Programme (NZUP) and construction is planned to start in 2023 and be completed by late 2024
- wider Drury-Ōpāheke-Papakura area to wider South Auckland and connect to Drury West and Drury Central station.
- Additional bus routes, including services proposed by AT to support future urban development within Drury.

The future public transport network for the area surrounding SH 22 is shown below in Figure 6-10.

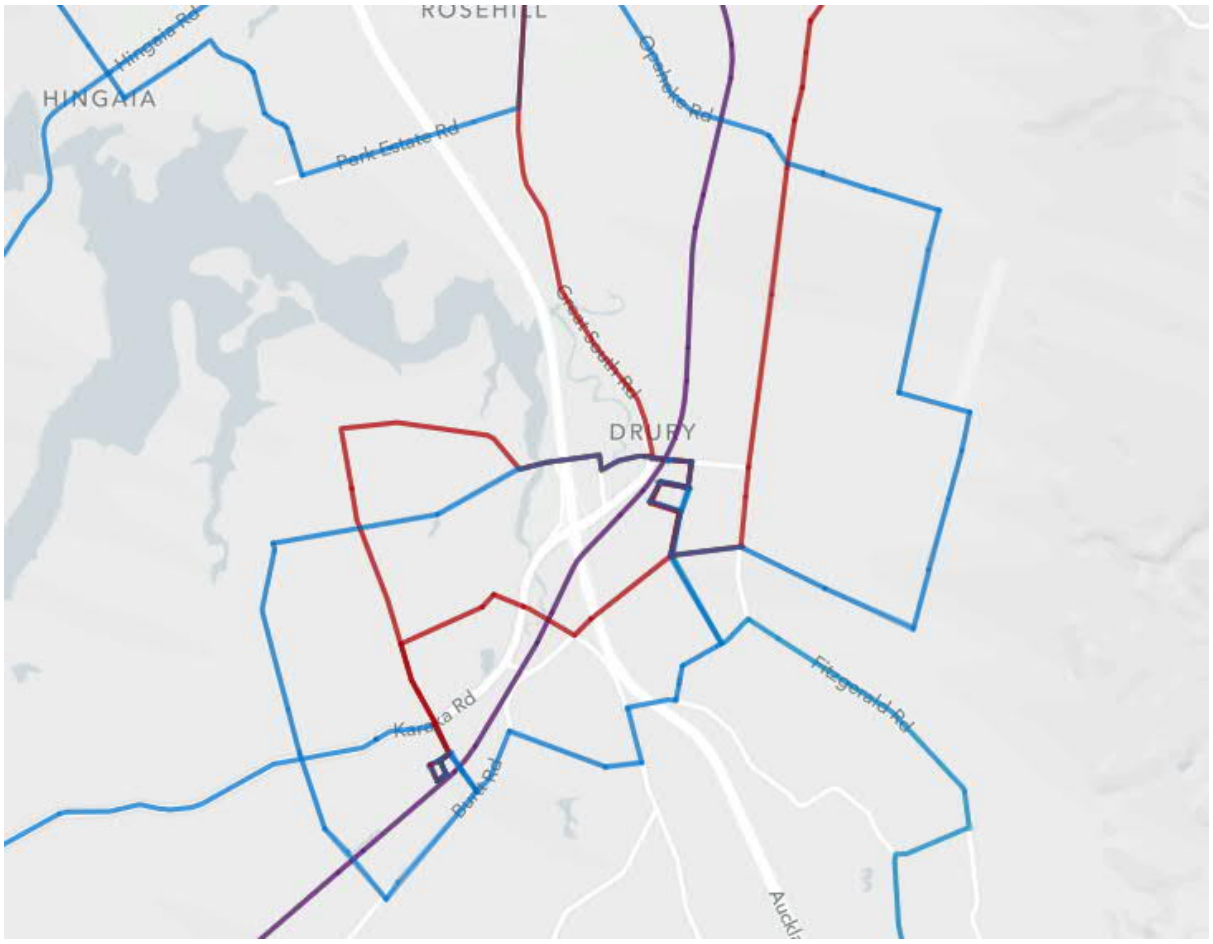


Figure 6-10: Future Public Transport Network (2048+)

SH 22 forms an integral part of the future public transport network, providing an east-west function for walking and cycle access to stations and for future bus services along SH 22, as well as a north-south crossing function to enable the wider future FTN (Drury and Ōpāheke) to connect from Jesmond Road to access Drury West Station, as shown in Figure 6-10.

The following undesirable outcomes relating to public transport that will occur if future growth progresses and existing SH 22 infrastructure remains the same:

- Access to employment and social amenities will be compromised by traffic congestion impacting the effectiveness, reliability and attractiveness of bus services within and through Drury West
- Poor integration with proposed Drury West Station, south of SH 22 and wider Drury-Ōpāheke area. The FTN routes, along Jesmond Road (NoR D2) connecting to wider Drury West, will be compromised by not having adequate priority to cross SH 22.
- The ability to contribute to sustainable mode shift will be compromised if additional provision for reliable public transport services is not able to be provided, leading to reduced ridership.
- Future bus routes along SH 22 (east-west) and the future transit network (north-south) will be constrained to existing roads or new collectors, which will lead to delays and unreliability.
- The lack of provision for reliable public transport choices, will result in increased emissions from increase of car-based travel and lead to adverse air quality and health effects.

6.2.2.6 Access

As the area surrounding SH 22 develops, access to existing properties will be re-routed to the collector road network as indicated in the Drury-Ōpāheke Structure Plan where and direct property access to SH 22 is not recommended due to limited access and high movement function, therefore such direct access is considered to have significant adverse safety effects. Where appropriate, priority intersections will be restricted to left in, left out if they intersect with the strategic network, to improve safety.

The following undesirable outcomes relating to access are predicted to occur if future growth progresses and existing SH 22 infrastructure remains the same:

- The existing high-speed and high traffic flow environment on SH 22 makes the crash exposure for priority right turn movements high. The planned future growth surrounding SH 22 will increase crash exposure between driveways, general traffic and active modes
- Adding additional controlled intersections to allow access to SH 22 will impact on the efficiency and reliability along SH 22, if the existing general 2-lane corridor form was retained
- Retaining the current direct property access onto SH 22 will undermine Vision Zero and Road to Zero outcomes to achieve a safe land transport system with no fatalities or serious injuries involving road traffic.

6.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

This section describes the effects of the Project on the likely future transport and urban environment, including planned growth (movement and place patterns). It firstly assesses operational transport effects expected after the Project is implemented then assesses the transport effects during construction. The assessment is undertaken for each mode/element of the transport system. Measures to avoid, remedy or mitigate actual or potential adverse effects are also identified.

6.3.1 Assessment of Operational Effects

This section describes how each element of the transport system will function operationally after construction of the Project (SH 22 Upgrade), and therefore the effect it will have on the existing and likely future environment.

6.3.1.1 Road Safety

The design of the Project has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrade of SH 22 is expected to result in positive effects on safety when compared to the existing corridor, and these consist of:

- Significantly improved walking and cycling facilities along SH 22 (including separation), resulting in improved protection for vulnerable road users.
- Significantly improved walking and cycling crossing facilities (crossing SH 22) at Oira Road, Jesmond Road and the Great South Road intersection, resulting in a significantly safer environment for all road users.
- A significantly improved speed environment by reducing speed limits to more appropriate urban speeds (e.g. 50km/h) with enhanced place function and consequential reductions in the risk of DSIs.
- Significantly reduced likelihood of head-on crashes by providing raised medians to separate the two directions of traffic.
- Additional lane capacity to accommodate the strategic traffic in this corridor that could otherwise divert to less suitable rural or future neighbourhood roads.

It is anticipated that the number of pedestrians and cyclists will increase significantly as the area surrounding SH 22 urbanises and Drury West Station opens (planned to be completed by late 2024).

The traffic volume on SH 22 will likely increase over time prior to the completion of the Pukekohe Expressway. Thus, the exposure between motorists and vulnerable road users will be significantly higher than the existing road environment. However, the Project propose to lower the speed limit to 50km/h and provide segregated walking and cycling facilities to reduce the likelihood and severity in the event of a crash.

Overall, the proposed design of the Project is well aligned with the transport safety principles from AT and Waka Kotahi. It will provide a much safer transport system which will likely reduce the number of DSIs and result in positive effects for all road users. It is noted that the detailed design will be completed in the future to further detail measures to achieve the anticipated safety outcomes.

6.3.1.2 General Traffic

For general traffic, SH 22 serves as both a key gateway for localised trips (including rail stations, centre and strategic east-west movements) and as a key connection to SH1. SH 22 is well-connected with the existing network and the planned network. The strategic planned network surrounding SH 22 is shown in Figure 6-11. The existing daily flow already exceeds LoS E (22,000 vpd), and the growth of east-west traffic is in the area is expected to grow from 24,400vpd to 65,300[7]vpd (2048+).

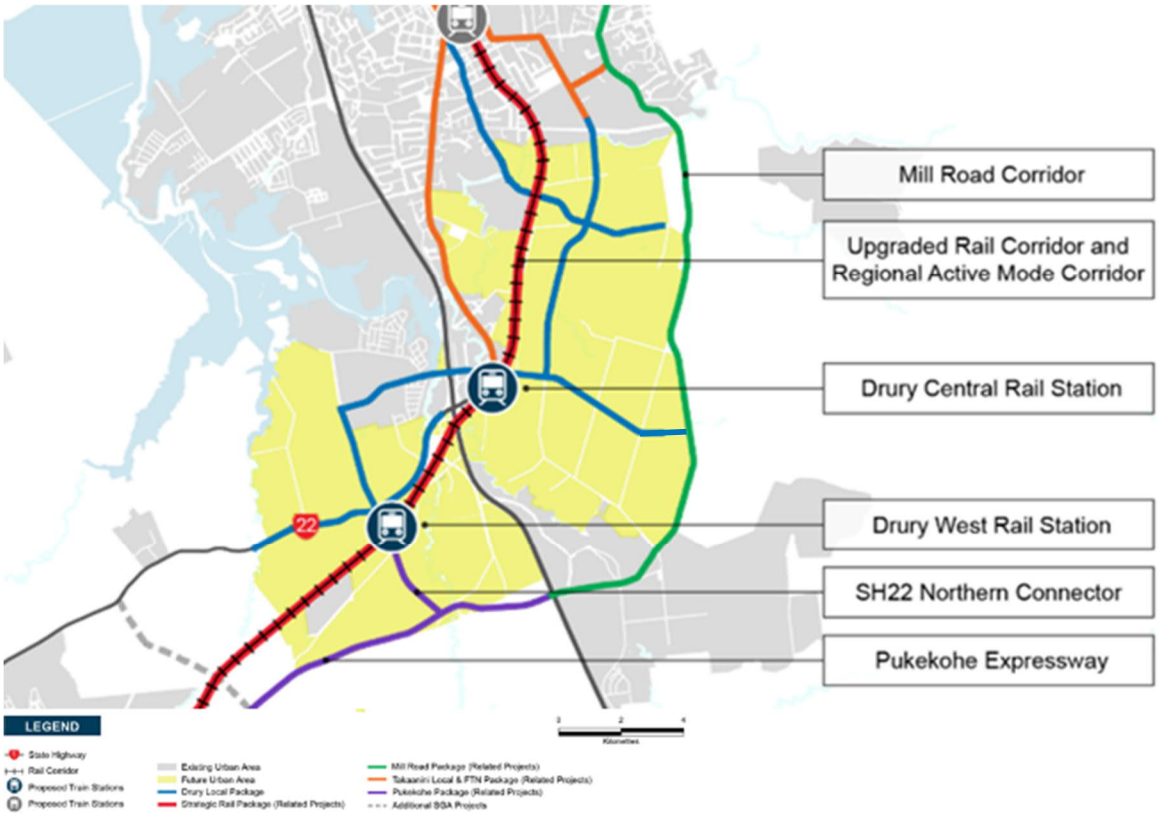


Figure 6-11: SH 22 Future Network Connections

SH 22 is planned to be connected to the future Pukekohe Expressway via the proposed SH 22 Northern Connector. Other connections to the wider region will be made to Drury West via Oira Road, Jesmond Road and Burberry Road, and any of the collector networks as indicated in the Drury-Ōpāheke Structure Plan.

The transition from a rural two-lane state highway to an urban four-lane arterial will increase east-west traffic capacity and improve priority for north-south crossing with appropriate controlled intersections. The effect of the additional capacity will improve journey times, with improvements ranging from one to eight minutes (shown in Table 6-5) and provide more reliable speeds without compromising safety outcomes.

[7] Includes SH 22, Burtt Road, Runciman Road and Pukekohe Expressway

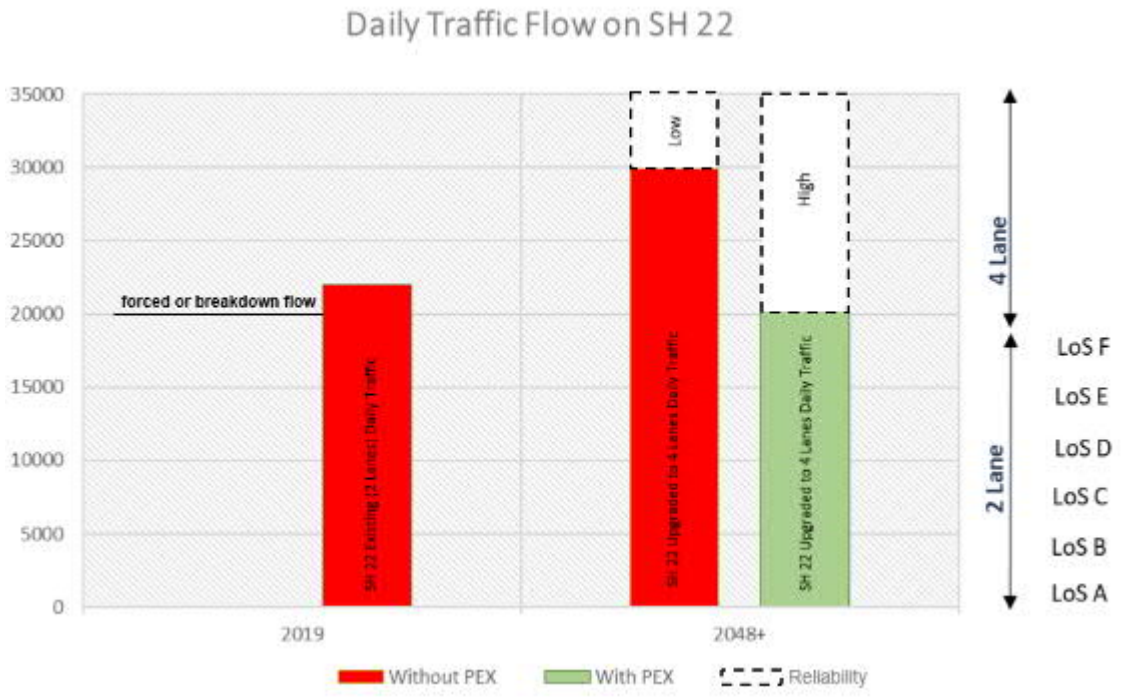
Table 6-5: Journey Times Benefits of SH 22 Upgrade (2048+)

Model Time Period	Journey Time Benefits*
Morning Peak (AM)	8min 32s
Inter-Peak (IP)	1min 24s
Evening Peak (PM)	5min 43s

*Includes both directions and exclude Pukekohe Expressway and constant speed of 50kph

Without the additional lane capacity, the expected demand and installation of controlled intersections will cause unreliable travel in this corridor, resulting in diversion of some traffic to unsuitable rural roads.

The increased capacity will also be able to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors. Figure 6-12 provides daily flow context on how the increased capacity in SH 22 is able to respond to urban development triggers and parallel future infrastructure corridors (Pukekohe Expressway) over time.



*Note: Pukekohe Expressway (PEX)

Figure 6-12: SH 22 Daily Traffic Flow Forecast (With and Without Pukekohe Expressway)

Regarding the existing and future traffic volume, the approximate ADT for SH 22 based on SATURN modelling are:

- 22,100 ADT in 2019 (observed)
- 29,900 ADT in the 2048+ model, with Drury Package (without Pukekohe Expressway)
- 20,100 ADT in the 2048+ model, with Drury Package (with Pukekohe Expressway).

As shown, the change in traffic volume with and without Pukekohe Expressway is significant. Once Pukekohe Expressway is complete, it creates an opportunity to improve the place function along SH 22 further. Therefore, in the short and long term the additional capacity can provide space for priority vehicles, such as buses or high-occupancy vehicles or additional support for crossing and accessing movements and the additional capacity is justified irrespective of Pukekohe Expressway.

As the surrounding area is urbanised over time, the function of SH 22 will change from a rural state highway to an urban arterial road. The change in function will involve a reduction of the speed limit to 50kph, reducing the attractiveness of this route for strategic movements. This will encourage the use of alternative faster routes via SH1 and the future Pukekohe Expressway (once completed) for these movements.

Four lanes will allow flexibility in how the corridor is operated in future, such as consideration of bus, freight or high-occupancy vehicle lanes.

Figure 6-13: 2038 Traffic rerouting with and without SH22 upgrade

Until the expressway is completed, SH 22 will still be the key connection between Pukekohe and Drury and may therefore experience higher volumes in the interim, as shown in Figure 6-13.

The modelling results shown in Figure 6-14, were undertaken using a 2038 forecast scenario to ascertain the likely daily rerouting effect that will occur with SH 22 upgrade implemented but Pukekohe Expressway not implemented by 2038.

The modelling results suggest that a large proportion of the traffic will reroute to SH 22 and SH 1 and a lower proportion will reroute onto surrounding low order rural and local roads. This reinforces the need for four lanes of traffic along SH 22 to support higher volumes in the interim until Pukekohe Expressway is complete.

Figure 6-14: 2038 Rerouting Effect Without Pukekohe Expressway

The early implementation of the rail network upgrade including two new stations and park and ride facilities in Drury, and new facilities for walking and cycling, will likely have some positive effects on reducing the vehicle trips on SH 22 in the interim.

In addition to the operational effects of general traffic lanes, the performance of intersections along the route have also been analysed. The performance of the intersections was based on a 2048+ scenario[8]. A summary of these key performance measures is shown below in Table 6-6.

Table 6-6:Summary of intersection performance 2048+

Intersection	Peak Period	Overall Level of Service (LOS)	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Oira Road/SH 22 (roundabout)	Morning Peak	B	0.84	40
	Evening Peak	A	0.69	20
Jesmond Road/SH 22/SH 22 North Connection (signals)	Morning Peak	D	0.814	116
	Evening Peak	C	0.911	88
Great South Road/SH 22 (signals)	Morning Peak	D	0.89	151
	Evening Peak	C	0.82	60

[8] 2048+ with Drury scenario is also viewed as the reference case for assessment purposes

Overall, the proposed intersections are predicted to perform at LOS D or better which is anticipated to be a satisfactory level during the peak periods under a 2048+ scenario. The project will improve performance for general traffic, freight and public transport services.

In addition, the mid-block (cross section) performance of SH 22 has also been included for context and reported as a Volume over Capacity (VoC) ratio to provide an understanding of the cross-sectional constraints. For reference, a VoC ratio above 75% produces significant mid-block journey time delays.

The traffic volume used for the assessment is based on SATURN 2048+ model and is summarised in Table 6-7 below. The results suggest that the mid-block performance will significantly improve as a result of the SH 22 upgrade, resulting in improved performance for general traffic, freight and public transport services.

Table 6-7:Summary of Mid-Block VoC Performance 2048+

SH 22 mid-block section	Direction of traffic	2048+ demand without SH22 upgrade and Pukekohe Expressway	2048+ demand with SH22 upgrade without Pukekohe Expressway	2048+ demand with SH22 upgrade and Pukekohe Expressway
SH22 (West of Oira Road)	Eastbound (AM Peak)	105%	53%	36%
	Westbound (PM Peak)	111%	56%	29%
SH22 (East of GSR Road)	Eastbound (AM Peak)	112%	56%	47%
	Westbound (PM Peak)	79%	39%	37%

The overall operational effects of the Project in terms of general traffic are:

- Improved reliability and resilience for general traffic travelling along (ranging from one to eight minutes) and crossing SH 22
- Improved integration with the proposed Drury West Station (park and ride) and the future urban areas surrounding SH 22
- Significantly improve corridor and intersection capacity to cater for future growth, which will reduce strategic traffic rerouting to existing unsafe rural roads and future neighbourhoods north and south of SH 22
- Increased capacity, which improves movement function to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

6.3.1.3 Walking and Cycling

The Project proposes separated walking and cycling facilities on both sides of the SH22 corridor. It also includes dedicated pedestrian and cycle crossing facilities at Jesmond Road, Great South Road

and Oira Road, which connect with the expected future adjacent facilities (included in NoR D2 and the future collector network).

The proposed walking and cycling facilities have been designed in accordance with relevant AT standards and policies as summarised in Table 6-8.

Table 6-8: SH 22 upgrade AT standards and policy assessment for walking and cycling facilities

Policy/Standard	Network Component	Assessment
Auckland Transport Vision Zero[9]	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 proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on SH 22 are proposed to be 50km/hr, therefore the proposed design of the walking and cycling facilities is considered to be appropriate for these standards.
AT Transport Design Manual[10]	**Footpaths:** 1.8m minimum	A 1.8m footpath (2.4m at centres) is proposed on all corridors and a 2.0m cycle path with a 2.3m berm. The total width of 6.8m is proposed from carriageway to road boundary. This is in accordance with the AT TDM requirements

The predicted 2048+ usage of the walking and cycling facilities along this corridor are shown in Table 6-9 and provide context about likely future demand that will benefit from these facilities.

The outputs were extracted from the SAMM and Station Access Tool. These numbers are based on average predicted daily flows along (east-west) and across (north-south) on or surrounding SH 22.

Table 6-9: Daily Walking and Cycling Predicted Movements (2048+)

Area	Direction	Walking Trips	Cycling Trips
North-South (Jesmond Road*, Great South Road and Oira Rd)	Northbound	3200	700
	Southbound	4100	1000
East-West Travel (SH 22, Regional cycleway*)	Eastbound	1400	600
	Westbound	1200	600

*expected to be key routes for both walking and cycling

[9] Auckland Transport: Vision Zero: https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

[10] Auckland Transport – Transport Design Manual: https://at.govt.nz/about-us/manuals-guidelines/roads-and-streets-framework-and-the-transport-design-manual/

Exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided by vision zero guidance. For dual roundabouts, signalised active mode crossing facilities are proposed.

The Project will have a number of significant positive effects on walking and cycling as it will:

- Significantly reduce the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and across SH 22
- Improve integration with the future walking and cycling network, resulting in improved east-west and north-south walking and cycling connectivity
- Lead to significant environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips
- Serve as a key enabler for greater use of active transport modes by providing safe connector route between urban areas and the proposed Drury West and Drury Central Rail Stations. Significantly improve existing and likely future safety and network connectivity
- Support growth surrounding SH 22 and significantly improve safety and access to employment and social amenities.

6.3.1.4 Public Transport

The Project comprises additional traffic lanes on the existing cross-section to allow for more capacity and provide priority for north-south crossings to enable the wider future frequent transit corridor (Drury and Ōpāheke) to connect from Jesmond Road to access the Drury West Station.

The cross-section will 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.

In the short and long term, the upgrade will still significantly improve public transport resilience, provide space for priority vehicles such as buses or high-occupancy vehicles (T2, T3).

Prior to implementation of the Pukekohe Expressway, the traffic demands on the upgraded SH 22 will be high. Post-implementation of the Pukekohe Expressway, traffic demand will lessen on SH 22 which will result in the overall traffic declining (lowering of general traffic to below 2019 levels). It is noted that public transport is planned to run in the general traffic lanes along SH 22. There is scope once Pukekohe Expressway is implemented to transition two of the four lanes to further priority public transport lanes.

For future public transport services, there is one proposed bus routes[11] which will use this section of SH 22. These are:

- A section of #390 Paerata, which has a 12-minute frequency in peak

The Project's potential operational effects on public transport are:

[11] Based on the AT SGA Remix File – frequencies and routes subject to change

- Improved journey time performance and consistency for public transport users as the additional traffic lane will allow for more public transport capacity
- Reduced delays and improved reliability for future public transport services on SH 22 (east-west) and the future transit network (north-south)
- Improved integration with the future public transport network and improved east-west and north-south connectivity, as well as improved access to employment and social amenities
- The improvements will enable the road to be used by bus services as a diversion in the event of disruptions on other corridors, improving the resilience of the public transport network
- Increased attractiveness and uptake of public transport trips which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits
- It will serve as a key enabler for greater use of active transport modes by providing safe connector route between urban areas and the proposed Drury West and Drury Central

6.3.1.5 Access

Based on the high traffic flow per day along SH 22 and limited access classification, direct property access is not recommended onto the network given the potential negative safety implications. The anticipated traffic volumes and multi-lane crossing manoeuvres will undermine Vision Zero as vehicles using driveways will conflict with other modes, in addition to driver and active mode safety being compromised through merging movements into traffic flow.

As the area develops the existing properties accesses will be re-routed on to the collector road network as indicated in the Drury-Ōpāheke Structure Plan, where appropriate.

The indicative collector network is subject to change as developers progress these connections through the plan change processes. For the Burberry Road and McPherson Road connection, the local collector network will be triggered by developers, until such a time it is assumed that both function as a left-in and left-out only, with right turn movements prohibited.

Some existing properties will face a minor diversion impact on the main network given that limited (left-in and left-out only) direct property access will be permitted. The diversion for the few number existing properties with direct access to SH 22 will range from 36 seconds to two minutes. While some properties may require longer routes for access (such as where right turn access is banned), these effects are expected to be offset by the more reliable and significant improvement to safety.

The potential operational effects of providing limited direct property access on SH 22 are:

- A decrease in crash exposure between driveways, general traffic and active modes
- Eliminate the crash risk related to merging onto the road and crossing multiple traffic lanes.

Overall, the effects on direct property access are considered to be neutral.

6.3.1.6 Freight

Similar to general traffic, the improved corridor capacity as a result of the Project will result in improved journey times and reliability for existing and future freight. The corridor will be able to accommodate freight movements along the mid-block and through the intersections.

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.

6.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The Project provides significant positive effects and there are no operational adverse effects to mitigate.

6.3.3 Assessment of Transport Construction Effects

This section describes the assessment of potential transport effects during construction of the Project.

Construction of the Project will include road widening on the existing SH 22 alignment from the SH1 Drury Interchange to the west of Oira Road intersection. The construction works also include the upgrade of three intersections at Great South Road, Jesmond Road, and Oira Road. Three stormwater wetlands and two culverts are proposed parallel to SH 22, along with reconstruction of the existing SH 22 Ngakoroa Stream Bridge over the Ngakoroa Stream. Figure 6-15 shows the indicative construction zones.

Figure 6-15: Construction Zones – State Highway 22 upgrade

The Project is estimated to take two to three years to complete:

- Enabling works: three to four months
- Westbound Carriage: eight to ten months

- Eastbound Carriage: eight to ten months
- Pavement and finishing works: five to six months.

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for each zone. The indicative construction method has been developed based on a concept design with consideration of using the most practical construction techniques and equipment. There are likely alternative methods in the future that could be used to complete the works, however, this document only intends to capture the traffic impacts based on the indicative construction method.

6.3.3.1 Temporary Traffic Management

Most of the work required for construction of the Project will be road widening and intersection works on the existing SH 22 corridor. This means that temporary traffic management will be required to delineate live traffic away from the construction zones. The scale of temporary traffic management is largely dependent on the various stages and requirements of the construction activities.

It is expected that full road closure may be required for some specific activities, such as road surfacing, traffic switches and bridge beam installation. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work.

It is considered that the temporary effects from the construction activities on SH 22 can be adequately managed through the implementation of a CTMP during the construction phase of the Project.

If required, Site-Specific Traffic Management Plans (SSTMP) should be developed to manage constraints on access to affected properties.

6.3.3.2 Construction Traffic Effects

The construction of the Project will require significant earthworks. The estimated volumes of cut and fill are approximately 142,000m^3 based on the current indicative design. Final cut and fill volumes will be confirmed following detailed design prior to construction. In addition, it is expected that the pavement construction will require an estimated 20,000m^3 to 30,000m^3 of imported aggregates. The construction traffic movements to accommodate these activities will likely result in the increase of traffic volume on construction routes used during the construction period of SH 22 upgrade.

6.3.3.2.1 Expected construction traffic routes

Given the timing of the construction of SH 22 upgrade has yet to be determined, there is a degree of uncertainty associated with any predicted construction methodology and associated traffic routes. This means:

- The routes that will be used by construction vehicles will depend on the locations of quarries and disposal sites which are not yet certain.
- The exact location and extent of compound sites/lay down areas has yet to be determined.
- The timing of construction of other projects could impact on likely construction vehicle routes, especially the Jesmond Road FTN Upgrade, the Bremner Road FTN Upgrade (both sections of NoR D2 of the Drury Package) and the SH1 Papakura to Drury South improvements project (part of the New Zealand Upgrade Programme).

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 along SH 22 identified as part of future CTMPs. Details of the routes and time restrictions for access will need to be updated and refined as part of the CTMP process. It is anticipated that the routes for construction traffic will likely be limited to arterial corridors and intersections with the provision of adequate vehicle tracking.

It is noted that the existing SH1 motorway bridge at the Drury interchange has a height limit of 4.66m. Therefore, any construction vehicles exceeding this limit, are prohibited to go under the bridge. However, the Drury interchange is expected to be upgraded as part of the SH1 Papakura to Drury South project and road network vehicle restrictions should be reassessed prior to -construction as this constraint may no longer exist.

The potential construction traffic routes are shown below in Figure 6-16.

Figure 6-16: Potential construction routes for SH 22 upgrade project

6.3.3.2.2 Expected construction traffic generation

Based on the proposed construction methodology and activities, the estimated duration of works is between two and three years, which includes four stages of construction works. Construction vehicles will include truck movements (heavy), light delivery and staff/contractor vehicle movements (light).

The total estimated trips associated with construction works are approximately 39,000 truck movements staged over two and three years.

To estimate the daily number of truck movements to and from the site, the following working assumptions were adopted:

- Working days: 20 days construction per month
- Hours of delivery of earthwork and other materials: a total of any eight hours between 6am to 6pm. It is noted that truck movements should avoid the peak hours of traffic or alternatively specified times agreed with respective RCA.
- The duration of construction: 2 years for all four stages of construction works. Note for the assessment of construction effects, a shorter construction period of 2 years has been adopted in the assumptions, given that this will generate more trips.

The daily number of construction vehicles have been calculated and summarised below in Table 6-10.

Table 6-10: Expected Daily Traffic Movements from Construction Works

Stages	Expected duration (approx.)	Truck movements (daily)	Light movements (daily)	Total (daily)	Construction Movements
Stage 1: Enabling works	3 months	10 to 20	250 to 300	260 to 320	• Truck movements likely to include low loaders for plant delivery and collection, articulated trucks/truck and trailer units/concrete units, concrete trucks. • Light vehicle movements are likely from construction staff and contractors.
Stage 2: Westbound Carriageway	8 months	120 to 330	350 to 500	470 to 830	
Stage 3: Eastbound Carriageway	8 months	120 to 330	350 to 500	470 to 830	
Stage 4: Median and Finishing works	5 months	10 to 20	250 to 300	260 to 320	

In order to assess the full extent of the effects from the expected construction traffic, the traffic environment at the time of construction needs to be re-assessed. For the construction of SH 22, analysing the impact of construction on the surrounding road network should be included as part of the CTMP for this project.

The expected daily movements caused by construction traffic in peak construction period will be approximately 3% - 4% of the current traffic volumes of SH 22 itself. It is anticipated that this increase in traffic will be unlikely to cause any notable impacts to the existing traffic on SH 22 given that it will largely be operating outside of morning and evening peak hours.

It is recommended that an updated assessment of construction traffic be prepared prior to the time of construction, which will be used to inform the traffic management measures in the CTMP.

6.3.3.3 Road Safety Assessment During Construction Period

6.3.3.3.1 Speed Limit

Site access points (SAPs) will likely be located along SH 22 to accommodate construction traffic access to the nominated construction zones / work areas. To improve safety, the SAPs should only allow left in and left out movements, and right turn movements should be avoided where practical. These movements will require construction trucks to have long decelerate / accelerate distance and time which is likely to affect the operating speed of existing traffic on SH 22.

SH 22 is currently a high-speed rural state highway connecting SH 1 with the rural and urban areas of Pukekohe, Drury, Glenbrook and Paerata. As part of the Safe Network Programme, Waka Kotahi recently implemented new speed limits as shown in Figure 6-17.

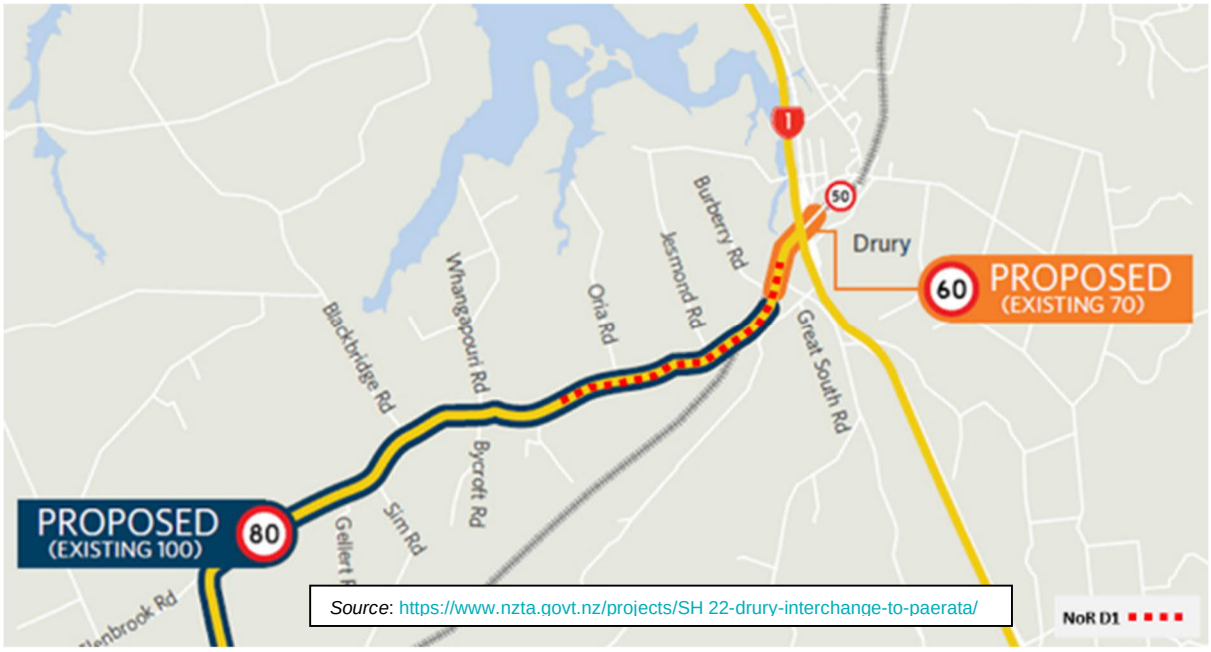


Figure 6-17: Current speed limits on SH 22

The posted speed is likely to cause some potential safety concerns given the longer deceleration distance required by construction trucks entering the SAPs.

In addition, the section of SH 22 upgrade contains some horizontal curves which may have limited sight lines for vehicle entry and egress. These will result in an increased crash risk when the travelling speed suddenly changes due to construction vehicle access to/from the SAPs.

Therefore, it is recommended to implement via the CTMP a safe and appropriate temporary speed limit on SH 22 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. Details of operational hours for construction trucks are also recommended to avoid the peak period to minimise the traffic impact and exposure to potential conflict. 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.

6.3.3.3.2 Pedestrians and Cyclists

The existing roadside facilities on this section of SH 22 have no walking and cycling facilities, but the existing 1.5m sealed shoulders are used informally by pedestrians, cyclists and general traffic. Given the timing of the construction of the Project has yet to be determined, the impacts to active mode activity should be assessed as part of the CTMP for the Project prior to construction.

It is anticipated that the layout of temporary traffic management measures such as traffic cones and temporary signage will likely encroach on the existing shoulder. Depending on the nature of construction works, the road shoulder may not be available at certain times for pedestrians and cyclists to use during construction.

Because the existing environment is unattractive and unsafe, pedestrian and cyclist movements will likely be low during construction. It is anticipated that the Project will be constructed before, in parallel or staged with the future urban zoned land surrounding SH 22 being developed. It is likely that the demand will increase if urbanisation occurs prior to construction, although future parallel collectors could be used as alternative routes for pedestrians and cyclists. Therefore, potential effects on pedestrians and cyclists should be reassessed prior to construction to reflect the current traffic environment.

Overall, it is not anticipated that construction traffic movements will have any notable impact on existing active transport modes over and above existing conditions. However, it is recommended that local residents and stakeholders (such as Bike Auckland and cycling clubs) be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity will be used to inform appropriate traffic management measures in the CTMP.

6.3.3.3.3 Property Access for SH 22 Residents and Businesses

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

6.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

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

a. A CTMP shall be prepared prior to the Start of Construction for a Stage of Work. Any potential construction traffic effects shall be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction.

b. 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:

    (i) Methods to manage the effects of temporary traffic management activities on traffic;

(ii) Measures to ensure the safety of all transport users;

(iii) 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;

(iv) Size 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;

(v) Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;

(vi) Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;

(vii) 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;

(viii) Method that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

c. Auditing, monitoring and reporting requirements relating to traffic management activities shall be undertaken in accordance with Waka Kotahi's Code of Practice for Temporary Traffic Management.

d. Any CTMP prepared for a Stage of Work shall be submitted to Council for information ten (10) working days prior to the Start of Construction for a Stage of Work.

6.4 Summary of Effects (SH22 Upgrade)

The assessment of transport effects for the Project is summarised in Table 6-11.

Table 6-11: Assessment of Effects Summary for NoR D1

Operational and Construction Transport Effects	
Safety	In summary, the effects of the Project on safety are: • it prioritises facilities to support safe travel by active or public transport, which is consistent with the Vision Zero outcomes sought by AT and Waka Kotahi • significantly improved walking and cycling facilities along SH 22, resulting in improved protection for vulnerable road users. • significantly improved walking and cycling crossing (crossing SH 22) facilities at Oira Road, Jesmond Road and Great South Road intersection, resulting in a significantly safer environment for all road users. • significantly improved speed environment with a more appropriate speed of 50km/h, resulting in rerouting strategic movements and reduced risk for death and serious injuries (DSIs) • reduces strategic traffic diverted to unsuitable rural roads by unreliable or congested travel on SH22 • significantly reduced likelihood of head-on crashes by providing raised median to separate the two directions of traffic
Walking and cycling	In summary, the effects of the Project on walking and cycling are: • it enables safe movement for vulnerable road users along and across SH 22 and significantly reduces the likelihood and exposure to potential crashes • good integration with future walking and cycling network, resulting in improved east-west and north-south walking and cycling connectivity • the higher number of active mode trips reduces the reliance on vehicle trips, which results in positive environmental and health benefits • good integration with the wider active mode network connecting to proposed Drury West and Central Stations and it will serve as a key enabler to achieve mode shift targets • improvements to existing and likely future safety and severance issues • significantly improve safety and access to employment and social amenities.
Public Transport	In summary, the effects of the Project on public transport are: • increased capacity due to the additional traffic lanes, resulting in improved journey time performance and consistency for public transport users • reduced delays and improved reliability for future public transport services on SH 22 (east-west) and the future transit network (north-south) • good integration with the future public transport network and significantly improved east-west and north-south connectivity and improved access to employment and social amenities • reduced reliance on vehicle trips by a higher number of public transport trips, which results in positive environmental and health benefits • increased access to the proposed Drury West and Central Stations
General Traffic	In summary, the effects of the Project on general traffic are: • improved travel time and productivity for all general traffic traveling along and crossing SH 22 and without the Project demand will exceed capacity, resulting in excessive congestion

	• improved integration with the proposed Drury West Station (park and ride) and the future urban areas surrounding SH 22. • provision of sufficient corridor and intersection capacity to cater for future growth, which will otherwise lead to excessive congestion and trigger strategic traffic rerouting to existing unsafe rural roads and future neighbourhoods north and south of SH 22 • Increased capacity which will improve the movement function of the corridor to respond to the timing, scale and form of urban development triggers and the change in function will have a positive effect on transport and land use integration.
Access	In summary, the effects of the Project on access are: • a decrease in crash exposure between driveways, general traffic and active modes • eliminate the crash risk related to merging onto the road and crossing multiple traffic lane
Construction Transport Effects	
In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management during construction, including construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users and driveways and property access. These effects can be appropriately mitigated through a CTMP prepared before construction commences.	

6.5 Conclusion (NoR D1)

The existing SH 22 (without the Project) is not fit for purpose to support the planned future urban growth. The crash history shows that there was a total of 78 crashes recorded in the 10-year period between 2010 to 2019. These included two fatal crashes which involved pedestrians, and 11 serious injury crashes which were due to vehicles turning/crossing, being rear ended or losing control/involved in a head on collision.

The existing daily flow already exceeds LoS E (22,000 vpd), and the growth of east-west traffic is in the area is expected to grow from 24,400vpd to 65,300vpd (2048+). Also, there are currently no dedicated pedestrian or cycle facilities on SH 22, and the road shoulder does not provide any protection for vulnerable users for both east-west and north-south future demand. The existing SH 22 does not have enough capacity to cater for the planned future urban growth in the area. Furthermore, to treat safety-related adverse effects expected if future growth progresses, the intersection controls along SH 22 will need to be changed to provide a safe environment for east-west and north-south travel. As a result, this will significantly reduce east-west capacity for general traffic and freight. This will lead to more east-west congestion and result in strategic traffic rerouting to existing unsafe rural roads and future neighbourhoods north and south of SH 22.

There are significant adverse effects expected if future growth progresses and the existing SH 22 corridor remains the same. The adverse effects are increased safety risk and severance for all users, decreased journey time reliability for general traffic and public transport. All the above will then lead to further undesirable transport and land use integration outcomes.

The Project will have significant positive effects on the operation of SH 22 and to service future growth in Drury. The Project provides a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improve access to employment and social amenities.

The Project will significantly improve all transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport. It improves corridor capacity, resulting in improved journey times and reliability for future freight and public transport demand. The journey time benefits for general traffic is expected to be largest in the morning peak (8min 32s), followed by the inter peak (1min 24s) and evening peak (5min 43s), when compared with the likely future environment without the project.

The upgrade will also significantly improve safety for vulnerable users (with the provision of additional segregated walking and cycling facilities) and will significantly reduce the risk of DSIs for the predicted demand (east-west and north-south) for walking (9,900 daily) and cycling (2,900 daily). The upgrade will integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project. Some existing properties will face a minor diversion impact on the main network given that limited direct property access (left-in and left-out only) but the significant safety benefits will offset effects.

In terms of construction effects, the are several potential adverse effects mainly linked to temporary traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended the impact of any construction traffic effects is reassessed when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through conditions relating to Construction Traffic Management Plans and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that the Project will have significant positive operational effects.

7.0 NoR D2: Jesmond to Waihoehoe West FTN Upgrade

Chapter Summary

The existing roads within NoR D2 are not fit for purpose to support the planned future urban growth.

The current environment is a medium to high-speed environment, with poor east-west connectivity for public transport, general traffic, and active modes with limited or no walking and cycling facilities to protect vulnerable users. Also, Norrie Road has a severe capacity (one-lane capacity) and width restriction at Norrie Road Bridge, limiting east-west movement, and it is unable to accommodate large vehicles and public transport. Furthermore, there are no public transport facilities or intersections to support or prioritise public transport usage.

The existing daily traffic flow is relatively low, but it is expected to grow significantly (from 6600vpd to 41,800vpd) as a result of the planned growth and is expected to operate near general traffic capacity. NoR D2 forms an integral part of the future public transport network, providing a primary east-west and north-south function for future planned services, and serving as a gateway to key destinations in Drury (including new planned rail stations, centres and the strategic north-south PT network). Without adequate facilities for public transport, access to employment and social amenities will be compromised by congested, unreliable and unattractive east-west public transport connectivity.

The scale of growth will trigger effects on all elements of the transport system. There are significant adverse effects expected if future growth progresses and existing infrastructure remains the same. These adverse effects will compromise safety, wellbeing, liveability and lead to several undesirable transport and land use integration outcomes as detailed in section 7.2.2.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project provides a safe, reliable multi-modal arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improve access to employment and social amenities in and around the Drury-Ōpāheke area.

The Project will significantly improve the transport facilities for all modes, resulting in improved safety for those that travel by car, active modes or public transport as well as the movement of goods and services. The dedicated FTN facilities will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for future public transport users. The journey time benefits for public transport are expected to be largest in the morning peak (12 min), followed by the inter peak (over 4 min) and evening peak (over 6 min)

The Project will also significantly improve safety for vulnerable users (with the provision of additional segregated walking and cycling facilities) and will significantly reduce the risk of DSIs.

The upgrade will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

The Project will also significantly improve reliability, resilience and productivity for all road users travelling between Drury East and West.

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project. Some existing properties will face a minor diversion impact on the main network given that limited direct property access (left-in and left-out only) but the significant safety benefits will offset effects.

In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is

recommended that the impact of any construction traffic effects is assessed again when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through conditions relating to CTMPs and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes, the Project will have significant positive effects and the potential adverse effects arising during construction can be appropriately mitigated.

7.1 Project Description

The Jesmond to Waihoehoe West FTN Project (NoR D2) includes an approximately 4.1km long four-lane FTN arterial route along Jesmond Road, through a new greenfields link between Jesmond Road and the existing Bremner Road, Bremner Road, Norrie Road and Waihoehoe Road West. It primarily involves upgrading and widening existing transport corridors with the exception of two new links between Jesmond Road and the existing Bremner Road and the new bridge connection over Hingaia Stream. The intent of the Project is to provide an appropriate urban arterial connecting the growth areas of Drury West to the wider network and centres, including providing a frequent transport bus network to respond to the planned place function and its associated movement. Generally, a 30m wide transport corridor will be provided with two general traffic lanes, two bus lanes and separated walking and cycling facilities on both sides of the road corridor. The urban arterials will have a likely speed limit of 50kph.

For assessment purposes, the Project has been separated into three sections, as shown in Figure 7-1, including:

- Jesmond Road FTN Upgrade;
- Bremner Road FTN Upgrade (including the Jesmond to Bremner link through the Auranga Development[12], Bremner Road and Norrie Road); and
- Waihoehoe Road West FTN Upgrade including the Great South Road intersection.

The indicative alignment has been prepared for assessment purposes, and to indicate what the final design of the Project may look like. The final alignment will be refined and confirmed at the detailed design stage. Key features of the proposed upgrade common to each Project section include the following:

- A typically 30m wide road with four lanes and separated walking and cycling facilities
- Localised widening around the existing intersections to accommodate for vehicle stacking and tie-ins and walking and cycling facilities/crossings
- Batter slopes and retaining to enable widening of the corridor and/or wetland construction, and associated cut and fill activities
- Vegetation removal along the existing road corridor
  Areas identified for construction related activities including site compounds, construction laydown, bridge works area, the re-grade of driveways and construction traffic manoeuvring.

[12] First Auranga Development

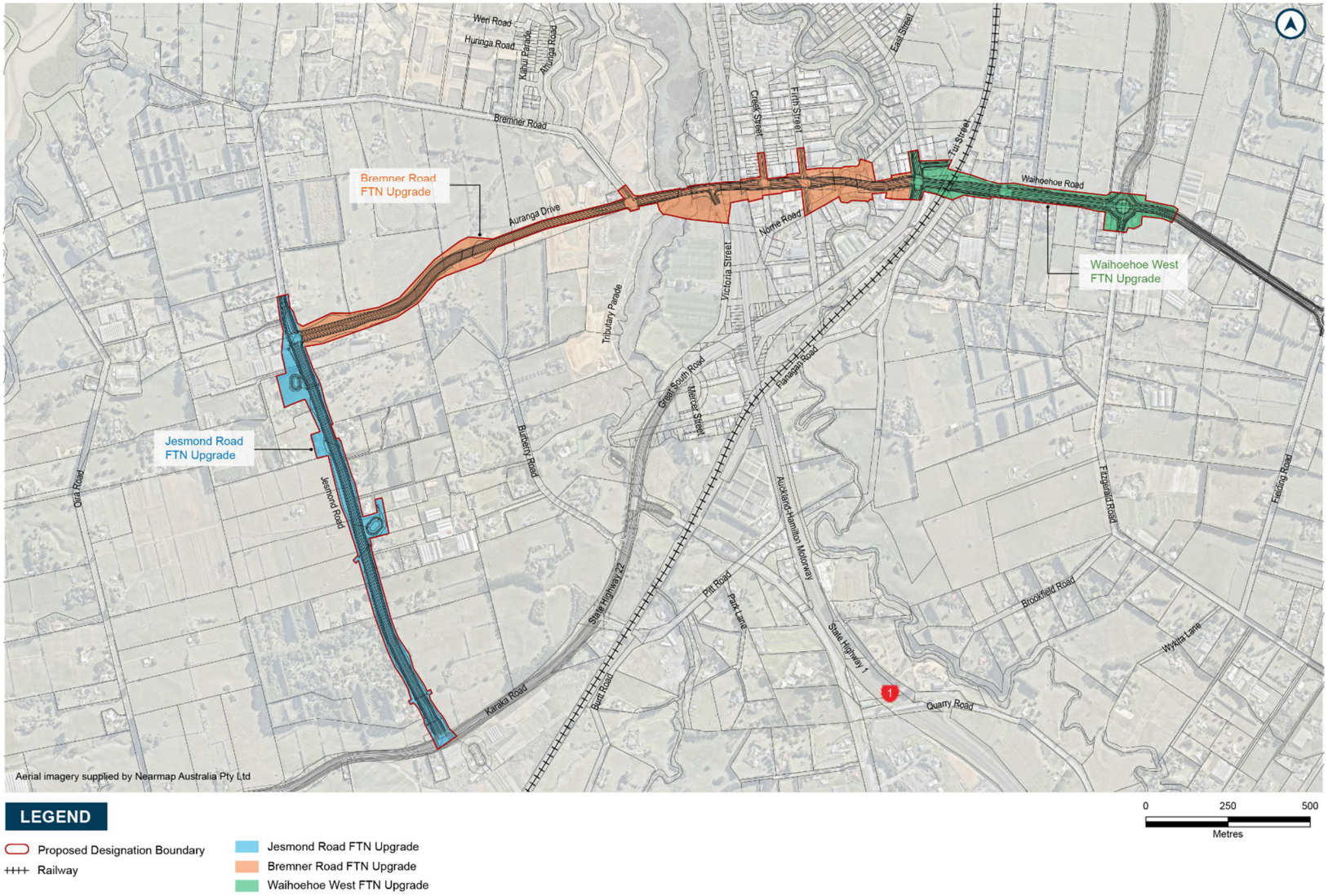


Figure 7-1 Overview of NoR D2

7.1.1 Network and Corridor Design

NoR D2 was developed as part of network planning for the wider area and concurrently with the structure planning undertaken by the Council. Those wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the problems. As such, the Project Area is part of a wider integrated network planned for the area.

The Project proposes that the function of Jesmond Road, Bremner Road and Waihoehoe Road West change from an existing rural two-lane road to an urban four-lane arterial with provision for vehicles, public transport and active modes.

The proposed design includes additional facilities for bus lanes, walking and cycling to accommodate for the higher demand as shown in Figure 7-2.

Figure 7-2: Jesmond to Waihoehoe West FTN Upgrade (NoR D2) future corridor design

The development of the corridor design uses AT's Roads and Streets Framework, which qualitatively assesses the typology (movement and place value) and modal priority.

In the long term, the future corridors movement function will increase to medium significance as the Drury area urbanises over time. Jesmond Road, Bremner Road and Waihoehoe Road West will become the key FTN, walking and cycling arterial connecting Drury East and Drury West and will also serve as a key gateway to the proposed new rail stations, centres, regional cycling networks and wider south Auckland FTN network.

The corridor is therefore assessed to have the following RASF typology and modal priority, shown in Figure 7-3:

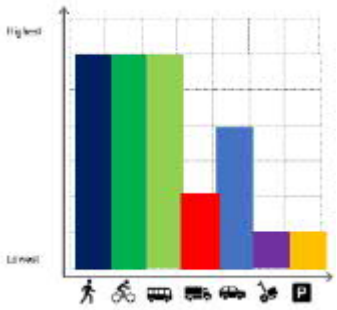
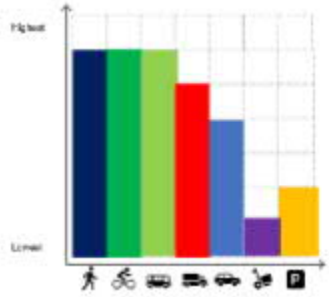
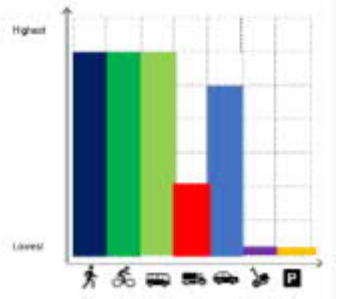
NoR D2 Section	Existing and Future Movement Function (Existing)	Existing and Future Place Function (Existing)	Modal Priority
Jesmond Road Section	Existing = M1 (rural) Future = M2 (urban)	Existing = P1 (rural) Future = P2 (urban)	
Bremner Road Section	Existing = M1 (rural/urban) Future = M2 (urban)	Existing = P1 (rural/urban) Future = P1 (urban)	
Waihoehoe Road Section	Existing = M1 (rural) Future = M2 (urban)	Existing = P1 (rural) Future = P2 (urban)	

Figure 7-3: Assessment of Topology for the proposed section

For NoR D2 this indicates a desire for a high priority to walking, cycling and public transport, with a medium priority for general traffic and freight movement, but with a lesser need for specific loading, servicing, access and parking priority.

The Project, with its separated walking and cycle facilities, reduced speed environments, controlled intersections for safe crossing and access and dedicated lanes for bus priority align with the modal priorities. As such NoR D2 is considered to be supportive of the draft RASF mandates and desired movement and place outcomes.

The generic cross-section for the Project is shown in Figure 7-4. This cross-section has been used to identify the expected general form and footprint of the corridor; however, it is noted that the exact form and dimensions will be subject to future detailed design at the time of implementation.

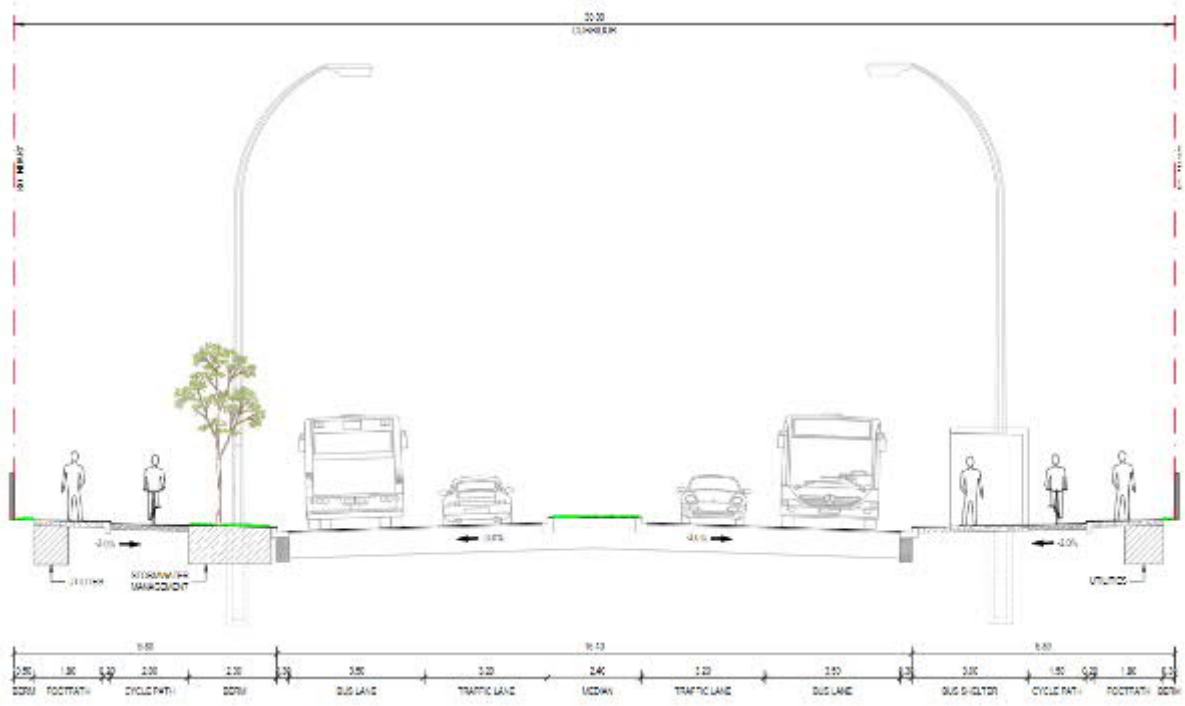


Figure 7-4: NoR D2 Typical Cross Section (indicative)

Transport features of the Project common across the three sections include:

- Four-lane FTN arterial standard road (28-30m cross section)
- Two lanes for FTN/buses and two lanes for general traffic
- 1.8m footpaths on both sides of the road
- 2.0m separated cycle lanes on both sides of the road
- 3.0m spacing for bus shelter

Further specific details of each Project section are provided in the sections below.

7.1.2 Jesmond Road FTN Upgrade Section

7.1.2.1 Section Overview

The Jesmond Road corridor provides greater accessibility via a north-south link that connects Bremner Road to the proposed Drury West Station and town centre, forming a key public transport and active mode spine through Drury West. An overview of the proposed design is provided in Figure 7-5. In addition to those listed above, the key features of the Jesmond Road section include:

- New and extended pipe culverts for cross drainage
- Two stormwater wetlands.

7.1.2.2 Specific Transport features of this section

In addition to those listed in section 7.1, the key transport features within this section include:

- Four-lane FTN between the Jesmond Road/SH 22 intersection to the Jesmond/Bremner Road link and urban speed environment
- Signalised intersections at SH 22/Jesmond Road and Jesmond Road/Bremner Road

The intent of this Project from a transport perspective is to provide an appropriate urban arterial connecting the growth areas of Drury West to the wider network and centres, including providing a frequent transport bus network. The Jesmond Road corridor will provide greater accessibility via a north-south link that connects Bremner Road to the Drury West Station and town centre, forming a key public transport and active mode spine through Drury West.

Figure 7-5 Overview of Jesmond Road FTN Upgrade Section

7.1.3 Bremner Road FTN Upgrade section

7.1.3.1 Section overview

The Bremner Road FTN Upgrade section extends from Jesmond Road in the west, approximately 1.98km to the end of Norrie Road in the east. This section involves the construction of a new road from Jesmond Road to the existing Bremner Road referred to as the "Jesmond to Bremner Link" and widening, and direct connection via a new bridge over Hingaia Stream, of Bremner Road and Norrie Road to enable the four-lane FTN arterial. This section provides greater east-west accessibility that connects Jesmond Road to Great South Road and town centre, forming a key public transport and active mode spine. An overview of the concept design is provided in Figure 7-6.

In addition to those listed above, the key features of the Bremner Road FTN Upgrade section include:

- Between Jesmond and Bremner Roads (Jesmond to Bremner Link):
    - A new road from Jesmond Road to an unnamed stream at the Auranga Development.
    - Forming of two additional lanes for the FTN within the Auranga "Road 1" from the unnamed stream to Bremner Road)
- A new bridge over an unnamed stream within the Jesmond to Bremner Link
- Widening or duplication of the two existing bridges crossing Ngakoroa Stream and SH1. Noting that these two bridges are proposed to be reconstructed in the near future as part of the SH1 widening by the Papakura to Drury South Waka Kotahi Project which is a project under of the New Zealand Upgrade Programme.
- A new bridge connection from Bremner Road to Norrie Road across Hingaia Stream
- Removal of Norrie Road Bridge and closure of Norrie Road west
- Removal of access to Bremner Road from Creek Street (south)

7.1.3.2 Specific Transport features of this section

In addition to those listed in section 7.1, the key transport features within this section include:

- Signalised intersections for Bremner Road, Creek Street, Firth Street and changing Bremner Road and Creek Street intersection from a 4 arm to a 3 arm intersection by the closing the southern arm.
- Replacing the narrow one-way bridge on Norrie Road, with a new and widened corridor along Bremner Road and Norrie Road.

As mentioned above, the Project interfaces with the Papakura to Drury South project (part of New Zealand Upgrade Programme) at Bremner Road and SH1. At the time if writing this report, the Papakura to Drury South project is intending to lodge their NoR and consent applications in mid-2021.

From a transport perspective, the Project provide an appropriate urban arterial connecting the growth areas between Drury East and Drury West to the wider network and centres. Consistent with that intent, the Bremner Road corridor provides greater east-west accessibility that connects Jesmond Road to Great South Road and Drury town centre, forming a key public transport and active mode spine.

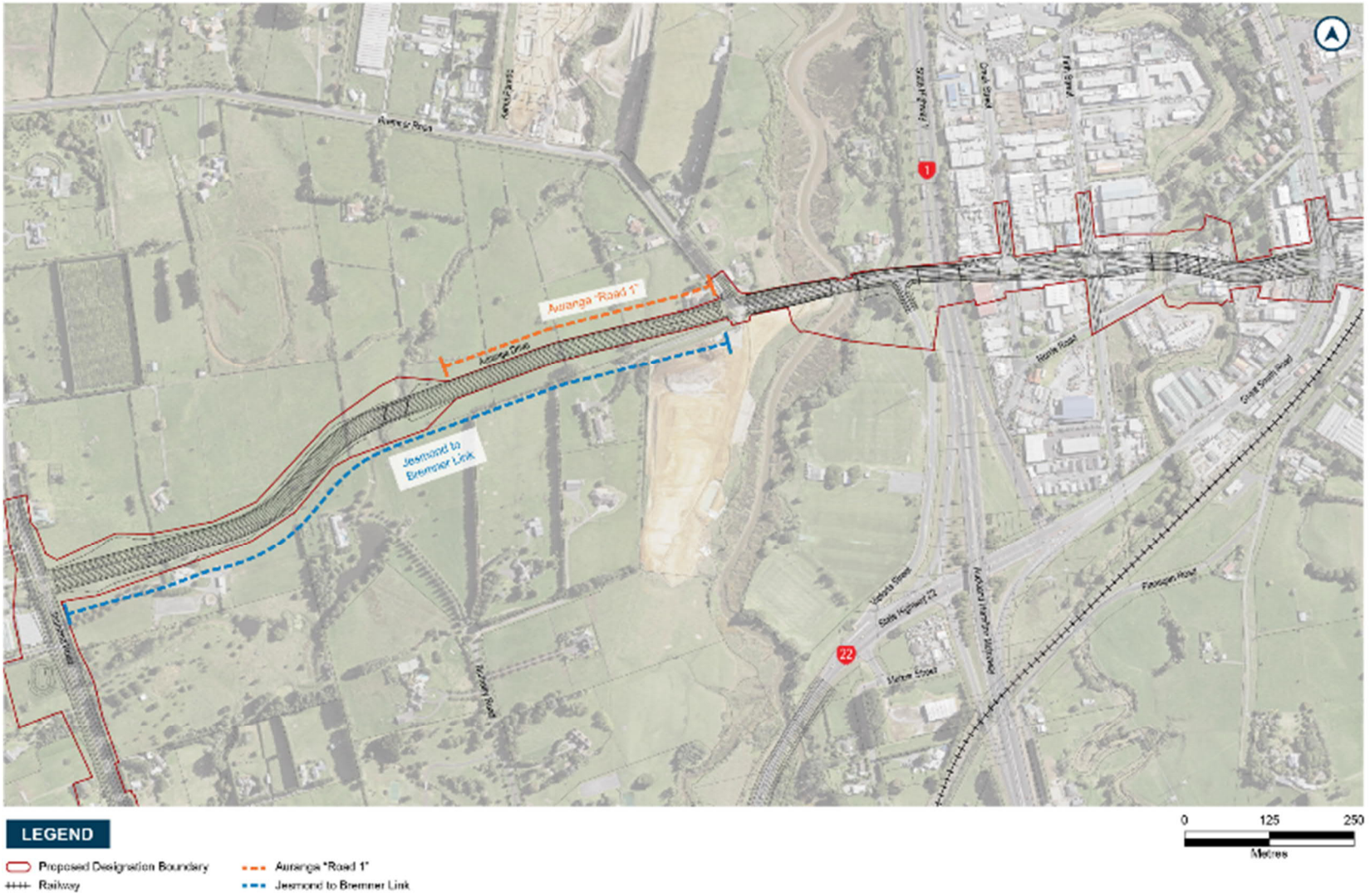


Figure 7-6 Overview of Bremner Road FTN Upgrade Section

7.1.4 Waihoehoe Road West FTN Upgrade section

7.1.4.1 Section overview

The Waihoehoe Road West FTN Upgrade section extends from Great South Road in the west, approximately 800m east to just past Fitzgerald Road in the east and involves widening the existing two-lane rural road to enable the four-lane FTN arterial. This section provides a strategic east-west link between strategic north-south and east-west corridors (Norrie Road, Great South Road and the Ōpāheke N-S FTN Arterial) that connects Waihoehoe Road to the Drury Central Station (and associated park and ride facilities) and town centre, forming a key public transport and active mode spine through Drury West. An overview of the concept design is provided in Figure 7-7.

In addition to those listed above, the key features of the Waihoehoe Road West FTN Upgrade section include:

- Realignment of Tui Street to Great South Road
- Reconstruction of the bridge crossing the NIMT rail line
- Relocation of the Waikato 1 watermain. The point of re-location to be agreed with Watercare at future detailed design.

Figure 7-7 Overview of Waihoehoe Road West FTN Upgrade Section

7.1.4.2 Specific Transport features of this section

In addition to those listed in section 7.1, the key transport features within this section include:

- Reduce urban speed environment to 50kph
- Signalised intersections for Great South Road and Fitzgerald Road/ Ōpāheke N-S FTN Arterial

From a transport perspective, the Project provide an appropriate urban arterial connecting the growth areas of Drury-Ōpāheke area to the wider network and centres, including providing a frequent transport bus network. The Waihoehoe West Road corridor provides a strategic east-west link between strategic north-south and east-west corridors (Norrie Road, Great South Rd and the Ōpāheke N-S FTN Arterial) that connects Waihoehoe Road to the Drury Central Station (and associated park and ride facilities) and Drury town centre, forming a key public transport and active mode spine through Drury West. The Drury Central rail station project is part of the New Zealand Upgrade Programme and the Waihoehoe Road West FTN Upgrade section interfaces with this project on Waihoehoe Road and Flanagan Road. Table 7-1 provides a summary of the proposed intersections along the NoR D2 corridors.

Table 7-1: Intersection Summary for Jesmond Road FTN Upgrade/FTN (NoR D2)

Road	Intersection	Current Form	Proposed Form	Key Outcomes
Jesmond Road	Jesmond Road/SH 22	Stop Controlled intersection	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
	Jesmond Road/Bremner Link	N/A	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Bremner Road	Bremner Road/Bremner Road link	N/A	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
	Bremner Road/Creek Street	Give-way controlled intersection	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
	Bremner Road/Firth Street	Give-way controlled intersection	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Waihoehoe Road West	Waihoehoe Road West/Great South Road	Roundabout	Signals	Multi-lane signalised intersection with protected walking and cycling facilities

Road	Intersection	Current Form	Proposed Form	Key Outcomes
	Waihoehoe Road West/Fitzgerald Road/Ōpāheke N-S	Give-way controlled intersection (no leg for Ōpāheke N-S FTN Arterial)	Roundabout	Multi-lane roundabout intersection with protected walking and cycling facilities

7.2 Existing and Likely Future Environment

This section describes the current and likely future environment without the Project. The subsequent section describes the effect of the Project on the likely future environment.

7.2.1 Existing Environment

The current land use surrounding Jesmond Road, Bremner Road and Waihoehoe Road West is largely greenfield land, low-density residential and rural zones with agriculture and rural lifestyle blocks. Residential development is underway at the Auranga Development on Bremner Road in Drury West. Industrial zoned land is located on Bremner Road, Norrie Road and Great South Road and this connects to the existing Drury town centre. Bremner Road acts as an east-west connection between Drury East and Drury West over SH 1. Figure 7-8 shows the aerial of the current land use environment.

Figure 7-8: Current land use surrounding Jesmond Road, Bremner Road and Waihoehoe Road West

7.2.1.1 Existing transport network

The existing transport network on and surrounding NoR D2 can be summarised as follows:

- Jesmond Road is a rural two-lane secondary collector road and provides a connection between Bremner Road and SH22 with an 60kph speed limit (recently changed). There are no public transport, walking or cycling facilities.
- Bremner Road is a two-lane secondary collector between Jesmond Road and Firth Road with an 50kph (recently changed) speed limit (Jesmond Road and Bremner Road bridge) and 50kph speed limit between Bremner Road bridge and Drury Town Centre. Segregated walking and cycling facilities are provided between the Auranga development up to the Bremner Road bridge. Footpaths are provided for between the bridge and the town centre. There are no walking and cycling facilities between Jesmond Road and the Auranga development. No public transport facilities are provided along the entire corridor. The section between Victoria Road and Firth Street is also classified as an over-dimension and overweight freight route.
- Norrie Road is a two-lane secondary collector between Firth Street and Great South Road with a severe capacity (one-lane capacity) and width restriction at Norrie Road Bridge limiting east-west movement and access to large vehicles.
- Waihoehoe Road West is a rural two-lane secondary collector road and provides connection between Great South Road and Fitzgerald Road with a 50kph to 70kph speed limit, limited walking facilities (not continuous, limited to one side and substandard for urban context) and no public transport or cycling facilities.
- The intersection controls on the existing roads within NoR D2 include seven intersections (six priority controlled and one roundabout) with limited or no pedestrian and cyclist facilities. The intersection with Bremner Road and Bremner Road (Auranga Development) is signalised and is the only intersection with fully protected facilities for pedestrians and cyclists.

Appendix 4 and Appendix 5 provides more detail on the key characteristics of the existing road network.

7.2.1.2 Road safety

Crash history has been obtained for each road within NoR D2 from CAS to provide a high-level understanding of crash patterns and safety concerns. The crash data has been extracted for a ten-year period from January 2010 to December 2019 (inclusive).

7.2.1.2.1 Crash history on Jesmond Road

Figure 7-9 shows the indicative crash locations along Jesmond Road between the SH 22 intersection and Bremner Road between 2010 and 2019.

Figure 7-9: Location of crashes along Jesmond Road

The crash history data shows that there was a total of four crashes recorded in the 10-year period. This included one minor injury crash which was due to loss of control along Jesmond Road. Refer to Appendix 3 for the collision diagrams and crash reports for these crashes.

The other crashes were a result of lost control at the bend and on the straight stretch of road, as well as a crossing/ turning crash. It is likely that the existing speed environment (80km/h) and road surface quality may be contributing factors causing these crashes. The short-term mitigation from AT is the speed reduction to 60km/h which was implemented from 30th June 2020.

This section of Jesmond Road has a low number of reported crashes. The likely reason for the low number of crashes can be linked to the rural land use setting, where low volumes presenting less opportunities for crashes.

7.2.1.2.2 Crash History on Bremner Road

Figure 7-10 shows the indicative crash locations along the existing Bremner Road between Jesmond Road intersection and Great South Road intersection between 2010 and 2019. The Great South Road intersection is excluded from this section (part of the Waihoehoe Road West section).

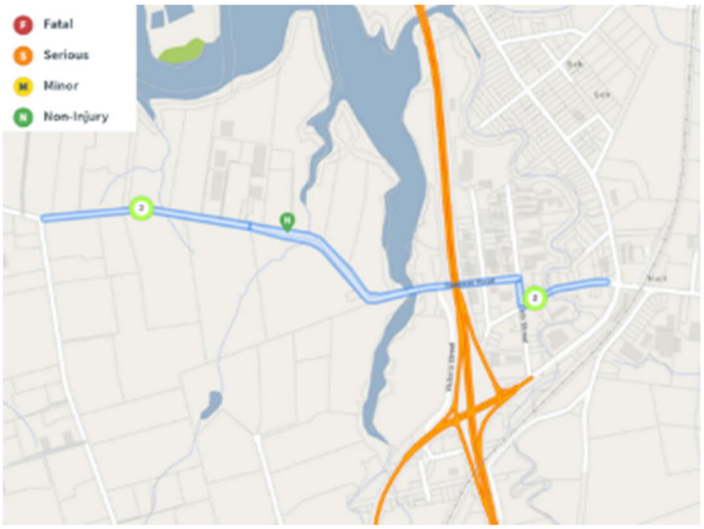


Figure 7-10: Location of Crashes along Bremner Road

The crash history shows that there was a total of five crashes recorded in the 10-year period. These include lost control and rear end/obstruction crashes. Refer to Appendix 3 for the collision diagrams and crash reports for these crashes.

These crash types indicate that the alignment, road surface quality and high speed may potentially be contributing factors causing crashes at this site. However, the crash history at this site does not reveal any particular existing road safety concerns, which is likely due to the historically very low traffic flows.

7.2.1.2.3 Crash History on Waihoehoe Road West

Figure 7-11 shows the indicative crash locations which occurred along the extent of works on Waihoehoe Road West between 2010 and 2019.

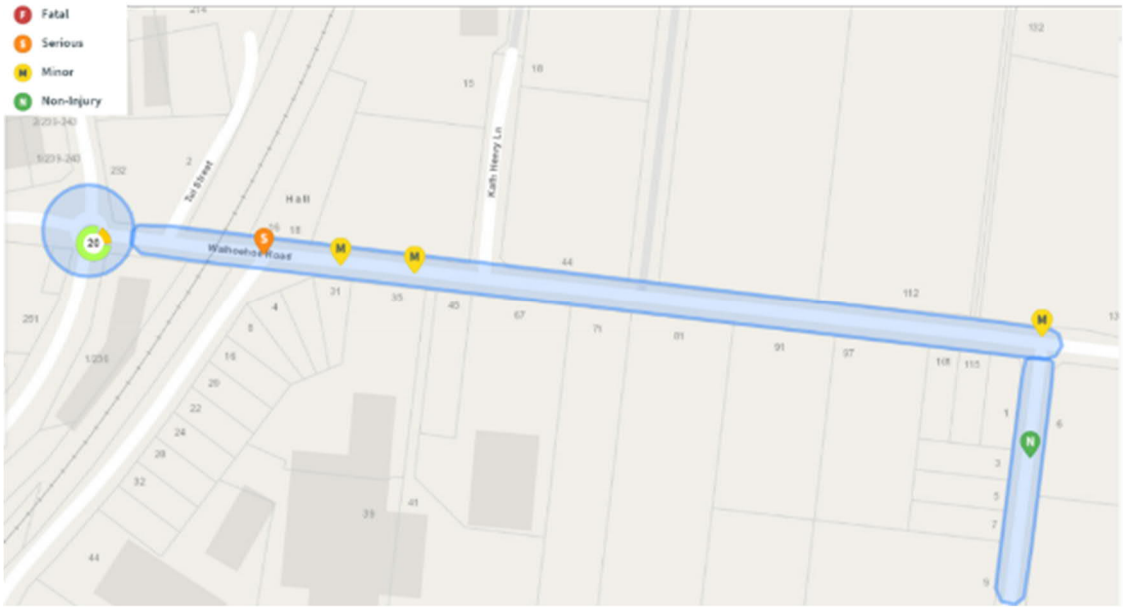


Figure 7-11: Location of Crashes along Waihoehoe Road West

The crash history shows that there was a total of 25 crashes recorded in the 10-year period. There was one serious injury crash due to a head-on vehicle crash on Waihoehoe Road near the intersection with Flanagan Road. There were also a number of crossing/ turning crashes at the roundabout, along with rear-end/obstruction crashes along the extent of works on Waihoehoe Road West. A significant number of lost control crashes also occurred. A minor injury crash involving a pedestrian between Flanagan Road and Kath Henry Lane, was also recorded. Refer to Appendix 3 for the collision diagrams and crash reports of those serious and minor injury crashes.

This data suggests there is an existing crash problem at this location on Waihoehoe Road West between the intersection of Great South Road and Fitzgerald Road. The lack of high-standard facilities for pedestrian and cyclists is likely to be a contributing to the existing incidents for vulnerable road users. Road surface quality, alignment and a high-speed environment are potential factors contributing to the loss of control crashes.

7.2.1.3 General traffic

The existing traffic volumes on Jesmond Road, Bremner Road, Waihoehoe Road West and other adjacent roads were retrieved from Mobile Road[13] in April 2020. The volumes are either estimated or actual data available from the State Highway New Zealand database and Auckland Council databases.

Table 7-2 summarises current road classifications from One Network Road Classification (ONRC) and the average daily traffic (ADT) with the percentage of heavy vehicles on each road. Survey dates can be actual or estimated – referred as “est” in the below table.

The existing traffic volumes on Jesmond Road, Bremner Road and the adjacent roads are relatively uncongested. Waihoehoe Road West has a moderate amount of congestion and Great South Road is congested and operating near capacity. SH 1 is very congested during commuter peaks with extensive queues, which often leads to diversion to Great South Road (the only north-south alternative) through the Drury/Waihoehoe Road roundabout.

The existing capacity constraint on the Norrie Road single-lane bridge also contributes to localised east-west traffic needing to rely on congested Great South Road.

Table 7-2: Existing Traffic Volumes on Jesmond Road, Bremner Road and Waihoehoe Road

Road Name	Road Classification	Survey Date	5 Day ADT	% HCV
Jesmond Road	Secondary Collector	June 2018 (est)	240	5
Bremner Road	Secondary Collector	June 2018 (est)	1100	11
Victoria Street	Access	December 2019 (actual)	200	10

[13] Mobile Road: https://mobileroad.org/desktop.html

Road Name	Road Classification	Survey Date	5 Day ADT	% HCV
Creek Street	Secondary Collector	June 2018 (est)	480	5
Firth Street	Arterial	June 2019 (est)	1850	22
Waihoehoe Road between Great South Road and Fitzgerald Road	Primary Collector	June 2018 (est)	5260	5
Norrie Road	Primary Collector	June 2018 (est)	1760	11
Great South Road	Arterial	June 2019 (est)	13700	7
Flanagan Road	Low Volume	June 2018 (est)	170	5
Fitzgerald Road	Primary Collector	June 2019 (est)	2400	14

7.2.1.4 Walking and cycling

The current roads within the NoR D2 corridor are largely high-speed rural connectors with limited (Bremner industrial area) to no walking and cycling facilities, resulting in high conflict and unsafe conditions between general traffic and vulnerable road users. The current environment is not fit for purpose for walking and cycling nor to accommodate future mode growth. The only walking and cycling facilities are around the existing Drury town centre, where footpaths exist on some sections of the route. There is also currently an upgrade from Bremner Road to the Auranga development that provides segregated walking and cycling facilities.

There are no pedestrian and cyclist crossing facilities provided at any of the intersections within NoR D2, with the exception around the Auranga development. The surrounding land use suggests that the existing walking and cycling demand is low for all corridors within the Project Area. The current environment is therefore not suitable for walking and cycling, especially given the likely future urban environment.

7.2.1.5 Public transport

Based on the existing AT Public Transport Network, there is no public transport provision (services and facilities) on Jesmond Road, Bremner Road, Waihoehoe Road West or the adjacent local roads. The closest public transport service is bus service 376 connecting Drury to the Papakura Station. There is a bus stop located near the Great South Road/Waihoehoe Road intersection. The existing roads and roadside facilities will not be able to provide a quality provision for public transport to connect Drury West and Drury East. The existing single-lane Norrie Road bridge is also a key east-west constraint (capacity and width) that will severely limit potential future public transport services.

There are no rail stations close to the Project area compromising the ability to access the key north-south rail service (between Pukekohe and Auckland City Centre). The closest railway station is Papakura Station located approximately 5km away from the Project.

7.2.1.6 Access

The existing properties adjacent to the NoR D2 corridors have access either to side roads or direct property access connected to residential and rural zones with agriculture, rural lifestyle blocks, and some local businesses (light industry and local centres). Given the current low-density land use and low traffic environment, property access/egress turn exposure is expected to be low. However, the high-speed environment on Jesmond Road, Bremner Road and Waihoehoe Road West does present a safety concern to existing properties with direct access onto these roads. Any future growth surrounding these corridors will increase safety risk and exposure, whilst also increasing the demand of access points along these corridors.

7.2.1.7 Freight

Bremner Road has a local freight function to enable access to and from the surrounding light industry area. Only a section of Bremner Road between Victoria Road and Firth Road is currently classified as an over-dimension and overweight route. The rest of the existing roads included in the Project Area are not considered to have a high freight function based on the current AT freight classification, or Waka Kotahi over-dimension vehicle and overweight routes.

7.2.2 Likely future environment (Without Project)

This section describes the likely future environment with the expected and planned growth and development, but without the Project

7.2.2.1 Future Transport Network and Land Use

The wider Drury, Ōpāheke, Pukekohe and Paerata areas in the south of Auckland have been signalled to undergo significant urban growth in the AUPOIP and the Council approved the Structure Plan in 2019 and recently received private plan changes to zone these areas.

The Drury – Ōpāheke structure plan area is estimated to provide about 22,000 houses and about 12,000 jobs with a population growth of about 60,000 over a 30-year period. The Drury- Ōpāheke growth area is shown in Figure 7-12 and also indicate where Jesmond Road, Bremner Road and Waihoehoe Road West (NoR D2) are relative to growth areas.

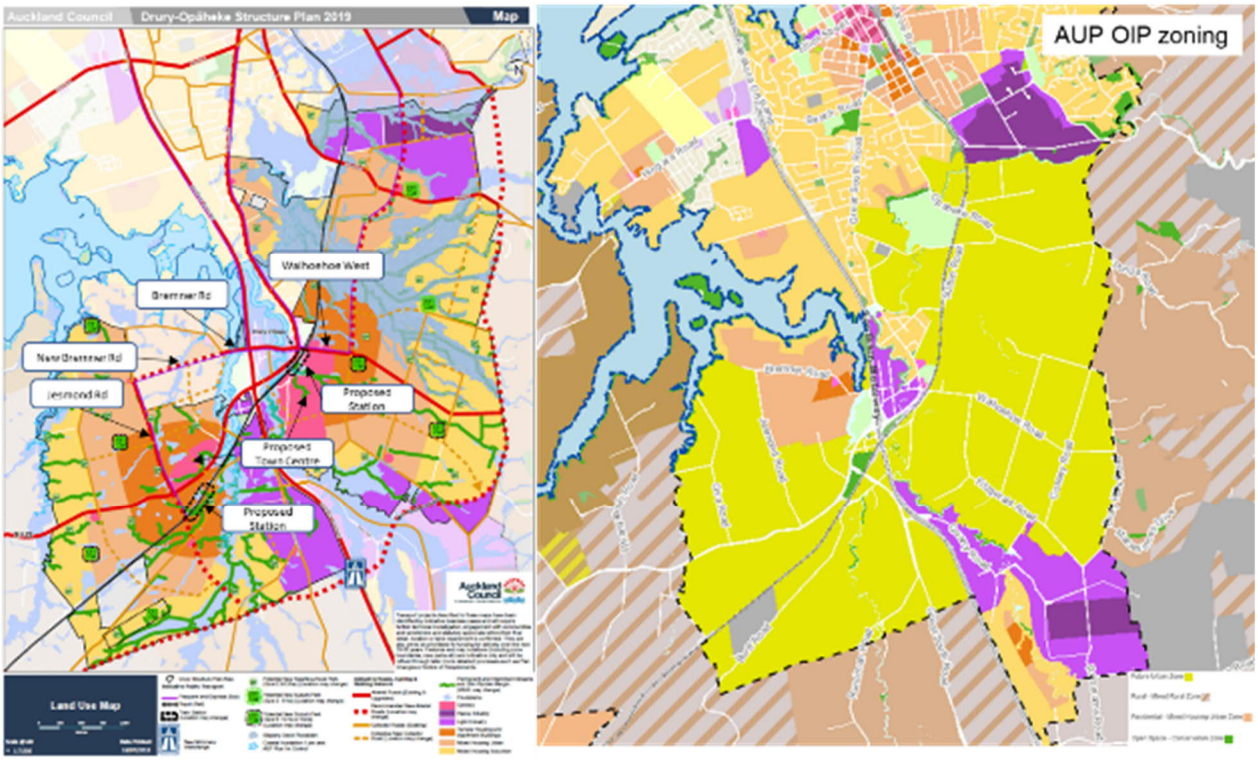


Figure 7-12: Future Transport and Land Use

The Drury – Ōpāheke Structure Plan is shown in Figure 7-12, indicating both the expected pattern of urban development and the future transport projects (subject to planning and funding approvals) surrounding the Project Area, that are proposed to support the growth in and adjacent to this area.

The proposed future urban development surrounding the Project Area are largely signalled to transition from rural to urban with a proposed a town centre, terrace housing and apartment building, mixed urban housing, mixed suburban housing and new suburban parks. A number of developers are seeking private plan changes to rezone the land in Drury east and west. The proposed land use sought by developers is generally consistent with that of the Drury-Ōpāheke Structure Plan.

The future transport projects surrounding NoR D2 and wider planned changes to the regional transport system are:

- New rail stations at Drury Central, Drury West, and associated park and ride facilities*
- New Mill Road Corridor - a strategic alternative route from Manukau to Drury in the long term, running parallel and to the east of State Highway 1 (SH1) *
- SH 1 Papakura-to-Bombay Upgrade providing more north-south regional capacity**
- SH 22 Drury-to-Paerata (Safe Network Programme which proposes short term safety upgrades)**
- Additional rail capacity between Pukekohe and Papakura (4 tracking, electrification and associated grade separations at road/rail crossings) **
- Regional north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH 1 and the NIMT***
- New rail station at Paerata, and associated park and ride facilities***

- New Pukekohe Expressway – an alternative route to SH 22 between SH 1 (east of the proposed Drury South interchange) and Pukekohe (to the north-eastern connection to Pukekohe Ring Road) and connections between Pukekohe Expressway to SH22***
- State Highway 22 Upgrade (NoR D1) ***
- Waihoehoe Road East Upgrade (NoR D3) ***
- Ōpāheke North-South FTN Arterial (NoR D4) ***
- Ponga Road and Ōpāheke Road Upgrade (NoR D5) ***
- The future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas get urbanised. ***

Note: funding approved*, funding partially approved** and subject to planning and funding approvals*** (as at the date of this report).

7.2.2.2 Road Safety

The existing roads within NoR D2 are not fit for purpose to support the planned future urban growth. The existing environment would compromise safety, wellbeing, liveability and lead to several undesirable future safety outcomes.

The following undesirable outcomes are predicted to occur if future growth progresses and existing infrastructure remains the same:

- The high-speed road environment in the Project Area would significantly increase the risk of DSI's
- The lack of safe intersection controls for all users will significantly increase the risk of DSI's at intersections.
- The absence of segregated walking and cycling facilities will compromise protection for vulnerable road users and anticipated future growth will significantly increase crash exposure.
- The existing properties adjacent to NoR D2 corridors have access either to side roads or direct access. The future growth surrounding these corridors will significantly increase traffic flow and as a result increase safety risk and exposure to direct property access.

Although low-scale targeted safety improvements are planned or likely (such as speed limits reduced to 60kph), the scale of traffic flow, increase in access movement and demand for safe walking and cycling means that the existing form of the road corridors are simply unsuitable to safely accommodate the future environment.

7.2.2.3 General Traffic

Based on 2048+ modelling data, the existing and likely future traffic flows on Jesmond Road, Bremner Road and Waihoehoe Road West suggest that the future growth will significantly increase demand as a result of the growth. Table 7-3 provides a summary of the existing and likely future traffic flows. This modelling data indicates:

- Jesmond Road will likely have a low amount of mid-block congestion and a moderate amount of congestion at adjacent intersections.
- Bremner Road will operate near capacity and likely have a moderate amount of congestion at mid-block and at adjacent intersections.

- Waihoehoe Road will operate near capacity and likely be very congested at mid-block and adjacent to intersections.

Due to existing east-west capacity constraints (e.g. the single-lane Norrie Road bridge), the predicted growth is expected to divert to other more congested corridors and surrounding collector roads.

Table 7-3: Existing and Likely Future ADT Traffic Volumes

Road Name	Existing Traffic ADT (2018/19)	Future Traffic ADT (2048+ without Project)
Jesmond Road	240	6,900
Bremner Road	1100	15,000
Waihoehoe Road West between Great South Road and Fitzgerald Road	5260	19,900

If future growth progresses and existing infrastructure remains the same, the following undesirable outcomes are predicted to occur:

- It will result in poor east-west local connectivity between Drury West and Drury East, create severance issues, and encourage traffic to use future residential streets.
- The existing single-lane Norrie Road bridge is a key east-west constraint (capacity and width) that will severely limit potential future capacity. This will compromise future east-west reliability and resilience for all road users.
- The lack of direct local east-west connectivity will encourage local traffic to rely on congested SH 22 (the only east-west strategic traffic route) for travel between Drury West and Drury East.
- The existing intersection controls will not have enough capacity to cater for future growth, leading to an increased delay or traffic rerouting through future collector roads surrounding the project area.

7.2.2.4 Walking and Cycling

Jesmond Road, Bremner Road and Waihoehoe Road West forms an integral part of connecting Drury East and Drury West for active modes, providing a primary east-west function, north-south function as shown in Figure 7-13.

Figure 7-13: Future walking and cycling network (2048+)

As previously discussed, there are currently limited or no walking and cycling facilities, and the road shoulder does not provide adequate protection for vulnerable users for both east-west and north-south existing movements or future demand.

The following undesirable outcomes will occur if future growth progresses and existing infrastructure remains the same:

- Access to employment and social amenities will be compromised, especially for immediately adjacent land uses
- Walking and cycling network severance between Drury East and Drury West if safe crossing facilities are not provided
- Poor integration with the proposed Drury West and Central Stations
- Poor integration with the proposed future wider walking and cycling network
- The ability to contribute to mode shift will be severely compromised if key walking and cycling facilities are not provided. This will lead to further reliance on low-occupancy vehicle use, further exacerbating congestion and safety issues both locally and on the wider network.
- Significantly increase the crash exposure for vulnerable road users as demand increases
- Significantly increase the risk for DSI's for vulnerable users
- Lack of provision for sustainable travel choices will result in increased emissions from continuation of car-based travel and lead to adverse environmental and health effects.

7.2.2.5 Public Transport

In the longer term, Drury will have a number of public transport facilities such as train services from the new stations, and an expanded bus network including routes that are part of the frequent transit network (FTN). These facilities are proposed to connect Drury both inter-regionally to places such as the Auckland City Centre, Manukau and Auckland Airport, and local links to surrounding town centres. Related projects include:

- Proposed rail stations in Drury West, Drury Central and Paerata. These rail stations are included in the New Zealand Upgrade Programme (NZUP) and construction is planned to start in 2023 and be completed by late 2024
- FTN routes, connecting to wider Drury-Ōpāheke area to Drury West and Drury Central stations.
- Additional bus routes, including services proposed by AT to support future urban development within Drury.

The future public transport network for the area surrounding NoR D2 is shown below in Figure 7-14.

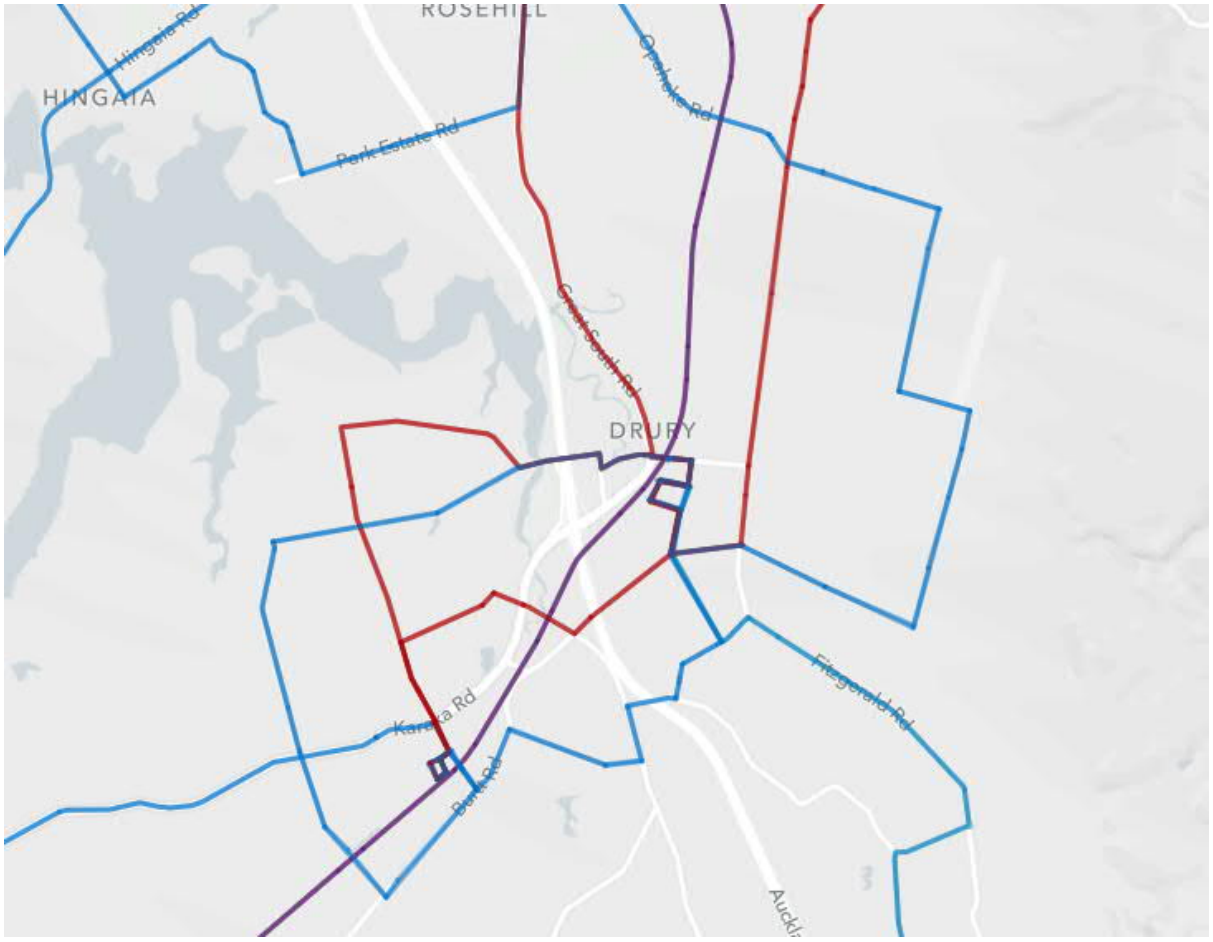


Figure 7-14: Future Public Transport Network (2048+)

The following undesirable outcomes are likely to occur if future growth progresses and existing infrastructure remains the same:

- Access to employment and social amenities will be compromised by congested, unreliable and unattractive east-west public transport connectivity

- Poor integration with the proposed Drury West and Central Stations
- The ability to contribute to transformational mode shift and increased ridership will be compromised if additional provision for reliable public transport is not provided.
- Future bus routes along NoR D2 road corridors and the future transit network will be constrained to existing roads or new collectors, which will lead to delays and unreliability.
- The lack of provision for reliable public transport choice, will result in increased emissions from continuation of car-based travel and lead to adverse environmental and health effects.

7.2.2.6 Access

As the area surrounding the Project Area develops, the existing properties will be re-routed on to the collector road network as indicated in the Drury-Ōpāheke Structure Plan; and direct property access is not recommended.

The following undesirable outcomes will occur if future growth progresses and existing infrastructure remains the same:

- The growth in traffic and existing high-speed environment will significantly increase the crash exposure for priority right turn movements.
- The planned surrounding future growth will also increase crash exposure between driveways, general traffic and active modes.
- Retaining the current direct property access will increases the risk and exposure to risk of fatalities / serious injury accidents (undermine Vision Zero outcomes to achieve a safe land transport system with no fatalities or serious injuries involving road traffic).
- Bremner Road will experience a conflict in function and performance having a mix of collector, local and arterial functions if the new section is not provided.

7.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

This section describes the effects of the Project on the likely future transport and urban environment, including planned growth (movement and place patterns). . It firstly assesses operational effects after the Project is implemented, then the transport effects during construction. The assessment is undertaken for each element of the transport system. Measures to avoid, remedy or mitigate actual or potential adverse effects are also identified.

7.3.1 Assessment of Operational Effects

This section describes how each element of the transport system will function operationally after construction of NoR D2, and therefore the effect it will have on the existing and likely future environment. Given the intention of the Project to provide for and support the urban development planned in the area, the ‘existing’ environment has been informed by the planned urban development.

7.3.1.1 Road Safety

The design of NoR D2 has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrades that comprise NoR D2 are expected to result in positive effects on safety including:

- Reducing the speed environment from 70km/h-80km/h to the more appropriate urban speed of 50km/h. This is likely to result in a safer speed environment, which will significantly decrease the risk of DSIs at intersections and mid-block.
- Providing separated and protected walking and cycling facilities in the Project Area to improve safety for existing and future vulnerable road users. This will significantly decrease the risk DSI's along NoR D2.
- Providing safe intersection controls at seven key intersections along the Project Area with controls on vehicle movements, provision of safer pedestrian crossing facilities at intersections and improvements to vehicle access to adjacent side roads. This will significantly decrease the risk of DSI's at intersections.
- Providing appropriate vehicle lane widths and delineations to enhance the urban environment and to align with the urban speed limit.
- Providing raised medians to separate the two directions of traffic and reduce head-on crashes.

It is anticipated that the number of pedestrians and cyclists will increase significantly as the area surrounding NoR D2 urbanises and the Drury West and Drury Central Stations open.

Overall, the proposed design of the NoR D2 Project is well aligned with the transport safety principles of both AT and Waka Kotahi. It will provide a much safer transport system which significantly reduces the number of DSIs and results in positive effects for all road users. It is noted that further complementary measures to achieve the safety outcomes identified will be completed as part of detailed design, prior to works commencing.

7.3.1.2 General Traffic

For general traffic, the Project serves as both a key gateway for localised trips (including rail stations, centre and east-west movements between Drury East and Drury West). It is well connected with the existing network and the planned future network. The planned network surrounding NoR D2 is shown in Figure 7-15.

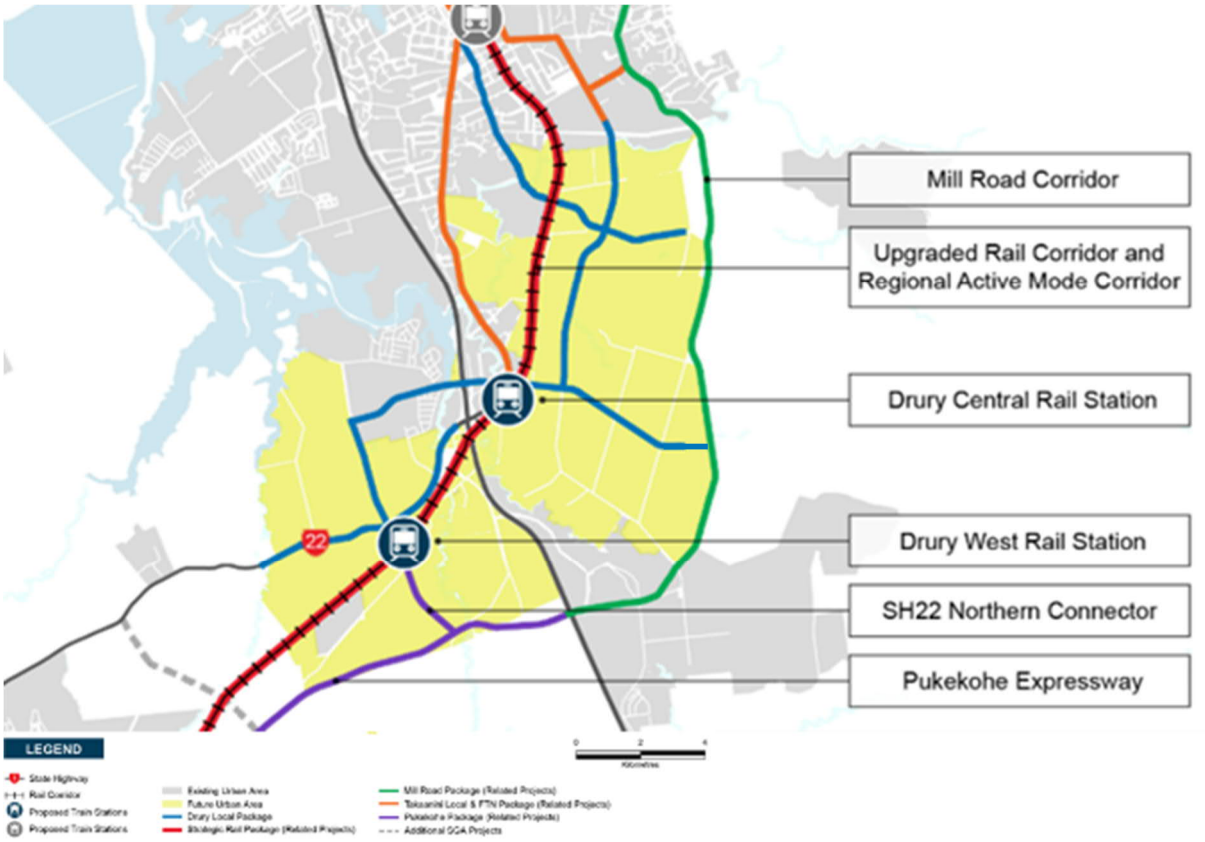


Figure 7-15: NoR D2 Future Network Connections, IBC recommended network

The new and upgraded roads within the Project Area will support the urbanisation of the Drury area, resulting in improved connectivity and urban form outcomes. The underlying premise of NoR D2 is to provide a four-lane multimodal east-west spine between Drury East and Drury West of which only two lanes are allocated for general traffic. From SH 22 in the west to Ōpāheke North-South FTN Arterial at Fitzgerald Road / Ōpāheke N-S FTN Arterial in the east.

The new and upgraded sections will increase east-west connectivity (new links and more direct routes), capacity (mid-block and intersections) and provide a reliable local connection between Drury East and Drury West in the future.

The modelling results shown in Figure 7-16, were undertaken using a 2048+ forecast scenario to ascertain the likely daily rerouting effect that will occur as a result of the Project. The modelling results suggest that a larger proportion of traffic will reroute from the surrounding collector network on to the new Bremner Road connection, reducing the reliance on the collector network.

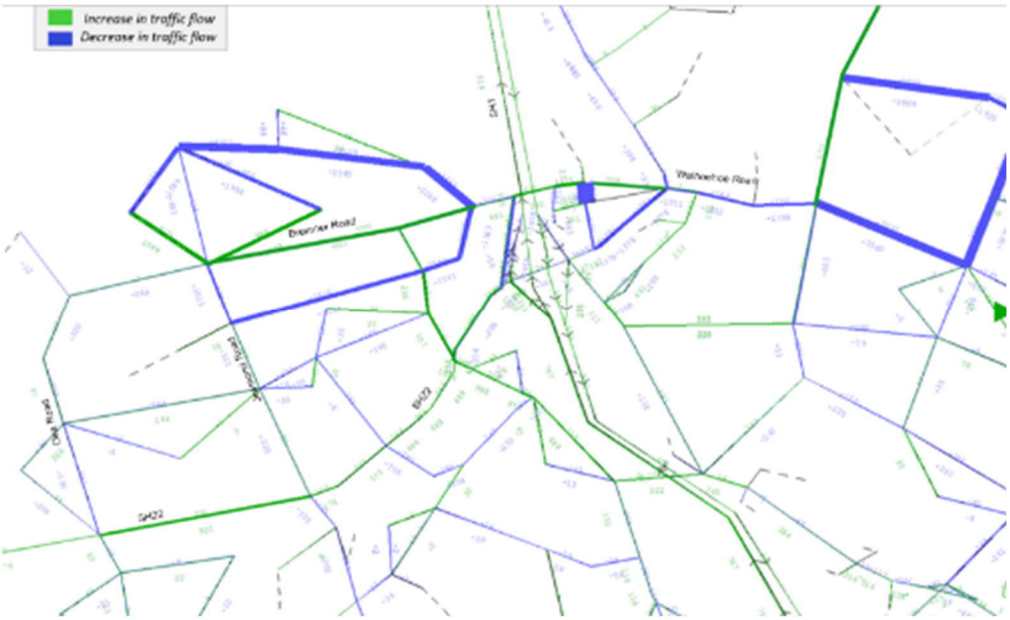


Figure 7-16: 2048+ Daily Rerouting Effect of NoR D2

The Jesmond to Bremner link (east and west of SH 1) and improved roading facilities will shorten the travel distance between Drury West and Drury East, and reduce 10,781 vehicle kilometres travelled daily. Although there will be a reduction in vehicle kilometres travelled due to the shorter east-west connection, the corridor (except for Norrie Road) will remain two lanes for general traffic, with a similar corridor capacity.

These corridors form part of the future strategic transport network to enable access to economic and social opportunities for current and future residents in Drury growth areas, including access to the proposed rail stations.

Regarding the existing and future traffic volume, the approximate ADT for NoR D2 based on SATURN modelling are shown in Table 7-4. The daily traffic flow with and without the Project remain largely similar at existing locations but localised rerouting occurs between existing collectors and new arterial connections as shown in Figure 7-16.

Table 7-4: ADT average summary for NoR D2

Road	Average 2016 ADT	Average ADT 2048+ (with NoR D2)	Average ADT 2048+ (without NoR D2)
Jesmond Road	800	6,700	6,900
Bremner Road	1,100	16,900	15,000
Waihoehoe Road West	5,100	18,200	19,900

As shown, there is a significant increase in traffic volumes between 2016 and 2048+ along all routes as the surrounding area is urbanised over time. The function of Jesmond Road, Bremner Road and Waihoehoe Road West will need to cater for much higher demand. The daily ADT suggest that Jesmond Road will be relatively uncongested, Bremner Road will be almost congested, and Waihoehoe Road West will likely experience congestion during peak periods.

Although some sections of NoR D2 will experience congestion at peaks, two lanes (one lane in each direction) of general traffic are viewed as adequate for each alignment based on the general traffic forecasts, with the priority for additional corridor width allocated to walking/cycling and FTN frequent transit services.

In addition to the operational effects of general traffic lanes, intersections along the route have also been analysed. The performance of the intersections, based on a 2048+ scenario,[14] have been assessed using SIDRA Intersection Software with inputs from the SATURN models. A summary of these key performance measures using indicative forecast flows is shown below in Table 7-5**.**

Table 7-5: Summary of intersection performance 2048+ (with NoR D2)

Road	Intersection	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Jesmond Road	Jesmond Road/SH 22/SH 22 North Connection (Signals)	Morning Peak	D	0.814	116
		Evening Peak	C	0.911	88
	Jesmond Road/Bremner Link (Signals)	Morning Peak	D	0.641	92
		Evening Peak	D	0.930	92
Bremner Road	Bremner Road/Bremner Road link (Signals)	Morning Peak	C	0.832	147
		Evening Peak	C	0.775	105
	Bremner Road/Creek Street (Signals)*	Morning Peak	B	0.575	56
		Evening Peak	B	0.579	43
	Bremner Road/Firth Street (Signals)	Morning Peak	D	0.905	116
		Evening Peak	C	0.868	75
Waihoehoe Road West**		Morning Peak	E	0.993	292

[14] 2048+ with Drury scenario is also viewed as the reference case for assessment purposes

Road	Intersection	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
	Waihoehoe Road West/Great South Road (Signals)	Evening Peak	D	0.985	109
	Waihoehoe Road West/Fitzgerald Road/Ōpāheke N-S (Roundabout)	Morning Peak	C	0.892	59
		Evening Peak	C	0.784	65

*The effects of changing Creek St into a T intersection improve reliability and travel time for westbound public transport services and improve westbound active modes operations through the intersection. ** The Flannagan Road intersection with Waihoehoe Road West is expected to be closed through NZUP as a result of the new Drury Central Rail station and park and ride facilities.

Overall, the proposed intersections are predicted to perform at a satisfactory level during the peak periods under a 2048+ scenario. Although Waihoehoe Road West/Great South Road during the morning peak is expected to experience congestion, it is still considered appropriate since this will only happen in peak periods and providing additional capacity to general traffic will undermine public transport priority and walking and cycling crossing facilities.

In addition, the mid-block performance of Waihoehoe Road East has also been included for context and reported as a Volume over Capacity (VoC) ratio to provide an understanding of the cross-sectional constraints. For reference, as VoC ratios rise above 75%, significant mid-block journey time delays and queueing become apparent.

The traffic volume used for the assessment is based on the SATURN 2048+ model and is summarised in Table 7-6 below. The results suggest that the traffic increase will have a relatively minor (with reference to capacity) effect on the mid-block VoC performance. Therefore, the predicted future demand is still expected to operate satisfactorily, with relatively low mid-block congestion during all peak periods under a 2048+ scenario.

Table 7-6: Summary of mid-block performance Existing and2048+ with NoR D2

NoR2 mid-block section	Direction of traffic	VoC Ratio Existing	VoC Ratio 2048+ with Project
Jesmond Road	Northbound (AM Peak)	2%	9%
	Southbound (AM Peak)	3%	20%
	Northbound (PM Peak)	2%	19%

NoR2 mid-block section	Direction of traffic	VoC Ratio Existing	VoC Ratio 2048+ with Project
	Southbound (PM Peak)	4%	21%
Bremner Road	Eastbound (AM Peak)	3%	63%
	Westbound (AM Peak)	5%	25%
	Eastbound (PM Peak)	4%	26%
	Westbound (PM Peak)	8%	65%
Waihoehoe Road West	Eastbound (AM Peak)	13%	70%
	Westbound (AM Peak)	22%	27%
	Eastbound (PM Peak)	28%	44%
	Westbound (PM Peak)	18%	64%

In summary, the effects of the Project on general traffic are:

- Improved integration with proposed Drury West and Central Stations (including associated park and ride facilities) and the future urban areas surrounding NoR D2.
- Improved east-west connectivity between Drury West and Drury East by providing a reliable alternative route that reduces vehicle kilometres travelled compared to without the Project.
- More direct local east-west connectivity enabling local traffic to rely less on congested SH 22 (the only east-west alternative traffic route) for travelling between Drury West and Drury East.
- Removal of east-west movement capacity constraints and improved future east-west reliability and resilience for all road users, particularly for active modes and priority vehicles/buses.
- The separation of public transport into priority lanes also benefit general traffic by segregating removing buses and boarding and alighting at bus stop.
- Improved intersection controls and increased capacity to cater for future growth, resulting in decreased delay and less traffic rerouting through future collector roads surrounding the Project Area.

7.3.1.3 Walking and cycling

NoR D2 proposes separated walking and cycling facilities on both sides of the road from SH 22 to Fitzgerald Road. It also includes dedicated pedestrian and cycle crossing facilities at seven intersections, which will connect with the expected future adjacent facilities.

It also provides an east-west function (alternative to SH 22) connecting Drury West and Drury East and serves as a gateway to key destinations in Drury (including new planned rail stations, centres and the strategic north-south PT network).

The Project also proposes to reduce the speed environment to urban speeds such as 50km/h (or less at key locations with high conflicting movements from all modes), repurpose the proposed designation corridor to an urban arterial and provide segregated walking and cycling facilities on both sides of the road to support growth, enable sustainable travel choice and combat expected safety concerns.

An assessment of the proposed walking and cycling facilities against relevant AT standards and policies is summarised in Table 7-7.

Table 7-7: NoR D2 AT Standards and Assessment for Walking and Cycling Facilities

Policy/Standard	Network Component	Assessment
Auckland Transport Vision Zero[15]	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 proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on NoR D2 are proposed to be 50km/hr, therefore the proposed design of the walking and cycling facilities is considered to be appropriate for these standards.
Auckland Transport Design Manual[16]	**Footpaths:** 1.8m minimum **Cycle Paths:** 2.0m minimum	A 1.8m footpath (2.4m at centres) is proposed on all corridors and a 2.0m cycle path with a 2.3m berm. The total width of 6.8m is proposed from carriageway to road boundary. This is in accordance with the AT TDM requirements

Walking and cycling are a key component to the future environment surrounding Jesmond Road, Bremner Road and Waihoehoe Road West. There are several key attractors which imply walking and cycling will significantly increase as growth progresses in the Drury area, these include:

- The area surrounding the Project is signalled to undergo significant urban growth with a variety of terrace housing and apartments, local centres and mixed urban and suburban housing

[15] Auckland Transport: Vision Zero: https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

[16] Auckland Transport – Transport Design Manual: https://at.govt.nz/about-us/manuals-guidelines/roads-and-streets-framework-and-the-transport-design-manual/

- High quality FTN routes are also proposed along the corridors, resulting in walking trips attracted to bus stops along it
- Wider connectivity is planned with facilities along SH22 (NoR D1), Waihoehoe Road East (NoR D3) and the proposed Ōpāheke N-S FTN Arterial (NoR D4)
- Jesmond Road is the key gateway for walking and cycling to the proposed Drury West Station, and SH 22, and Waihoehoe Road West provides direct links to Drury Central Station and the town centre
- NoR D2 provides an east-west function (alternative to SH 22) connecting Drury West and Drury East and serves as a local gateway to key destinations in Drury

The predicted 2048+ usage of the walking and cycling facilities along this corridor are shown in Table 7-8 and provide context about likely future demand that will benefit from these facilities.

Movement estimates were extracted from the Strategic Active Mode Model (SAMM) and Station Access Tool. These numbers are based on average daily flows along Jesmond Road, Bremner Road and Waihoehoe Road West.

Table 7-8: Daily walking and cycling predicted people movements (2048+)

Area	Direction	Walking (Daily Flows)	Cycling (Daily Flows)
Jesmond Road	Northbound	2400	600
	Southbound	3200	900
Bremner Road	Eastbound	1300	350
	Westbound	1300	350
Waihoehoe Road West	Eastbound	1600	500
	Westbound	2000	650

All intersections within the Project will be provided with safe pedestrian and cycle crossing facilities, which connect with the expected future adjacent facilities.

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 effects of the Project on walking and cycling are:

- supports growth surrounding NoR D2 without compromising safety and significantly improves access to employment and social amenities
- significantly reduces the risk for DSI's by enabling safe movement for vulnerable road users along and across the Project Area
- significantly improves east-west and north-south walking and cycling connectivity and integrates with future walking and cycling network
- positive environmental and health benefits by increasing the number of active mode trips and reducing the reliance on vehicle trips
- serves as a key enabler to achieve mode shift targets through integration with proposed Drury West and Central Stations

- prevents existing and likely future safety and severance issues between Drury West and Drury East by providing and more direct network connection.

7.3.1.4 Public transport

The Project forms an integral part of the future public transport network, providing a primary east-west and north-south function for future planned services and serves as a gateway to key destinations in Drury (including new planned rail stations, centres and the strategic north-south PT network).

For public transport, the Project will operate as both a high-quality transit spine for localised trips and the wider Drury – Ōpāheke area. The new and widened corridors along Jesmond Road, Bremmer Road and Waihoehoe Road West, enable a four-lane FTN arterial function with dedicated FTN facilities from SH 22 in the west to Fitzgerald Road in the east.

For network context, Figure 7-17 shows where the Jesmond Road, Bremmer Road and Waihoehoe Road West FTN upgrades are relative to the wider planned future public transport network. It is well connected with the existing network and the planned future public transport network, including new rail stations, centre and east-west movements between Drury East and Drury West and the wider FTN and rail public transport network.

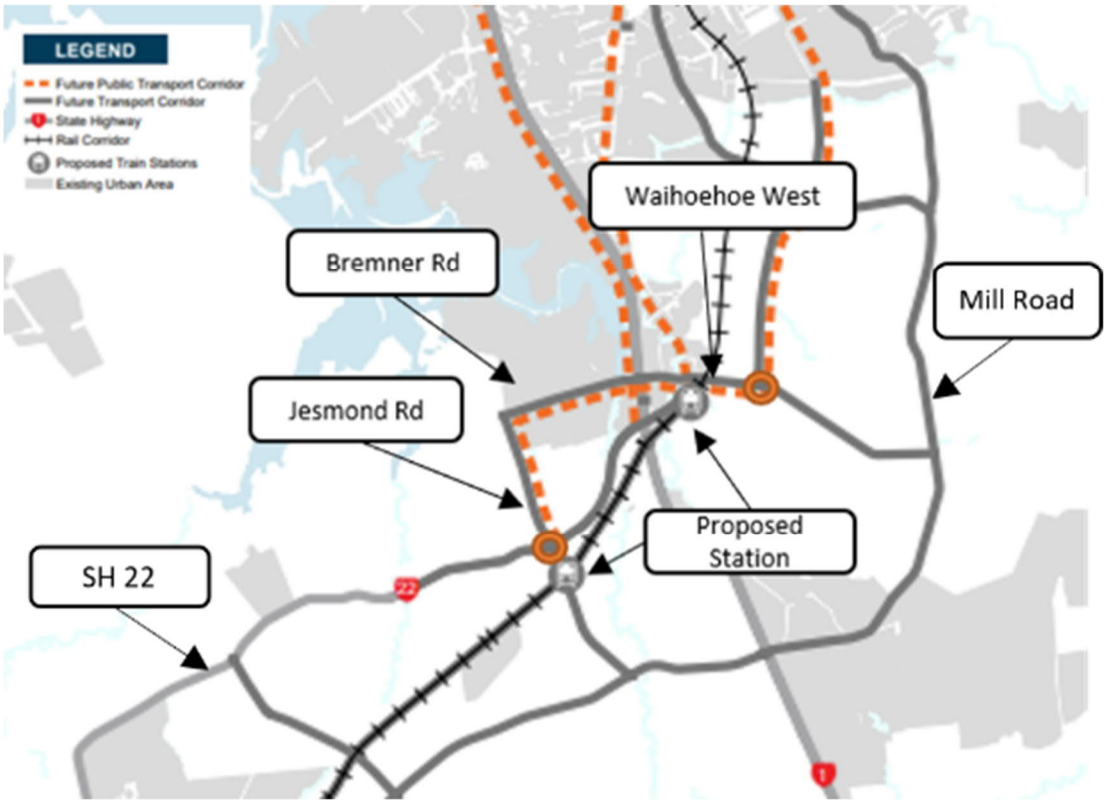


Figure 7-17: Future public transport network (2048+)

For future public transport services, there are four proposed bus routes[17] which will use this the Project Area in future, including:

[17] Based on the AT SGA Remix File – frequencies and routes subject to change

- A section of route #33 Great South Road, with a 10-minute frequency in peaks (Waihoehoe Road West)
- A section of the service #37 Drury and Ōpāheke, with a 7-minute frequency in peaks (Jesmond Road, Bremner Road and Waihoehoe Road West)
- A section of the service #374 Ōpāheke East, with a 10-minute frequency in peaks (Bremner Road and Waihoehoe Road West)

In addition to the planned bus routes, Drury Central and Drury West Stations are planned within the area. It is anticipated that the planned bus routes will provide connectivity to both these stations, providing a wider catchment for rail.

The proposed cross-sections provide two FTN lanes, one in either direction. The exact location of bus stops will be defined 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.

Table 7-9 provides a summary of the public transport flows and journey time benefits based on MSM modelling results along the NoR D2 FTN corridors. The modelling results suggest that journey time benefits as a result of the Project for public transport users are expected to be significant throughout the day. The anticipated public transport flows and journey times along NoR D2 provides context about the likely future public transport user that will benefit from these facilities.

Table 7-9: Public transport flows and journey times for NoR D2 (2048+)

Model Time Period	Jesmond Flow*	Bremner Flow*	Waihoehoe West Flow*	Journey Time Benefit*
Morning Peak (AM)	197	339	846	12 min 48s
Inter-Peak (IP)	76	164	546	4 min 46s
Evening Peak (PM)	163	324	978	6 min 46s
Daily Flow	**773**	**1555**	**4794**	**-**

*Includes both directions and compared without the project

The effects of the Project on public transport are:

- significant improvement to east-west public transport connectivity, which will significantly improve access to employment and social amenities
- dedicated FTN facilities which will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for public transport users
- significantly improve integration with the future public transport network, resulting in improved east-west and north-south connectivity
- a higher number of public transport trips which reduces the reliance on vehicle trips, resulting in positive environmental and health benefits
- significantly improve integration with proposed Drury West and Central Stations, and it will serve as a key enabler to achieve mode shift targets.

7.3.1.5 Access

Based on the high flow and four-lane movement function with mixed elements of walking, cycling, public transport and general traffic along NoR D2, direct property access onto Jesmond Road, Bremner Road or Waihoehoe Road West is not recommended given the negative safety implications. The traffic volume and multi-lane crossing will undermine Vision Zero as vehicles using driveways will conflict with other modes, in addition to driver safety and active mode being compromised by merging onto the road.

As the area develops the existing properties accesses will be re-routed where appropriate on to the collector road network as indicated in the Drury-Ōpāheke Structure Plan.

The indicative collector network is subject to change as developers progress these connections through the plan change processes. For existing connections, the local collector network will be triggered by developers, until such a time it is assumed that direct access to existing properties will function as a left-in and left-out only, with right turn movements prohibited.

Some properties will face a minor diversion impact on the main network given that limited (left-in and left-out only) direct access will be permitted, however this will be offset by the improved access and facilities on the corridor itself. The diversion for the few number existing properties with direct access to NoR D2 will range from 18 seconds to 2 min. While some properties may require longer routes for access (such as where right turn access is banned), these effects are expected to be offset by the more reliable and significant improvement to safety.

The effects of providing limited direct property access within certain parts of the Project Area are:

- decrease crash exposure between driveways, general traffic and active modes
- eliminate crash risk related to merging onto the road and crossing multiple traffic lanes

The Bremner Road FTN Upgrade section interfaces with the Waka Kotahi SH1 Papakura to Drury South project which is part of the New Zealand Upgrade Programme. There are a number of properties on the north side of Bremner Road that will be affected by that project where access will be addressed through those works. Therefore, at this stage the direct access from these properties onto Bremner Road has not been provided as part of the Project works. At the time of writing this report, the Papakura to Drury South project is expected to lodge their NoR and consent application in mid 2021.

The Waihoehoe Road West FTN Upgrade interfaces with the Drury Central rail station, which is also part of the New Zealand Upgrade Programme. Subsequent to the construction of the station (currently scheduled for completion in 2024), the Waihoehoe Road bridge will be reconstructed to four lanes as part of the Waihoehoe West FTN Upgrade. This means that Flanagan Road will in future no longer have access to Waihoehoe Road in its current position due to the reconstructed bridge and retaining required. As part of the rail station works, an accessway to the new station interchange facilities is planned, which will provide for access for Flanagan Road properties.

Overall, the effects on direct property access are considered to be neutral.

7.3.1.6 Freight

The improved east-west connections will also result in positive effects for localised freight serving the light industry and local centres in the surrounding area. The designation footprint will be able to

accommodate freight movements along the mid-block and through the intersections. These details are expected to be further developed in subsequent project detail design and/or resource consent phases.

7.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The Project provides significant positive effects and there are no operational adverse effects to mitigate.

7.3.3 Assessment of Transport Construction Effects

This section describes the assessment of potential transport effects during construction of the Project. For assessment purposes, an assessment of construction effects have been carried out for each section of NoR D2.

7.3.3.1 Assessment of construction effects – Jesmond Road

The Jesmond Road FTN Upgrade include a road widening on the existing Jesmond Road alignment from SH 22 to the proposed Bremner Road FTN Upgrade. The works also include three proposed stormwater wetlands, the extension of existing culverts and construction of new culverts. Figure 7-18 shows the indicative construction zone.

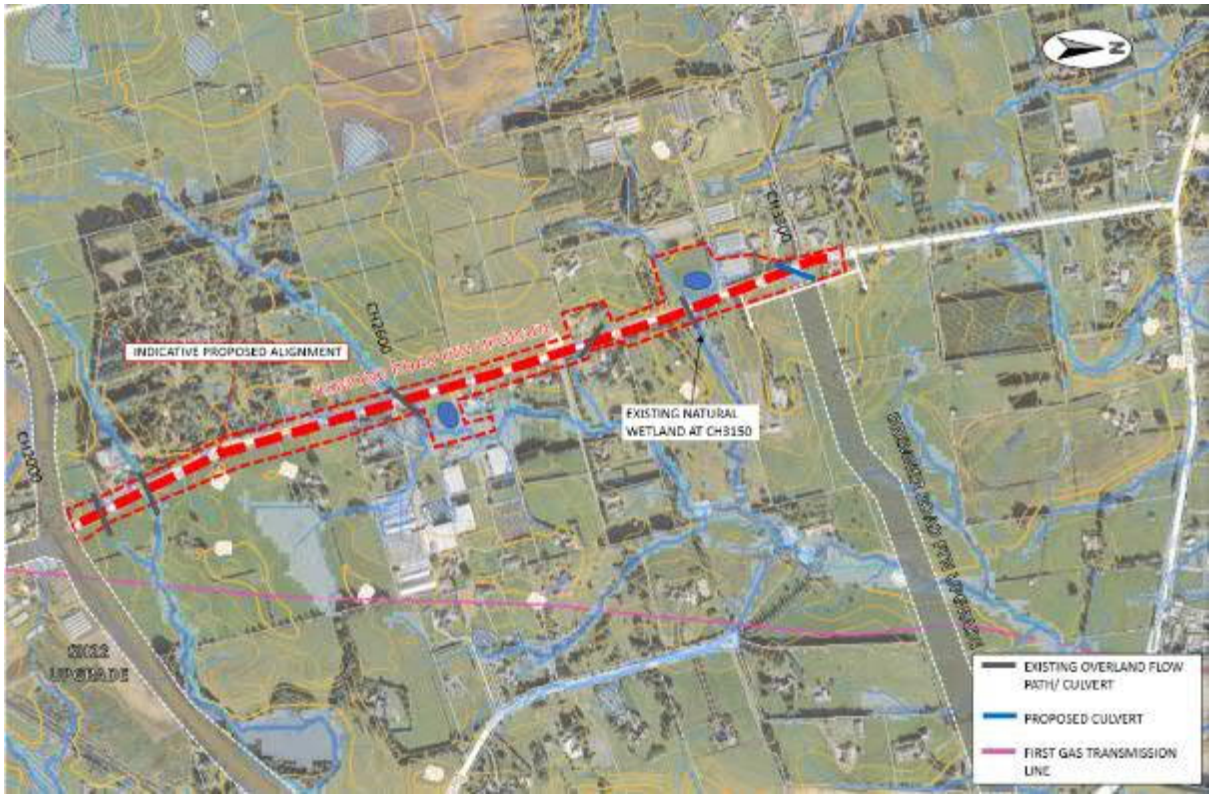


Figure 7-18: Construction zone – Jesmond Road FTN Upgrade

The Jesmond Road FTN Upgrade project is estimated to take one to two years to complete:

- Enabling works: two to four months

- Earthworks and drainage: six to eight months
- Pavement and finishing works: four to six months.

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for construction. The indicative construction method has been developed based on a concept design with consideration of using the most practical construction techniques and equipment. There are likely alternative methods in the future that could be used to complete the works, however, this document only intends to capture the traffic impacts based on the indicative construction method.

7.3.3.1.1 Temporary traffic management

It is anticipated that the larger part of works required for the Project will likely be adjacent to or on the live carriageway, which means that temporary traffic management will be required. The scale of temporary traffic management to delineate live traffic away from the construction zones is largely dependent on the various stages and requirements of the construction activities.

It is expected that short term temporary road closure for nights or weekends may be required for some specific activities, such as road surfacing, traffic switches and gas relocation. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work. The effect of temporary road closure or other traffic management methods to existing traffic on Jesmond Road and adjacent road network should be assessed in the future as part of the CTMP for the Project on the basis of the current traffic environment.

It is considered that temporary effects from the construction activities on Jesmond Road can be adequately managed through the implementation of a CTMP during the construction phase of the Project. The purpose of the CTMP is to ensure the construction of the 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 residential properties and local activities.

If required, SSTMP should be developed to manage constraints on access to affected properties.

7.3.3.1.2 Expected construction traffic routes

The construction of the Jesmond Road FTN Upgrade project will require significant earthworks. The estimated volumes of cut and fill are approximately 68,600m^3 based on the current indicative design. 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 the Project.

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

- The routes that will be used by construction vehicles will depend on the location of quarries and disposal sites which are not yet certain.
- The exact location and extent of compound sites/lay down areas has yet to be determined.
- The timing of construction of other projects could impact on likely construction vehicle routes, especially the SH 22 Upgrade and the Bremner Road FTN Upgrade.

It is noted that the access to compound sites/laydown areas and construction zone for construction vehicles, plant and materials will be via site access points on Jesmond Road 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 and intersections with the provision of adequate vehicle tracking.

It is noted that the existing SH1 motorway bridge at the Drury interchange has a height limit of 4.66m. Therefore, any construction vehicles exceeding this limit, are prohibited to go under the bridge., However, the Drury interchange is expected to be upgraded as part of the SH1 Papakura to Drury South project and road network vehicle restrictions should be reassessed prior to construction, as this constraint may no longer exist.

The potential construction traffic routes are shown below in Figure 7-19.

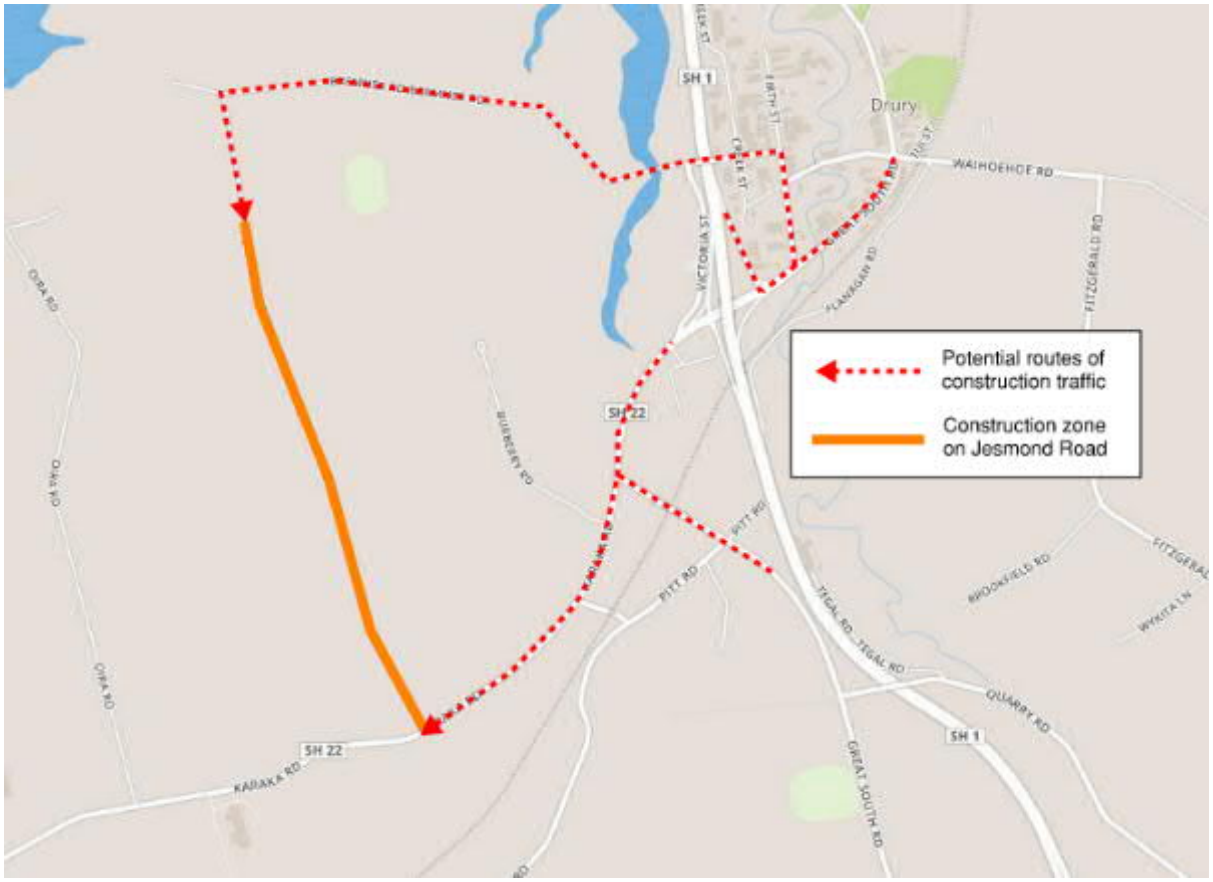


Figure 7-19: Potential construction routes for Jesmond Road FTN Upgrade project

7.3.3.1.3 Expected construction traffic generation

Based on the proposed construction methodology and activities, the estimated duration of work is between one and two years, which includes three stages of construction works. Construction vehicles will include truck movements (heavy), light delivery and staff/contractor vehicle movements (light). The estimated movements include approximately 20,500 truck movements for the entire construction period and 100 light vehicle movements daily by staff and contractors during the peak construction period.

To estimate the daily number of truck movements to and from the site, the following working assumptions were adopted:

- Working days: 20 days of construction per month
- Hours of delivering earthwork and other materials: a total of any eight hours between 6am to 6pm. It is noted that truck movements should avoid the peak hours of traffic or alternatively specified times agreed with the respective RCA.
- The duration of construction: 12 months for all three stages of construction works. Noted for the assessment of construction effects, a shorter construction period of one year has been adopted in the assumptions, given that this will generate more trips.

The daily number of construction vehicles have been calculated and summarised below in Table 7-10.

Table 7-10: Expected daily traffic movements from construction works – Jesmond Road FTN

Stages	Expected duration (approx.)	Truck movements (daily)	Light movements (daily)	Total movements (daily)	Typical vehicle movements
Stage 1: Enabling works	2 months	10 to 20	30 to 50	40 to 70	• Truck movements likely to include low loaders for plant delivery and collection, articulated trucks/truck and trailer units/concrete units, concrete trucks. • Light vehicle movements are likely from construction staff and contractors.
Stage 2: Earthworks and Drainage	6 months	85 to 330	70 to 100	155 to 430	
Stage 3: Pavement construction	4 months	10 to 20	30 to 50	40 to 70	

In order to assess the full extent of potential effects from the expected construction vehicles, the traffic environment at the time of construction needs to be understood. For the construction of the Jesmond Road FTN Upgrade, analysing the impact of the surrounding network should be included as part of the CTMP for this project.

The current traffic volume on Jesmond Road is estimated to have 240 vehicles per day, which is relatively low for a two-lane road. This means that the capacity of the current Jesmond Road may have ample capacity to accommodate the construction traffic and it is unlikely to cause any notable impact to the existing traffic environment on Jesmond Road.

The future traffic volume is significantly more than the existing volume on Jesmond Road. Depending on the staging of Jesmond Road FTN Upgrade project, an updated assessment of construction traffic will be required prior to the time of construction, which can be used to inform the traffic management measures in the CTMP.

7.3.3.1.4 Road safety assessment during construction period

Speed Limit

Jesmond Road is currently a high-speed rural road (80km/h) connecting SH 22 to Bremner Road. As part of the Safer Speed Programme, AT is currently implementing new speed limits on Auckland's road network. Under the Speed Limits Bylaw 2019, the speed limit on Jesmond Road (in Drury) is now 60km/h permanently effective from 30th June 2020. Given the low number of construction

movements in/out of construction zones and low traffic volume on Jesmond Road, the likelihood of crashes occurring due to speed is low.

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

Pedestrians and cyclists

The existing Jesmond Road has no provision for pedestrian and cyclists. The analysis of the crash data did not show any current or history of incidents involving pedestrians and cyclists. Thus, it is unlikely that the additional construction traffic will have any notable impact on existing active transport modes. It is likely that the demand will increase if urbanisation occurs prior to construction, but future parallel collectors could also be used as an alternative route. Therefore, effects should be assessed again when a greater level of detail is available about surrounding facilities and land use activities prior to construction.

However, it is recommended that residents and stakeholders(such as Bike Auckland and cycling clubs) be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity will be used to inform appropriate traffic management measures in the CTMP.

Property access for Jesmond Road residents and businesses

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

7.3.3.2 Assessment of construction effects – Bremner Road

The Bremner Road FTN Upgrade will include:

- a new alignment from Jesmond Road to the Auranga development,
- pavement works within the existing road reserve in the Auranga development to provide for FTN bus lanes,
- road widening on the existing Bremner Road from the bridge over Ngakoroa Stream to the Firth Street intersection,
- a new alignment from this intersection to Great South Road.
- four bridges including over a stream withing the Auranga 1 Precinct, over the Ngakoroa Stream, over SH1 and over the Hingaia Stream.
- Local road tie-ins including Victoria Street and Bremner Road adjacent to the Auranga development.

The location of works and the construction activities will define the traffic management measures required. The assessment of construction effects is, therefore, separated into three zones:

- **Zone 1**: new alignment between Jesmond Road to the Auranga 1 Precinct through greenfield areas.
- **Zone 2**: upgrade of local road within the Auranga development between Zone 1 to bridge over Ngakoroa stream.
- **Zone 3**: from the bridge over Ngakoroa stream to Great South Road. The construction activities, including the construction of the new bridges, will likely interact with live traffic and commercial properties.

Figure 7-20 shows the indicative construction zones.

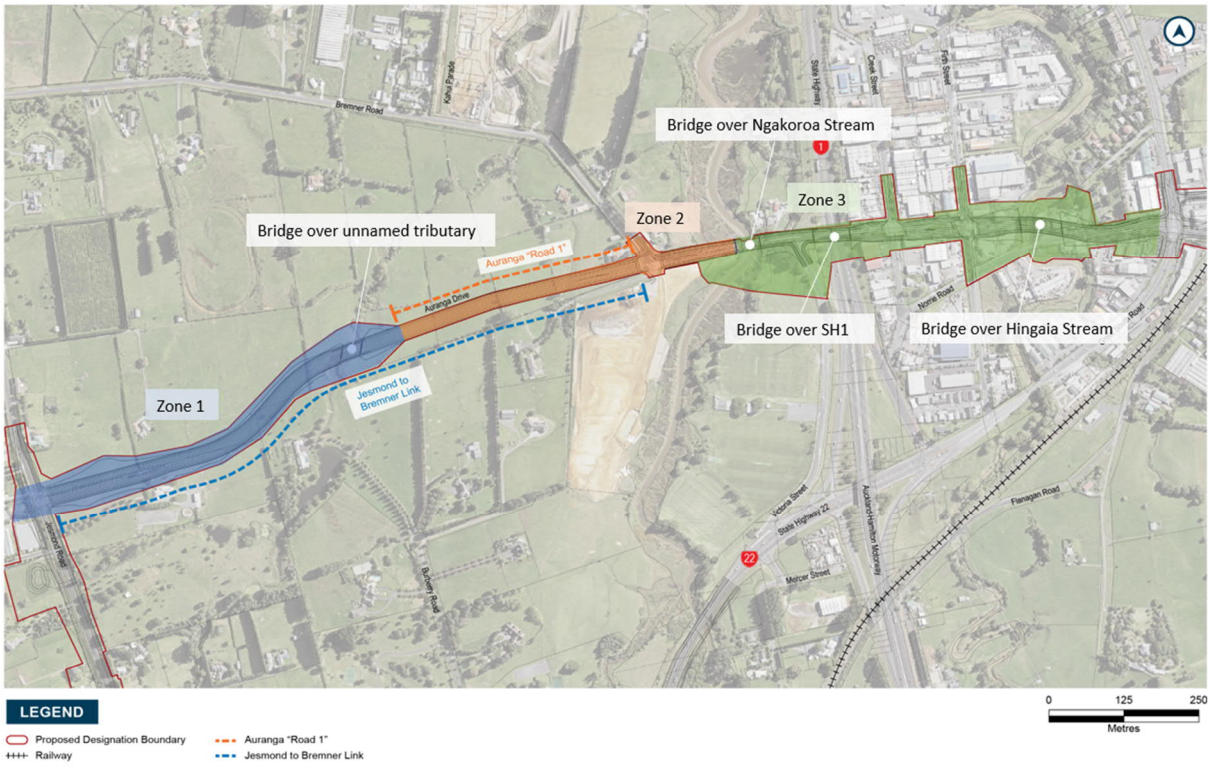


Figure 7-20: Construction zones - Bremner Road FTN Upgrade

The Bremner Road FTN Upgrade project is estimated to take 3 to 3.5 years to complete:

- Enabling works: six to nine months
- Zone 1 and Zone 3 construction works will be carried out at the same time, including bridge construction. These will take approximately two years.
- Zone 2 construction works will be carried out at the same time with zone 1 and zone 3 works, however, it is expected to complete within one year.
- Pavement and finishing works: six to nine months.

The assessment of construction effects is based on the indicative construction programme and the nature of works for each zone. The indicative construction method has been developed based on a concept design with consideration of using the most practical construction techniques and equipment.

There are likely alternative methods in the future that could be used to complete the works, however, this document only intends to capture the traffic impacts based on the indicative construction method.

7.3.3.2.1 Temporary traffic management

Traffic management – Zone 1 and Zone 2

It is anticipated that most of the construction works in Zone 1 and Zone 2 will be carried out in greenfield areas if the section through the proposed Auranga Development has not yet been built at the time of commencing Bremner Road FTN Upgrade. The two SAPs are likely to be located on Jesmond Road, and at the eastern end of Bremner Road near the Ngakoroa Stream Bridge. It is expected that temporary traffic management will only be required at these two locations for the construction activities of both zones. The temporary traffic management measures may include stop-go measures to accommodate construction vehicles coming in/out of the sites, and some minor traffic management for the tie-in works to Jesmond Road intersection and the existing Bremner Road. These measures will be in accordance with the latest traffic management guidelines / standards at the time of construction.

However, if the road through the Auranga Development has already been built prior to the Bremner Road Section, it is anticipated that there will be more traffic management measures required to delineate live traffic away from the construction zones. The scale of temporary traffic management required for these zones is largely dependent on the various stages and requirements of the construction activities. This will be addressed as part of the CTMP once the construction environment is known.

Traffic management – Zone 3 (excluding construction of bridges)

Temporary traffic management will be required to facilitate the construction activities within Zone 3, including the construction of bridges. Full road closures or partial closures may be required for some specific activities, such as road surfacing, traffic switches and construction of new intersections at Bremner Road / Firth Street and Bremner Road / Great South Road. These closures will typically be done during night-time and/or weekends to minimise the disruptions to motorists.

The construction methodology for the Bremner Road section will require full closure of Norrie Road (east of Firth Street). It is anticipated that the intersections with Firth Street, and with Great South Road, will require some adjustments to accommodate the additional traffic being diverted.

Some other construction activities can be accommodated by stop/go or contraflow traffic management which can be implemented on lower traffic volume roads such as the existing Bremner Road, Creek Street and Victoria Street.

Traffic management – Bridges and structures

The construction works include one bridge over SH1, and two bridges over streams (Ngakoroa and Hingaia Streams). In order to manage and minimise the construction impacts to residents and businesses, it is recommended that the construction of the three bridges be sequenced and programmed appropriately. One bridge may need to be constructed and operational first before the next one can begin. The traffic management methods for each bridge should be assessed in the future as part of the CTMP for the Bremner Road Section.

The existing Norrie Road bridge over Hingaia Stream will be removed after the new bridge is operational. Similarly, it is anticipated that temporary traffic management may be needed for SAPs and managing detour traffic.

For the Bremner Road Bridge over SH1, traffic management will be required on SH1 to facilitate the construction of bridge abutments and the central pier. Temporary measures should include temporary speed limits, traffic barriers, and / or lane reconfigurations. In addition, the construction work associated with the bridge beam installation and demolition of the old bridge will likely require a full closure and/or partial closure of the SH 1, between the SH 22 interchange and the Hingaia Road/Beach Road interchange.

Figure 7-21 shows the potential detour route for the closure of SH 1 that is using Great South Road – Beach Road, which will require further detailed assessments of capacity, intersection performance and safety along this route. It is noted that if the proposed Mill Road project is completed prior to the closure of the motorway, it may be used to divert some traffic and reduce the detour traffic on Great South Road.

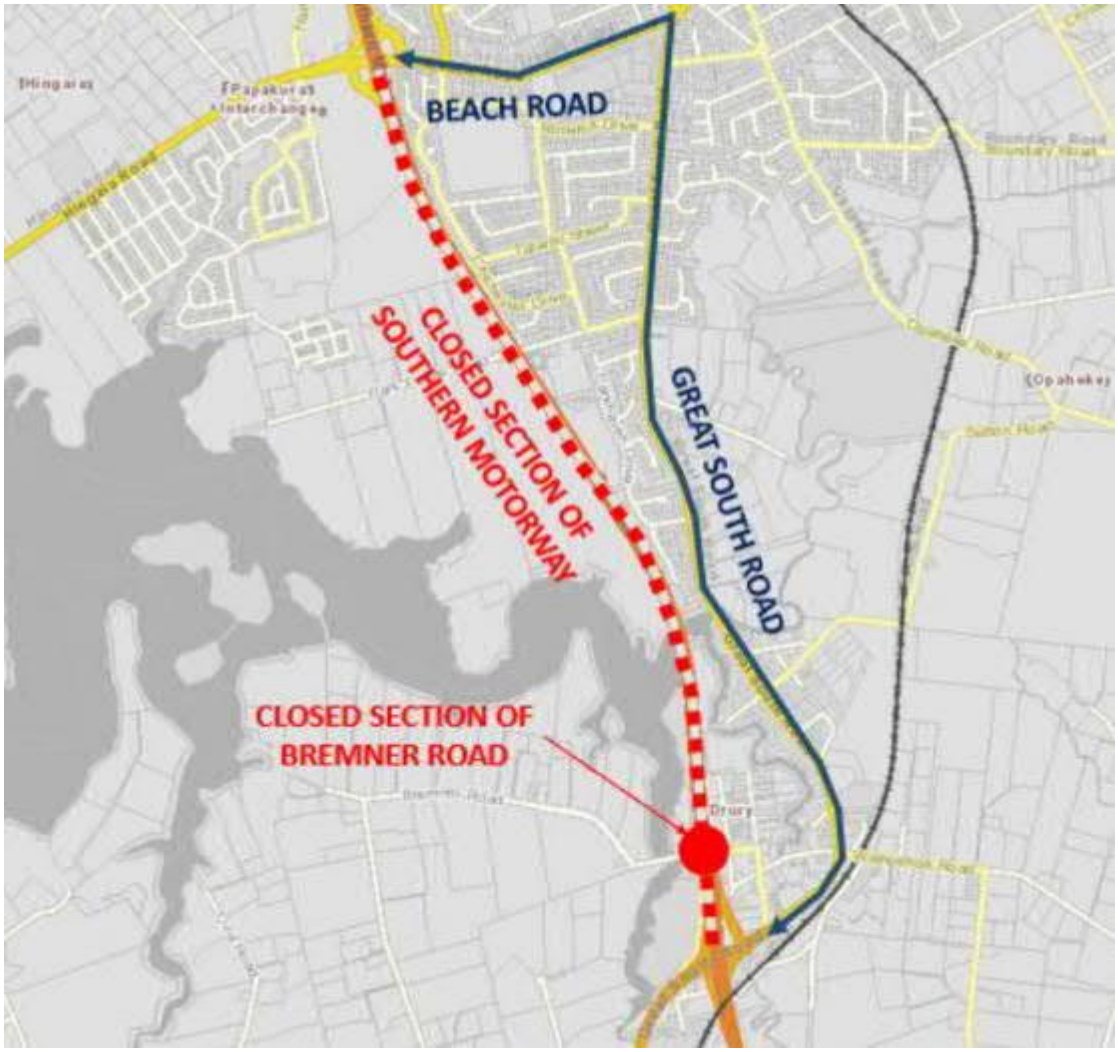


Figure 7-21: Potential detour route for SH1 closure

It is expected that road closures and motorway closures may be required for some specific activities, especially with the construction of bridges. The effects of these closures, closure periods and detour

routes should be assessed as part of the CTMP for the Bremner Road FTN Upgrade project on the basis of the current traffic environment. It is recommended to include the below requirements:

- Methods to manage the effects of temporary traffic management activities on traffic and other projects occurring in the area at the same time (e.g. SH 22 Upgrade, Jesmond Road FTN Upgrade, Waihoehoe Road FTN Upgrade and SH1 Papakura to Drury South project. Noting that SH1 Papakura to Drury South project is a New Zealand Upgrade Project and is likely to be constructed ahead of the Drury Package projects.
- Methods to manage the effects of motorway closure on traffic on the detour routes and the impact to wider road network.
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be. This includes the access to property / business owners in the industrial area of Bremner Road, Firth Street and Norrie Road.

It is noted that the completion time of the proposed Mill Road project will be vital to the assessment of motorway closure as the future Mill Road can be an alternative detour route in addition to Great South Road detour option.

It is considered that temporary effects from the construction activities of Bremner Road FTN Upgrade project can be adequately managed through the implementation of a CTMP during the construction phase of the Project. The purpose of the CTMP is to ensure the construction of the 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 residential properties, local activities and SH1 motorway traffic.

If required, SSTMP should be developed to manage constraints on access to affected properties.

7.3.3.2.2 Expected construction traffic routes

The construction of the Bremner Road FTN Upgrade project will require significant earthworks. The estimated volumes of cut and fill are approximately 77,800m^3 based on the current indicative design. 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 the Project.

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

- The routes that will be used by construction vehicles will depend on the location of quarries and disposal sites which are not yet certain.
- The exact location and extent of compound sites/lay down areas has yet to be determined.
- The timing of construction of other projects could impact on likely construction vehicle routes, especially SH 22 Upgrade, Jesmond Road FTN Upgrade, Waihoehoe Road FTN Upgrade and SH1 Papakura to Drury South project.

It is noted that the access to compound sites/laydown areas and construction zone for construction vehicles, plant and materials will be via site access points on Bremner Road 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 and intersections with the provision of adequate vehicle tracking.

It is noted that the existing SH1 motorway bridge at the Drury interchange has a height limit of 4.66m. Therefore, any construction vehicles exceeding this limit, are prohibited to go under the bridge. However, the Drury interchange is expected to be upgraded as part of the SH1 Papakura to Drury South project and road network vehicle restrictions should be reassessed prior to construction, as this constraint may no longer exist.

The potential construction traffic routes are shown below in Figure 7-22.

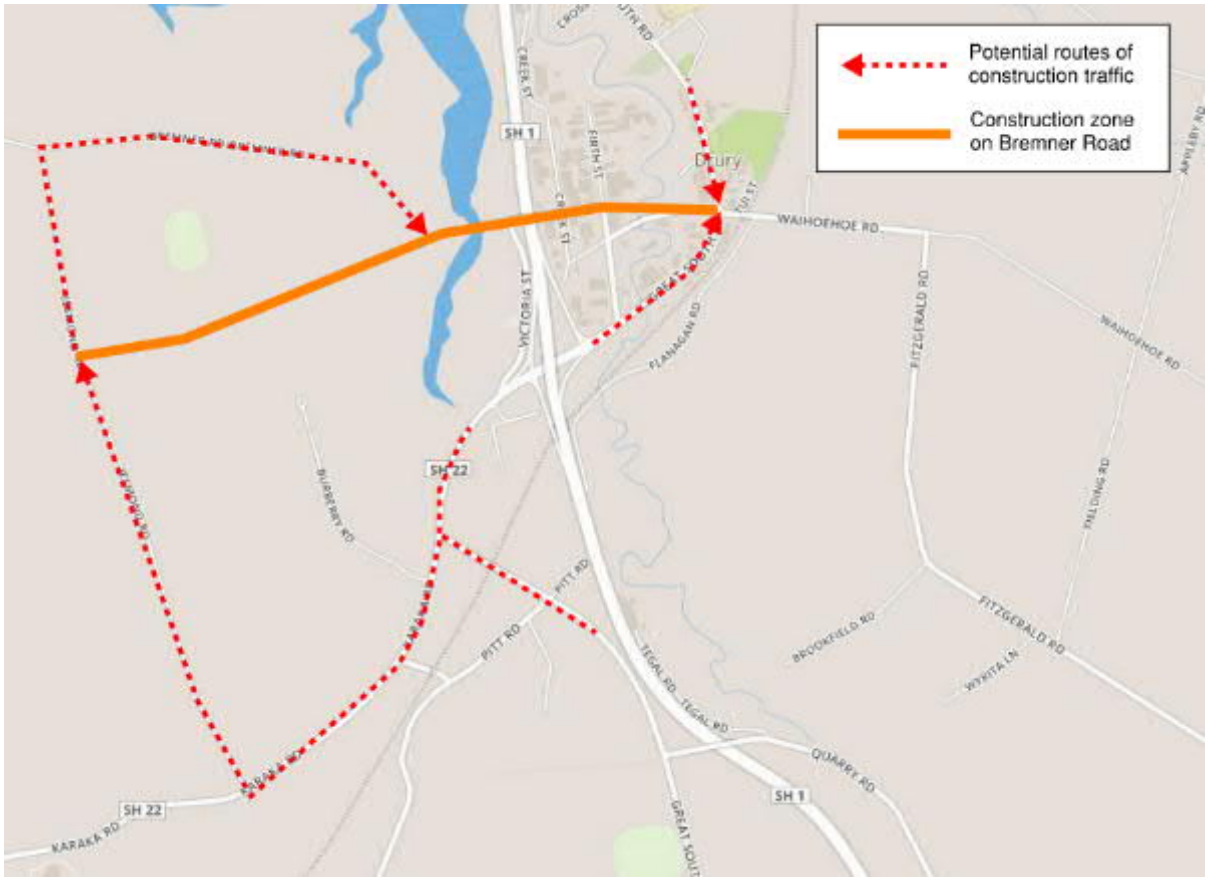


Figure 7-22: Potential Construction Routes for Bremner FTN Upgrade project

7.3.3.2.3 Expected construction traffic generation

Based on the proposed construction methodology and activities, the estimated duration of work is between 36 months and 42 months over three stages of construction works. The estimated construction movements include approximately 33,200 heavy truck movements. In addition, there will be approximately 300 light vehicle movements per day from staff and contractors during the peak construction period.

To estimate the daily number of truck movements to and from the site, the following working assumptions were adopted:

- Working days: 20 days construction per month

- Hours of delivering earthworks and other materials: a total of 8 hours a day. It is noted that truck movements should avoid the peak hours of traffic or alternatively specified times agreed with respective RCA.
- The duration of construction: 36 months for all three stages of construction works. For the assessment of construction effects, a shorter construction period of 36 months has been adopted in the assumptions, given that this will generate more trips.

The daily number of construction vehicles have been calculated and summarised below in Table 7-11.

Table 7-11: Expected Daily Traffic Movements from Construction Works – Bremner Road FTN

Stages	Expected duration (approx.)	Truck movements (daily)	Light movements (daily)	Total movements (daily)	Typical vehicle movements
Stage 1:	6 months	10 to 20	80 to 120	90 to 140	• Truck movements likely to include low loaders for plant delivery and collection, articulated trucks/truck and trailer units/concrete units, concrete trucks. • Light vehicle movements are likely from construction staff and contractors.
Stage 2: Construction works for all 3 zones and Construction of bridges	24 months	50 to 240	200 to 300	250 to 540	
Stage 3: Pavement construction	6 months	10 to 20	80 to 160	90 to 180	

In order to assess the full extent of effects from this expected construction traffic, the traffic environment at the time of construction needs to be understood. For the construction of the Bremner Road FTN Upgrade, analysing the impact of the surrounding network should be included as part of the CTMP for this project.

The current traffic volume on Bremner Road is estimated to have 1,100 vehicles per day, which is relatively low for a two-lane road. This means that Bremner Road may currently have ample capacity to accommodate the construction traffic, and it is unlikely to cause any notable impact to the existing traffic environment on Bremner Road and the adjacent road network.

The future traffic volume is significantly more than the existing volume on Bremner Road. Depending on the staging of this section or the rest of NoR D2, an updated assessment of construction traffic will be required prior construction, which can be used to inform the traffic management measures in the CTMP.

7.3.3.2.4 Road safety assessment during construction period

Speed limit

Bremner Road is currently a high-speed rural road, connecting Jesmond Road to Firth Street in the commercial area. The current speed limit is 80km/h for the section of Bremner Road between the Jesmond Road intersection and the Victoria Street intersection. Between Victoria Street to Firth Street, the current speed limit is 50km/h. It is noted that the current speed limit on Jesmond Road is 80km/h and will likely to be reduced to 60km/h as part of AT's safe speed programme.

To improve the safety of all road users, implementation of a safe and appropriate temporary speed limit on Jesmond Road, Bremner Road, and Great South Road is recommended within the extent of works. This should be in accordance with the latest traffic management standards at the time of construction.

The construction of the new Bremner Road Bridge over SH1 will include the construction of abutments adjacent to the motorway shoulder, and central piers on the motorway. These construction activities will likely cause disruption to the speed of motorway traffic (100km/h speed limit currently) and the effects on motorway operation and safety should be assessed as part of the CTMP for the Bremner Road section. It is recommended to include the following requirements:

- A detailed assessment of safe and appropriate temporary speed on SH 1 section between SH 1/SH 22 interchange and SH 1/Beach Road interchange.
- A traffic impact assessment for the construction on Bremner Road and demolition of the existing bridge. The assessment should include the traffic impacts at adjacent interchanges, intersections on detour routes and wider network impacts.

Pedestrians and cyclists

The existing roadside facilities on the western section of Bremner Road are not user-friendly for pedestrians and cyclists given the side drains and lack of shoulders on both sides of the road. It is noted that the eastern section of Bremner Road is currently being developed and a new footpath provided as part of the development. The land use on the eastern side of SH 1 is commercial / light industrial, which includes footpaths.

It is noted that Norrie Road between Firth Street and Great South Road is proposed to be closed to normal traffic during construction. However, it is recommended that the footpath should be open for pedestrians. The cyclists can be detoured via Great South Road if there is any cycling demand.

The analysis of the crash data did not show any current or historic incidents involving pedestrians and cyclists. Thus, it is expected that the additional construction traffic will be unlikely to have any notable impact to existing active transport modes.

However, it is recommended that residents and stakeholders(such as Bike Auckland and cycling clubs) be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity should be used to inform appropriate traffic management measures in the CTMP.

Property access for Bremner Road residents and businesses

During construction, there will be temporary traffic management controls such as temporary concrete or steel barriers which may impact property access. Norrie Road between Firth Street and Great South Road is proposed to be closed to the public. However, the property / business owners will be able to access Norrie Road through temporary traffic management control measures. It is also anticipated that the existing driveways on Bremner Road that remain will require temporary access during construction. The contractor will undertake detailed assessment of any affected driveways and provide temporary access if required. The temporary access will ensure the ability for residents to safely access and exit their property.

7.3.3.3 Assessment of construction effects – Waihoehoe Road West

The Waihoehoe Road West FTN Upgrade project will consist of road widening on the existing Waihoehoe Road between Great South Road intersection to Fitzgerald Road intersection, upgrades to two intersections, and reconstruction of the bridge over the NIMT rail line. The Project will also include a roundabout with Ōpāheke North-South (N-S) FTN Arterial and Fitzgerald Road, and local road realignment of Tui Street onto Great South Road.

The location of works and the construction activities proposed define the traffic management measures required. The works proposed are a mix of earthworks, bridge works, utility relocation, pavement construction and drainage. Most of these works will be constructed using the existing alignment of Waihoehoe Road West and will be directly adjacent to live traffic, so will require temporary traffic management. Figure 7-23 shows the indicative extent of works.

Figure 7-23: Extent of works - Waihoehoe Road West FTN Upgrade

The Waihoehoe Road West FTN Upgrade project is estimated to take two to two and half years to complete:

- Enabling works: four to six months
- Eastbound carriageway: six to eight months
- Westbound carriageway: six to eight months
- Pavement and finishing works: six months
- Bridge construction will be carried out at the same time as construction of the eastbound and westbound carriageway

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for each zone. The indicative construction method has been

developed based on a concept design with consideration of using the most practical construction techniques and equipment. There are likely alternative methods in the future that could be used to complete the works, however, this document only intends to capture the traffic impacts based on the indicative construction method.

7.3.3.3.1 Temporary traffic management

Most of the construction work will be road widening to the north of Waihoehoe Road West and works at the intersection with Great North Road and Fitzgerald Road. It is anticipated that the larger part of works required for the Project will likely be adjacent to or on 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 zone is largely dependent on the various stages and requirements of the construction activities.

It is expected that short-term road closures for nights or weekends may be required for some construction activities, such as road surfacing and traffic switches. Other activities may require contraflow or stop-go traffic management. The effect of temporary road closure or other traffic management on existing traffic on Waihoehoe Road West and the adjacent road network should be assessed in the future as part of the CTMP for the Project on the basis of the current traffic environment. It is recommended to include the following requirements:

- Methods to manage the effects of temporary traffic management activities on traffic and other projects occurring in the area at the same time (e.g. Bremner Road FTN Upgrade, Waihoehoe Road East Arterial Upgrade and Ōpāheke N-S FTN Arterial)
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be.

It is considered that the temporary effects from the construction activities on Waihoehoe Road West can be adequately managed through the implementation of a CTMP during the construction phase of the Project. The purpose of the CTMP should be to ensure the construction of the 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 residential properties and local activities.

If required, SSTMP should be developed to manage constraints on access to affected properties.

7.3.3.3.2 Expected construction traffic routes

The construction of the Waihoehoe Road West FTN Upgrade project will require some earthworks. The estimated volumes of cut and fill are approximately 24,200m^3 based on the current indicative design. Final cut and fill volumes will be confirmed following detailed design prior to construction. The construction traffic movements to accommodate the earthworks and other construction activities will likely result in the increase of traffic volume on construction routes used during the construction period of the Project.

Given the timing of the construction of Waihoehoe Road West Upgrade has yet to be determined, there is a degree of uncertainty associated with any predicted construction methodology and associated construction routes. This means:

- The routes that will be used by construction vehicles will depend on the locations of quarries and disposal sites which are not yet certain.
- The exact location and extent of compound sites/lay down areas has yet to be determined.
- The timing of construction of other projects could impact on likely future construction vehicle routes, especially SH 22 Upgrade (NoR D1), Bremner Road FTN Upgrade (part of NoR D2), Waihoehoe Road East Upgrade (NoR D3), and Ōpāheke North-South FTN Arterial (NoR D4), the new Drury train stations and the proposed upgrade of the Mill Road corridor.

It is noted that the access to compound sites/laydown areas and construction zone for construction vehicles, plant and materials will be via site access points on Waihoehoe Road and potentially on Great South Road which will need to be identified as part of future CTMPs. Details of the routes for construction traffic will likely be limited to arterial corridors and intersections with adequate vehicle tracking provision.

It is noted that the existing SH1 motorway bridge at the Drury interchange has a height limit of 4.66m. Therefore, any construction vehicles exceeding this limit, are prohibited to go under the bridge. However, the Drury interchange is expected to be upgraded as part of the SH1 Papakura to Drury South project and road network vehicle restrictions should be reassessed prior to construction as this constraint may no longer exist.

The potential construction traffic routes are shown below in Figure 7-24.

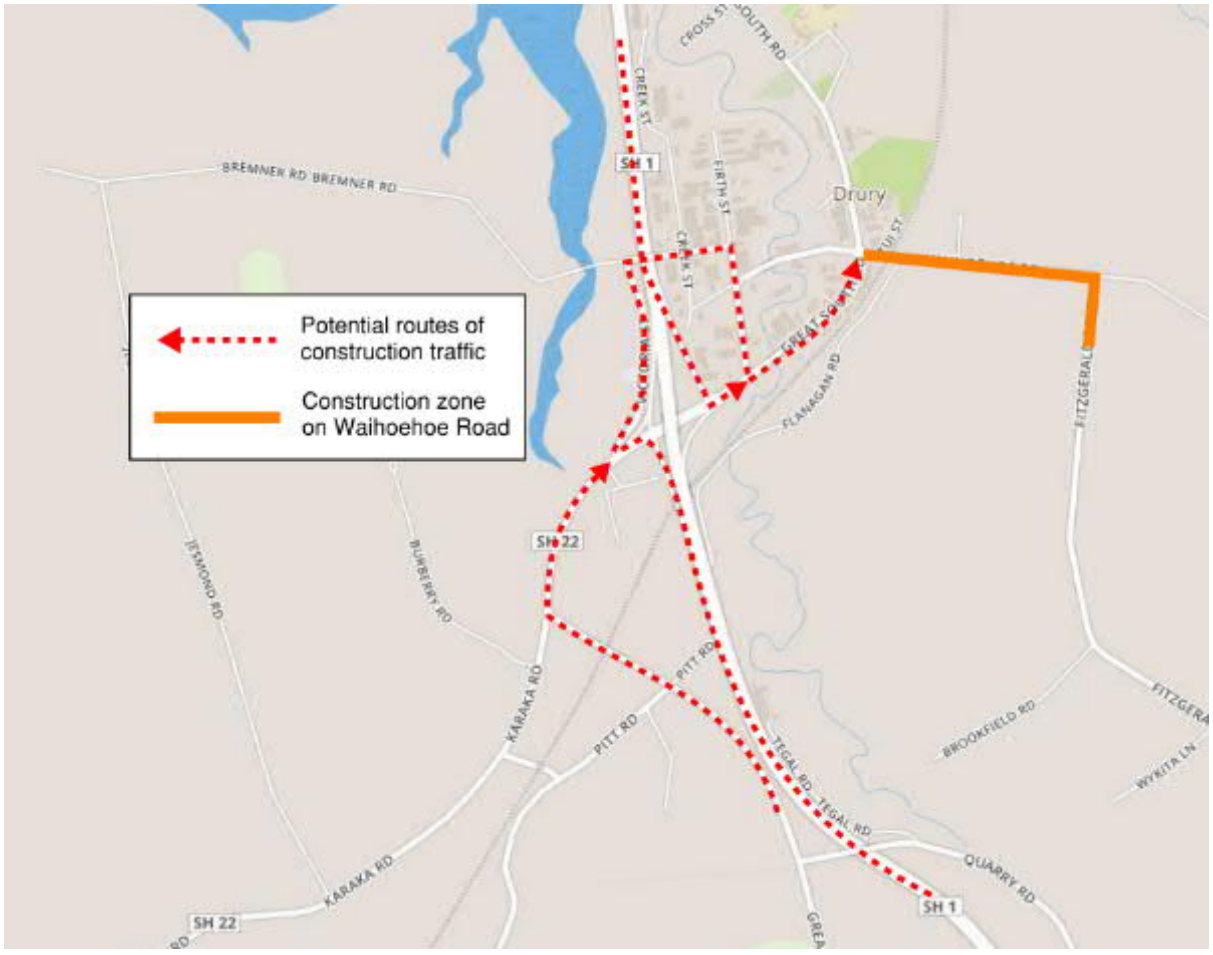


Figure 7-24: Potential construction routes for Waihoehoe Road West

7.3.3.3.3 Expected construction traffic generation

Based on the proposed construction methodology and activities, the estimated duration of work is between 24 months and 30 months, which includes three stages of construction works. The estimated construction movements include approximately 9,400 trips from heavy trucks. In addition, there will be approximately 100 vehicle movements per day from staff and contractors during the peak construction period.

To estimate the daily number of truck movements to and from the site, the following working assumptions were adopted:

- Working days: 20 days construction per month
- Hours of delivering earthworks and other materials: a total of 8 hours a day. It is noted that truck movements should avoid the peak hours of traffic or alternatively specified times agreed with respective RCA.
- The duration of construction: 24 months for all three stages of construction works. For the assessment of construction effects, a shorter construction period of 24 months has been adopted in the assumptions, given that this will generate more trips.

The daily number of construction vehicles have been calculated and summarised below in Table 7-12.

Table 7-12: Expected daily traffic movements from construction works – Waihoehoe Road West FTN

Stages	Expected duration (approx.)	Truck movements (daily)	Light movements (daily)	Total movements (daily)	Typical vehicle movements
Stage 1: Enabling works	4 months	10 to 20	30 to 50	40 to 70	• Truck movements likely to include low loaders for plant delivery and collection, articulated trucks/truck and trailer units/concrete units, concrete trucks. • Light vehicle movements are likely from construction staff and contractors.
Stage 2: Construction works for eastbound, westbound and Construction of bridge over rail	14 months	20 to 180	70 to 100	90 to 280	
Stage 3: Pavement construction	6 months	10 to 20	30 to 50	40 to 70	

In order to assess the full extent of effects from the expected construction traffic, the traffic environment at the time of construction needs to be understood. For the construction of Waihoehoe Road West Section, analysing the impact on the surrounding network should be included as part of the CTMP for this project.

The current traffic volume on Waihoehoe Road West is estimated to have between 4,000 to 5,260 vehicles per day, which is a moderate volume for a two-lane road. The capacity of existing Waihoehoe Road West is anticipated to be able to accommodate the additional traffic associated with

construction and it is unlikely to cause any notable impact to the existing traffic environment on Waihoehoe Road West.

The future traffic volume is twice the existing traffic volume on Waihoehoe Road West. Depending on the staging of the Project, an updated assessment of construction traffic will be required prior to construction. This will be used to inform the traffic management measures in the CTMP.

7.3.3.3.4 Road safety assessment during construction period

Speed limit

Waihoehoe Road (west of the bridge over rail line) and Fitzgerald Road are currently rural roads with speed limits of 70km/h. Under the Speed Limits Bylaw 2019, the permanent speed limit is now 60km/h, effective from 30th June 2020. The other section of Waihoehoe Road towards the Great South Road intersection currently has a speed limit of 50km/h. Given the low number of construction movements in/out of construction zones and the existing traffic volume on Waihoehoe Road is medium-low, the likelihood of crashes occurring due to speed is low.

However, to improve the safety of all road users, a safe and appropriate temporary speed limit on Waihoehoe Road within the extent of works, and along the construction routes should be implemented if needed. This should be in accordance with the latest traffic management standards at the time of construction. These recommended measures and other measures highlighted in the CTMP are expected to reduce the potential safety risks that may be associated with construction traffic.

Pedestrians and cyclists

The existing roadside facilities on Bremner Road are not user-friendly for pedestrians and cyclists given the side drains and lack of shoulders on both sides of the road. A narrow footpath is provided on the northern side of Waihoehoe Road. Analysis of crash data showed one minor crash involving a pedestrian on Waihoehoe Road.

However, it is recommended that residents and stakeholders (such as Bike Auckland and cycling clubs) be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity will be used to inform appropriate traffic management measures in the CTMP.

Waihoehoe Road and Fitzgerald Road residents and businesses

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

7.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects – NoR D2

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

a. A CTMP shall be prepared prior to the Start of Construction for a Stage of Work. Any potential construction traffic effects shall be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction.

b. 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:

(i) Methods to manage the effects of temporary traffic management activities on traffic;

(ii) Measures to ensure the safety of all transport users;

(iii) 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;

(iv) Size 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;

(v) Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;

(vi) Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;

(vii) 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;

(viii) Method that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

c. Auditing, monitoring and reporting requirements relating to traffic management activities shall be undertaken in accordance with Waka Kotahi's Code of Practice for Temporary Traffic Management.

d. Any CTMP prepared for a Stage of Work shall be submitted to Council for information ten (10) working days prior to the Start of Construction for a Stage of Work

7.4 Summary of Effects (NoR D2)

The assessment of transport effects for NoR D2 has identified the following potential effects.

Table 7-13: Assessment of Effects Summary for NoR D2

Operational Transport Effects	
Safety	The upgrades that comprise NoR D2 are expected to result in positive effects on safety including: • Reducing the speed environment from 70km/h-80km/h to the more appropriate urban speed of 50km/h. This is likely to result in a safer speed environment, which will significantly decrease the risk of DSIs at intersections and mid-block. • Providing separated and protected walking and cycling facilities in the Project Area to improve safety for existing and future vulnerable road users. This will significantly decrease the risk DSI's along NoR D2. • Providing safe intersection controls at seven key intersections along the Project Area with controls on vehicle movements, provision of safer pedestrian crossing facilities at intersections and improvements to vehicle

Operational Transport Effects	
	access to adjacent side roads. This will significantly decrease the risk of DSI's at intersections. • Providing appropriate vehicle lane widths and delineations to enhance the urban environment and to align with the urban speed limit • Providing raised medians to separate the two directions of traffic and reduce head-on crashes.
Walking and cycling	The effects of the Project on walking and cycling are: • supports growth surrounding NoR D2 without compromising safety and significantly improves access to employment and social amenities • significantly reduces the risk for DSI's by enabling safe movement for vulnerable road users along and across the Project Area • significantly improves east-west and north-south walking and cycling connectivity and integrates with future walking and cycling network • positive environmental and health benefits by increasing the number of active mode trips and reducing the reliance on vehicle trips • serves as a key enabler to achieve mode shift targets through integration with proposed Drury West and Central Stations • prevents existing and likely future safety and severance issues between Drury West and Drury East by providing and more direct network connection.
Public Transport	In summary, the effects of the Project on public transport are: • significant improvement to east-west public transport connectivity, which will significantly improve access to employment and social amenities • dedicated FTN facilities which will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for public transport users • significantly improve integration with the future public transport network, resulting in improved east-west and north-south connectivity • a higher number of public transport trips which reduces the reliance on vehicle trips, resulting in positive environmental and health benefits • significantly improve integration with proposed Drury West and Central Stations, and it will serve as a key enabler to achieve mode shift targets.
General Traffic	In summary, the effects of the Project on general traffic are: • Improved integration with proposed Drury West and Central Stations (including associated park and ride facilities) and the future urban areas surrounding NoR D2. • Improved east-west connectivity between Drury West and Drury East by providing a reliable alternative route that reduces vehicle kilometres travelle d compared to without the Project. • More direct local east-west connectivity enabling local traffic to rely less on congested SH 22 (the only east-west alternative traffic route) for travelling between Drury West and Drury East. • Removal of east-west movement capacity constraints and improved future east-west reliability and resilience for all road users, particularly for active modes and priority vehicles/buses. • The separation of public transport into priority lanes also benefit general traffic by segregating removing buses and boarding and alighting at bus stop.

Operational Transport Effects	
	• Improved intersection controls and increased capacity to cater for future growth, resulting in decreased delay and less traffic rerouting through future collector roads surrounding the Project Area.
Access	The effects of providing limited direct property access within certain parts of the Project Area are: • decrease crash exposure between driveways, general traffic and active modes • eliminate crash risk related to merging onto the road and crossing multiple traffic lanes While some properties may require longer routes for access (such as where right turn access is banned), these effects are expected to be offset by the more reliable and safer travel provided along the corridor itself. Overall the effects on direct property access are considered to be neutral.
Construction Transport Effects	
In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management during construction, including construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users and driveways and property access. These effects can be appropriately mitigated through a CTMP prepared before construction commences.	

7.5 Conclusion (NOR D2)

The existing roads within NoR D2 are not fit for purpose to support the planned future urban growth.

The current environment is a medium to high-speed environment, with poor east-west connectivity for public transport, general traffic, and active modes with limited or no walking and cycling facilities to protect vulnerable users. Also, Norrie Road has a severe capacity (one-lane capacity) and width restriction at Norrie Road Bridge, limiting east-west movement, and it is unable to accommodate large vehicles and public transport. Furthermore, there are no public transport facilities or intersections to support or prioritise public transport usage.

The existing daily traffic flow is relatively low, but it is expected to grow significantly (from 6600vpd to 41,800vpd) as a result of the planned growth and is expected to operate near general traffic capacity. NoR D2 forms an integral part of the future public transport network, providing a primary east-west and north-south function for future planned services, and serving as a gateway to key destinations in Drury (including new planned rail stations, centres and the strategic north-south PT network). Without adequate facilities for public transport, access to employment and social amenities will be compromised by congested, unreliable and unattractive east-west public transport connectivity.

The scale of growth will trigger effects on all elements of the transport system. There are significant adverse effects expected if future growth progresses and existing infrastructure remains the same. These adverse effects will compromise safety, wellbeing, liveability and lead to several undesirable transport and land use integration outcomes as detailed in section 7.2.2.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project provides a safe, reliable multi-modal arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improve access to employment and social amenities in and around the Drury-Ōpāheke area.

The Project will significantly improve the transport facilities for all modes, resulting in improved safety for those that travel by car, active modes or public transport as well as the movement of goods and services. The dedicated FTN facilities will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for public transport users. The journey time benefits for public transport are expected to be largest in the morning peak (12 min), followed by the inter peak (over 4 min) and evening peak (over 6 min).

The Project will also significantly improve safety for vulnerable users (with the provision of additional segregated walking and cycling facilities) and will significantly reduce the risk of DSIs.

The upgrade will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

The Project will also significantly improve reliability, resilience and productivity for all road users travelling between Drury East and West.

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project. Some existing properties will face a minor diversion impact on the main network given that limited direct property access (left-in and left-out only) but the significant safety benefits will offset effects.

In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through conditions relating to CTMPs and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes, the Project will have significant positive effects and the potential adverse effects arising during construction can be appropriately mitigated.

8.0 NoR D3: Waihoehoe Road East Upgrade

Chapter Summary

The existing Waihoehoe Road East is not fit for purpose to support the planned future urban growth. Significant adverse effects expected if future growth progresses and the existing Waihoehoe Road East infrastructure remains the same. The adverse effects are increased safety risk for all users, encourage a hostile and unsafe environment for active modes, decreased reliability for general traffic and public transport and would lead to several undesirable transport and land use integration outcomes.

The Project proposes that the function of Waihoehoe Road East will change from an existing rural two-lane collector road to an urban two-lane arterial catering for vehicles, public transport and active modes to combat the expected undesirable outcomes. The proposed design includes separated walking and cycling facilities on both sides of the road, and a central median (either flush or raised) to separate the two directions of traffic movements.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improves access to employment and social amenities. The Project will significantly improve transport facilities (for all modes), resulting in improved safety for those that travel by car, active mode and public transport.

The Project will serve as a key enabler to achieve mode shift targets and will provide a critical east-west walking and cycling connection to the proposed Mill Road corridor for longer inter-regional routes and to the proposed Drury Central Station and the town centre. It will also result in significant improvements to safety for vulnerable users (with the provision of additional segregated walking and cycling facilities) and will significantly reduce the risk for DSI's.

The Project will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

In terms of construction effects, there are several potential temporary adverse effects mainly associated traffic management (construction traffic routes, partial or full road closures, construction traffic, speed limits, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through condition(s) relating to a CTMP and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that operationally the Project will have significant positive effects and potential construction traffic effects can be appropriately mitigated.

8.1 Project Description

8.1.1 Project Overview

The Waihoehoe Road East Upgrade (NoR D3) consists of the widening of Waihoehoe Road to a two-lane arterial with walking and cycling facilities from the proposed intersection with Ōpāheke N-S FTN Arterial in the east, to Drury Hills Road in the east. The intent of the Project is to provide strategic east-west connectivity between the strategic north-south corridors (Great South Road, the Ōpāheke N-S FTN Upgrade (NoR D4) and Mill Road), providing multi-modal access to the wider network for the planned growth area as well as providing access to the existing Drury township and proposed rail station (an NZUP project).

The eastern extent of the Project will tie into the future Mill Road corridor which forms a separate NZUP project. The intersection with Ōpāheke North-South is proposed to be signalised, but this work forms part of NoR D2. Roundabouts are proposed at the intersections with Appleby Road and Cossey Road . The road will be an urban arterial with a likely reduced speed limit of 50kph. An overview of the proposed design is provided in Figure 8-1.

Figure 8-1 Overview of Waihoehoe Road East Upgrade

The indicative alignment has been prepared for assessment purposes, and to indicate what the final design of the Project may look like. The final alignment will be refined and confirmed at the detailed design stage. Key features of the proposed upgrade include the following:

- Widening of Waihoehoe Road from its current general width of 20m to enable a 24m wide two-lane cross-section including separated walking and cycling facilities

- Localised widening around the existing intersections to accommodate for the two proposed roundabouts
- Batter slopes to enable widening of the corridor, and associated cut and fill activities.
- Vegetation removal along the existing road corridor
- Areas identified for construction related activities including site compounds, construction laydown, the re-grade of driveways and construction traffic manoeuvring.

8.1.2 Network and Corridor Design

The Waihoehoe Road East Upgrade project was developed as part of network planning for the wider area and concurrently with the Drury-Ōpāheke Structure Plan 2019 undertaken by the Council. Those wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the problems. As such, the Waihoehoe Road East project is part of a wider integrated network planned for the area.

The Project proposes that the function of Waihoehoe Road East will change from an existing rural two-lane collector road to an urban two-lane arterial catering for vehicles, public transport and active modes. The proposed design includes separated walking and cycling facilities on both sides of the road, and central median (either flush or raised) to separate the two directions of traffic movements.

Figure 8-2 shows the proposed indicative cross-section for the Waihoehoe Road East corridor.

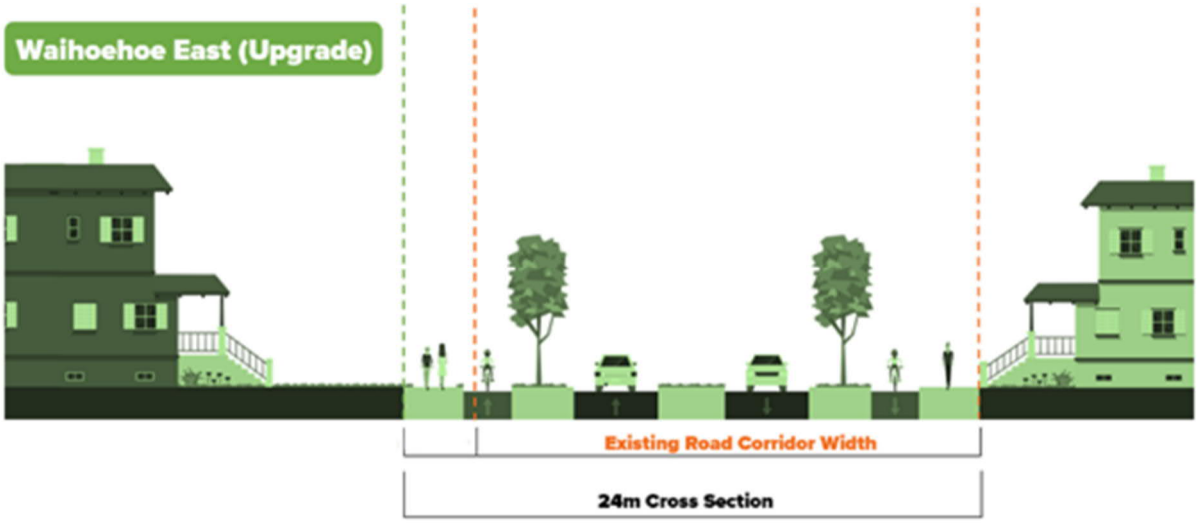


Figure 8-2: Indicative future corridor design - Waihoehoe Road East

The development of the corridor design has included 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, that will be used to inform future development and operation of the corridor.

In the long term, the future corridor movement function will be the key east-west route between the future Mill Road and Ōpāheke N-S FTN Arterial. The land adjacent use is planned to be residential, increasing in desired density towards the western end adjacent to the Drury Town Centre. The corridor is therefore assessed to have the following long-term RASF typology:

- Place function will remain primarily local (P1),
- Movement function - transitioning from M1 to M2 (long term)

The following Figure 8-3 indicates the likely long-term modal priorities for the corridor.

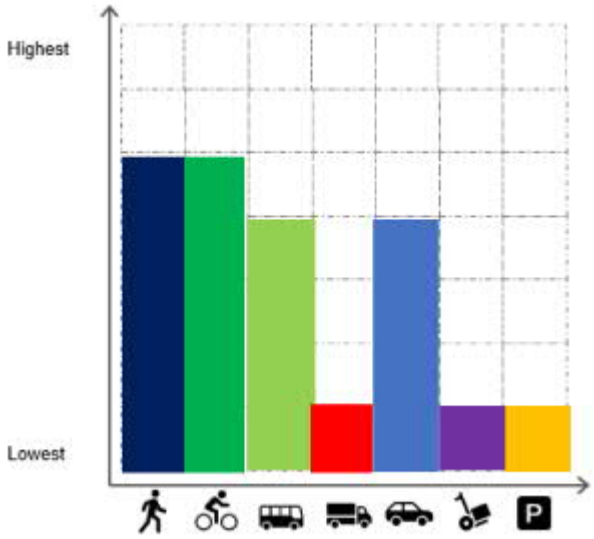


Figure 8-3: Future modal priority in 2048+ for Waihoehoe Road East

This indicates a desire for a high priority to walking, cycling, buses and general traffic movement, but with a lesser need for specific freight, loading, servicing, parking or access priority.

The Project includes fully separated walking and cycling facilities and the estimated traffic flows on this section of the network are such that general traffic, freight and buses are expected to be able to operate together without the need for specific priority facilities. Vehicle access is expected to be primarily from local and collector roads rather than directly from this arterial. The proposed design of two traffic lanes with walking and cycling facilities on both sides reflects the desired movement and place functions identified for this corridor.

The Project is therefore considered to support the assessed typology and modal priorities for this corridor.

The key transport features within the Project include (see Figure 8-4):

- Upgrades to the existing road corridor to suit the future urban context
- A two-lane arterial standard road (24m cross-section) between the proposed Ōpāheke N-S FTN Arterial (NoR D4) and the Mill Road corridor
- Roundabout intersections with Appleby Road, Cossey Road and Ōpāheke North-South (part of NoR D2). The intersection with Mill Road will also be a roundabout but is not part of this project.
- 1.8m footpaths on both sides of the road

- 2.0m separated cycle lanes on both sides of the road

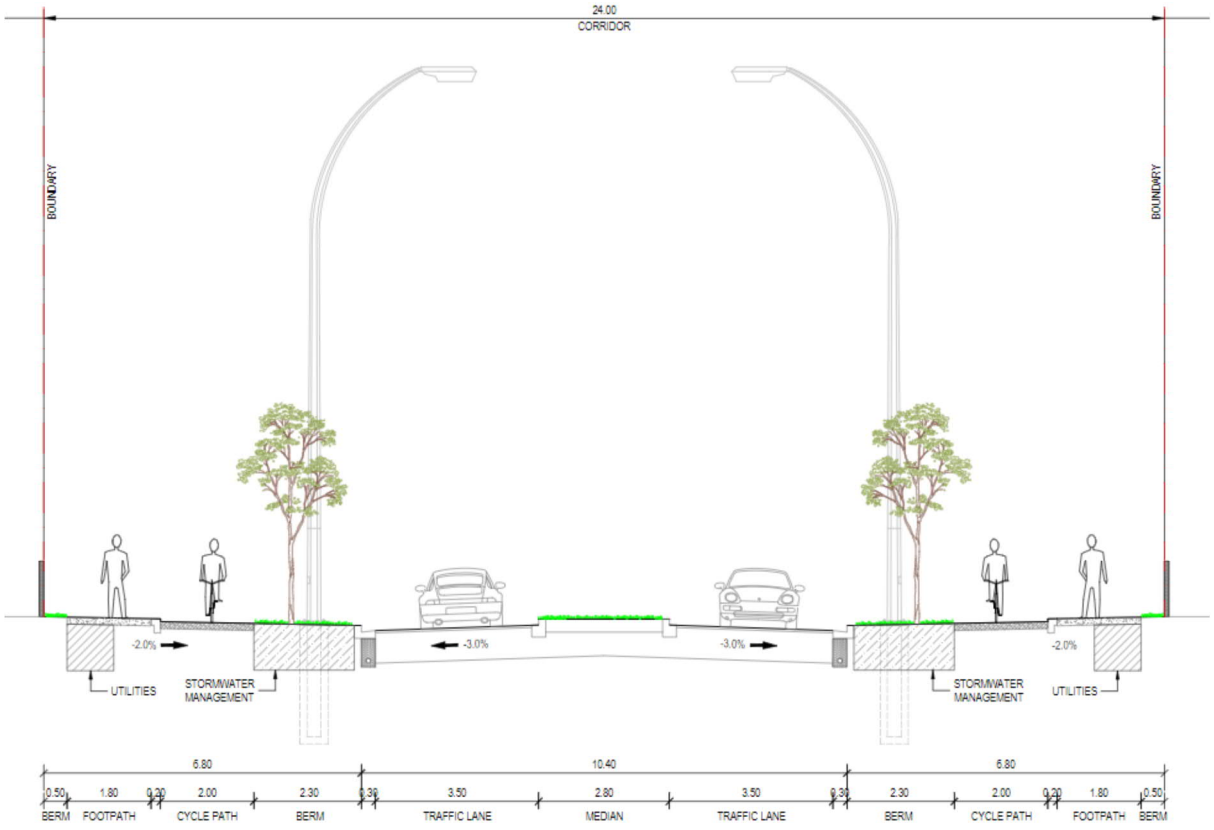


Figure 8-4: Waihoehoe East Typical Cross Section (indicative)

The intent of this Project is to provide strategic east-west connectivity between the strategic north-south corridors (Great South Road, the proposed Ōpāheke North-South Arterial (NoR D4) and proposed Mill Road), providing multi-modal access to the wider network for the planned growth area as well as providing access to the existing Drury township and proposed rail station.

8.2 Existing and Likely Future Environment

8.2.1 Existing Environment

The current land use surrounding the Project Area is largely low-density residential and rural activity with agriculture, rural lifestyle blocks, and some local businesses. Figure 8-5 shows an aerial photo of the current rural land use environment along Waihoehoe Road East.

Figure 8-5: Current land uses surrounding Waihoehoe Road East

8.2.1.1 Existing Transport Network

The existing road network along the Project Area can be summarised as follows:

- Waihoehoe Road East is a primary collector road which provides the majority of east-west connections within Drury east
- It has a posted speed of 80kph and provides access to the local and collector road network
- There are no walking and cycling facilities, with such activities occurring either within the traffic lanes or on the grass verge
- There are no public transport facilities.

Most of the intersections along this section are priority T-junctions with give-way or stop controls. They have limited crossing facilities and safety measures for vulnerable road users. Appendix 4 and Appendix 5 provide more detail on the key characteristics of the existing road network.

8.2.1.2 Road Safety

Crash history on Waihoehoe Road East has been obtained from CAS to provide a high-level understanding of crash patterns and safety concerns of this section. The crash data has been extracted for a ten-year period from January 2010 to December 2019 (inclusive).

Figure 8-6 shows the indicative crash locations which occurred along the extent of works on Waihoehoe Road East between 2010 and 2019.

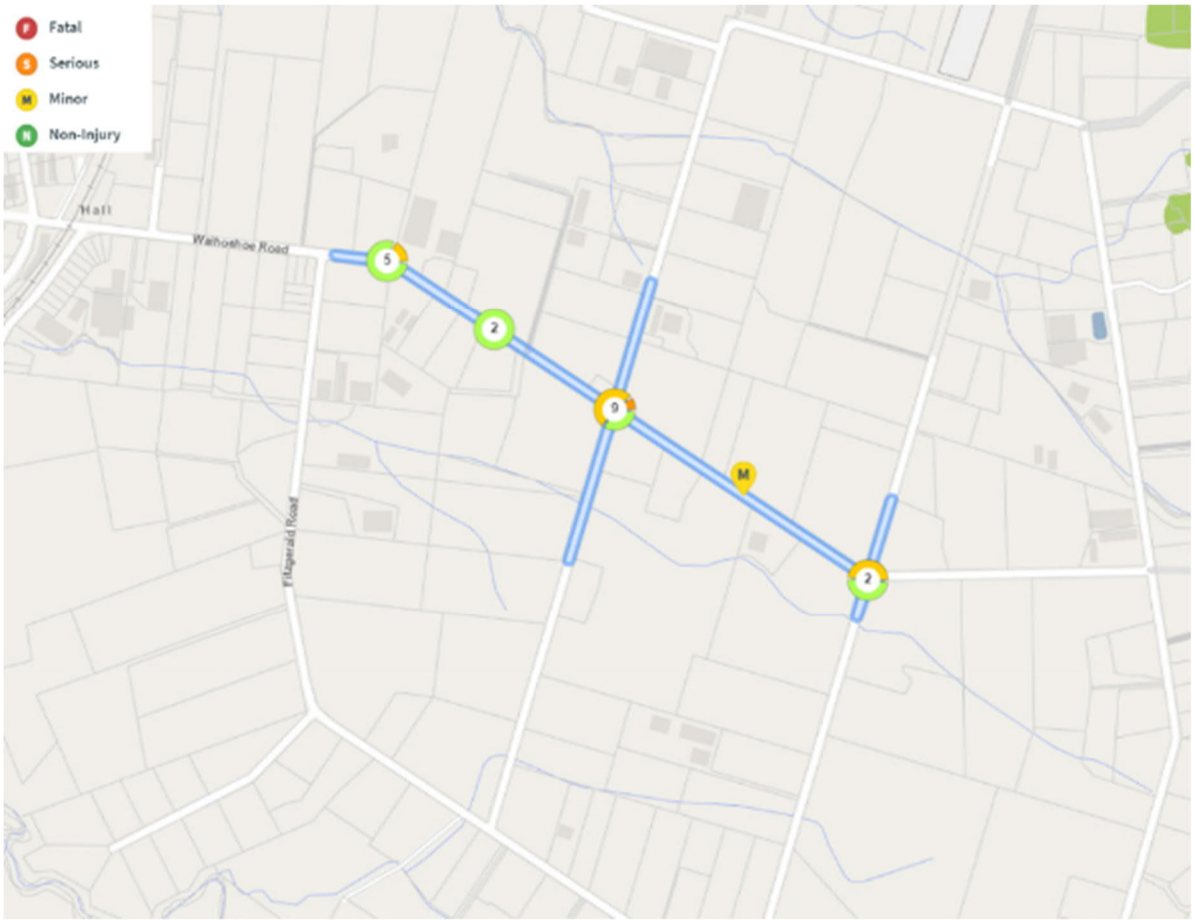


Figure 8-6: Location of Crashes along Waihoehoe Road East

The crash history shows that there was a total of 19 crashes recorded in the 10-year period (between 2010 to 2019). This included one serious injury crash which was a right-angle intersection crash occurring at the junction between Waihoehoe Road and Appleby Road. The majority of the crashes involved crossing/ turning crash types at the intersections with Appleby Road and Cossey Road. There were a number of lost control crashes also occurring at the bend, travelling eastbound along Waihoehoe Road. Refer to Appendix 3 for the detailed crash data along this section.

These crash types indicate that intersection improvement is required at the intersections of Appleby Road and Cossey Road. The existing high-speed environment, road environment and form of the intersection controls are contributing factors causing these crashes. Whilst Waihoehoe Road East has a low volume of traffic and low demand for active modes, the severity of the crash can be significant due to the high-speed environment and no facilities provided for pedestrians and cyclists.

8.2.1.3 General Traffic

The existing traffic volumes on Waihoehoe Road East and other adjacent roads were retrieved from Mobile Road[18] in April 2020. The volumes are either estimated or used actual data available from the State Highway New Zealand database and Auckland council databases.

[18] Mobile Road: https://mobileroad.org/desktop.html

Table 8-1 summarises current road classifications from One Network Road Classification (ONRC) and the average daily traffic (ADT) with the percentage of heavy vehicles on each road.

The existing daily traffic flow along this section of Waihoehoe Road East and the intersecting roads are relatively low and reflect the primary rural access function of the road. Regular congestion is not experienced on this section of road.

Table 8-1: Existing Traffic Volumes on Waihoehoe Road East

Road Name	Road Classification	Estimated Date	5 Day ADT	% HCV
Waihoehoe Road between Fitzgerald Road and Drury Hills Road	Primary Collector	June 2018	1970	8
Fitzgerald Road	Primary Collector	June 2019	2400	14
Fielding Road	Access	June 2018	110	5
Appleby Road	Secondary Collector	June 2018	790	5
Cossey Road	Low Volume	June 2018	30	5
Drury Hills Road	Secondary Collector	June 2018	650	5

8.2.1.4 Walking and Cycling

The current Waihoehoe Road East environment is a high-speed rural connector with no walking and cycling facilities, resulting in high conflict and unsafe conditions between general traffic and vulnerable road users. Although cycling can occur on the road, this is an unsafe and hostile environment for both cyclists and motorists, especially with vehicles often trying to overtake using the other lane from the opposite direction.

There are no pedestrian or cyclist crossing facilities provided along Waihoehoe Road East. The surrounding land use suggests that the existing walking and cycling demand is low, however the consequences of a crash will likely be severe due to the high-speed environment and narrow lanes. The current environment is therefore hostile and unsafe for walking and cycling.

8.2.1.5 Public Transport

Based on the existing AT Public Transport Network, there is no public transport provision (services and facilities) on Waihoehoe Road East and the adjacent local roads. The closest public bus service is bus service 376 connecting Drury and Papakura Station. The bus-stop is located near the Great South Road/Waihoehoe Road intersection, that is located 700m west from the Project. The key public transport facility servicing this area is the (currently limited) rail service with the closest train station at Papakura centre some 6km away.

The narrow carriageway and lack of roadside facilities will not provide a quality provision for public transport along Waihoehoe Road.

8.2.1.6 Access

The existing properties adjacent to Waihoehoe Road East have access either to side roads connected to Waihoehoe Road East, or directly onto Waihoehoe Road East itself. Given the current land uses, the number of access points to Waihoehoe Road East is relatively low. While the frequency of turning in and out is low, the high-speed environment on Waihoehoe Road East increases the safety risk for accessing movements.

8.2.1.7 Freight

The existing Waihoehoe Road East is not classified to have a high freight function and is not on the current Waka Kotahi over-dimension vehicle route or overweight route.

8.2.2 Likely Future Environment (without Project)

This section describes the likely future environment with the expected and planned growth and development, but without the proposed Waihoehoe Road East Upgrade Project.

8.2.2.1 Future Transport Network and Land Use

The wider Drury, Ōpāheke, Pukekohe and Paerata areas in the south of Auckland have been signalled to undergo significant urban growth in the AUPOIP and the Council approved the Structure Plan in 2019 and recently received private plan changes to zone these areas.

The Drury – Ōpāheke structure plan area is estimated to provide about 22,000 houses and about 12,000 jobs with a population growth of about 60,000 over a 30 year period. The Ōpāheke-Drury growth area is shown in Figure 8-7 and also indicates where Waihoehoe Road East is relative to growth areas.

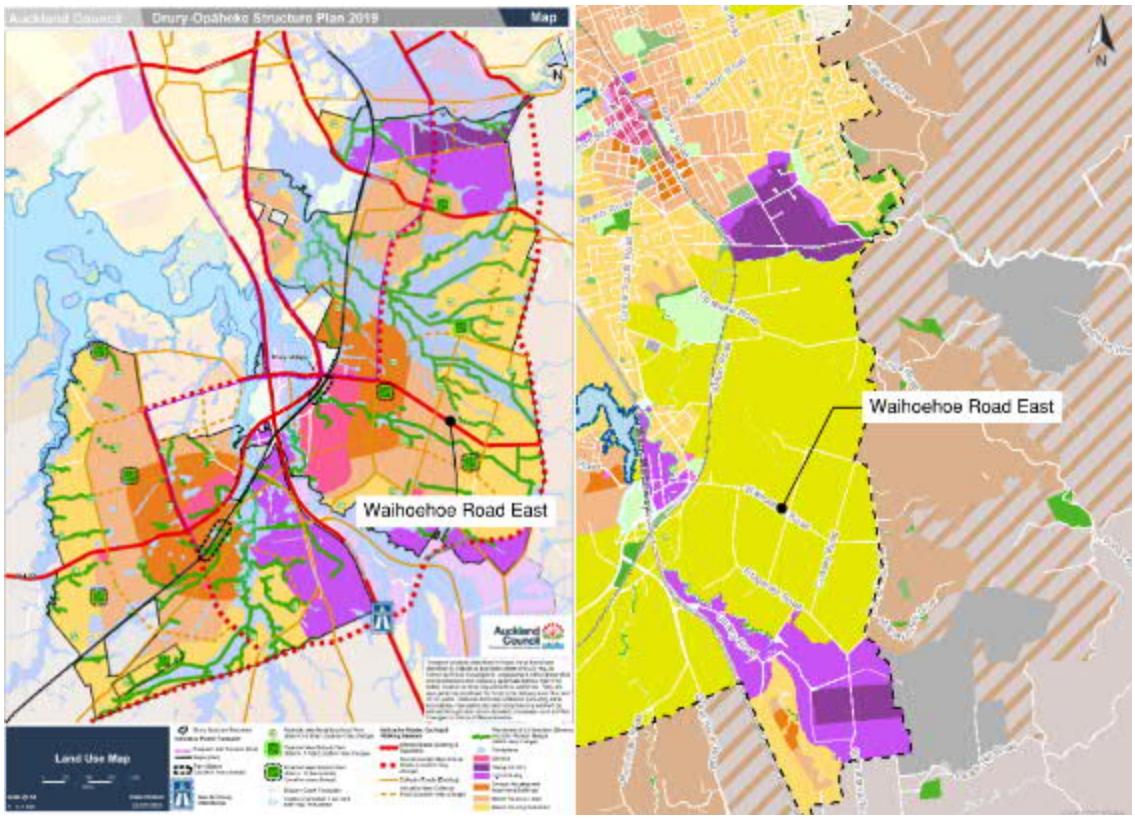


Figure 8-7: Future Transport and Land Use adjacent to NoR D3

The Drury – Ōpāheke Structure Plan is shown in Figure 8-7, indicating both the expected pattern of urban development and the future transport projects (subject to planning and funding approvals) that have been developed to support the growth in and adjacent to this area.

The proposed future urban development surrounding NoR D3 (north and south) are signalled to transition from rural to urban with a proposed terrace housing and apartment building, mixed urban housing, mixed suburban housing and potential new neighbourhood and suburb parks. A number of developers are seeking private plan changes to rezone the land in Drury east and west. The proposed land use sought by developers is generally consistent with that of the Drury-Ōpāheke Structure Plan.

The future transport projects surrounding NoR D3 and wider planned changes to the regional transport system are:

- New rail stations at Drury Central, Drury West, and associated park and ride facilities*
- New Mill Road Corridor - a strategic alternative route from Manukau to Drury in the long term, running parallel and to the east of SH 1*
- SH 1 Papakura-to-Bombay Upgrade providing more north-south regional capacity**
- SH 22 Drury-to-Paerata (Safe Network Programme which proposes short term safety upgrades)**
- Additional rail capacity between Pukekohe and Papakura (4 tracking, electrification and associated grade separations at road/rail crossings) **
- Regional north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH 1 and the NIMT***

- New rail stations at Paerata, and associated park and ride facilities***
- New Pukekohe Expressway – an alternative route to SH 22 between SH 1 (east of the proposed Drury South interchange) and Pukekohe (to the north-eastern connection to Pukekohe Ring Road) and connections between Pukekohe Expressway to SH22***
- State Highway 22 Upgrade (NoR D1) ***
- Jesmond to Waihoehoe West FTN Upgrade (NoR D2) ***
- Ōpāheke North-South FTN Arterial (NoR D4) ***
- Ponga Road and Ōpāheke Road Upgrade (NoR D5) ***
- The future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas get urbanised. ***

Note: funding approved*, funding partially approved** and subject to planning and funding approvals***.(as at the date of this report).

8.2.2.2 Road Safety

The existing Waihoehoe Road East 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 DSI's.

The expected increase in safety issues and lack of quality PT facilities is also likely to constrain the attractiveness of other modes (such as 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 Waihoehoe Road East will remain unsafe to safely accommodate future growth due to the type and number of conflicts expected.

8.2.2.3 General Traffic

The existing Waihoehoe Road East is a two-lane road which is expected to have sufficient capacity to accommodate future growth on this section (assuming other key projects in Drury are implemented). As the area urbanises, the future traffic volume on Waihoehoe Road East and the adjacent roads will increase, both from local movements and its future role connecting Drury central to the proposed Mill Road strategic corridor. While a general 2-lane form is expected to be sufficient for through traffic.

Table 8-2 provides a summary of the expected traffic volumes along Waihoehoe Road East.

Table 8-2: Existing and likely future daily traffic volumes

Road Name	2018/2019 (ADT)	2048+ (ADT)
Waihoehoe Road between Fitzgerald Road and Drury Hills Road	1970	6600
Fitzgerald Road	2400	4400

Road Name	2018/2019 (ADT)	2048+ (ADT)
Fielding Road	110	3660
Appleby Road	790	6000
Cossey Road	30	3200
Drury Hills Road	650	2000

8.2.2.4 Walking and Cycling

Waihoehoe Road East will have walking and cycling demands from both local movement and connecting movements accessing the Drury Town Centre and train station. These local and connecting demands are shown in Figure 8-8.

Figure 8-8: Future walking and cycling movements on Waihoehoe Road East

There are currently no walking and cycling facilities along Waihoehoe Road East and no crossing facilities. The following undesired outcomes will occur if the area is urbanised and the existing Waihoehoe Road East infrastructure remains the same:

- The safety-related issues and crash exposure to vulnerable road users will increase significantly as demand from both normal traffic and active modes increase. The risk of DSI's will be significant.

- Poor integration with the proposed wider walking and cycling network
- Poor connection for active modes to Drury Central station and to bus services on FTN routes (Waihoehoe Road West (part of NoR D2) and Ōpāheke N-S FTN Arterial (NoR D4))
- Accessibility to social amenities and employment by active modes will be compromised
- The ability to encourage mode shift will be compromised resulting in more traffic on roads and increases in vehicle emissions. The reduced accessibility to the Drury Central rail station will constrain mode shift over a much larger area than just this corridor.

8.2.2.5 Public Transport

It is expected that Drury will have some significant upgrades to infrastructure in the future, especially in terms of public transport facilities such as bus and rail. These facilities will connect Drury both inter-regionally to the Auckland City Centre and surrounding areas, and to local places in the south. The future projects for public transport planned at Drury are:

- Two new rail stations at Drury, which are included in the New Zealand Upgrade Programme (NZUP). Construction is planned to start in 2023 and be completed in late 2024. NZUP also includes park and ride facilities, as well as a bus and rail interchange at Drury.
- FTN routes along Waihoehoe Road West and Ōpāheke N-S FTN Arterial. Waihoehoe Road East is connecting to these two routes

No bus routes are currently proposed to use Waihoehoe Road East in the long term, however, services may use it in the medium term until the final road network is developed and final bus routes can be implemented. Services may also use the road in the long term during diversions. The future public transport network for the area surrounding Waihoehoe Road East is shown below in Figure 8-9.

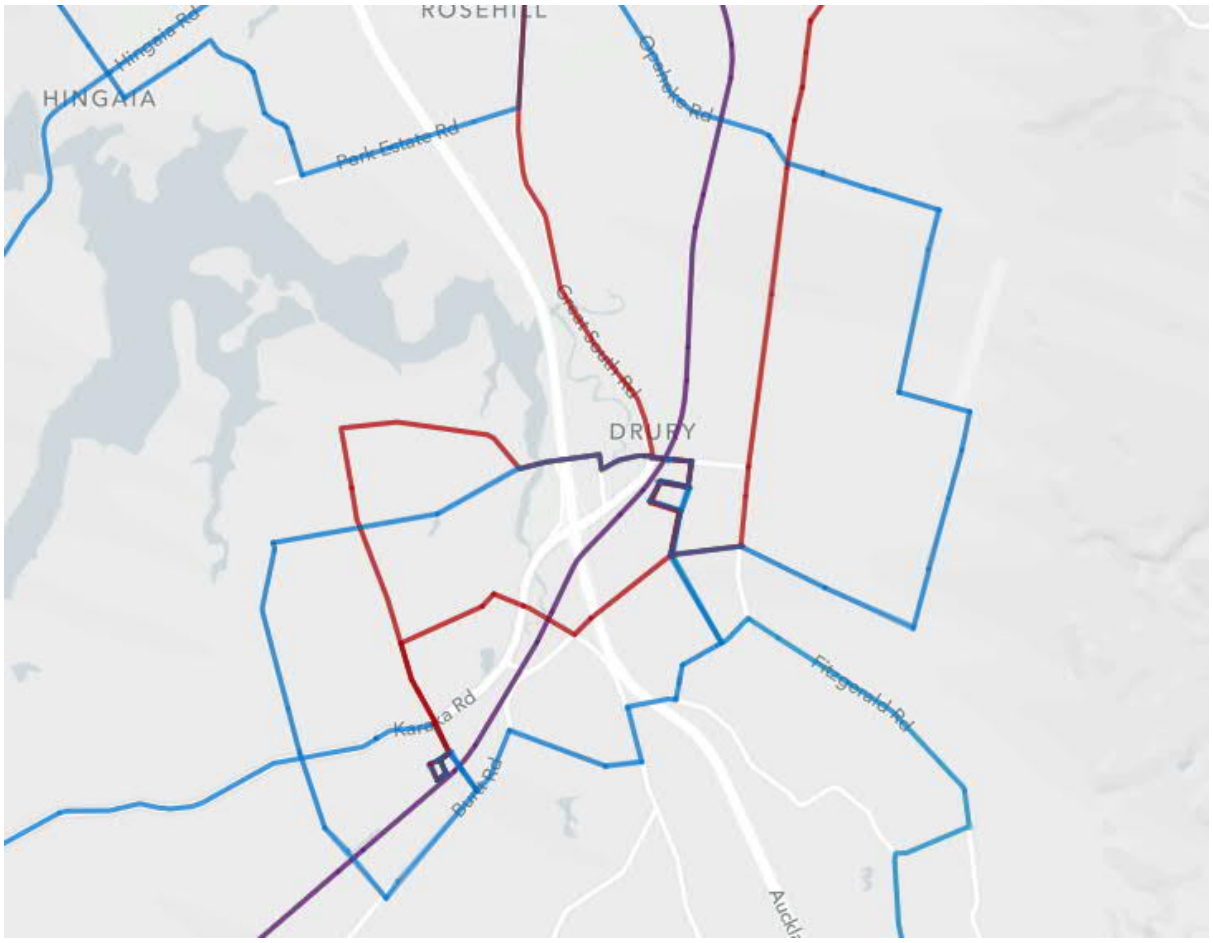


Figure 8-9: Future public transport network (2048+)

The following outcomes associated for public transport will occur if the poor existing Waihoehoe Road East bus infrastructure remains the same:

- The existing road does not have indented bus bays to remove bus vehicles from the general flow of traffic. Stopping buses will create stop-go interruptions with consequential safety and congestion impacts.
- Reduced the attractiveness of bus usage in this corridor due to the lack of safe and reliable bus facilities and no walking and cycling facilities
- Poor integration with the wider public transport network in Drury.

8.2.2.6 Access

The area surrounding Waihoehoe Road East is to be urbanised in the future which suggests more demand for access points along these roads. The following undesired outcomes will occur if urbanisation commences without upgrading the existing roads:

- The existing high-speed environment and increased turning movements make the crash exposure for right turning movements high and severity can be significant. The planned future growth along these routes will increase the conflicts between vehicles accessing driveways, general traffics, pedestrians and cyclists.

- Higher demand for turning in and out from driveways will likely impact the operational efficiency and reliability of through traffic.
- Increased local traffic movements will increase turning movements at connecting local and collector roads, resulting in increased delay and safety conflicts with through movements, and consequential diversion to local streets.

8.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

This section describes the effects of the Project on the likely future transport and urban environment, including planned growth (movement and place patterns). It firstly assesses operational effects after the Project is implemented, then the assessment of transport effects during construction. The assessment is undertaken for each mode/element of the transport system. Measures to avoid, remedy or mitigate actual or potential adverse effects are also identified where relevant.

8.3.1 Assessment of Operational Effects

This section assesses how each mode/element of the transport system will function operationally after the construction of the Project, and therefore the effect it will have on the existing and likely future environment.

8.3.1.1 Road Safety

The design of the Project has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrades of Waihoehoe Road East are expected to result in positive effects on safety including:

- Providing for separated and protected walking and cycling facilities on Waihoehoe Road East to improve the safety for existing and future vulnerable road users.
- Changing the form of existing intersections to roundabouts which will provide better give-way control, improve visibility, reduce the speed of approaching vehicles and provide safer walking and cycling crossing facilities.
- Reducing the speed environment from 80kph to a more appropriate and significantly safer urban speed of 50kph
- Providing appropriate vehicle lane widths and buffer-space for planting/design features between each facility type, to reinforce the lowered urban road speed environment and provide for additional separation between modes
- Providing a centre median (flush and raised) to separate the two directions of traffic and prevent head-on crashes.

It is anticipated that the number of pedestrians and cyclists will increase significantly when the Drury Central station is completed and operational. The Project is expected to mitigate the safety issues described in the likely future environment without the project. The traffic volume will increase as the result of urbanisation in the area, and completion of the proposed Mill Road corridor. Thus, the exposure between motorists and vulnerable road users will likely be higher than the existing road environment. However, with segregated walking and cycling facilities and a lowered speed limit, it will likely reduce the likelihood and severity of a crash.

Overall, the proposed design of Waihoehoe Road East Upgrade is well aligned with the transport safety principles from AT and Waka Kotahi. It will provide a much safer transport system which will likely reduce the number of DSIs, resulting in positive effects on all road users. It is noted that the future detailed design process will provide more detailed complementary measures to achieve improved safety outcomes.

8.3.1.2 General Traffic

Waihoehoe Road East is well connected with the existing network and the planned network. It will serve as the east-west connection between two strategic routes (the Ōpāheke N-S FTN Arterial and the Mill Road corridor). The planned network surrounding NoR D3 is shown in Figure 8-10:.

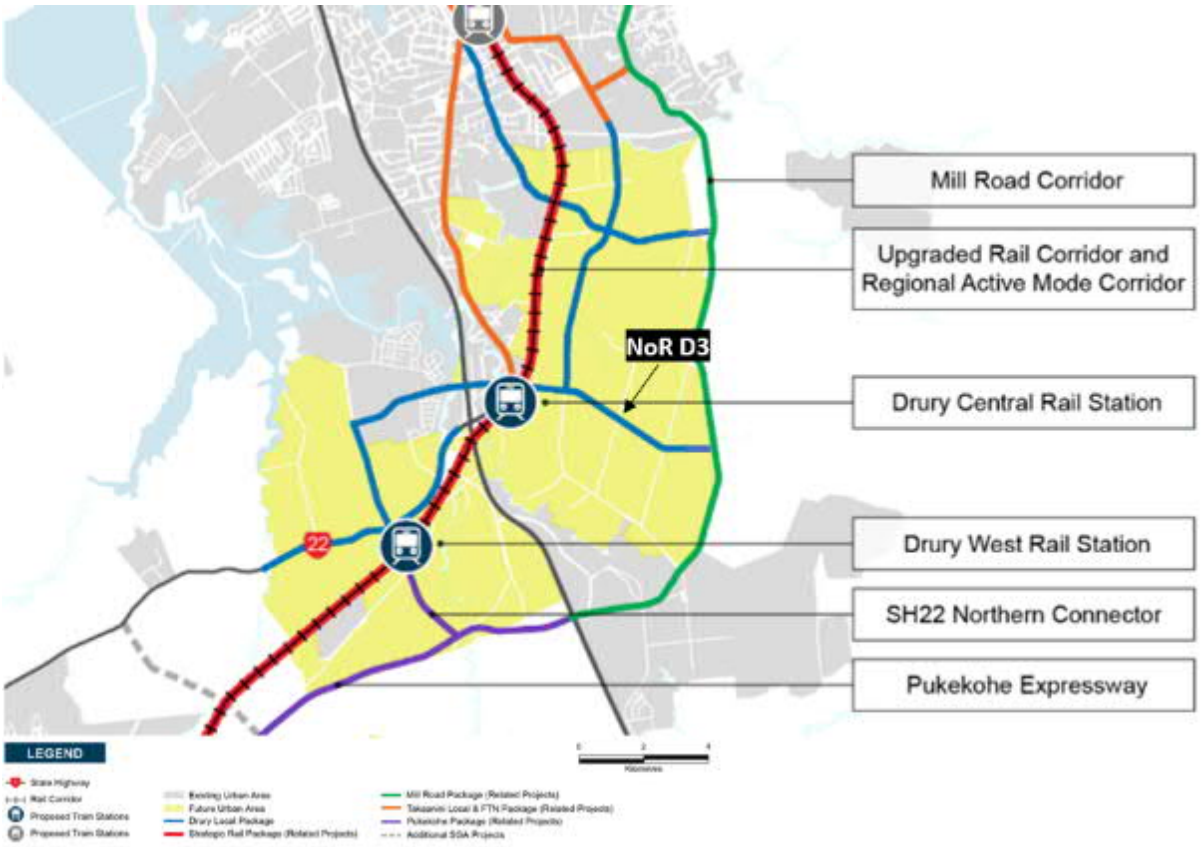


Figure 8-10: Future Network Connections

The Waihoehoe Road East upgrade consists of widening the existing alignment from the proposed Ōpāheke N-S FTN Arterial (NoR D4) to Drury Hills Road and will tie into the proposed Mill Road corridor. It also includes a reduction of the speed to a 50km/hr urban arterial standard. Other connections will be made via the collector network as indicated in the Drury-Ōpāheke Structure Plan.

The average ADT for Waihoehoe Road East based on SATURN modelling are:

- 3,100 ADT in the 2016 model
- 6,600 ADT in the 2048+ model

As shown, there is an increase in traffic volumes between 2016 and 2048+. As the surrounding area is urbanised over time, the function of Waihoehoe Road East transitions from a rural road to an urban arterial. Two lanes for general traffic is viewed as adequate based on the general traffic forecasts.

In addition to the operational effects of general traffic lanes, intersections along the route have also been analysed. Table 8-3 provides a summary of the proposed intersections along NoR D3.

Table 8-3: Intersection summary for Waihoehoe Road East upgrade (NoR D3)

Intersection	Current Form	Proposed Form	Key Outcomes
Waihoehoe Road East/Appleby Road	Give-way controlled intersection	Roundabout	Single lane roundabout with protected walking and cycling facilities
Waihoehoe Road East/Cossey Road	Give-way controlled intersection	Roundabout	Single lane roundabout with protected walking and cycling facilities

The performance of the intersections, based on a 2048+ scenario,[19] have been assessed using SIDRA Intersection Software with inputs from the SATURN models. A summary of these key performance measures is shown below in Table 8-4**.**

Table 8-4: Summary of intersection performance 2048+ (with Drury)

Intersection	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Waihoehoe Road East/Appleby Road	Morning Peak	A	0.343	7
	Evening Peak	A	0.478	12
Waihoehoe Road East/Cossey Road	Morning Peak	A	0.226	4
	Evening Peak	A	0.34	6

Overall, the proposed intersections are predicted to have ample supply during the peak periods under a 2048+ scenario.

In addition, the mid-block performance of Waihoehoe Road East has also been included for context and reported as a Volume over Capacity (VoC) ratio to provide an understanding of the cross-sectional constraints. For reference to table below, a VoC ratio above 75% produces significant mid-block journey time delays.

The traffic volume used for the assessment is based on SATURN 2048+ model and is summarised in Table 8-5 below. The results suggest that the traffic increase will have a relatively minor (with

[19] 2048+ with the Drury scenario is also viewed as the reference case for assessment purposes.

reference to capacity) effect on the mid-block VoC performance. Therefore, the predicted future demand is still expected to operate satisfactory, with relatively low mid-block congestion during all peak periods under a 2048+ scenario.

Table 8-5:Summary of mid-block performance 2048+

Waihoehoe Road East mid-block section	Direction of traffic	VoC Ratio (Existing)	VoC Ratio (2048+ Future)
Waihoehoe Road between Fitzgerald Road and Drury Hills Road	Eastbound (AM Peak)	7%	20%
	Westbound (AM Peak)	10%	14%
	Eastbound (PM Peak)	14%	12%
	Westbound (PM Peak)	8%	27%

Overall the operational effects of the Project on general traffic are:

- Improved integration with the proposed Drury Central station (park and ride) and the future urban areas.
- Provision of ample corridor and intersection capacity to cater for future growth and reduction in speed of the corridor that improves safety
- Reductions in conflicts and crash exposure between general traffic and vulnerable road users

8.3.1.3 Walking and Cycling

The current Waihoehoe Road East has a rural, high-speed environment. There are currently no dedicated facilities along this route. This environment results in high conflict and unsafe conditions between general traffic and vulnerable road users. The current environment is therefore not deemed fit for purpose for walking and cycling.

The Project proposes to reduce the speed along Waihoehoe Road East to 50km/h, repurpose Waihoehoe Road East to an urban arterial and provide segregated walking and cycling facilities on both sides of the road to support growth, enable sustainable travel choice and combat expected safety concerns.

An assessment of the proposed walking and cycling facilities against relevant AT standards and policies is summarised in Table 8-6.

Table 8-6: Waihoehoe Road East AT standards and policy assessment for walking and cycling facilities

Policy/Standard	Network Component	Assessment
Auckland Transport Vision Zero[20]	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 proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on Waihoehoe Road East are proposed to be 50km/hr, therefore the proposed design of the walking and cycling facilities is considered to be appropriate for these standards.
Auckland Transport Design Manual[21]	**Footpaths:** 1.8m minimum	A 1.8m footpath is proposed on all corridors and a 2.0m cycle path with a 2.3m berm. The total width of 6.8m is proposed from carriageway to road boundary. This is in accordance with the AT TDM requirements.
	Cycle Paths: 2.0m minimum	

Walking and cycling are key components of the future environment surrounding Waihoehoe Road East. There are several key attractors which indicate walking and cycling will significantly increase as growth progresses in Drury. These include:

- The future land use zoning in this area allows for medium to high density residential. This density implies a mixture of modal movements ranging from local to strategic.
- Waihoehoe Road East connects to the proposed Mill Road corridor, which will provide access to a longer inter-regional route.
- Waihoehoe Road East will provide a link to the proposed Drury Central Station and the town centre.

The predicted 2048+ usage of the walking and cycling facilities along this corridor are shown in Table 8-7 and provide context about likely future demand that will benefit from these facilities. The detail outputs were extracted from the Strategic Active Mode Model (SAMM) and Station Access Tool.

Table 8-7: Daily walking and cycling predicted movements (2048+)

Area	Direction	Walking (Daily Flows)	Cycling (Daily Flows)
Waihoehoe Road (east)	Eastbound and Westbound	2600	650

[20] Auckland Transport: Vision Zero: https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

[21] Auckland Transport – Transport Design Manual: https://at.govt.nz/about-us/manuals-guidelines/roads-and-streets-framework-and-the-transport-design-manual/

Exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided by vision zero guidance. For single-lane roundabouts, the proposed treatments are raised table crossings with zebra, paired cycling crossing facilities. For dual roundabouts, signalised active mode crossing facilities are proposed.

The Project will have a significant number of positive effects on walking and cycling:

- significantly reduce the likelihood and exposure to potential crashes by providing safe movement for vulnerable road users along and across Waihoehoe Road East
- provide good integration with future walking and cycling network, especially between the future Mill Road and Drury East
- reduce the reliance on vehicle trips due to the higher number of active mode trips, which will result in positive environmental and health benefits
- provide good integration with proposed Drury Central Station and FTN routes (Ōpāheke N-S FTN Arterial (NoR D4) and Waihoehoe Road West (NoR D2) and serves as a key enabler to achieve mode shift targets
- combat existing and likely future safety and network severance issues
- support urban growth of the surrounding areas by providing for a safe walking and cycling connection between key destinations.

8.3.1.4 Public Transport

The cross-section will provide adequate spacing to facilitate public transport. The exact location of bus stops or interim routes will be defined at later stages, 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 public transport services will share facilities with general traffic. Based on the predicted general traffic volumes in 2048+ and the proposed intersection controls, the results suggest that they are operationally efficient and public transport services will experience minimal delay.

The effects of the Project on public transport are:

- improved east-west connection for interim services between Mill Road and Drury centre and increased integration with the future public transport network in Drury
- Provide an alternative transport mode/connection to access the future urban areas

8.3.1.5 Access

Based on the average ADT of 6,600 vehicles per day along two lanes, (based on the 2048+ scenario), direct property access is not recommended on to Waihoehoe Road East given the negative safety implications. The traffic volume will undermine Vision Zero as vehicles using driveways will conflict with other modes, in addition to driver safety and active modes being compromised by merging on to the road.

As properties develop, they will typically be designed to have access via the local and collector road network rather than directly onto this arterial.

The indicative collector network is subject to change as developers progress these connections through the plan change and subdivision processes. Some existing rural properties may require retention of their access onto this road until they are re-developed. The specific details for each site will depend on the timeframe of the Project and development of each site. In general, it is proposed that any such direct access will only be permitted if no other options were readily available and will likely be subject to movement control (such as banning of right turns). The design of the wider collector network and proposed provision of roundabouts will mean such restrictions on right turns could be readily accommodated with limited diversion.

The effects of the Project on property access are:

- Direct walking and cycling access to this corridor from these properties
- Improved access to the arterial network via the upgrade and its controlled intersections with side roads
- Where direct access onto the network is permitted (either due to the lack of alternative access or for the purpose of providing interim connection to existing rural sites), such vehicle movements will likely be subject to restrictions such as no right turns. Given the proximity to future roundabouts, the effect of such restrictions could be made with limited diversion. Overall the effects on direct property access are considered to be neutral.

8.3.1.6 Freight

The existing Waihoehoe Road East is not classified to have a high freight function and is not expected to change in future. The designation footprint will be able to accommodate freight movements along the mid-block and through the intersections. The details are expected to be further developed in subsequent project phases.

8.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project.

8.3.3 Assessment of Transport Construction Effects

This section describes the assessment of potential traffic effects during construction of the Project.

The Waihoehoe Road East Section will consist of road widening on the existing Waihoehoe Road East between the east of Fitzgerald Road intersection to Drury Hill Road. This includes upgrades of the two existing intersections with Appleby Road and Cossey Road to roundabouts. It is noted that construction at the Fitzgerald Road intersection is included in the Waihoehoe Road West FTN Section (part of NoR D2).

The location of works and the construction activities proposed defines the traffic management measures required. The works proposed are a mix of earthworks, utility relocation, widening the existing intersections, pavement construction and drainage. Figure 8-11 shows the indicative extent of works.

Figure 8-11 : Extent of works - Waihoehoe Road East Upgrade

The Waihoehoe Road East Upgrade project is estimated to take 2 to 2.5 years to complete:

- Enabling works: 3 months
- Eastbound carriageway: 9 months to 12 months
- Westbound carriageway: 9 months to 12 months
- Pavement and finishing works: 3 months

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for construction. The indicative construction method has been developed based on a concept design with consideration of using the most practical construction techniques and equipment. There are likely alternative methods in the future that could be used to complete the works, however, this document only intends to capture the traffic impacts based on the indicative construction method.

8.3.3.1 Temporary traffic management

It is anticipated that the larger part of works required for the Project will likely be adjacent to or on 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 closures for nights and weekends may be required for some specific activities such as pavement surfacing and traffic switches. Other activities may require stop-go or contraflow traffic management. The effect of temporary traffic management methods to existing traffic on Waihoehoe Road East and the adjacent road network should be assessed in the future as part of the CTMP for the Project on the basis of the current traffic environment.

It is considered that the temporary effects from the construction activities on Waihoehoe Road East can be adequately managed through the implementation of a CTMP during the construction phase of the Project. The purpose of the CTMP is to ensure the construction of the 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 residential properties and local activities.

If required, SSTMP should be developed to manage constraints on access to affected properties.

8.3.3.1.1 Expected construction traffic routes

The construction of the Project will require significant earthworks. The estimated volumes of cut and fill are approximately 75,500m^3 based on the current indicative design. 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 the Project.

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

- The routes that will be used by construction vehicles will depend on the locations of quarries and disposal sites which are not yet certain
- The exact locations and extent of compound sites/lay down areas has yet to be determined.
- The timing of construction of other projects could impact on likely construction vehicle routes, especially the Waihoehoe Road West FTN Upgrade (part of NoR D2), the Ōpāheke North-South FTN Arterial (NoR D4) and the Mill Road corridor project.

It is noted that the access to compound sites/laydown areas and construction zone for construction vehicles, plant and materials will be via site access points on Waihoehoe Road East and possibly through the future Mill Road corridor. The New Zealand Upgrade Programme[22] indicates that the construction of the Mill Road corridor will likely start in late 2022 and be completed in stages between 2025 to 2030. It is anticipated that the construction of Waihoehoe Road East Upgrade will likely to be happened at a later time after Mill Road corridor is fully constructed and operational.

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

It is noted that the existing SH1 motorway bridge at the Drury interchange has a height limit of 4.66m. Therefore, any construction vehicles exceeding this limit, are prohibited to go under the bridge. However, the Drury interchange is expected to be upgraded as part of the SH1 Papakura to Drury South project and road network vehicle restrictions should be reassessed prior to construction as this constraint may no longer exist.

The potential construction traffic routes are shown below in Figure 8-12.

[22] https://www.nzta.govt.nz/planning-and-investment/nz-upgrade/auckland-package/mill-road/

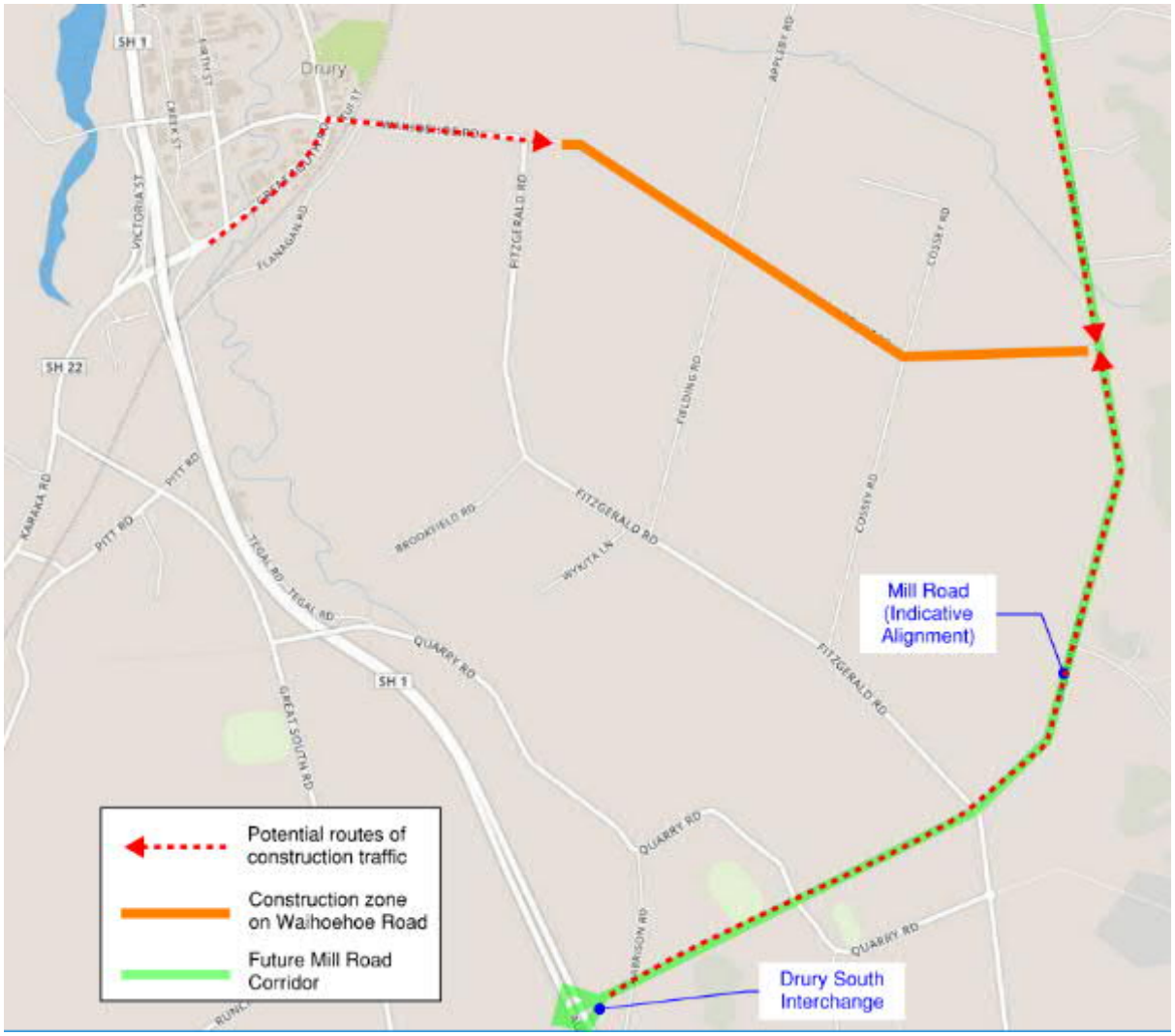


Figure 8-12: Potential construction routes for Waihoehoe Road East Upgrade project

8.3.3.2 Expected construction traffic generation

Based on the proposed construction methodology and activities, the estimated duration of work is between 24 months to 30 months, which includes three stages of construction works. The estimated construction movements include approximately 16,400 trips from heavy trucks. In addition, there will be approximately 100 light vehicle movements daily from staff and contractors during the peak construction period.

To estimate the daily number of truck movements to and from the site, the following working assumptions were adopted:

- Working days: 20 days construction per month
- Hours of delivering earthworks and other materials: a total of 8 hours a day between 6am to 6pm. It is noted that truck movements should avoid the peak hours of traffic or alternatively specified times agreed with respective RCA.

- The duration of construction: 24 months for all 3 stages of construction works. Noted for the assessment of construction effects, a shorter construction period of 24 months has been adopted in the assumptions, given that this will generate more trips.

The daily number of construction vehicles has been calculated and summarised below in Table 8-8.

Table 8-8: Expected daily traffic movements from construction works – Waihoehoe Road East

Stages	Expected duration (approx.)	Truck movements (daily)	Light movements (daily)	Total movements (daily)	Typical vehicle movements
Stage 1: Enabling works	4 months	10 to 20	30 to 50	40 to 70	• Truck movements likely to include low loaders for plant delivery and collection, articulated trucks/truck and trailer units/concrete units, concrete trucks. • Light vehicle movements are likely from construction staff and contractors.
Stage 2: Construction works for eastbound, westbound and Construction of bridge over rail	14 months	35 to 230	70 to 100	105 to 330	
Stage 3: Pavement construction	6 months	10 to 20	50 to 70	60 to 90	

In order to assess the full extent of potential effects from the expected construction vehicles, the traffic environment at the time of construction needs to be understood. For the construction of Waihoehoe Road East Upgrade, analysing the impact of the surrounding network should be included as part of the CTMP for this project.

The current traffic volume on Waihoehoe Road East is estimated to have 1,970 vehicles per day, which is considered to be low for a two-lane road. The capacity of existing Waihoehoe Road East is anticipated to be able to accommodate the additional traffic associated with construction and it is unlikely to cause any notable impact to the existing traffic environment on Waihoehoe Road East.

The future traffic volume is significantly more than the existing traffic volume on Waihoehoe Road East. Depending on the staging of Waihoehoe Road East Arterial upgrade, an updated assessment of construction traffic will be required prior to construction, which can be used to inform the traffic management measures in the CTMP.

8.3.3.3 Road safety assessment during construction period

8.3.3.3.1 Speed Limit

Waihoehoe Road East between the west of Fitzgerald Road intersection to Drury Hills Road intersection is currently a rural road with a speed limit of 80km/h. This permanent speed will be likely to cause some potential safety concerns given the longer deceleration distance required by construction trucks entering the SAPs. A crash between construction vehicles and normal traffic can occur when the travelling speed suddenly changes due to construction vehicles accessing the SAPs. Given the low number of construction movements in/out of construction zones and the existing traffic volume on Waihoehoe Road East is low, the likelihood of crashes occurring due to speed is low.

However, a safe and appropriate temporary speed limit on Waihoehoe Road East should be implemented 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. This recommended measure and other measures highlighted in the CTMP are expected to reduce the potential safety risks that may associated with construction traffic.

8.3.3.3.2 Pedestrians and Cyclists

The existing roadside facilities on the existing Waihoehoe Road East are not user-friendly for pedestrians and cyclists given the side drains and unsealed shoulders on one side of the road. The analysis of the crash data did not show any current or historic incidents involving pedestrians and cyclists. Thus, it is expected that the additional construction traffic will be unlikely to have any notable impact on existing active transport modes.

It is likely that the demand to use pedestrian and cycling facilities will increase if urbanisation occurred prior to construction of the Project, although if this occurred, future parallel collectors could be used as an alternative route. In light of this, construction effects on pedestrians and cyclists should be assessed again prior to construction, when a greater level of detail is available about surrounding facilities and land use activities.

It is also recommended that the residents and stakeholders (such as Bike Auckland and cycling clubs) be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity will be used to inform appropriate traffic management measures in the CTMP.

8.3.3.3.3 Property access for Waihoehoe Road East residents and businesses

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

8.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

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

a. A CTMP shall be prepared prior to the Start of Construction for a Stage of Work. Any potential construction traffic effects shall be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction.

b. 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:

    (i) Methods to manage the effects of temporary traffic management activities on traffic;

    (ii) Measures to ensure the safety of all transport users;

(iii) 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;

(iv) Size 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;

(v) Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;

(vi) Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;

(vii) 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;

(viii) Method that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

c. Any CTMP prepared for a Stage of Work shall be submitted to Council for information ten (10) working days prior to the Start of Construction for a Stage of Work

8.4 Summary of Effects (NoR D3)

The assessment of transport effects for the Waihoehoe Road East Upgrade is summarised in Table 8-9.

Table 8-9: Assessment of Effects Summary for NoR D3

Operational Transport Effects	
Safety	In summary, the effects of the Project on safety are: • Significant improvements to the safety of existing and future vulnerable road users as a result of the separated and protected walking and cycling facilities on Waihoehoe Road East. • Significant improvement to the safety of all road users as a result of the change from existing intersections to roundabouts. • Significant improvement on safety for all road users as a result of the reduced speed environment, reduced from 80kph to the more appropriate speed of 50kph • Improvements to safety as a result of the appropriate vehicle lane widths and delineations to enhance the urban-type road environment • Significantly reduced likelihood of head-on crashes by separating the two directions of traffic with a centre median.
Walking and cycling	In summary, the effects of the Project on walking and cycling are:

Operational Transport Effects	
	• Enable safe movement for vulnerable road users along and across Waihoehoe Road East and significantly reduce the likelihood and exposure to potential crashes • Good integration with future walking and cycling network, especially between the future Mill Road and Drury East • A Reduced reliance on vehicle trips due to a higher number of active mode trips, which results in positive environmental and health benefits • Significantly improve integration with the proposed Drury Central Station and FTN routes (Ōpāheke North South and Waihoehoe Road West) and serves as a key enabler to achieve mode shift targets. • Significantly improve existing and likely future safety and network severance issues • It supports growth in surrounding areas and significantly improves safety and access to employment and social amenities.
Public Transport	In summary, the effects of the Project on public transport are: • Decrease the conflicts between access/driveway to general traffic and active modes • Minimise the impact to operation of through traffic which will likely result in more reliable journey time
General Traffic	In summary, the effects of the Project on general traffic are: • Improve integration with the proposed Drury Central Station (park and ride) and the future urban areas • Reduced conflict and crash exposure between general traffic and vulnerable road users
Access	In summary, the effects of the Project on access are: • A decrease in crash exposure between driveways, general traffic and active modes. • Minimise the impact to operation of through traffic which will likely result in more reliable journey time
Construction Transport Effects	
In terms of construction effects as a result of the Project, there are several potential temporary adverse effects mainly linked to traffic management during construction, including construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users and driveways & property access. These effects can be appropriately mitigated through a CTMP prepared before construction commences.	

8.5 Conclusion (NoR D3)

The existing Waihoehoe Road East is not fit for purpose to support the planned future urban growth. Significant adverse effects are expected if future growth progresses and the existing Waihoehoe Road East infrastructure remains the same. The adverse effects are increased safety risk for all users, encourage a hostile and unsafe environment for active modes, decreased reliability for general traffic and would lead to several undesirable transport and land use integration outcomes.

The Project proposes that the function of Waihoehoe Road East will change from an existing rural two-lane collector road to an urban two-lane arterial catering for general traffic and active modes to combat the expected undesirable outcomes. The proposed design includes separated walking and cycling facilities on both sides of the road, and a central median (either flush or raised) to separate the two directions of traffic movements.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improves access to employment and social amenities. The Project will significantly improve transport facilities, resulting in improved safety for those that travel by car and active modes.

The Project will serve as a key enabler to achieve mode shift targets and will provide a critical east-west walking and cycling connection to the proposed Mill Road corridor for longer inter-regional routes and to the proposed Drury Central Station and the town centre. It will also result in significant improvements to safety for vulnerable users (with the provision of additional segregated walking and cycling facilities) and will significantly reduce the risk for DSI's.

The Project will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

In terms of construction effects, there are several potential temporary adverse effects mainly associated traffic management (construction traffic routes, partial or full road closures, construction traffic, speed limits, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through condition(s) relating to a CTMP and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that operationally the Project will have significant positive effects and potential construction traffic effects can be appropriately mitigated.

9.0 NoR D4: Ōpāheke North-South FTN Arterial

Chapter Summary

The existing transport environment between Drury and Papakura has poor connectivity and is not fit for purpose to support the planned future urban growth. The average north-south traffic flows are expected to increase up to 138,000 veh/day by 2048, which is approximately three times the existing traffic in the area. The absence of direct connectivity and the scale of growth will trigger effects on all modes. There are significant adverse effects expected if future growth progresses and existing infrastructure remains the same. The adverse effects are increased safety risk for all users, significantly increase journey times for general traffic and public transport, network severance of north-south connectivity and lead to several undesirable transport and land use integration outcomes.

The proposed Ōpāheke N-S FTN Arterial corridor is a new 3.2 km long 4-lane urban arterial through existing greenfield areas, including public transport, walking and cycling facilities.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project will provide a safe, reliable north-south multi-modal arterial network that supports growth, enables sustainable travel choice and combats safety concerns and improve access to employment and social amenities.

The Project will significantly improve transport facilities for all modes in the Drury-Ōpāheke area, resulting in improved north-south connectivity for those that travel by car, active mode and public transport, as well as the movement of goods and services.

It will significantly improve north-south movement between Drury and Papakura and will reduce vehicle kilometres travelled daily as a result of the Project. The Project will also significantly improve safety for vulnerable users (providing new segregated north-south walking and cycling spine) and will significantly reduce the risk for DSIs. The Project will also significantly improve north-south capacity and resilience, with a more direct local connection that enables local traffic and freight to rely less on congested SH 1, Great South Road and the proposed Mill Road (which will be the only north-south alternatives in future).

The Project will improve north-south connectivity in the Drury-Ōpāheke area and will form an integral part to the future public transport network, providing access to east-west connections and north-south FTN corridors and serving as a gateway to key destinations in Drury and Ōpāheke (including new planned rail stations, centres and the strategic north-south PT network)

The Project will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project.

In terms of construction effects, there are several potential adverse effects, mainly linked to staging of projects, traffic management (construction traffic routes, partial or full road closures, construction traffic, speed limits, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through Construction Traffic Management Plan conditions and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that operationally, the Project will have significant positive effects and potential adverse effects arising during construction of the Project can be appropriately mitigated

9.1 Project Description

9.1.1 Project Overview

The Ōpāheke North-South FTN Arterial is a new 30m four-lane FTN arterial with separated walking, cycling and strategic public transport facilities between Hunua Road in the north and Waihoehoe Road in the south. The road will be an urban arterial with a likely speed limit of 50kph. The intent of NoR D4 from a transport perspective is to increase connectivity and provide for good people-movement and public transport function through the FUZ. NoR D4 will also support SH1 (strategic), Great South Road and the proposed Mill Road (strategic corridor) by providing a new corridor which will cater more to local north-south trips in Drury.

The road traverses greenfields zoned FUZ, crossing approximately seven streams (or tributaries of streams) and areas of flood plain, providing a new north-south connection between Drury and Papakura. The intersection with Hunua/Boundary Roads will be signalised, and roundabouts are proposed at Ōpāheke Road / Ponga Road, Walker Road and Waihoehoe Road. The intersection at Waihoehoe Road is not included in this project extent (it is included within NoR D2). An overview of the proposed design is provided in Figure 9-1.

The indicative alignment has been prepared for assessment purposes, and to indicate what the final design of the Project may look like. The final alignment will be refined and confirmed at the detailed design stage. Key features of the proposal include the following:

- A new road to enable a 30m wide four-lane cross section including bus lanes and separate walking and cycling facilities
- Localised widening around intersections with existing roads to accommodate for vehicle stacking and tie-ins and walking and cycling facilities/crossings
- Proposed new culverts
- Four proposed stormwater wetlands
- Two proposed bridges over Waipokapū Stream (approximately 120m) and Waihoehoe Stream and floodplain (approximately 265m)
- Batter slopes and retaining to enable construction of the corridor, and associated cut and fill activities
- Vegetation removal
- Areas identified for construction related activities including site compounds, construction laydown, bridge works area, the re-grade of driveways and construction traffic manoeuvring

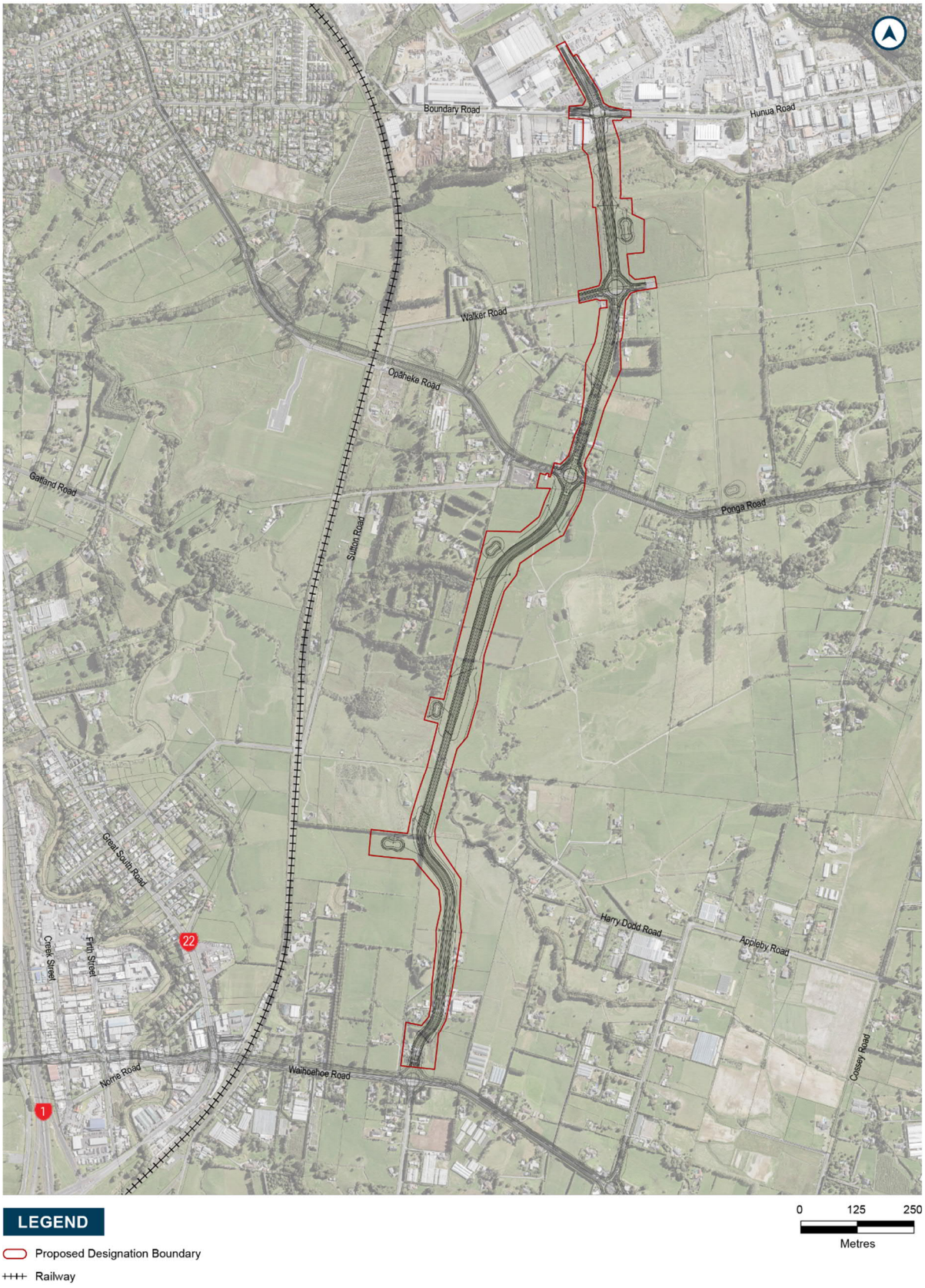


Figure 9-1 Overview of Ōpāheke N-S FTN Arterial Upgrade

9.1.2 Network and Corridor Design

NoR D4 was developed as part of network planning for the wider area and concurrently with the structure planning undertaken by Auckland Council. Those wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the problems. As such, NoR D4 is part of a wider integrated network planned for the Drury-Ōpāheke area.

The proposed Ōpāheke N-S FTN Arterial corridor is a new 3.2 km long 4-lane urban arterial through existing greenfield areas, approximately 30m width and including public transport, walking and cycling facilities. The cross-sectional staging of this corridor is expected to change over time. The interim corridor is expected to be a 2-lane urban standard with walking and cycling and then transition to a 4-lane urban arterial (full build out).

Figure 9-2 shows the proposed indicative cross-section for the proposed new Ōpāheke N-S FTN Arterial corridor.

Figure 9-2: Ōpāheke North-South FTN arterial (NoR D4) future corridor design

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, that will be used to inform future development and operation of the corridor.

In the long term, the new Ōpāheke North-South FTN Arterial corridor will have a medium movement significance as the Drury area are urbanises over time. It will become the key FTN, walking and cycling arterial connecting Drury, Ōpāheke, Papakura and also serves as a key gateway to proposed new rail stations, centres, future suburban park and wider north-south FTN network.

The corridor is therefore assessed to have the following RASF typology:

- Place function - P2 (long term)

- Movement function - M2 (long term)

The place function will have a medium place significance as the areas adjacent to the Project are urbanised with mainly residential housing, future suburban park, a small centre and light industry to the north.

The following Figure 9-3 indicates the likely long-term modal priorities for the corridor.

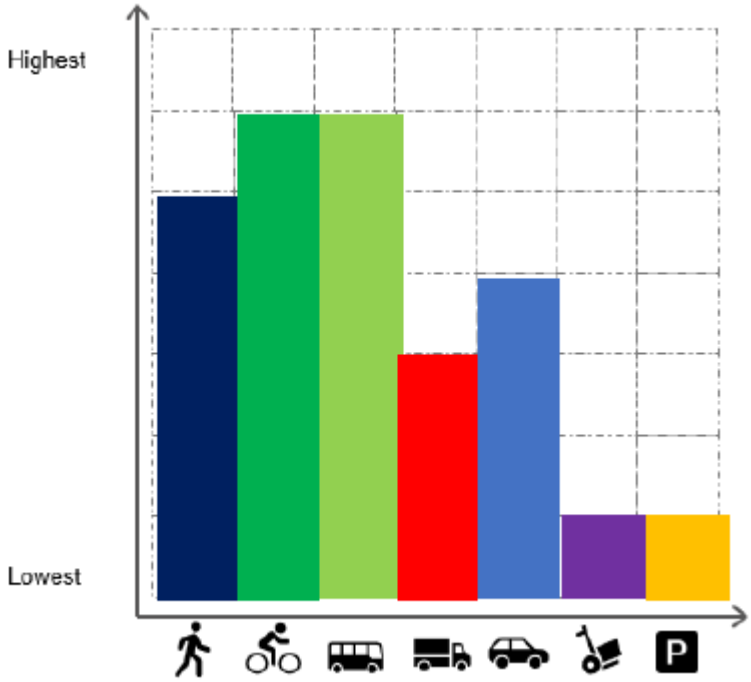


Figure 9-3: Future modal priority in 2048+ for Ōpāheke North-South FTN Arterial

This indicates a desire for high priority for walking, cycling and bus movements, a median desire for general traffic and freight movements but with a lesser need for loading, servicing, parking or access priority.

The Project includes fully separated walking and cycling facilities, two dedicated public transport lanes and the estimated traffic flows on this section of the network are such that general traffic and freight are expected to be able to operate together without the need for specific priority facilities. Vehicle access is expected to be primarily from local and collector roads rather than directly from this arterial. The proposed design of two traffic lanes, two bus lanes with walking and cycling facilities on both sides of the corridor reflects the desired movement and place functions identified for this corridor.

The new Ōpāheke North-South FTN Arterial is therefore considered to support the assessed typology and modal priorities for this corridor.

The key transport features within the Project include (see Figure 9-4):

- New four-lane FTN arterial standard corridor (30m cross section) between Hunua Road and Waihoehoe Road
- Two lanes for FTN and two lanes for general traffic

- New roundabouts at Waihoehoe Road (included in NoR D2), Ponga/ Ōpāheke Road and Walker Road and upgraded signalised intersections to tie in with the local roads at the Boundary Road intersection.
- 1.8m footpaths on both sides of the road
- 2.0m separated cycle lanes on both sides of the road
- 3.0m spacing for bus shelter

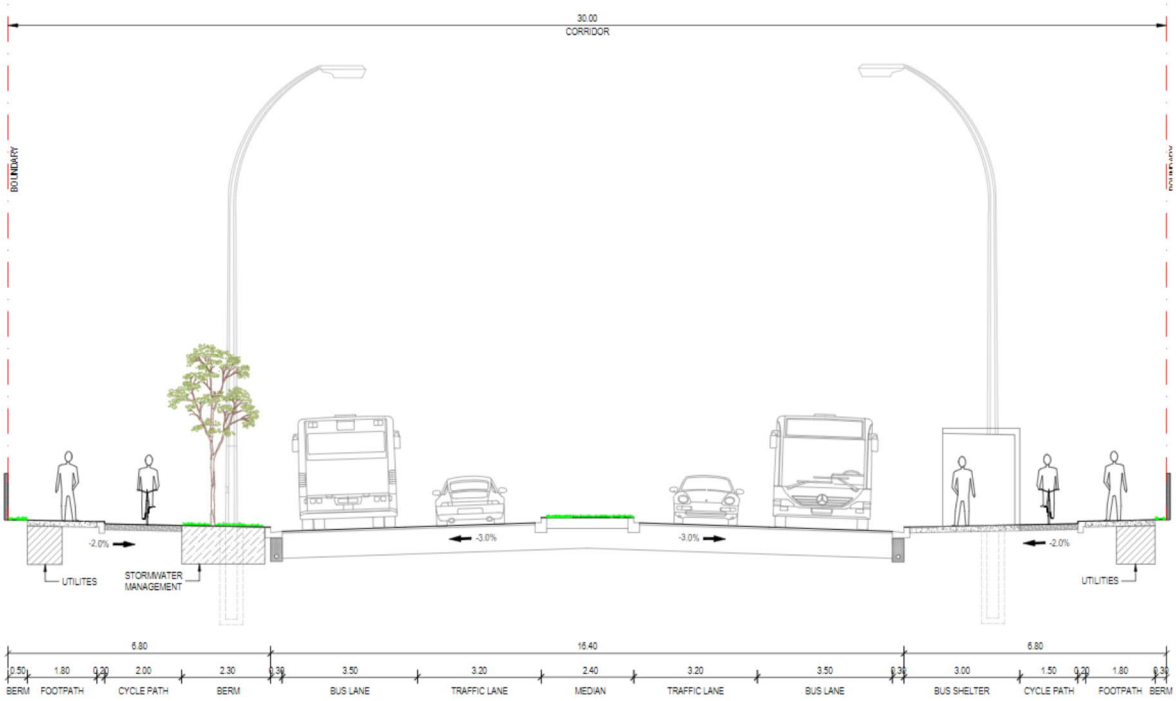


Figure 9-4: Ōpāheke North-South typical cross section (indicative)

Table 9-1 provides a summary of the proposed intersections along NoR D4.

Table 9-1: Intersection summary for the Ōpāheke North-South FTN Arterial (NoR D4)

Intersection	Current Form	Proposed Form	Key Outcomes
Walker Road/Ōpāheke North South FTN Arterial	n/a	Roundabout	Multi-lane Roundabout with protected walking and cycling facilities
Ōpāheke Road/Ponga Road/N-S Arterial	n/a	Roundabout	Multi-lane Roundabout with protected walking and cycling facilities
Hunua Road/N-S Arterial	n/a	Signal	Multi-lane signalised intersection with protected walking and cycling facilities

The intent of the Project from a transport perspective is to increase connectivity and provide for good people-movement and public transport function through the FUZ. The Project will also support SH1 and the proposed Mill Road corridor by providing a new corridor which will cater more to local north-south trips in Drury.

The Project will improve north-south connectivity in the Drury-Ōpāheke area and will form an integral part to the future public transport network, providing access to east-west connections and north-south FTN corridors and serving as a gateway to key destinations in Drury and Ōpāheke (including new planned rail stations, centres and the strategic north-south PT network).

9.2 Existing and Likely Future Environment

This section describes the current and the likely future environment without the Project. The subsequent section describes the effect of the Project on that likely future environment. Because the current environment is expected to change significantly (through urbanisation), the key focus of this assessment is the likely future environment, with the current environment described mostly for context.

9.2.1 Existing Environment

The current land use surrounding the Project area is largely greenfield land and low-density residential and rural zones with agriculture or rural lifestyle blocks that connect to the local network. The northern extent of the alignment will route into the existing Papakura industrial zone. Figure 9-5 shows the aerial of the current land use environment.

Figure 9-5: Current land use environment

9.2.1.1 Existing Transport Network

The existing transport network on and surrounding NoR D4 can be summarised as follows:

- The north-south connectivity between Waihoehoe Road and Hunua Road is poor, with Great South Road and Sutton Road the only local corridors connecting Drury and Papakura
- Sutton Road is a 2-lane primary collector west of the rail crossing and a secondary collector road east of the rail crossing with a posted speed of 80kph, and no walking and cycling facilities to protect vulnerable users. It also intersects with the north-south regional rail corridor, with an at-grade rail crossing. The corridor has no public transport services or facilities.
- Great South Road is a 2-lane arterial road with a posted speed limit ranging between 50kph and 70kph with dedicated walking facilities and no cycling facilities to protect vulnerable users. The public transport facilities along the corridor are limited bus stops but does not have any mid-block priority for public transport.

Appendix 4 and Appendix 5 provides more detail on the key characteristics of the existing road network and intersections respectively.

9.2.1.2 Road Safety

As there is no existing road alignment on Ōpāheke North-South FTN arterial there is no data on historic crash patterns. However, without this link, traffic from the growth area will be likely to use other existing connections in this area. Crash data was obtained for the existing intersections and on Sutton Road to provide some understanding of crash patterns and safety concerns at these locations.

The CAS analysis on the existing intersections on Boundary/ Hunua Road and Ponga/ Sutton Road for a ten-year period from 2010-2019 was undertaken. The majority of crashes occurred on the Boundary/Hunua intersection, which is an unsignalised T-intersection and bounded by high-volume arterial roads with a posted speed of 70 km/h. The crash data along the north-south aligned secondary collector, Sutton Road, was also extracted to understand the underlying north-south road safety issues.

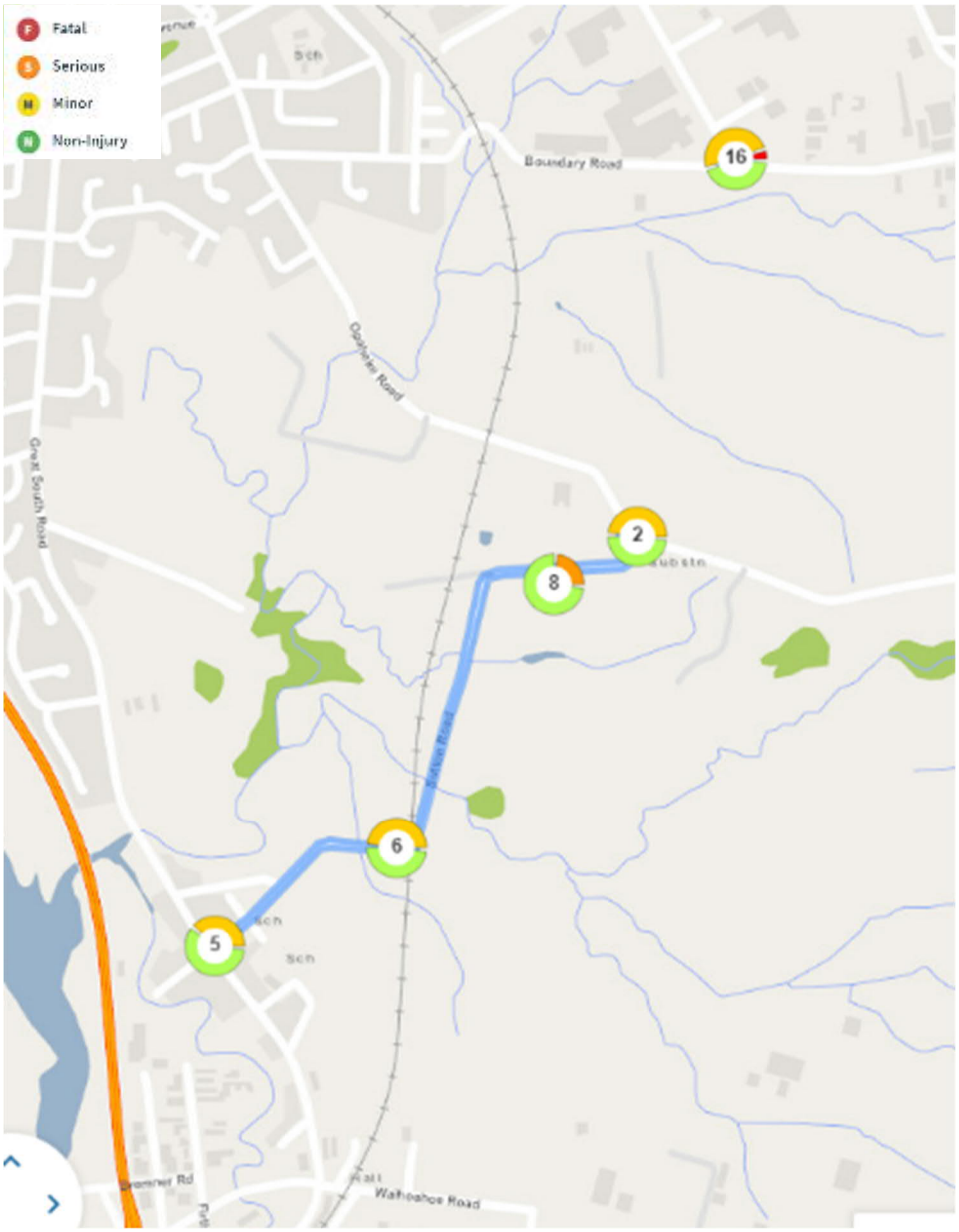


Figure 9-6: Location of crashes along Sutton Road and intersections

Figure 9-6 above shows the crashes within 50m radius of the existing intersections and within 10m buffer of Sutton Road, from January 2010 to December 2019 (both inclusive).

The number of fatal crashes is low with one occurring on the Hunua Road/Boundary Road intersection as a result of over-speeding, causing a loss of control over the bend. The two serious injury incidents occurred on Sutton Road due to its high-speed environment. Sutton Road has a 2-lane undivided carriageway crossing the railway line with a speed limit of 80kph. The minor/non-injury crash numbers are higher, around 34 out of 37 crashes in total mostly due to crossing/turning movements. Also, the at-grade rail crossing presents a significant safety concern and any future growth in traffic or train frequency will increase exposure for all road users.

Overall, it is considered that without an alternative north-south connection, traffic from this growth area will likely use existing rural roads which will not be suitable for significant increases in traffic. Short local trips could also be forced to use other strategic corridors, such as Great South Road and SH 1, adding unnecessary conflicting turning movements to those busy corridors.

9.2.1.3 General Traffic

This Project is a proposed new alignment and therefore there is no traffic volume data available. However, data on the other adjacent roads was retrieved from Mobile Road[23] in April 2020. The volumes are either estimated or used actual data available from the State Highway New Zealand database and Auckland Council databases.

Table 9-2 summarises current road classifications from One Network Road Classification (ONRC) and the average daily traffic (ADT) with the percentage of heavy vehicles on each road. Survey dates can be actual or estimated – referred to as "est" in the below table. For Ōpāheke Road and Ponga Road the Traffic Volumes were extracted from the 2016 Saturn base model.

Table 9-2: Existing Traffic Volumes

Road Name	Road Classification	Survey Date	5 Day ADT	% HCV
State Highway 1	High Volume	Dec 2019 (est)	33,300	9
Great South Road	Arterial	June 2018 (est)	14,500	7
Sutton Road (Ōpāheke)	Secondary Collector	June 2018 (est)	470	5
Waihoehoe Road	Primary Collector	June 2018 (est)	4010	10
Fitzgerald Road	Primary Collector	June 2019 (est)	2400	14

[23] Mobile Road: https://mobileroad.org/desktop.html

Road Name	Road Classification	Survey Date	5 Day ADT	% HCV
Ōpāheke Road	Primary Collector	2016	1600	15
Ponga Road	Primary Collector	2016	1600	9
Walker Road	Low Volume	June 2018 (est)	10	5
Boundary Road	Arterial	June 2019 (est)	2910	11
Hunua Road	Arterial	June 2018 (est)	3980	25

The existing traffic volumes suggest the east-west collectors and arterials are relatively uncongested. SH1 and Great South Road are the only existing arterial or strategic north-south connections between Drury, Ōpāheke and Papakura and both corridors are operating close to or near capacity and experience significant delays. Furthermore, Sutton Road is a secondary collector that connects Drury and Ōpāheke and presents significant safety and capacity issues related to the at-grade rail crossing.

9.2.1.4 Walking and Cycling

The current Drury-Ōpāheke area has poor north-south connectivity for walking and cycling between Drury, Ōpāheke and Papakura. The existing north-south connectivity is restricted to Great South Road, Sutton Road, Ōpāheke Road and Boundary Road as shown in Figure 9-7.

The road environments are high speed with limited to no walking and cycling facilities provided, resulting in high conflict and unsafe and hostile conditions for vulnerable road users. Also, where existing roads intersect with other transport networks (both road and rail) there are limited to no walking and cycling facilities that provide protection for vulnerable road users crossing safely.

The combination of poor north-south connectivity and inadequate facilities highlight that the environment is not suitable for walking and cycling, especially for the likely future urban environment.

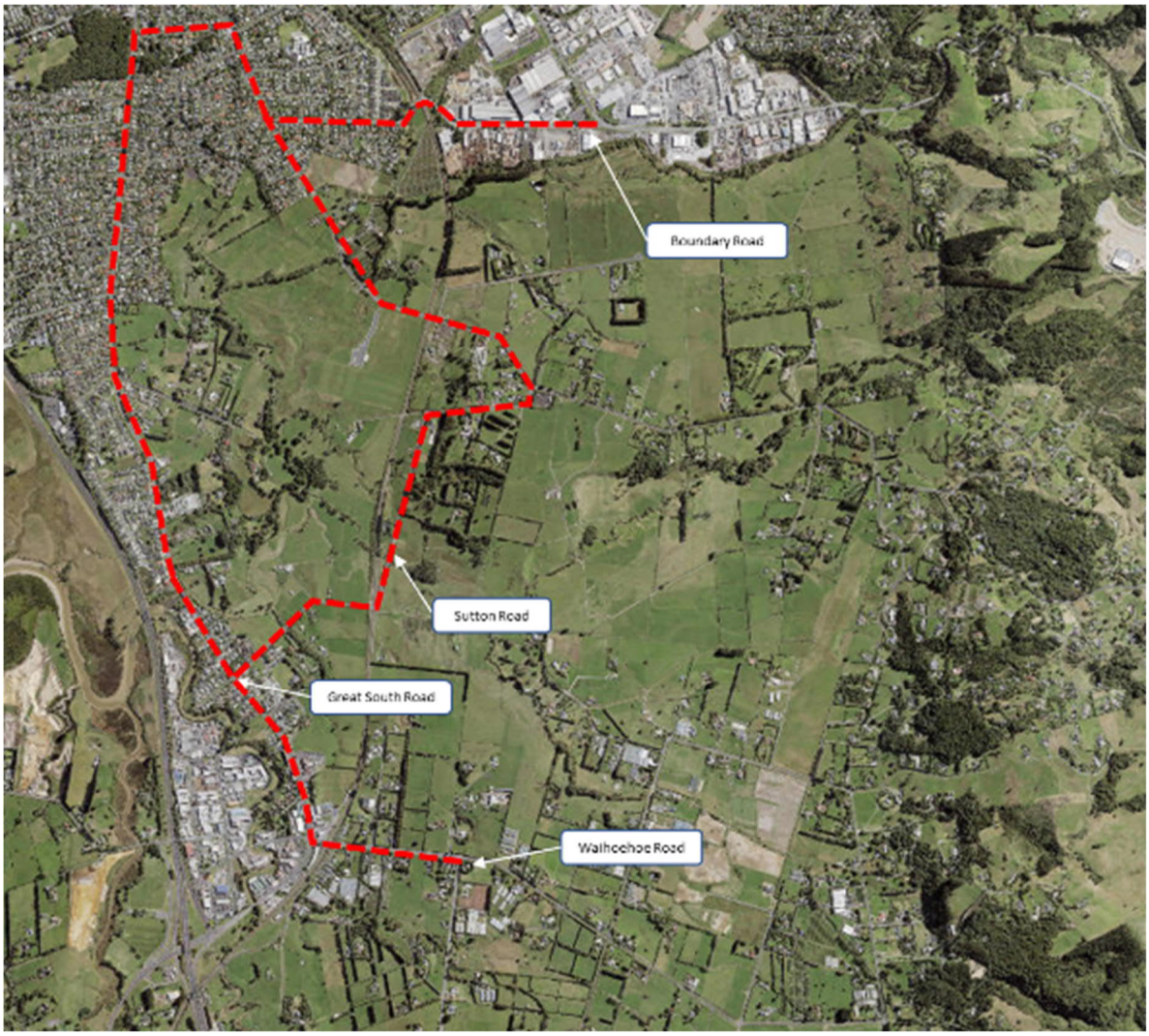


Figure 9-7: North-South connectivity for walking and cycling

9.2.1.5 Public Transport

Based on the existing AT Public Transport Network, there is no public transport provision (services or facilities) close to the Project area. The closest public transport service is bus service # 376 connecting Drury and Papakura Station. The bus stop is located near the Great South Road/Waihoehoe Road intersection. The existing roads and roadside facilities will not be able to provide quality provision of public transport to connect Drury, Ōpāheke and Papakura. The existing north-south connectivity is restricted to Great South Road, Sutton Road, Ōpāheke Road and Boundary Road as shown in Figure 9-7.

Also, there are no dedicated north-south facilities on Great South Road that prioritise public transport, and the existing Great South Road is already operating at or near capacity during the morning and evening peak.

9.2.1.6 Access

The Project is a new road alignment, so there are limited existing access matters to discuss. The existing properties adjacent to the NoR D4 corridor have access to the surrounding rural road

network, either to side roads or via direct access connected to residential and rural zones with agriculture, rural lifestyle blocks and some light industry.

9.2.1.7 Freight

The Project is a new road alignment, so there are no existing freight matters to discuss. Similar to general traffic, the lack of north-south resilience and connectivity also apply to localised freight.

9.2.2 Likely Future Environment (without Project)

This section describes the likely future environment with the expected and planned growth and development, but without the Project.

9.2.2.1 Future Transport Network and Land Use

The wider Drury, Ōpāheke, Pukekohe and Paerata area in the south of Auckland have been signalled to undergo significant urban growth in the AUP and the Council approved the Structure Plan in 2019 and recently received private plan changes to zone these areas.

The Drury – Ōpāheke structure plan area over 30 years is estimated to provide extra 22,000 houses, 12,000 jobs and a population growth of 60,000. The Drury - Ōpāheke growth area is shown in Figure 9-8 below which also indicates where the proposed Ōpāheke North-South FTN Arterial is relative to the growth areas.

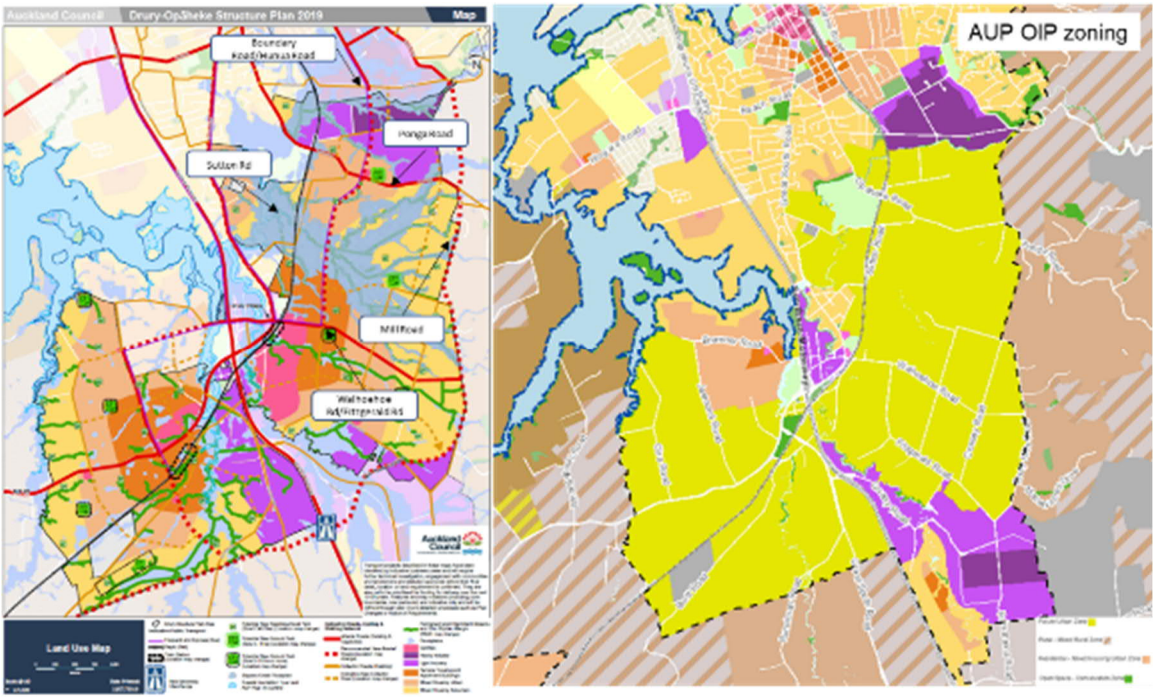


Figure 9-8: Future transport and Land Use adjacent to NoR D4

The Drury – Ōpāheke Structure Plan indicates both the expected pattern of urban development and the future transport projects (subject to planning and funding approvals) in the Ōpāheke and Drury area that have been developed to support the anticipated growth. A number of developers are seeking private plan changes to rezone the land in Drury east and west. The proposed land use sought by developers is generally consistent with that of the Drury-Ōpāheke Structure Plan.

The future transport projects surrounding the NoR D4 area and wider planned changes to the regional transport system are:

- New rail stations at Drury Central, Drury West, and associated park and ride facilities*
- New Mill Road Corridor - a strategic alternative route from Manukau to Drury in the long term, running parallel and to the east of State Highway 1 (SH1) *
- SH 1 Papakura-to-Bombay Upgrade providing more north-south regional capacity**
- SH 22 Drury-to-Paerata (Safe Network Programme which proposes short term safety upgrades)**
- Additional rail capacity between Pukekohe and Papakura (4 tracking, electrification and associated grade separations at road/rail crossings) **
- Regional north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH 1 and the NIMT***
- New rail stations at Paerata, and associated park and ride facilities***
- New Pukekohe Expressway – an alternative route to SH 22 between SH 1 (east of the proposed Drury South interchange) and Pukekohe (to the north-eastern connection to Pukekohe Ring Road) and connections between Pukekohe Expressway to SH22***
- State Highway 22 Upgrade (NoR D1) ***
- Jesmond to Waihoehoe West FTN Upgrade (NoR D2) ***
- Waihoehoe Road East Upgrade (NoR D3) ***
- Ponga Road and Ōpāheke Road Upgrade (NoR D5) ***
- The future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas get urbanised. ***

Note: funding approved*, funding partially approved** and subject to planning and funding approvals***.(as at the date of this report).

9.2.2.2 Road Safety

The existing road environment in Drury-Ōpāheke area is not fit for purpose to support the planned future urban growth. The existing environment will compromise safety and lead to several undesirable transport and land use integration outcomes.

The following undesirable outcomes will be expected to occur if future growth progresses and existing infrastructure remains the same:

- The high-speed road environment in the Drury-Ōpāheke area will significantly increase the risk for DSIs
- The lack of safe intersection controls for all users will significantly increase the risk for DSIs
- The absence of segregated walking and cycling facilities will compromise protection for vulnerable road users and the future growth will significantly increase crash exposure.
- The poor north-south connectivity will trigger more demand to use Sutton Road, which will significantly increase the risk for DSIs for all users due to the high speed rural environment, unsafe at-grade rail crossing and expected future rail frequency increases.

Although low-scale targeted safety improvements are planned or likely (such as speed limits reduced to 60kph), the scale of growth and the expected demand for all road users means that the road environment in the in Drury-Ōpāheke area is simply unsuitable to safely accommodate the planned growth.

9.2.2.3 General Traffic

The future north-south corridors form an integral part for general traffic and freight in Drury-Ōpāheke area. The existing SH 1 and Great South Road do not have enough capacity to cater for existing conditions or for future growth. The future Mill Road corridor (connecting Manukau to Drury South) is expected to be an alternative to SH 1, providing a strategic north-south corridor for freight and strategic movements, and is forecasted to operate at capacity in 2048+. Therefore, there will still be an over-reliance on Great South Road and Sutton Road to accommodate the higher traffic flows in the Drury-Ōpāheke area.

The existing and likely future north-south traffic flows show that the future growth will significantly increase demand. Table 9-3 provides context of the existing and likely future north-south traffic flows.

Table 9-3: North-South Average Daily Traffic

Year	Total Daily North-South Traffic (ADT)*
2016	48,000
2038	109,800
2048+	138,600

*Includes SH 1, Great South Road, Ōpāheke N-S FTN arterial and Mill Road

In addition, there are also plans to close Sutton Road due to unsafe conditions predicted as a result of increased demand for passenger rail services, rail capacity upgrades and increases and general traffic that will trigger more safety issues.

The following undesirable transport outcomes are predicted to occur if future growth progresses and existing infrastructure remains the same:

- Poor north-south connectivity between Drury, Ōpāheke and Papakura, creating severance, increases in vehicle kilometres travelled and travel times.
- Poor integration with the proposed Drury Central Station (including associated park and ride facilities) and the future urban areas in Drury and Ōpāheke.
- The lack of direct local north-south connectivity will force local traffic to rely on congested SH 1, Great South Road, Mill Road and the unsafe Sutton Road in the interim. This will compromise future reliability and resilience for all road users.
- The existing intersection controls will not have enough capacity to cater for future growth, which will lead to increased delays or traffic rerouting through future collector roads.

9.2.2.4 Walking and Cycling

The current Drury-Ōpāheke area has poor north-south connectivity for walking and cycling between Drury, Ōpāheke and Papakura, and presents significant unsafe and hostile conditions for vulnerable road users. As the Drury-Ōpāheke area urbanises in the future, the existing north-south corridors will not be able to accommodate the growth without compromising safety, wellbeing, liveability and leading to several undesirable future safety outcomes.

Future north-south connectivity will form an integral part of the future walking and cycling network, providing access to primary east-west connections and a north-south function to enable safe pedestrian and cyclist crossing facilities as shown in Figure 9-9.

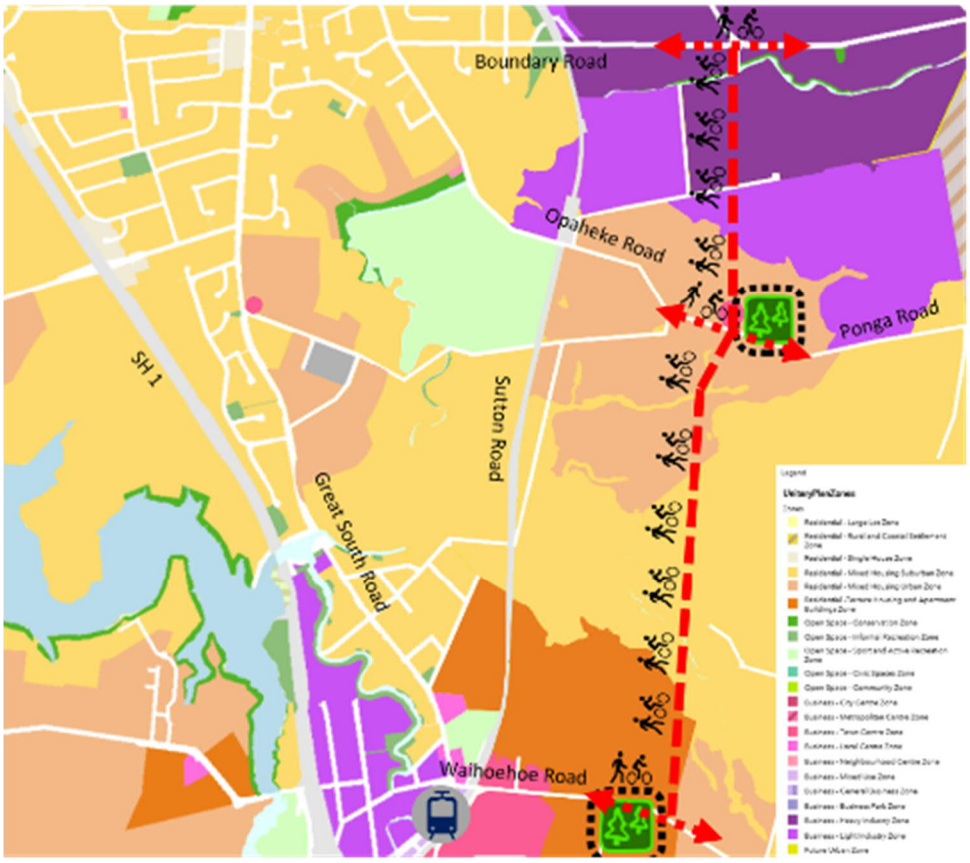


Figure 9-9: Future Walking and Cycling Movements on North South arterial

The following undesirable outcomes will occur if future growth progresses and existing infrastructure provision surrounding the growth areas remains the same:

- Access to employment and social amenities will be compromised, especially for future growth areas
- Walking and cycling network severance will occur for the existing and future Drury, Ōpāheke and Papakura areas
- Integration with the proposed Drury Central Station and wider Drury and Papakura areas will be compromised
- Poor integration with the proposed future walking and cycling network

- The ability to contribute to mode shift will be compromised if key walking and cycling facilities are not provided. This will strengthen the reliance on low-occupancy vehicle use, further exacerbating the other congestion and safety issues both locally and on the wider network
- The existing safety-related issues and crash exposure to vulnerable road users will increase significantly as demand increases as a result of the growth
- Significantly increase the risk for DSIs for vulnerable users
- The lack of provision for sustainable travel choices, will result in increased emissions from continuation of car-based travel and lead to adverse environmental and health effects.

9.2.2.5 Public Transport

In the longer term, Drury will have a number of public transport facilities such as train services from the new stations, and an expanded bus network including routes that are part of the frequent transit network (FTN). These facilities are proposed to connect the Drury, Ōpāheke and Papakura areas both inter-regionally to places such as the Auckland City Centre, Manukau and Auckland Airport, and local links to surrounding town centres. Related projects include:

- Proposed rail stations in Drury West and Drury Central. These rail stations are included in the NZUP and construction is planned to start in 2023 and be completed by late 2024
- FTN routes, connecting the wider Drury-Ōpāheke area to Drury West and the Drury Central stations
- Other bus routes, including services proposed by AT, to support future urban development within Drury.

Similar to general traffic, the existing SH 1, Great South Road and future Mill Rd corridor will experience significant future growth resulting in significant congestion. There are currently no planned public transport priority facilities that suggest that public transport (particularly road-based transit) will be able to function reliably between Drury, Ōpāheke and Papakura. Also, SH 1 and the proposed Mill Road corridor do not have attractive speed and catchment areas to serve localised public transport users. Therefore, over-reliance on Great South Road will compromise public transport connectivity.

Future north-south connectivity in the Drury-Ōpāheke area will form an integral part to the future public transport network, providing access to east-west connections and north-south FTN corridors and serving as a gateway to key destinations in Drury and Ōpāheke (including new planned rail stations, centres and the strategic north-south PT network).

The following undesirable outcomes are predicted to occur if future growth progresses and existing infrastructure remains the same:

- Access to employment and social amenities will be compromised by congested, unreliable and hence unattractive north-south public transport connectivity
- Poor integration with proposed Drury West and Drury Central Stations
- The ability to contribute to mode shift will be compromised if additional north-south provision for public transport reliability are not provided
- Journey times and reliability will be compromised for all north-south road-based transit services in the Drury-Ōpāheke area

- Future road-based transit services will need to rely on congested Great South Road and the future Mill Road, which will lead to delays and unreliability.
- The lack of provision for reliable public transport choice, will result in increased emissions from continuation of car-based travel and lead to adverse environmental and health effects.

9.2.2.6 Access

The Project is a new road alignment, therefore there are limited existing and likely future access matters arising. The existing properties adjacent to the NoR D4 corridor have access to the surrounding rural road network, either to side roads or direct access connected to residential and rural zones with agriculture, rural lifestyle blocks and some light industry.

Given the current low-density land use and low traffic, exposure is expected to be minimal. However, as the area develops the existing high-speed environment in the surrounding rural road network will trigger safety concerns for existing and likely future properties with direct access. As the area surrounding it develops, the existing properties will be re-routed on to the collector road network as indicated in the Drury-Ōpāheke Structure Plan and direct property access is not recommended.

If future growth progresses and existing infrastructure remains the same there will be an increase in crash exposure between driveways, general traffic and active modes on collector roads since there is an absence of alternative north-south arterial corridors to support growth in traffic.

9.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

This section describes the effects of the Project on the likely future transport and urban environment, including planned growth (movement and place patterns). It assesses operational effects separately after the Project is implemented followed by the assessment of transport effects during construction. Measures to avoid, remedy or mitigate actual or potential adverse effects are also identified.

9.3.1 Assessment of Operational Effects

This section will assess how each element of the transport system will function operationally after the construction of the Project, and therefore the effect it will have on the existing and likely future environment.

9.3.1.1 Road Safety

The design of the proposed new alignment of the Ōpāheke N-S FTN Arterial has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero.

The new Ōpāheke N-S FTN Arterial is expected to have the following positive effects on safety when compared with the existing and likely future network (without the project).

- It will significantly improve safety for vulnerable road users by providing segregated north-south walking and cycling facilities to connect Drury, Ōpāheke and Papakura

- It will significantly improve safety for all road users travelling between Drury and Ōpāheke by removing the need to rely on Sutton Road (unsafe) and Great South Road (congested) by providing a safe north-south alternative
- The alignment will consist of segregated public transport priority lanes that provide a safe and reliable alternative for public transport users
- It will control vehicular movements and provide safe walking/cycling crossings facilities at Hunua/Boundary Road (signalised intersection) and roundabouts at Walker Road, Ponga Road and Waihoehoe Road.
- The new corridor will be designed with a safe speed of 50kph
- It will provide a centre median (flush or raised) to separate the two directions of traffic and prevent head-on crashes.

Overall, the proposed design of the Ōpāheke N-S FTN Arterial is well aligned with the transport safety principles identified in AT's and Waka Kotahi's safety guidance documents. It will provide a much safer transport system which will likely reduce the number of DSIs, which will result in positive effects for all road users. It is noted that the future detailed design process will provide more detailed complementary measures to achieve improved safety outcomes.

9.3.1.2 General Traffic

For general traffic, NoR D4 serves as a key gateway for localised trips (including rail stations, centre and north-south movements between Drury, Ōpāheke and Papakura). It is well connected with the existing network and the planned future network and provides an alternative more direct north-south connection for general traffic (i.e. an alternative to Great South Road and Sutton Road). The planned network surrounding the Ōpāheke N-S FTN Arterial is shown in Figure 9-10.

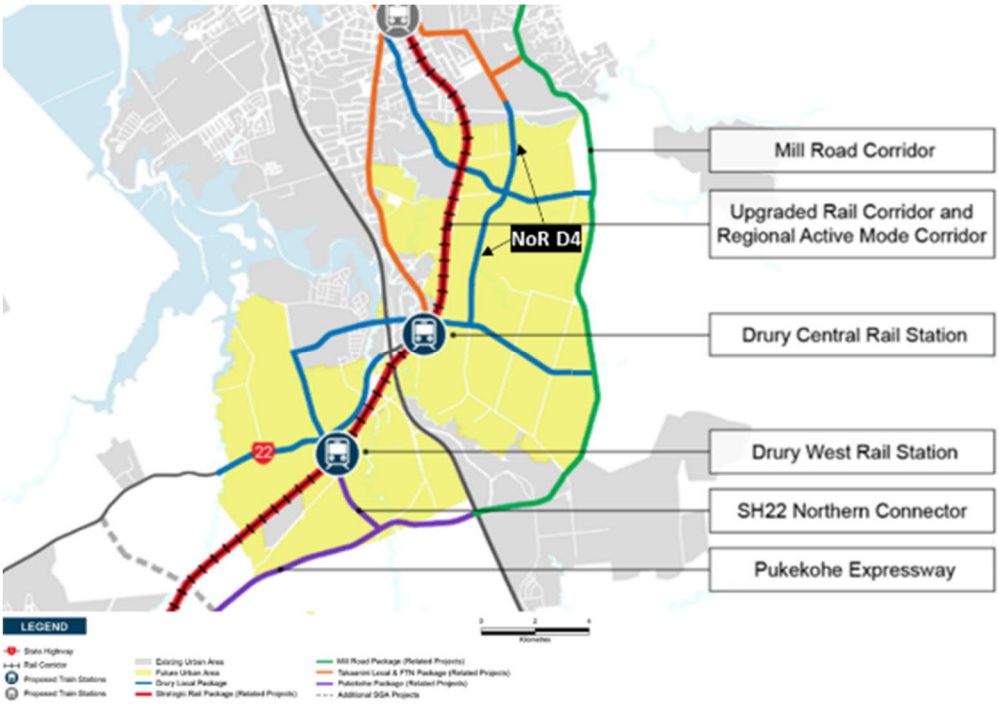


Figure 9-10: Ōpāheke North-South FTN Arterial and future network connections

The new Ōpāheke N-S FTN Arterial will support the urbanisation of the Drury-Ōpāheke area, resulting in improved connectivity and urban form outcomes. The underlying premise of NoR D4 is to provide a four-lane multimodal north-south spine between Drury, Ōpāheke and Papakura prioritising public transport with only two lanes allocated for general traffic.

The new alignment will significantly increase north-south connectivity, increase north-south capacity and provide and a reliable local connection. The modelling results shown in Figure 9-11 were undertaken using a 2048+ forecast scenario to ascertain the likely daily rerouting effect that will occur as a result of the Project.

The modelling results suggest that a large proportion of localised traffic would reroute from the surrounding collector network and Mill Rd as a result of the new connection, reducing the reliance on the collector network and strategic corridors to provide improved connectivity for localised traffic.

Figure 9-11: 2048+ daily rerouting effect of NoR D4

The new Ōpāheke N-S FTN Arterial also significantly improves connectivity and will shorten the local connection between Drury, Ōpāheke and Papakura and reduce 43,270 vehicle kilometres travelled daily, when compared with the existing and likely future network (without the project). This reduction in vehicle kilometres travelled will result in positive environmental and health benefits.

This corridor forms part of the future strategic transport network to enable access to economic and social opportunities for current and future residents in Drury growth areas, including access to the proposed rail stations.

The average ADT for the Ōpāheke N-S FTN Arterial based on SATURN modelling is predicted to be between 10,500 ADT to 17,000 ADT based on the 2048+ scenario. These figures provide a low and high scenario which are strongly linked to final alignment and design details for the parallel Mill Road corridor.

In addition to the operational effects of general traffic lanes, intersections along the route have also been analysed. The performance of the intersections, based on a 2048+ scenario[24], have been assessed using SIDRA Intersection Software with inputs from the SATURN models. A summary of these key performance measures is shown below in Table 9-4.

Table 9-4: Summary of intersection performance 2048+ (with Drury Package)

Intersection	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Walker Road/Ōpāheke North South FTN Arterial	Morning Peak	A	0.538	12
	Evening Peak	A	0.288	5
Ōpāheke Road/Ponga Road/N-S Arterial	Morning Peak	A	0.684	23
	Evening Peak	A	0.3	5
Hunua Road/N-S Arterial	Morning Peak	D	0.896	174
	Evening Peak	C	0.794	62

Overall, the proposed intersections are predicted to perform at a satisfactory level during the peak periods on Hunua Road/N-S Arterial under a 2048+ scenario. The Walker Road/N-S Arterial and Ōpāheke Road/N-S Arterial proposed intersections will perform well with ample capacity during the peak periods under a 2048+ scenario.

The midblock performance of the Ōpāheke N-S FTN Arterial is calculated in the form of Volume-Capacity Ratio (VoC) over each section, to understand and analyse the cross-sectional capacity constraints. For this analysis, the Project consists of two parts from Ponga to Hunua Road (Northern part) and from Waihoehoe to Ponga Road (Southern part). A comparative study of the VoC ratio cannot be done as this is a new alignment and hence the directional VoC values are shown below in Table 9-5.

Table 9-5: Summary of Mid-Block Performance 2048+

NoR D4 mid-block section	Direction of traffic	VoC Ratio (2048+ Future)
Ōpāheke N-S Road (Northern part)	Northbound (AM Peak)	52%
	Southbound (AM Peak)	18%
Ōpāheke N-S Road (Northern part)	Northbound (PM Peak)	12%
	Southbound (PM Peak)	36%

[24] 2048+ with Drury scenario is also viewed as the reference case for assessment purposes

NoR D4 mid-block section	Direction of traffic	VoC Ratio (2048+ Future)
Ōpāheke N-S Road (Southern part)	Northbound (AM Peak)	66%
	Southbound (AM Peak)	12%
Ōpāheke N-S Road (Southern part)	Northbound (PM Peak)	21%
	Southbound (PM Peak)	30%

The overall effects of the Project on general traffic can be summarised as follows:

- Significantly improves north-south connectivity between Drury, Ōpāheke and Papakura by providing a reliable alternative that reduces vehicle kilometres travelled and travel time.
- Significantly improves north-south capacity and resilience, with a more direct local connection that enables local traffic to rely less on Mill Road and Great South Road (the only north-south alternatives in future)
- Improves integration with proposed Drury Central rail station (including associated park and ride facilities) and the future urban areas (Drury-Ōpāheke area) surrounding the Project
- Enables north-south general traffic demand to rely less on unsafe Sutton Road to access Ponga Road and Ōpāheke Road.
- Improves intersection controls and increases capacity to cater for future growth, resulting in decreased delays and less traffic rerouting through future collector roads surrounding the Project.

9.3.1.3 Walking and Cycling

The Ōpāheke N-S FTN Arterial is a new route that currently traverses through a greenfield area. For walking and cycling, NoR D4 proposes separated walking and cycling facilities on both sides of the new north-south alignment from Hunua Road to Waihoehoe Road.

It also includes dedicated pedestrian and cycle crossing facilities at three intersections, which will connect with the expected future adjacent facilities. The Ōpāheke N-S FTN Arterial form an integral part of the future walking and cycling network, providing access to primary east-west connections and a north-south function.

An assessment of the proposed walking and cycling facilities against relevant AT standards and policies is summarised in Table 9-6.

Table 9-6: Ōpāheke North-South FTN Arterial AT standards and policy assessment for walking and cycling facilities

Policy/Standard	Network Component	Assessment
Auckland Transport Vision Zero[25]	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 proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on Ōpāheke N-S are proposed to be 50km/hr, therefore the proposed design of the walking and cycling facilities is considered to be appropriate for these standards.
Auckland Transport Design Manual[26]	**Footpaths:** 1.8m minimum	A 1.8m footpath is proposed on all corridors and a 2.0m cycle path with a 2.3m berm. The total width of 6.8m is proposed from carriageway to road boundary. This is in accordance with the AT TDM requirements
	Cycle Paths: 2.0m minimum	

Walking and cycling are a key component to the future environment of the Ōpāheke N-S FTN Arterial. There are several key attractors which imply walking and cycling will significantly increase as growth progresses in Drury-Ōpāheke area. These include:

- The future land use zoning in this area is mixed-use residential and industrial to the northern extent. This density implies a mixture of modal movements ranging from local to strategic.
- The route will have bus stops to facilitate the FTN routes, which will be key attractors for local movements around Drury and Ōpāheke.
- The place function will have a medium place significance in the future as the areas adjacent to the Project are urbanised with mainly residential housing, future suburban parks, a small centre and light industry to the north
- The proposed corridor purpose is of medium strategic significance, connecting sub-regions (Papakura to Drury East)

The predicted 2048+ usage of the walking and cycling facilities along this corridor are shown in Table 9-7 and provide context about likely future demand that will benefit from these facilities.

The detail outputs were extracted from the Strategic Active Mode Model (SAMM) and Station Access Tool. These numbers are based on average predicted daily flows proposed Ōpāheke N-S FTN Arterial.

[25] Auckland Transport: Vision Zero: https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

[26] Auckland Transport – Transport Design Manual: https://at.govt.nz/about-us/manuals-guidelines/roads-and-streets-framework-and-the-transport-design-manual/

Table 9-7: Daily walking and cycling predicted movements (2048+)

Area	Direction	Walking (Daily Flows)	Cycling (Daily Flows)
Ōpāheke N-S FTN Arterial	Northbound	1800	250
	Southbound	2000	350

Given the urban form and anticipated trip generators along the Ōpāheke N-S FTN Arterial, walking and cycling movements are expected in the future environment. The cross-section design standards for segregating these modes are viewed to be operationally efficient as these align with relevant policy documents and there is enough capacity to enable a good level of service throughout the day.

All intersections within the Project have been provided with safe pedestrian and cycle crossing facilities, which connect with the expected future adjacent facilities.

Exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided by vision zero guidance. For dual roundabouts, signalised active mode crossing facilities are proposed.

The effects of the Project on walking and cycling are:

- Significantly improves north-south connectivity between Drury, Ōpāheke and Papakura by providing safe and reliable north-south walking and cycling facilities
- supports growth surrounding NoR D4 and improve access to employment and social amenities
- significantly reduces risk for DSIs by providing safe movement for vulnerable road users along and across the Project
- provides good integration with the future walking and cycling network
- the higher number of active mode trips reduces the reliance on vehicle trips, which results in positive environmental and health benefits
- provides good integration with the proposed Drury Central station, the future suburban parks, a small centre and light industry to the north (as indicated on the Drury-Ōpāheke Structure Plan) and serves as a key enabler to achieve mode shift targets for future growth areas.
- The proposed segregated walking and cycling facilities will support growth, enable sustainable travel choice and combat expected safety concerns.

9.3.1.4 Public Transport

For public transport, the Project will provide a high-quality north-south transit spine for localised trips and the wider Drury – Ōpāheke area. The proposed new corridor provides a four-lane FTN arterial function with dedicated FTN facilities from Hunua Road to Waihoehoe Road.

For network context, Figure 9-12 shows where the Ōpāheke N-S FTN Arterial is relative to the wider planned future public transport network. It is well connected with the existing network and the planned future public transport network, including new rail stations, centre and east-west movements between Drury East and Drury West and the wider FTN and rail public transport network.

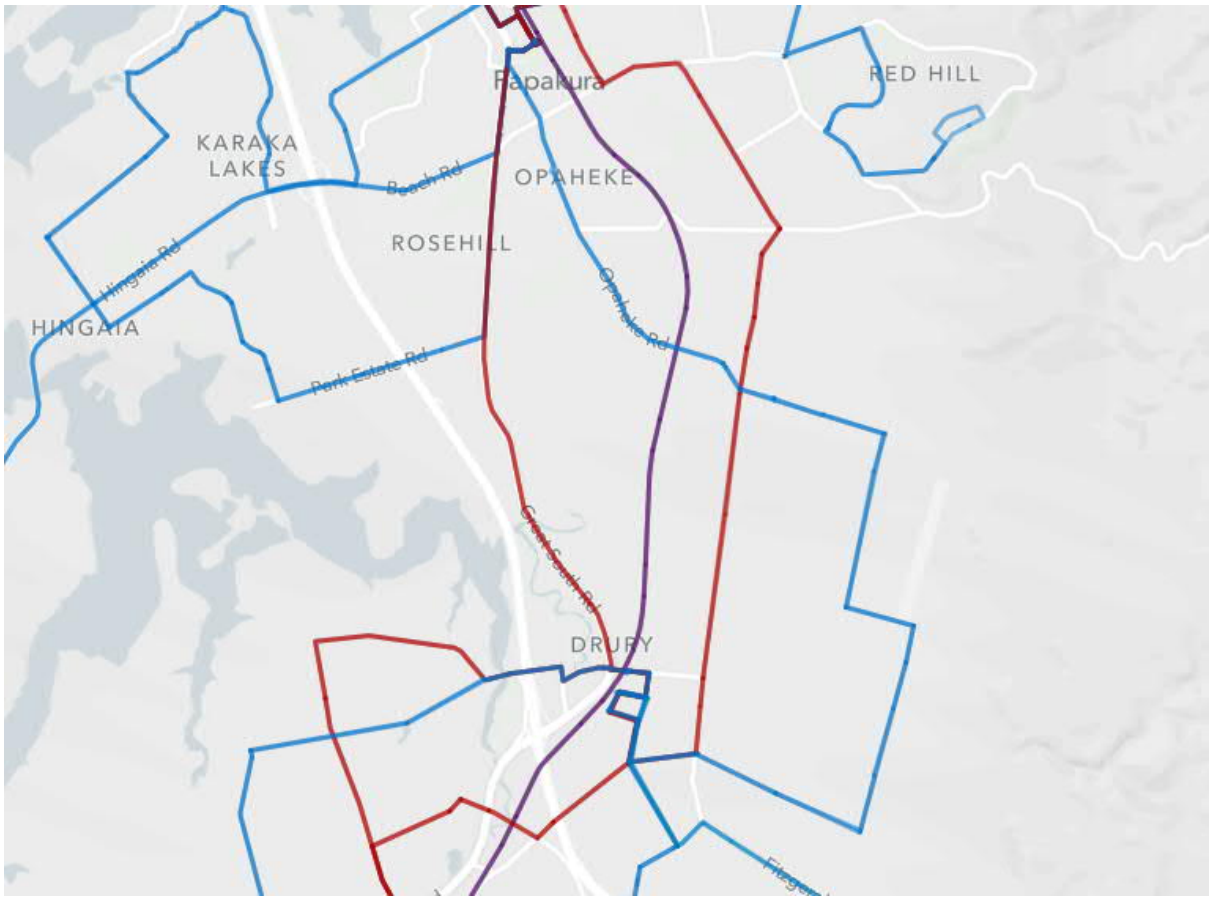


Figure 9-12: Future public transport network (2048+)

For future public transport services, there are planned bus services[27] that will use the Ōpāheke N-S FTN Arterial, the service #37 Drury and Ōpāheke, with a 7-minute frequency in peak.

The Ōpāheke N-S FTN Arterial will be the primary north-south public transport connection servicing the Drury-Ōpāheke area and will form an integral part of the future public transport network. In addition to the planned bus routes, Drury Central and Drury West rail stations are planned within the area. These projects will be delivered through a separate workstream. It is anticipated that the bus routes will provide connectivity to both of these stations, providing a wider catchment for this mode of transport.

The cross section will provide two FTN lanes, one in either direction. These lanes will have a 3.5m width, in addition to the 2.3m berm width to accommodate bus stops. The exact location of bus stops will be defined at later stages, as part of the 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 FTN is surrounded by FUZ, implying a high future residential catchment.

Table 9-8 provides a summary of the public transport flows and journey time benefits based on MSM modelling. The modelling results suggest that journey time benefits as a result of the Project for public transport users are expected to be significant throughout the day (compared with the existing and

[27] Based on the AT SGA Remix File – frequencies and routes subject to change

likely future network without the project). The public transport flow provides context about the likely future public transport users that would benefit from these facilities.

Table 9-8: Public Transport flows and Journey Times

Model Time Period	Public Transport Flows (Users)	Journey Time Benefit
Morning Peak (AM)	496	6 min 6s
Inter-Peak (IP)	268	3 min 25s
Evening Peak (PM)	458	4 min 29s
Daily	2412	

The effects of the Project on public transport are:

- significantly improves access to employment and social amenities by improving north-south public transport connectivity
- the dedicated FTN facilities will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for public transport users
- good integration with the future public transport network, resulting in improved east-west and north-south connectivity
- the higher number of public transport trips reduces the reliance on vehicle trips, which results in positive environmental and health benefits
- good integration with the proposed Drury West and Central Stations and serves as a key enabler to achieve mode shift targets
- Improve transport mode choice to the future urban areas.

9.3.1.5 Access

Based on the average ADT ranging between 10,500 to 17,000 vehicles per day along two lanes and two dedicated bus lanes (based on the 2048+ scenario) and the walking, cycling and public transport demand, direct property access is not recommended on to the network given the negative safety implications. The traffic volume and multi-lane crossing will undermine Vision Zero as vehicles using driveways will conflict with other modes, in addition to driver safety and active modes being compromised by merging onto the road.

There are no existing properties directly using the route given this is a new alignment. For any in proximity, it is recommended these will be re-routed on to the collector road network as indicated in the Drury-Ōpāheke Structure Plan, where appropriate.

The indicative collector network is subject to change as developers progress these connections through the plan change processes.

9.3.1.6 Freight

The Project is a new road alignment, therefore there are limited comparative matters to discuss. However, the additional north-south alignment will significantly improve connectivity for localised

freight movement between Drury, Ōpāheke and Papakura similar to the effects described in general traffic. The Project will be able to accommodate freight movements along the mid-block and through the intersections. The freight route classification and the network provisions are expected to be further developed in subsequent project phases. Overall the Ōpāheke N-S FTN Arterial is expected to have a significant positive effect on localised freight movement between Drury, Ōpāheke and Papakura.

9.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The Project provides significant positive effects and there are no operational adverse effects to mitigate

9.3.3 Assessment of Transport Construction Effects

The construction of the Ōpāheke N-S FTN Arterial works will only include a relatively small section of construction works on existing roads, including the intersection and connection at Boundary Road and Hunua Road, Walker Road, Ponga Road / Ōpāheke Road, and tie in works at Waihoehoe Road. This means that temporary traffic management will be required to delineate live traffic away from the construction zones at these locations. The scale of temporary traffic management is largely dependent on the various stages and requirements of the construction activities.

Based on the proposed construction methodology and activities the estimated duration of works is between 3.5 to 4 years. Figure 9-13 shows the construction works to be phased over three zones, including:

- Zone 1 - Boundary Road/ Hunua Road intersection works and Bridge 1
- Zone 2 – South of Bridge 1 to Ponga Road/ Ōpāheke Road intersection
- Zone 3 – South of Ponga Road/ Ōpāheke Road intersection to Waihoehoe Road

Zone 1 works include the Boundary Road, Hunua Road, Ōpāheke N-S FTN Arterial, and Bridge 1 works. It is generally located in a brownfield environment, with a significant presence of services and interfaces with the adjoining businesses and traffic.

Zone 2 covers the construction of the proposed alignment from south of Bridge 1, and includes the Walker Road intersection, Ōpāheke Road/ Ponga Road intersection. This zone is a mixture of greenfield works in a rural environment, with some interface with live services, traffic, and local residents.

Zone 3 is predominantly construction of the proposed road in a greenfield rural environment. The scope includes works south of the Ponga Road/ Ōpāheke Road intersection down to Waihoehoe Road and includes Bridge 2. It will have minimal interface with services, traffic, and residents.

The Ōpāheke N-S FTN Arterial project is estimated to take 3.5 to 4 years to complete:

- Enabling works: 3 months to 4 months
- Zone 1 including Bridge 1: 10 months to 12 months
- Zone 2: 18 months to 20 months
- Zone 3 including Bridge 2: 24 months to 28 months
- Pavement construction: 10 months to 12 months

- Cycleway and Footpath: 4 months to 6 months

Figure 9-13: Construction zones – Ōpāheke N-S FTN Arterial

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for construction. The indicative construction method has been developed based on a concept design with consideration of using the most practical construction techniques and equipment. There are likely alternative methods in the future that could be used to complete the works, however, this document only intends to capture the traffic impacts based on the indicative construction method.

9.3.3.1 Temporary traffic management

It is expected that the larger part of works required for the Project will likely to be in greenfield area which and will not be adjacent to live traffic. However, full road closures at intersections may be required for some specific activities, such as road surfacing, traffic switches and bridge beam installation. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work. The effect of temporary road closures or other traffic management methods for the construction works along Hunua Road/Boundary Road, Walker Road and Waihoehoe Road should be assessed in the future as part of the CTMP for the Project.

It is considered that the temporary effects from the construction activities for the Ōpāheke N-S FTN Arterial can be adequately managed through the implementation of a CTMP during the construction phase of the Project. The purpose of the CTMP is to ensure the construction of the Ōpāheke N-S FTN Arterial 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 residential properties and local activities.

If required, SSTMP should be developed to manage the constraints on access to affected properties.

9.3.3.2 Construction traffic effects

The construction of the new Ōpāheke N-S FTN Arterial will require significant earthworks to accommodate bridge construction, drainage and stormwater wetlands construction, services relocation, and pavement construction. The estimated volumes of cut and fill are approximately 243,000m^3 based on the current indicative design. 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 the Project. The activities associated with the construction traffic movements will be limited to sections of the network where access is possible.

Given this is a new road routing through a greenfield area, only a small section of the construction works will be on existing roads. These works will be around the intersection and connection at Boundary Road and Hunua Road, Walker Road, Ponga Road / Ōpāheke Road and Waihoehoe Road. Works at the Waihoehoe Road intersection (covered in NoR D3) and on Ponga Road and Ōpāheke Road on either side of their intersection with Ōpāheke N-S FTN (NoR D5) are not included in this assessment.

9.3.3.2.1 Expected construction traffic routes

Given the future timing of the construction of the Ōpāheke N-S FTN Arterial, there is a degree of uncertainty associated with any predicted construction methodology. This will result in uncertainty of:

- The accurate routes that will be used by construction vehicles as the locations of quarries and dump sites are not yet certain
- The exact location and extent of compound sites/lay down areas
- The timing of construction of other projects, especially the Waihoehoe Road West FTN Upgrade, Waihoehoe Road East Upgrade Ponga Road Upgrade Ōpāheke Road Upgrade, and Mill Road corridor project.

Since most construction works will be in mostly greenfield areas, it is anticipated that the construction vehicles, plant and materials will assess the construction sites via SAPs at several locations:

- Waihoehoe Road / Fitzgerald Road intersection
- Ponga / Ōpāheke Road intersection
- Hunua / Boundary Road intersection

Depending on the future traffic assessment, the details of the routes and time restrictions will be refined. The routes for construction traffic will likely be limited to arterial corridors and intersections with provision of adequate vehicle tracking. The selection of routes for construction movements and detour traffic should consider the impacts to the normal traffic and freight. It is anticipated that a full detailed traffic impact assessment will be required prior to construction. The assessment should include the impacts to local residents and businesses along the construction routes and/or detour routes.

If the Ōpāheke N-S FTN Arterial is to be constructed prior to the completion of Mill Road (noting that this is unlikely as the proposed Mill Road project is being funded through the NZ Upgrade Programme), the most feasible construction route will be Beach Road – Ōpāheke Road. There will be some potential constraints to this route:

- The land use on Ōpāheke Road (just north of Boundary Road) is existing urban residential predominantly and includes Ōpāheke Primary School. Heavy truck movements will likely cause some disruption to local residents and raise safety, noise and vibration concerns.
- There are a number of signalised intersections on Beach Road from the SH1 interchange to Ōpāheke Road, and the operation of these intersections might be impacted including vehicle tracking, right turn movements and delays caused by heavy vehicles.

It is noted that the existing SH1 motorway bridge at the Drury interchange has a height limit of 4.66m. Therefore, any construction vehicles exceeding this limit, are prohibited to go under the bridge. However, the Drury interchange is expected to be upgraded as part of the SH1 Papakura to Drury South project and road network vehicle restrictions should be reassessed prior to construction as this constraint may no longer exist.

The potential construction traffic routes are shown below in Figure 9-14.

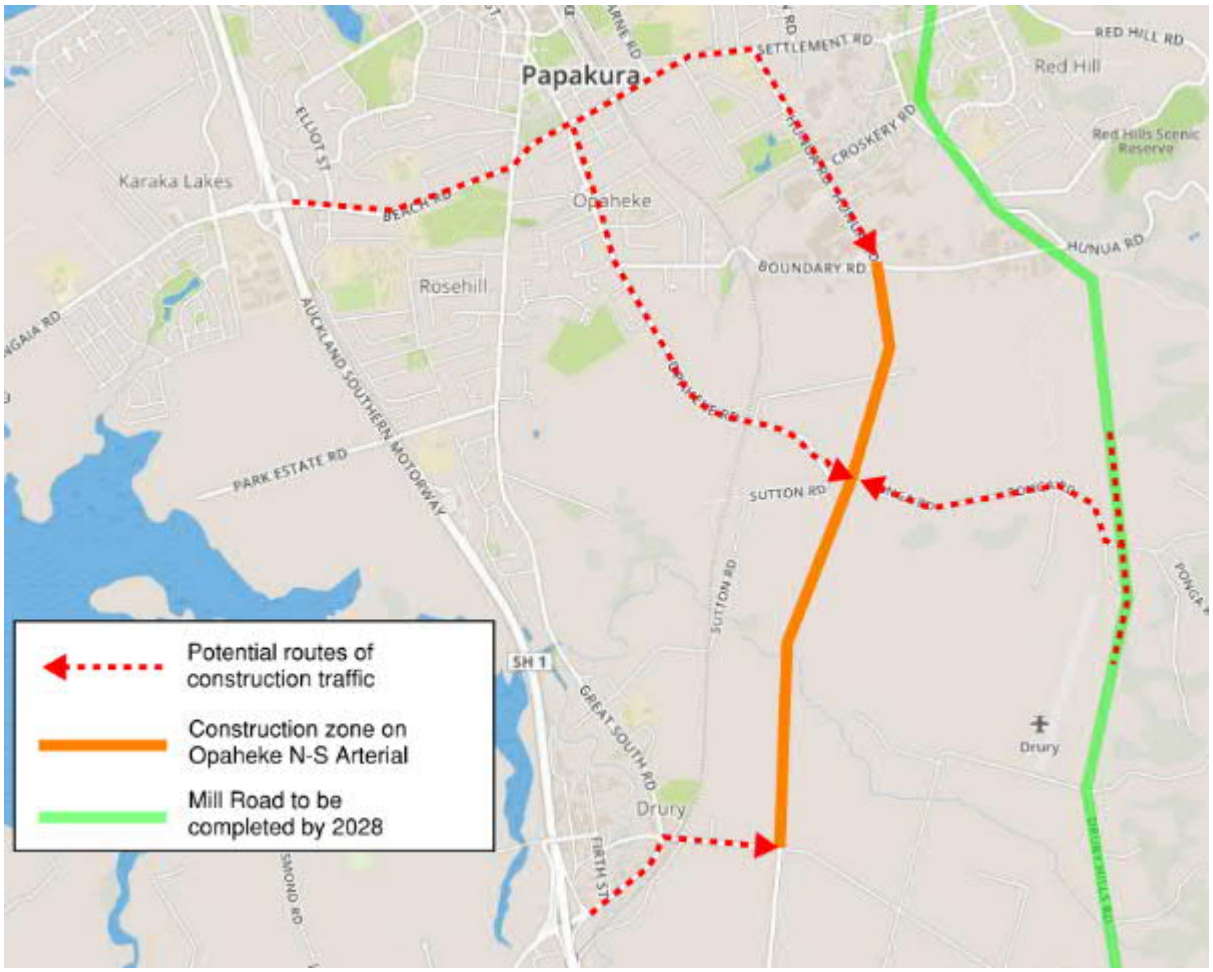


Figure 9-14: Potential construction routes for Ōpāheke N-S FTN Arterial project

9.3.3.2.2 Expected construction traffic generation

The construction of the new Ōpāheke N-S FTN arterial will require significant earthworks, bridge construction, drainage and stormwater wetlands construction, services relocation, and pavement construction. The activities associated with the construction traffic movements will be limited to sections of the network where access is possible. The indicative programme for construction period suggests the overall duration of work will be approximately 3.5 years to 4 years. The estimated construction movements include approximately 75,600 total trips from heavy trucks staged over 3.5 years to 4 years. In addition, there will be approximately 550 vehicle movements daily from staff and contractors during the peak construction period.

To estimate the daily number of truck movements to and from the site, the following working assumptions were adopted:

- Working days: 20 days construction per month
- Hours of delivering earthworks and other materials: a total of any 8 hours per day. It is noted that truck movements should avoid the peak hours of traffic or alternatively specified times agreed with respective RCA.
- The duration of construction: 42 months for construction works. For the assessment of construction effects, a shorter construction period of 42 months has been adopted in the assumptions, given that this will generate more trips.

The daily number of construction vehicles has been calculated and summarised below in Table 9-9.

Table 9-9: Expected daily traffic movements from construction works – Ōpāheke North-South FTN Arterial

Stages	Expected duration (approx.)	Truck movements (daily)	Light movements (daily)	Total movements (daily)	Typical vehicle movements
Stage 1: Enabling works	4 months	15 to 20	100 to 150	115 to 170	• Truck movements are likely to include low loaders for plant delivery and collection, articulated trucks/truck and trailer units/concrete units, concrete trucks. • Light vehicle movements are likely from construction staff and contractors.
Stage 2: Bridge 1, Zone 1, Zone 2, Bridge 2, and Zone 3	12 months	90 to 480	300 to 550	390 to 1030	
Stage 3: Completion of zone2, bridge 2, and part of zone 3	10 months	90 to 480	300 to 550	390 to 1030	
Stage 4: Completion of zone 3 and Pavement works	12 months	90 to 480	250 to 500	340 to 980	
Stage 5: Cycleway and footpath	4 months	15 to 20	100 to 150	115 to 170	

In order to assess the full extent of effects from the expected construction traffic, the traffic environment at the time of construction needs to be understood. For the construction of Ōpāheke N-S FTN Arterial, analysing the impact of construction activities on the surrounding road network should be included as part of the CTMP for this project.

It is anticipated that the peak time of construction movements will likely to be during Stage 1, and these movements will be distributed through three potential site accesses on Waihoehoe Road, Ōpāheke Road, and Boundary Road. If the construction traffic is not using one single route during peak time of construction, the additional traffic caused by construction is expected to spread out on three site accesses, and it is unlikely to have any significant impacts to the capacity on these routes and the adjacent road network.

However, if only one access is used during the peak time of construction, that site access is likely to experience a significant high number of construction traffic and may cause operational issues to the road network. Therefore, it is recommended to distribute the construction traffic as evenly as possible to reduce the impact to the existing traffic. An updated assessment of construction traffic will be required prior to the time of construction, which can be used to inform the traffic management measures in the CTMP.

9.3.3.3 Road safety assessment during construction period

9.3.3.3.1 Speed limit

SAPs will likely be located at the points of access to accommodate construction traffic access to the nominated construction zones / work areas. Boundary Road and Waihoehoe Road have current speeds of 70km/h, and Ōpāheke Road has a speed limit of 80km/h. These permanent speeds will likely cause some potential safety concerns given the longer deceleration distance required by construction trucks entering the sites. A crash between construction vehicles and normal traffic can occur when the travelling speed suddenly changes due to construction vehicles access to/from the SAPs.

Therefore, it is recommended that during construction these speeds be lowered temporarily. This should be in accordance with the latest traffic management standards at the time of construction. Details of operational hours for construction trucks are also recommended to avoid the peak period to minimise the traffic impact. This recommended measure and other measures highlighted in the CTMP are expected to reduce the potential safety risks that may associated with construction traffic

9.3.3.3.2 Pedestrians and cyclists

The future roadside facilities along Waihoehoe Road and Boundary Road/Hunua Road are anticipated to remain during the construction period where viable. It is noted that the Waihoehoe Road West and East Arterial projects will likely be constructed prior to the Ōpāheke North-South FTN Arterial project based on the expected growth and adjacent committed schemes (Mill Road and Drury Central Station) in the New Zealand Upgrade Programme. In addition, Drury Central Station is likely to be built prior to the Ōpāheke N-S FTN Arterial Project (as it is funded) and will generate much more demand for active modes.

The contractors will ensure the safety and operation of the future active modes on Waihoehoe Road by implementing temporary traffic management measures such as traffic cones and temporary signage. It is recommended that residents and stakeholders (such as Bike Auckland and cycling clubs) be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity will be used to inform appropriate traffic management measures in the CTMP.

9.3.3.4 Property access for impacted residents and businesses

During construction, there will be temporary traffic management controls such as temporary concrete or steel barriers. Existing driveways that remain during construction will be required to have temporary access provision. It is anticipated that the contractor should undertake a detailed assessment of any affected driveways and provide temporary access if required. The temporary access should ensure the ability for residents to safely access and exit the property. The requirements should be captured in the CTMP of SSCTMP, if required.

9.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

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

a. A CTMP shall be prepared prior to the Start of Construction for a Stage of Work. Any potential construction traffic effects shall be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction.

b. 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:

   (i) Methods to manage the effects of temporary traffic management activities on traffic;

   (ii) Measures to ensure the safety of all transport users;

   (iii) 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;

   (iv) Size 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;

   (v) Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;

   (vi) Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;

   (vii) 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;

   (viii) Method that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

c. Any CTMP prepared for a Stage of Work shall be submitted to Council for information ten (10) working days prior to the Start of Construction for a Stage of Work

9.3.5 Summary of effects (NoR D4)

The assessment of transport effects for the Ōpāheke N-S FTN Arterial is summarised in Table 9-10.

Table 9-10: Assessment of Effects Summary for NoR D4

Operational Transport Effects	
Safety	In summary, the effects of the Project on safety are: • significantly improve safety for vulnerable road users by providing segregated north-south walking and cycling facilities to connect Drury, Ōpāheke and Papakura • significantly improve safety for all road users travelling between Drury and Ōpāheke by removing the need to rely on Sutton Road (unsafe) and Great South Road (congested) by providing a safe north-south alternative • the alignment will consist of segregated public transport priority lanes that provide a safe and reliable alternative for public transport users • significantly improve walking/cycling crossings facilities at Hunua/Boundary Road (signalised intersection) and roundabouts at Walker Road, Ponga Road and Waihoehoe Road. • significantly reduced likelihood of head-on crashes by separating the two directions of traffic with a centre median.
Walking and cycling	In summary, the effects of the Project on walking and cycling are: • Significantly improved north-south connectivity between Drury, Ōpāheke and Papakura by providing safe and reliable north-south walking and cycling facilities • Significantly improved access to employment and social amenities. • Significantly reduced risk for DSI's for vulnerable road users along and across the Project • Good integration with the future walking and cycling network • the higher number of active mode trips will reduce the reliance on vehicle trips, which results in positive environmental and health benefits • Good integration with the proposed Drury Central station, the future suburban parks, a small centre and light industry to the north and serves as a key enabler to achieve mode shift targets for future growth areas • Significantly improved walking and cycling facilities, which will support growth, enable sustainable travel choices and combat expected safety concerns.
Public Transport	In summary, the effects of the Project on public transport are: • Significantly improved access to employment and social amenities by improving north-south public transport connectivity • Significantly improved capacity and resilience, resulting in improved journey time performance and consistency for public transport users • Good integration with future public transport network, resulting in improved east-west and north-south connectivity • The higher number of public transport trips reduces the reliance on vehicle trips, which will result in positive environmental and health benefits • Good integration with the proposed Drury West and Central Stations and serves as a key enabler to achieve mode shift targets • Improved transport mode choice to the future urban areas

General Traffic	In summary, the effects of the Project on general traffic are: • Significantly improved north-south connectivity between Drury, Ōpāheke and Papakura by providing a reliable alternative that reduces vehicle kilometres travelled and travel time. • Significantly improved north-south capacity and resilience, with a more direct local connection that enables local traffic to rely less on Mill Road and Great South Road (the only north-south alternatives in future) • Significantly improved integration with the proposed Drury Centre rail station (including associated park and ride facilities) and the future urban areas (Drury-Ōpāheke area) surrounding the Project • Improved intersection controls and increase capacity to cater for future growth, resulting in decreased delays and less traffic rerouting through future collector roads surrounding the Project.
Access	In summary, the effects of the Project on access are: • Improved access for existing and likely future properties
Construction Transport Effects	
In terms of construction effects as a result of the Project, there are several potential temporary adverse effects mainly linked to traffic management during construction, including construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users and driveways & property access. These effects can be appropriately mitigated through a CTMP prepared before construction commences.	

9.4 Conclusion (NoR D4)

The existing transport environment between Drury and Papakura has poor connectivity and is not fit for purpose to support the planned future urban growth. The average north-south traffic flows are expected to increase up to 138,000 veh/day by 2048, which is approximately three times the existing traffic in the area. The absence of direct connectivity and the scale of growth will trigger effects on all modes. There are significant adverse effects expected if future growth progresses and existing infrastructure remains the same. The adverse effects are increased safety risk for all users, significantly increase journey times for general traffic and public transport, network severance of north-south connectivity and lead to several undesirable transport and land use integration outcomes.

The proposed Ōpāheke N-S FTN Arterial corridor is a new 3.2 km long 4-lane urban arterial through existing greenfield areas, approximately 30m wide and including public transport, walking and cycling facilities.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project will provide a safe, reliable north-south multi-modal arterial network that supports growth, enables sustainable travel choice and combats safety concerns and improve access to employment and social amenities.

The Project will significantly improve transport facilities for all modes in the Drury-Ōpāheke area, resulting in improved north-south connectivity for those that travel by car, active mode and public transport, as well as the movement of goods and services.

It will significantly improve north-south movement between Drury and Papakura and will reduce vehicle kilometres travelled daily as a result of the Project. The Project will also significantly improve safety for vulnerable users (providing new segregated north-south walking and cycling spine) and will significantly reduce the risk for DSIs. The Project will also significantly improve north-south capacity

and resilience, with a more direct local connection that enables local traffic and freight to rely less on congested SH 1, Great South Road and the proposed Mill Road (which will be the only north-south alternatives in future).

The Project will improve north-south connectivity in the Drury-Ōpāheke area and will form an integral part to the future public transport network, providing access to east-west connections and north-south FTN corridors and serving as a gateway to key destinations in Drury and Ōpāheke (including new planned rail stations, centres and the strategic north-south PT network).

The Project will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

There are no predicted adverse effects on the operation of the transport system that require mitigation arising from the Project.

In terms of construction effects, there are several potential adverse effects, mainly linked to staging of projects, traffic management (construction traffic routes, partial or full road closures, construction traffic, speed limits, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through Construction Traffic Management Plan conditions and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that operationally, the Project will have significant positive effects and potential adverse effects arising during construction of the Project can be appropriately mitigated.

10.0 NoR D5: Ponga and Ōpāheke Road Upgrade

Chapter Summary

The existing Ponga Road and Ōpāheke Road is not fit for purpose to support the planned future urban growth.

There are significant adverse effects expected if future growth progresses and existing transport infrastructure remains the same. The adverse effects are increased safety risk for all users, hostile and unsafe environment for active modes, decreased reliability for general traffic and public transport and would lead to several undesirable transport and land use integration outcomes. The existing high-speed environment coupled with the increase in traffic as a result of the growth and lack of dedicated walking and cycling facilities will create a hostile environment for vulnerable road users.

The Project proposes that the function of Ponga Road and Ōpāheke Road (Rural and Urban section) change from an existing rural/urban two-lane collector road to an urban two-lane arterial catering for vehicles, public transport and active modes. The proposed design includes dedicated walking and cycling facilities on both sides of the road, and central median (either flush or raised) for Ponga Road and Ōpāheke Road rural section to separate the two directions of traffic movements and include grade separation of the NIMT with Ōpāheke Road. The Ōpāheke Road (Urban section) also includes an upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout with separated walking and cycling facilities, including crossing facilities and the re-grade of nine driveways.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and improves access to employment and social amenities.

The Project will significantly improve transport facilities for all modes, resulting in improved safety for those that travel by car, active mode and public transport. The upgrade will also unlock safe and sustainable east-west mode choices and connects to future strategic North-South corridors (Mill Rd and the Ōpāheke North-South FTN Arterial, and to Papakura township. It will significantly improve safety for vulnerable users (additional segregated walking and cycling provision) and significantly reduce the risk for DSI's. The grade separation of the NIMT with Ōpāheke Road will eliminate any crash risk and general traffic delay between road users and any existing and future rail services.

The increased safety measures for vulnerable road users will significantly reduce the risk for DSIs for the predicted demand for walking (2200 daily) and cycling (400 daily). The upgrade integrates well with surrounding land use and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

No adverse operational effects on the transport system were identified that required mitigation.

In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when greater level of details is available for construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through Construction Traffic Management Plan conditions and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that operationally, the Project will have significant positive effects and potential adverse effects arising during construction of the Project can be appropriately mitigated.

10.1 Project Description

As the Drury-Ōpāheke area is urbanised it is proposed to upgrade a 4.15km section of Ponga Road and Ōpāheke Road, from Great South Road in the north, to Jack Paterson Road and the future Mill Road corridor (which forms a separate NZUP project) in the southeast, to a two-lane arterial with separated walking and cycling facilities. The intent of the Project is a multimodal corridor that provides access to the proposed Mill Road corridor, FUZ in Papakura and employment areas to the north. The Project has been separated into three sections as shown in Figure 10-1:

- Ponga Road Upgrade: from Ōpāheke Road to Jack Paterson Road
- Ōpāheke Road Rural Upgrade: from the northern extent of the FUZ to Ponga Road
- Ōpāheke Road Urban Upgrade: north of the FUZ

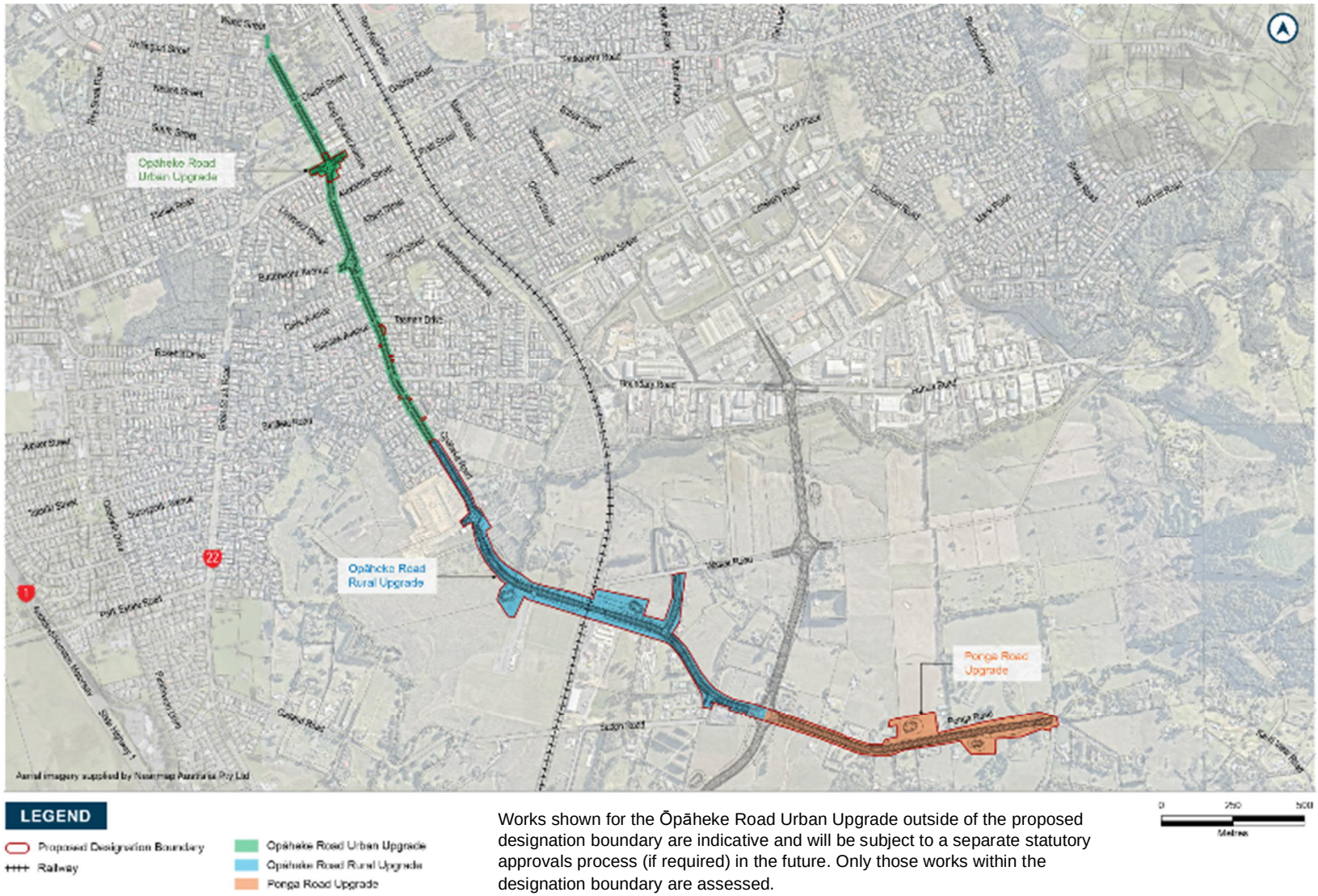
While the overall plan for the urban area of Ōpāheke Road is to upgrade the walking and cycling facilities from Ōpāheke Road Rural Upgrade in the south to Great South Road, Papakura in the north, generally, the upgrade can fit within the existing road reserve, therefore only the areas affecting land outside the existing road reserve are proposed to be designated.

For the Ponga Road and the Ōpāheke Road Rural upgrade sections it is proposed to widen the existing roads to 24m two-lane urban arterials with separated walking and cycling facilities. As the Ōpāheke Road urban section is an existing and constrained urban environment, it is proposed to upgrade the existing road to a 20m two-lane urban arterial with separated walking and cycling facilities.

The indicative alignment has been prepared for assessment purposes, and to indicate what the final design of the Project may look like. The final alignment will be refined and confirmed at the detailed design stage. Key features of the proposed upgrade common to each Project section include the following:

- A typically 24m or 20m wide road with two lanes and separated walking and cycling facilities
- Likely posted speed of 50kph
- Localised widening around the existing intersections to accommodate for vehicle stacking and tie-ins and walking and cycling facilities/crossings
- Batter slopes and retaining to enable widening of the corridor and/or wetland construction, and associated cut and fill activities
- Vegetation removal along the existing road corridor
- Areas identified for construction related activities including site compounds, construction laydown, bridge works area, the re-grade of driveways and construction traffic manoeuvring

Further details of each Project section are provided below.



Works shown for the Ōpāheke Road Urban Upgrade outside of the proposed designation boundary are indicative and will be subject to a separate statutory approvals process (if required) in the future. Only those works within the designation boundary are assessed.

Figure 10-1 Overview of NoR D5

10.1.1 Network and Corridor Design

NoR D5 was developed as part of network planning for the wider area and concurrently with the Drury-Ōpāheke Structure Plan undertaking by Auckland Council. Those wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the problems. As such, the Ponga Road and Ōpāheke Road project is part of a wider integrated network planned for the area.

The Project proposes to change the function of Ponga Road and Ōpāheke Road from an existing urban/rural two-lane collector road to an urban two-lane arterial catering for vehicles, public transport and active modes. The proposed design includes dedicated walking and cycling facilities on both sides of the road, and a central median (either flush or raised) for the Ponga Road and Ōpāheke Road rural section (from Ponga to Lorelei Place) to separate the two directions of traffic movements. The Ōpāheke Road urban section includes dedicated walking and cycling facilities from Lorelei Place to Great South Road. Figure 10-1 shows the proposed design of the Ōpāheke Road and Ponga Road corridor

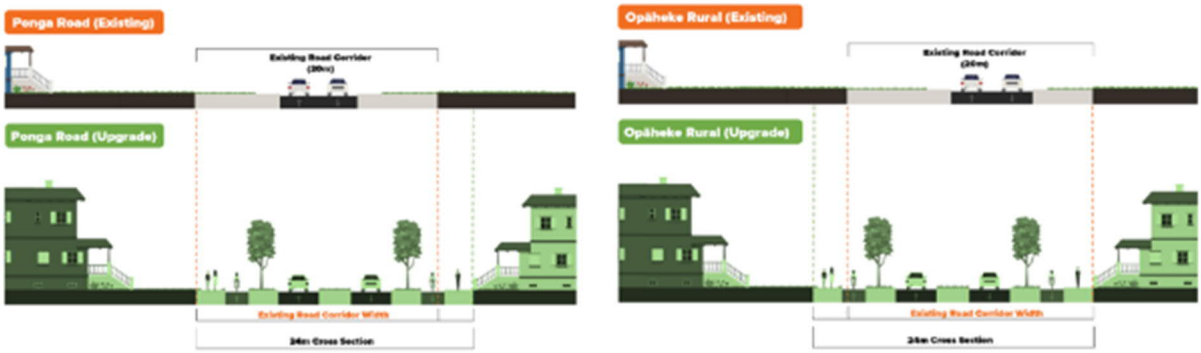


Figure 10-2: Indicative Future Corridor Design – Ōpāheke Road and Ponga Road

The development of the corridor design has included 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, that will be used to inform future development and operation of the corridor.

In the long term, the future corridor movement function of Ponga Road will be the key east-west route between the future Mill Road and the Ōpāheke North-South FTN Arterial, and Ōpāheke Road is the continuation of this east-west route to the Papakura centre. Both corridors are therefore assessed to have the following similar RASF typology:

- Place function will remain low P1 with mixed parts of P2 (long term)
- Movement function - transitioning from M1 to M2 (long term)

The following Figure 10-3 indicates the likely long-term modal priorities for the corridor.

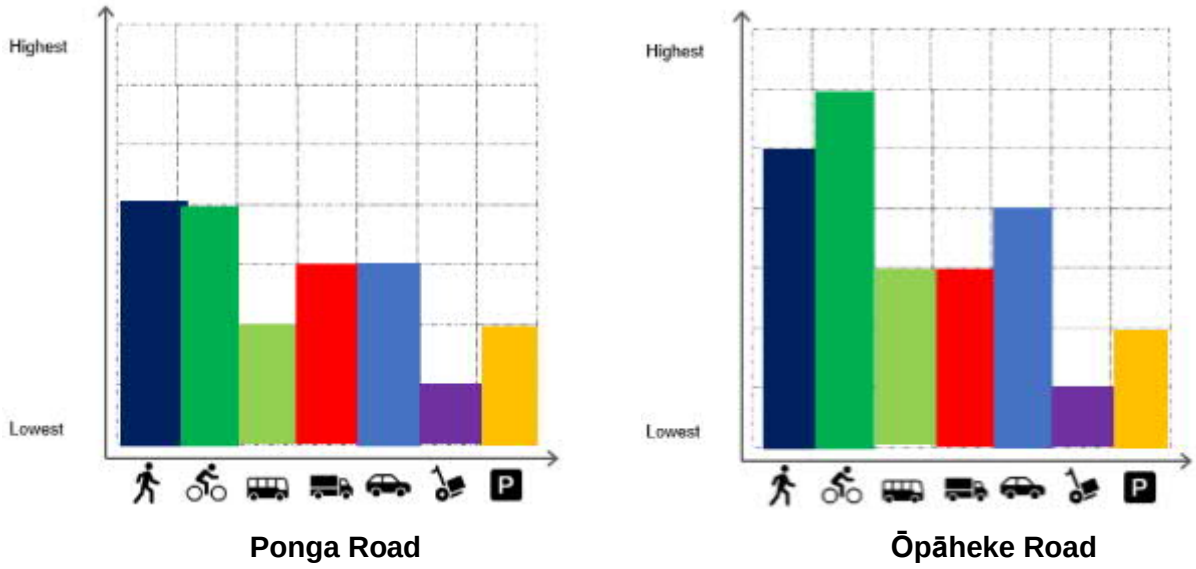


Figure 10-3: Future Modal Priority in 2048+ for Ponga Road and Ōpāheke Road

For Ponga Road this indicates a desire for a higher priority to walking and cycling, with a median priority for access, buses, general traffic and freight movement, but with a lesser need for specific loading, servicing and parking priority.

For Ōpāheke Road this indicates a desire for a higher priority to walking and cycling, with a median priority for buses, general traffic and freight movement, but with a lesser need for specific loading, servicing, access and parking priority.

The Project includes fully separated walking and cycling facilities and the estimated traffic flows on this section of the network are such that general traffic, freight and buses are expected to be able to operate together without the need for specific priority facilities. Vehicle access is expected to be primarily from local and collector roads rather than directly from this arterial. The proposed design of two traffic lanes with walking and cycling facilities on both sides reflects the desired movement and place functions identified for this corridor.

NoR D5 is therefore considered to support the assessed typology and modal priorities for this corridor.

10.1.2 Ponga Road Upgrade Section

10.1.2.1 Section Overview

The Ponga Road Upgrade section is a 1km long upgrade extending from the proposed intersection with Ōpāheke North-South FTN Arterial in the west, to Jack Paterson Road in the east. In the future Ponga Road will tie into the proposed Mill Road corridor which forms a separate NZUP project.

An overview of the concept design is provided in Figure 10-4.

Figure 10-4 Overview of Ponga Road Upgrade Section

In addition to those listed above, the key features of the Ponga Road Upgrade section include:

- Roundabout tying into the proposed Ōpāheke N-S FTN Arterial (NoR D4) and Ōpāheke Road Rural Upgrade section
- A bridge over Mangapū Stream
- Extension of existing pipe culverts
- Two stormwater wetlands.

The key transport features within the Project include (see Figure 10-5):

- Upgrade to the existing road corridor to support the urbanisation of this area
- Ponga Road section: Two-lane arterial standard road (24m cross section) between the proposed Ōpāheke North-South FTN Arterial to the proposed Mill Road
- A roundabout at the Ōpāheke North-South FTN Arterial (this work is part of NoR D4)
- 1.8m footpaths on both sides of the road
- 2.0m separated cycle lanes on both sides of the road

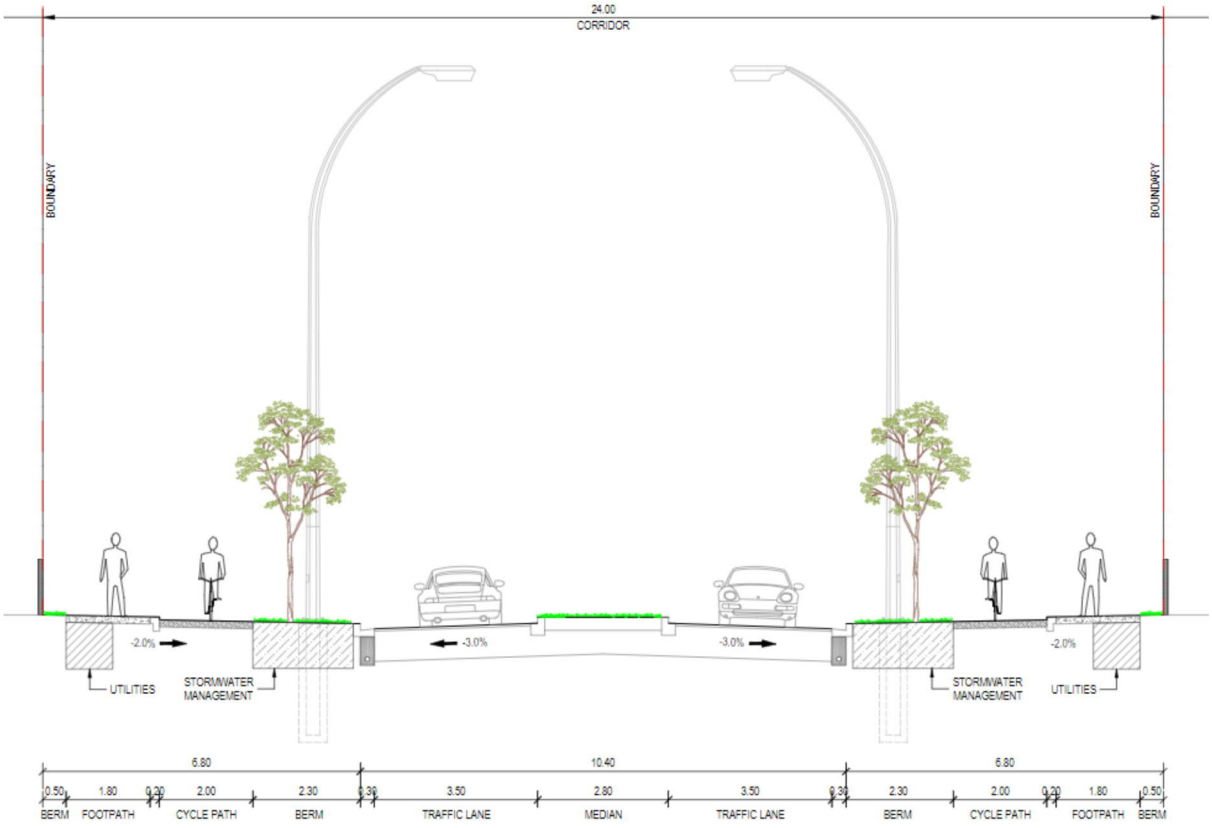


Figure 10-5: Ponga Road typical cross section (indicative)

The intent of this Project from a transport perspective is to provide a multi-modal connection between two key strategic north-south roads within Drury – the Ōpāheke N-S FTN Arterial (NoR D4) / Hunua Road and the future extension of the Mill Road corridor. This section of NoR D5 will provide a critical east-west corridor for future residents in the Drury-Ōpāheke area, connecting to the wider Papakura area.

10.1.3 Ōpāheke Road Rural Upgrade section

10.1.3.1 Section Overview

It is proposed to widen, and realign a portion of, the existing road within the Ōpāheke Road Rural Upgrade section to a 24m urban arterial. The Ōpāheke Road Rural Upgrade section extends 1.6km from the extent of the FUZ in the north to Ponga Road in the south. An overview of the concept design is provided in Figure 10-8.

Figure 10-6 Overview of Ōpāheke Road Rural Upgrade Section

In addition to those listed above, the key features of the Ōpāheke Road Rural Upgrade section include:

- Roundabouts at Bellfield Estate and Ōpāheke N-S FTN Arterial / Ponga Road
- Realignment of a section of Ōpāheke Road and grade separation of the NIMT to avoid the Waikato 1 watermain and Ōpāheke Sports Complex and to allow the bridge to be constructed offline
- New road connection to Walker Road (and closure of a section of the existing Ōpāheke Road – replaced by the new NIMT bridge)
- Two walking and cycling bridges adjoining each side of the existing Ōtūwairoa Stream road bridge
- Two stormwater wetlands. One is an extension of an existing wetland located within Ōpāheke Reserve

The key transport features within the Project include (see Figure 10-7:):

- Upgrade to the existing road corridor to a two-lane arterial standard road (24m cross section) between the proposed Ōpāheke North-South Road to near Lorelei Place
- Roundabout intersections with Ōpāheke North-South (NoR D4) and at Bellfield Estate
- 1.8m footpaths on both sides of the road
- 2.0m separated cycle lanes on both sides of the road

Figure 10-7: Ōpāheke Road (Rural) typical cross section (indicative)

The intent of this Project from a transport perspective is to provide a connection between the Ōpāheke N-S FTN Arterial / Hunua Road and Papakura (from Sutton Road to Lorelei Place). This corridor provides a critical east-west corridor for future residents in the Drury-Ōpāheke area, connecting to the wider Papakura area.

10.1.4 Ōpāheke Road Urban Upgrade section

10.1.4.1 Section Overview

While the overall plan for the urban area of Ōpāheke Road is to upgrade the walking and cycling facilities from Ōpāheke Road Rural Upgrade in the south to Great South Road, Papakura in the north, only the areas affecting land outside the existing road reserve are proposed to be designated and assessed as part of this assessment. The Ōpāheke Road Urban Upgrade section of NoR D5 includes the regrading of nine driveways along Ōpāheke Road and the upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout. An overview of the proposed designation areas is provided in Figure 10-8.

Figure 10-8 Overview of Ōpāheke Road Urban Section

The key features of the Ōpāheke Road Urban section include:

- Upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout to provide for separated walking and cycling facilities, including crossing facilities
- Re-grade of nine driveways.

The key transport features of the Ōpāheke Road Urban section include (see Figure 10-7:):

- Upgrade to the existing 20m road corridor between the proposed Great South Road to near Lorelei Place – noting that only the areas affecting land outside of the road reserve are designated.
- 1.8m footpaths on both sides of the road
- 2.0m separated cycle lanes on both sides of the road
- Upgrade Ōpāheke Road / Settlement Road intersection to a roundabout

Figure 10-9: Ōpāheke Road (Urban Section) typical cross section (indicative)

The intent of this Project from a transport perspective is to provide a dedicated cycling connection between Lorelei Place and Great South Road. This corridor provides a critical east-west / north-south corridor for future residents in the Drury-Ōpāheke area, connecting to the wider Papakura area.

10.2 Existing and Likely Future Environment

NoR D5 is composed of three sections: Ponga Road and Ōpāheke Road Rural and Urban sections. This section describes the current and likely future environment without the Project. Both rural sections have similar components with regard to the existing and future environment, so the existing and future environment for both sections is discussed within the section below. Because the current environment is expected to be urbanised in the rural sections in future, the key focus of this assessment is the likely future environment, with the current environment described mostly for context.

10.2.1 Existing Environment

The current land use surrounding Ponga Road is largely greenfield land, low-density residential and rural zones with agriculture, rural lifestyle blocks, some local businesses, light industry and a future suburban park (as indicated on the Drury-Ōpāheke Structure Plan). The current land use surrounding Ōpāheke Road is a combination of greenfield and rural landscape transitioning into a built-up urban residential area and connecting to the Papakura township. Figure 10-10 shows an aerial photo of the current rural land use environment along both roads.

Figure 10-10: Current land uses environment surrounding Ponga Road and Ōpāheke Road

10.2.1.1 Existing Transport Network

The existing road network can be summarised as follows:

- Ponga Road is a 2-lane primary collector, with a posted speed limit of 80kph providing east-west connectivity for the eastern part of the Ōpāheke area. It has no walking and cycling facilities to protect vulnerable users. The corridor has no public transport services or facilities.
- Ōpāheke Road (Rural Section) is a 2-lane primary collector, with a posted speed limit of 80kph providing east-west / north-south connection for the western part of the Ōpāheke area, from Sutton Road to Lorelei Place. It has no walking and cycling facilities to protect vulnerable users, and no public transport services or facilities.
- Ōpāheke Road (Urban Section) is a 2-lane primary collector, with a posted speed limit of 50kph providing north-south connection between Ōpāheke area and Papakura, from Lorelei Place to Great South Road. It currently has footpaths but no cycling facilities.
- All the intersections along Ponga Road from Jack Paterson Road to Lorelei Place on Ōpāheke Road (Rural section) are priority controlled (prioritising east-west movement) with no safe walking and cycling crossing facilities. The Ōpāheke Road (Urban section) is largely priority controlled, with a roundabout at Butterworth Rd and signalised intersection at Settlement Road.

- Local access roads to rural and urban neighbouring areas and consist of a number of direct property accesses and collector roads along the corridor.

Appendix 4 and Appendix 5 provides more detail on the key characteristics of the existing road network and intersections respectively.

10.2.1.2 Road Safety

Crash history has been obtained for Ponga Road and Ōpāheke Road from CAS to provide a high-level understanding of crash patterns and safety concerns of this section. The crash data has been extracted for a ten-year period from January 2010 to December 2019 (inclusive).

10.2.1.2.1 Crash History – Ponga Road

Figure 10-11 shows the indicative crash locations which occurred along the extent of works on Ponga Road between 2010 and 2019.

The crash history shows that there was a total of 10 crashes including 2 serious injury crashes recorded in the 10-year period (between 2010 to 2019). One serious injury crash involved a head on collision due to vehicles losing control while cutting a corner. The other serious crash involved a pedestrian crossing the road that was hit by a vehicle. The majority of the crashes involved lost control/ head on crashes at the bend. Refer to Appendix 3 for the details of those serious and minor injury crashes.

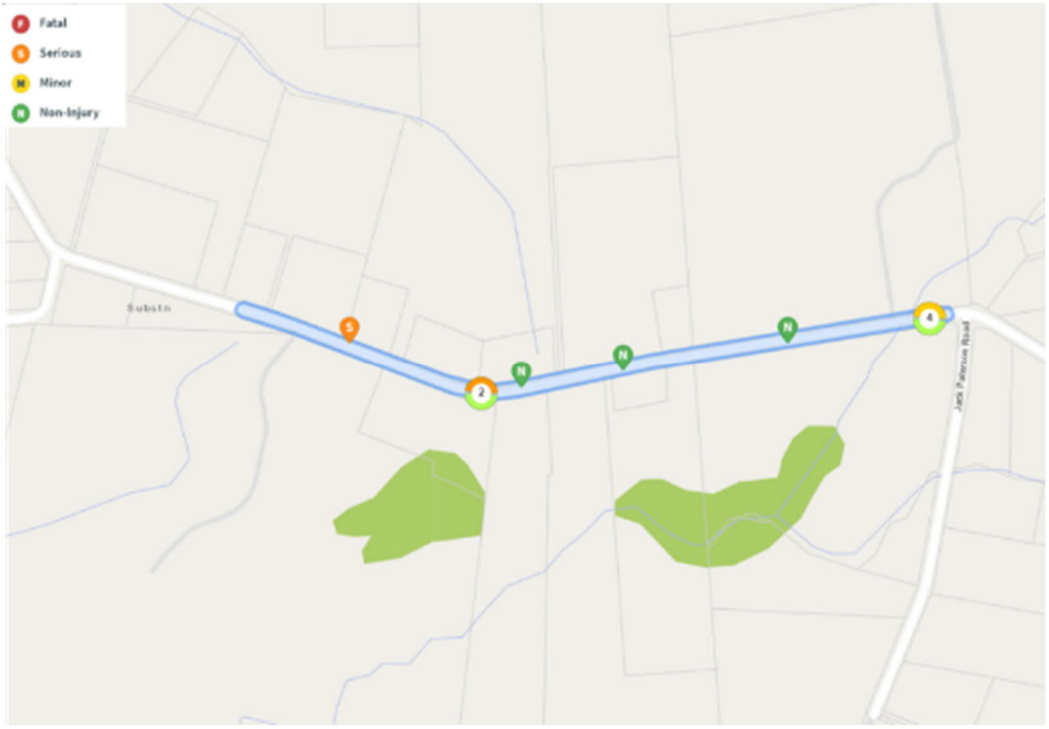


Figure 10-11: Location of Crashes along Ponga Road

These crash types indicate that existing Ponga Road has significant safety issues associated with the road alignment and speed. Whilst the traffic volume on Ponga Road is relatively low for a two-lane road, the high-speed and limited visibility (due to bends) can result in crashes. The likelihood of a

crash occurring may be low, but the severity can be significant, especially to vulnerable road users such as pedestrians and cyclists.

10.2.1.2.2 Crash history - Ōpāheke Road (Rural and Urban section)

Figure 10-12 shows the indicative crash locations which occurred along the extent of works on Ōpāheke Road between 2010 and 2019.

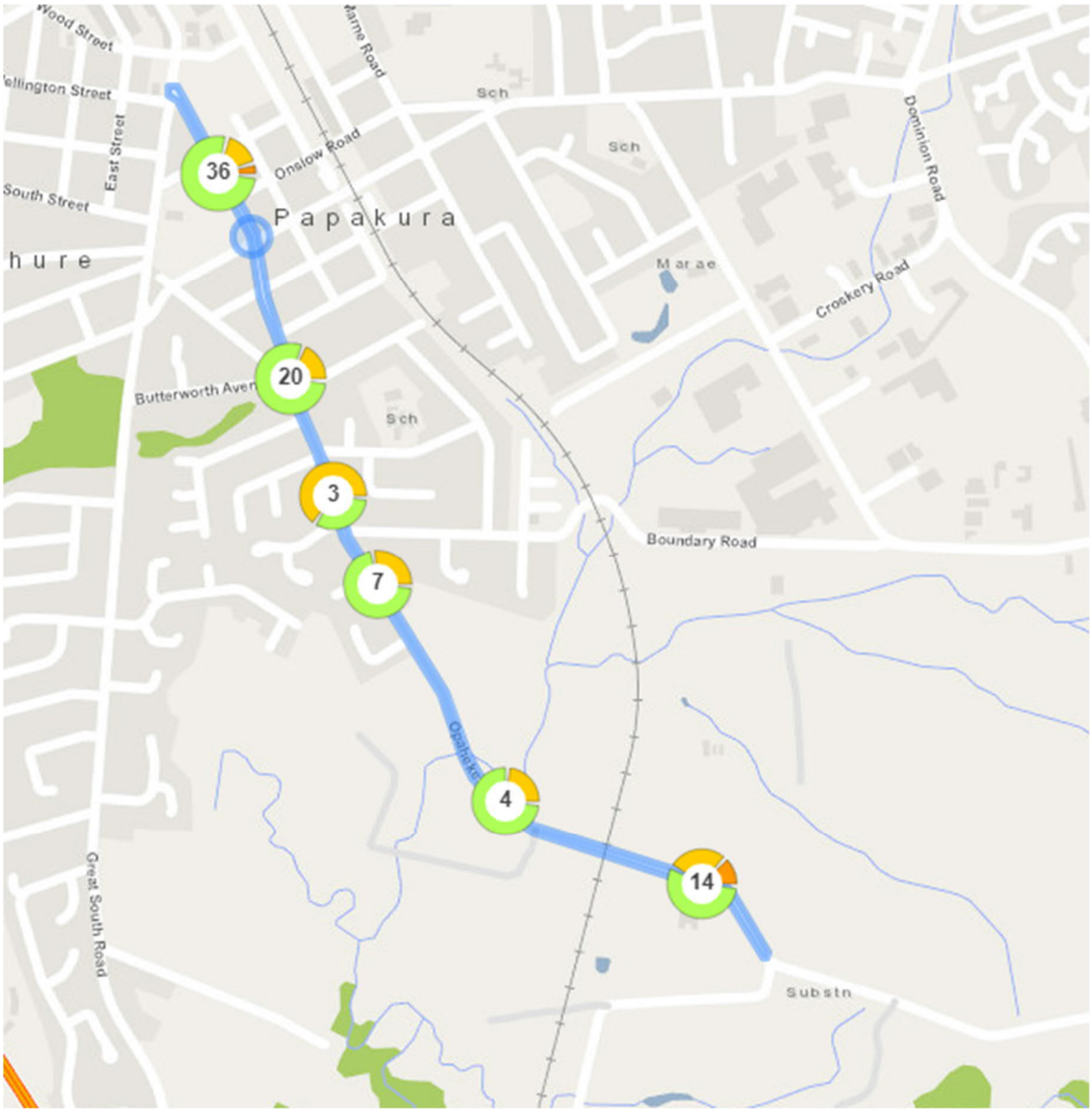


Figure 10-12: Location of Crashes along Ōpāheke Road

The crash history shows that there was a total of 84 crashes recorded in the 10-year period (between 2010 to 2019). These included four serious injury crashes, one of which involved a pedestrian crash. All the serious crashes were related to loss of control at the bend or crossing movements. The crash history indicates that 27 out of 84 crashes were due to crossing/ turning vehicles. Other crash types such as losing control on a bend and rear end obstruction contributed to around 25% each of the overall crashes on the Ōpāheke section, as shown in figure above.

Similar to Ponga Road, these crash types on Ōpāheke Road indicate that the existing road has some safety issues associated with the road alignment and speed. The high-speed environment in the southern section and limited visibility (due to bends) can result in crashes. The likelihood of a crash occurring may be low, but the severity can be significant, especially to vulnerable road users such as pedestrians and cyclists.

10.2.1.3 General Traffic

The existing traffic volumes on Ponga Road and Ōpāheke Road and other adjacent roads have been retrieved from Mobile Road[28] in April 2020. The volumes are either estimated or used actual data available from the State Highway New Zealand database and local council databases.

Table 10-1 summarises current road classification from the One Network Road Classification (ONRC) and the average daily traffic (ADT) with the percentage of heavy vehicles on each road. Where there is no actual traffic count available and the traffic volume is estimated (est). For Ōpāheke Road and Ponga Road the traffic volumes were extracted from the 2016 Saturn base model.

Table 10-1: Existing traffic volumes

Road Name	Road Classification	Date	5 Day ADT	% HCV
Ōpāheke Road	Primary Collector	2016	1600	15
Ponga Road	Primary Collector	2016	1600	9
Walker Road	Low Volume	June 2018 (est)	10	5
Sutton Road	Secondary Collector	June 2018 (est)	470	5

10.2.1.4 Walking and Cycling

The current northern extent of the Ōpāheke Road Urban section that is urbanised has footpath facilities on both sides of the road but no cycle facilities. For the remainder of the Ōpāheke Road Rural corridor and Ponga Road, the road environments are high speed with no walking or cycling facilities provided, resulting in high conflict and unsafe conditions between general traffic and vulnerable road users.

There are currently no crossing facilities provided at the intersection at Sutton Road and at Walker Road. The land use around these intersections suggest that the existing walking and cycling demand is low. However, even with low demand, there has already been one serious injury crash involving a pedestrian crossing road near Ponga-Sutton intersection. Any future growth surrounding this area will increase safety risk and exposure.

[28] Mobile Road: https://mobileroad.org/desktop.html

The current environment along Ōpāheke Road (rural section) and Ponga Road is therefore not suitable for walking and cycling, especially for the likely future urban environment. The Ōpāheke Road Urban section is not safe for cycling, for both the existing and likely future urban environment.

10.2.1.5 Public Transport

Based on the existing AT Public Transport Network, bus route 374 uses the northern extent of Ōpāheke Road, up to the intersection with Boundary Road. The existing roads and roadside facilities at the northern extent of Ōpāheke Road through the urbanised area have some spacing for public transport amenities.

However, the majority of existing roads and roadside facilities (bus stops, shelters and bays) within the extent of the Project are not likely to provide a quality provision for public transport along Ponga Road and Ōpāheke Road.

10.2.1.6 Access

The existing properties adjacent to Ponga Road and Ōpāheke Road Rural Upgrade section currently have access directly onto these roads. Given the current land uses of lifestyle blocks, the number of access points to these roads is low. Whilst the frequency of turning movements is low, the high-speed environment and the constraints along the existing alignment (such as horizontal bends) makes the crash severity high in the event of a crash. Any future growth in the area will increase safety risk and exposure, whilst also increasing the demand of access points.

10.2.1.7 Freight

The existing Ponga Road and Ōpāheke Road are not classified to have a high freight function based on the existing strategic freight network and the current Waka Kotahi over-dimension vehicle route and overweight route map.

10.2.2 Likely Future Environment (without Project)

This section describes the likely future environment without the Project and the subsequent section describes the effect of the Project on that likely future environment. Because the current environment is expected to change significantly (urbanise), the key focus of this assessment is the likely future environment.

10.2.2.1 Future Transport Network and Land Use

The wider Drury, Ōpāheke, Pukekohe and Paerata area in the south of Auckland have been signalled to undergo significant urban growth in the AUP and the Council approved the Structure Plan in 2019 and recently received private plan changes to zone these areas.

It is estimated to provide about 22,000 houses and about 12,000 jobs with a population growth of about 60,000 people. The Drury-Ōpāheke growth area is shown in Figure 10-13 below and also indicate where Ponga Road and Ōpāheke Road is relative to the growth areas.

The Ōpāheke Road Urban section is an established urban area. Land use includes mixed housing urban and suburban, terrace housing and apartment buildings and special purpose zone for body plots

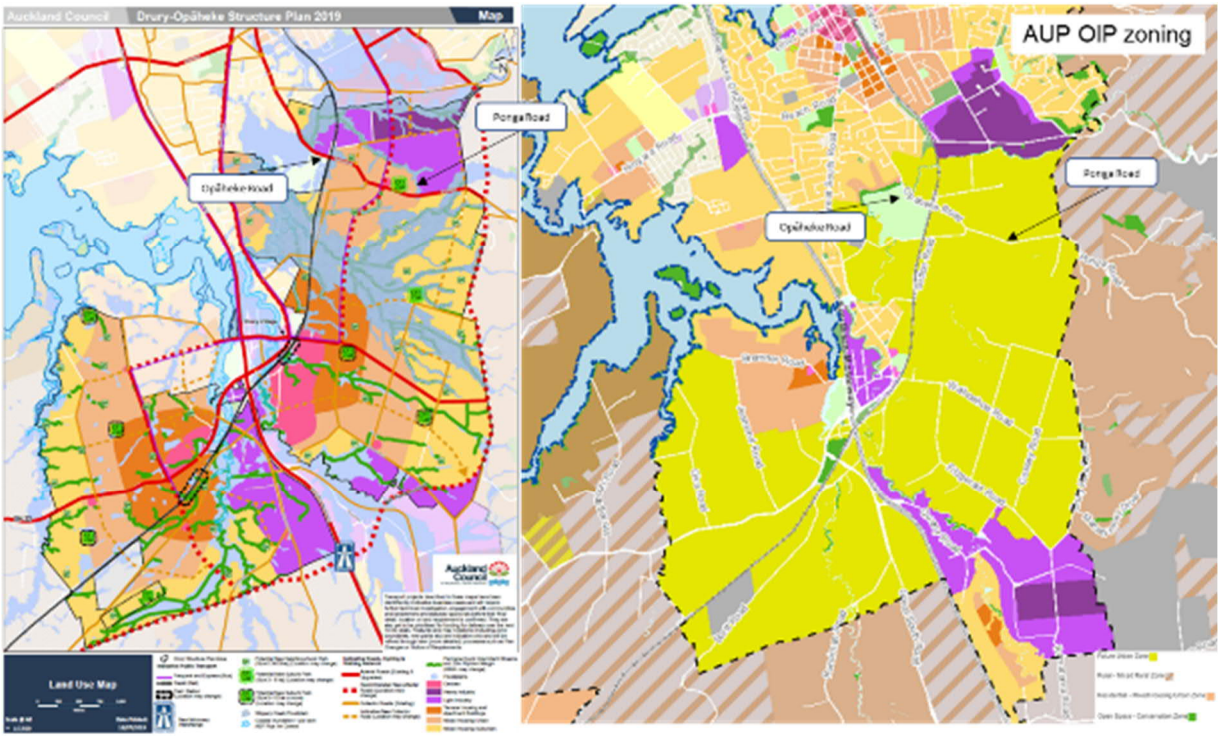


Figure 10-13: Future transport and Land Use adjacent to Ponga Road and Ōpāheke Road

The future transport projects surrounding NoR D5 and wider planned changes to the regional transport system are:

- New rail stations at Drury Central, Drury West, and associated park and ride facilities*
- New Mill Road Corridor - a strategic alternative route from Manukau to Drury in the long term, running parallel and to the east of State Highway 1 (SH1) *
- SH 1 Papakura-to-Bombay Upgrade providing more north-south regional capacity**
- Additional rail capacity between Pukekohe and Papakura (4 tracking, electrification and associated grade separations at road/rail crossings) **
- State Highway 22 Upgrade (NoR D1) ***
- Jesmond to Waihoehoe West FTN upgrade (NoR D2) ***
- Waihoehoe Road East Upgrade (NoR D3) ***
- Ōpāheke North-South FTN Arterial (NoR D4) ***
- The future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas get urbanised***

Note: funding approved*, funding partially approved** and subject to planning and funding approvals*** (as at the date of this report).

10.2.2.2 Road Safety

As identified above, the existing infrastructure on Ponga Road and Ōpāheke Road is not fit for purpose to support the planned future urban growth in the area. Significant adverse effects is expected if future growth progresses and existing transport infrastructure remains the same. The

adverse effects are increased safety risk for all users, hostile and unsafe environment for active modes, decreased reliability for general traffic and public transport and would lead to several undesirable transport and land use integration outcomes.

The undesirable outcomes are:

- The high-speed environment with higher traffic demand on Ponga Road and Ōpāheke Road Rural section for all road users will significantly increase the likelihood and severity of crashes which may lead to higher number of DSIs.
- The existing rural section do not have walking and cycling facilities to accommodate the future growth in active modes. The crash exposure for pedestrians and cyclists will significantly increase the likelihood and severity of crashes which may lead to higher number of DSIs.
- The lack of a separated median will likely increase the crash exposure for head on type crashes as a result of the increase in traffic.
- The existing unsafe at-grade rail crossing on Ōpāheke Road will significantly increase the likelihood and severity of crashes which may lead to higher number of DSIs as area urbanises and rail frequencies increase.
- The existing Ōpāheke Urban section do not have cycling facilities to accommodate the future growth in active modes. The crash risk for cyclists will increase and may lead to higher number of DSIs.

Although the speed limit could be reduced as a safety measure, the lack of adequate walking and cycling facilities along Ponga Road and Ōpāheke Road is not suitable to safely accommodate the future growth. Additionally, without urban road features typically expected with lower-speed roads (such as kerbs, footpaths, formed berms, planting etc), it could be hard to achieve compliance with a lower speed limit.

10.2.2.3 General Traffic

The existing Ponga Road and Ōpāheke Road are two-lane rural roads. As the area urbanises, the future traffic volume on these roads and the adjacent roads will increase. In addition, the future Mill Road corridor (new connection from Manukau to Drury South) is expected to be completed in 2028, which will connect to Ponga Road.

Therefore, Ponga Road will be the east-west link connection between the future Ōpāheke North-South FTN Arterial and the future Mill Road corridor. Ōpāheke Road will serve as the connection between the Ōpāheke North-South FTN Arterial and Papakura township. Ponga Road and Ōpāheke Road will likely experience not just local traffic, but also through traffic movements from the Ōpāheke area and Papakura.

Table 10-2 provides a summary of the expected traffic volumes on Ponga Road and Ōpāheke Road.

Table 10-2: Existing and Likely Future Daily Traffic Volumes

Road Name	2016 (ADT)	2048+ (ADT)
Ponga Road	1,600	5,400
Ōpāheke Road	1,600	6,000

As shown in Table 10-2 above, the traffic volumes on Ponga Road and Ōpāheke Road will increase significantly due to changes to the future land uses. Based on the predicted growth in traffic, a two-lane road should have enough through capacity to accommodate future growth. However, accessing the corridor from side roads will become more difficult and unsafe without controlled intersections and features that reinforce a lower speed environment.

If future growth progresses and existing transport infrastructure remains the same, the increase in traffic will likely increase the crash exposure for head-on type crashes as a result of not having separated median.

10.2.2.4 Walking and Cycling

As discussed above, Ponga Road will provide an east-west link connecting two strategic routes (the Ōpāheke North-South FTN Arterial and Mill Road) and Ōpāheke Road provides the continuous connection to the Papakura centre and Papakura train station. It is anticipated that this route will form part of the primary walking and cycling route connecting the Ōpāheke area to Papakura. The wider planned network connectivity is shown in Figure 10-14.

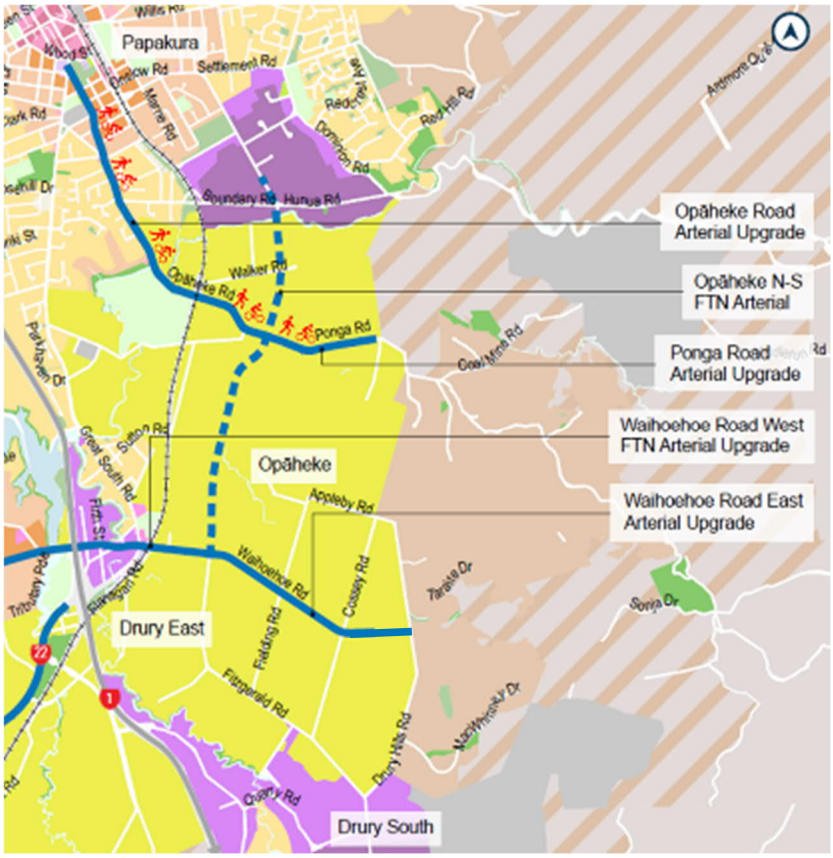


Figure 10-14: Proposed transport network surrounding Ponga Road and Ōpāheke Road

There are currently no walking and cycling facilities on Ponga Road and Ōpāheke Road (rural section) and there are no cycling facilities on Ōpāheke Road (urban section).

The future urbanisation adjacent to these roads it will increase demand for walking and cycling. The following undesired outcomes will occur if the area is urbanised and the existing infrastructure remains the same:

- The safety-related issues and crash exposure for vulnerable road users will increase significantly as demand from both normal traffic and active modes increases. This will significantly increase the likelihood and severity of crashes for vulnerable road users.
- Poor integration with the proposed wider walking and cycling network, particularly the Ōpāheke North-South FTN Arterial, the future Mill Road and the wider planned collector network.
- Accessibility to social amenities and employment by active modes will be compromised, especially for immediately adjacent land uses.
- Ability to contribute to mode shift will be compromised. This will strengthen the reliance on low-occupancy vehicle use which can result in more traffic on road and increases in emissions that lead to adverse environmental and health effects.

10.2.2.5 Public Transport

It is expected that there will be significant upgrades to infrastructure in the Drury-Ōpāheke area, especially with public transport facilities such as new bus routes and the FTN. These facilities will

connect Ōpāheke both inter-regionally to the Auckland City Centre and Isthmus, and to local town centres in the south. The future projects for public transport in the surrounding area are:

- FTN bus routes along Waihoehoe Road West and the Ōpāheke North-South FTN Arterial. Both Ponga Road and Ōpāheke Road connect to the Ōpāheke North-South FTN Arterial.
- Two new rail stations at Drury, which are included in the NZUP with construction planned to start in 2023 and be completed in late 2024. NZUP also includes park and ride facilities, as well as a bus and rail interchange at Drury.

In addition, Ponga Road and Ōpāheke Road also have several new bus services proposed by AT.

The future public transport network for the area surrounding Ponga Road and Ōpāheke Road is shown below in Figure 10-15.

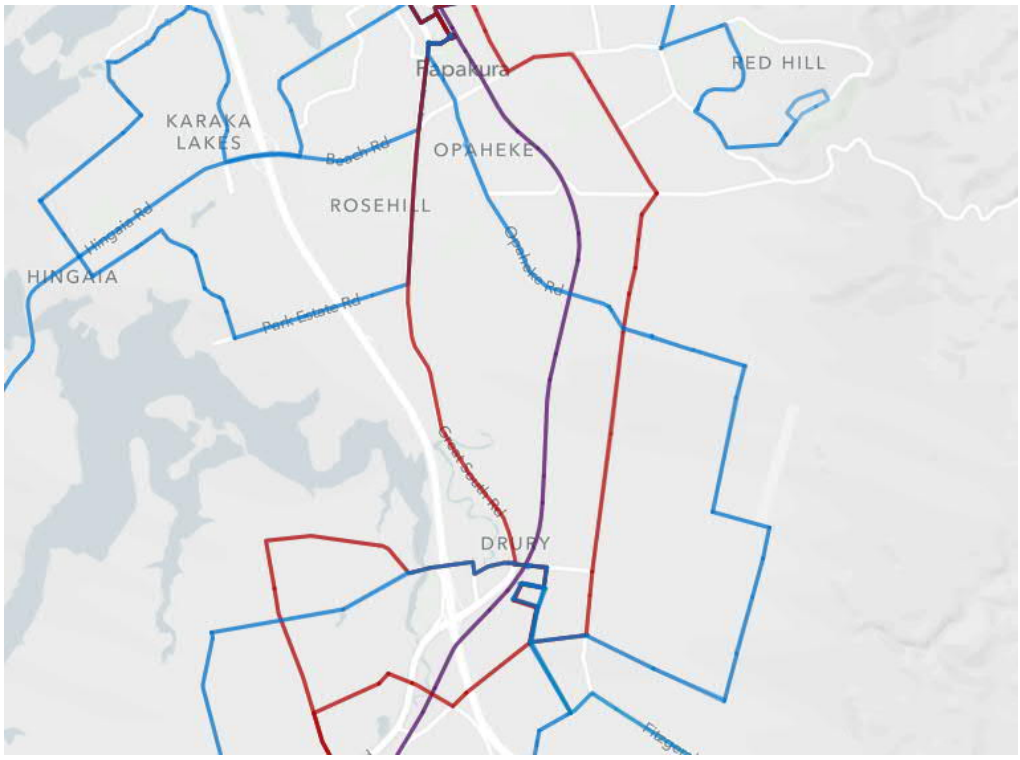


Figure 10-15: Future public transport network surrounding Ponga Road and Ōpāheke Road

The following outcomes associated with public transport will occur if existing infrastructure remains the same:

- The existing road does not have indented bus bays to remove bus vehicles from the general flow of traffic. Stopping buses will create a stop-go effect for general traffic
- Poor integration with the wider public transport network in Drury.

10.2.2.6 Access

The access arrangements on Ōpāheke Road (urban section) will remain largely unchanged in the likely future environment.

The area surrounding Ponga Road and Ōpāheke Road (rural section) is to be urbanised in the future which suggests more demand for access points along these roads. The following undesired outcomes will occur if urbanisation commences without upgrading the existing roads:

- The existing high-speed environment and more turning movements make the crash exposure for right turning movements high and severity can be significant. The planned future growth along these routes will increase the conflicts between vehicles accessing driveways, general traffic, pedestrians and cyclists
- Higher demand of turning in and out from driveways will likely impact the operational efficiency and reliability of through traffic.

10.3 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

This section describes the effects of the Project on the likely future transport and urban environment, including planned growth (movement and place patterns). It firstly assesses operational effects separately after the project is implemented then the assessment of transport effects during construction. The assessment is undertaken for each mode/element of the transport system. Measures to avoid, remedy or mitigate actual or potential adverse effects are also identified.

10.3.1 Assessment of Operational Effects

This section will assess how each element of the transport system will function operationally after construction of the Project, and therefore the effect it will have on the existing and likely future environment.

10.3.1.1 Road Safety

The design of the proposed Ponga Road and Ōpāheke Road upgrade has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrades of Ponga Road and Ōpāheke Road are expected to result in positive effects on safety including:

- separated and protected walking and cycling facilities on Ponga Road and Ōpāheke Road which will significantly improve the safety for existing and future vulnerable road users.
- reduced speed environment reduced from 80kph to the more appropriate speed of 50kph which will significantly improve safety for all users in rural sections
- appropriate vehicle lane widths and delineations to enhance the urban-type road environment which will improve safety in rural sections
- a centre median (flush or raised) that separate the two directions of traffic which will significantly prevent head-on crashes in rural sections.
- realignment of a section of Ōpāheke Road and grade separation of the North Island Main Trunk (NIMT) with Ōpāheke Road which will eliminate any crash risk between road users and existing and future rail services.

It is anticipated that the number of pedestrians and cyclists will increase significantly when the area is fully urbanised. The traffic volume will also increase as the result of future growth and completion of the proposed Mill Road corridor. Thus, the exposure between motorists and vulnerable road users will

likely be higher than the existing road environment. However, with segregated walking and cycling facilities and a lower speed limit, this will likely reduce the likelihood and severity of a crash.

Overall, the proposed design of Ponga Road and Ōpāheke Road Upgrade is well aligned with the transport safety principles from AT and Waka Kotahi. It will provide a much safer transport system which will likely reduce the number of DSIs and result in positive effects on all road users.

10.3.1.2 General Traffic

Ponga Road and Ōpāheke Road (rural sections) are not yet well connected with the existing network and but will be well connected with the planned network. It will serve as the east-west connection between two strategic routes (the Ōpāheke North-South FTN Arterial and proposed Mill Road corridor). The planned network surrounding Ponga Road and Ōpāheke Road is shown in Figure 10-16.

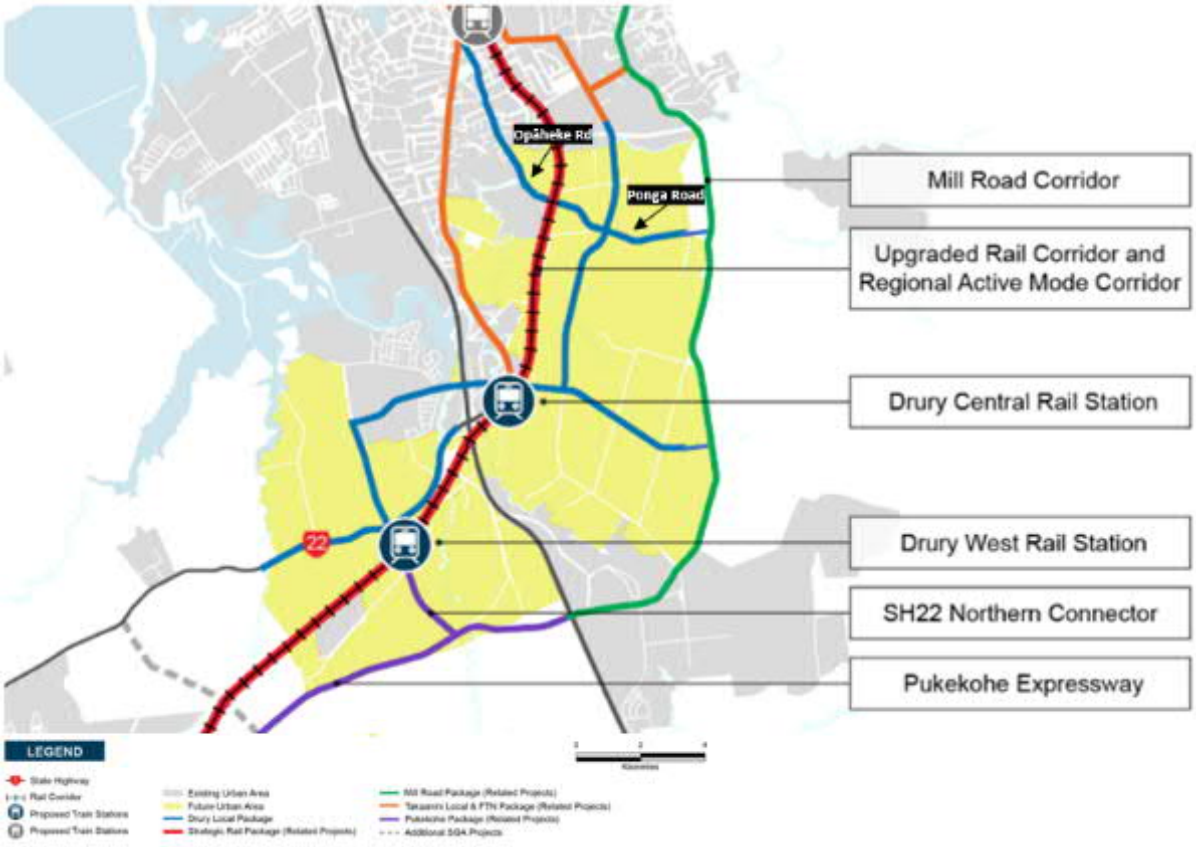


Figure 10-16: Future network connections

The Ponga Road upgrade consists of widening the existing alignment between the proposed Ōpāheke N-S FTN Arterial in the west (NoR D4), to near Jack Paterson Road east, which will tie into the future Mill Road corridor.

The Ōpāheke Road upgrade (rural section) consists of widening the existing alignment between the proposed Ōpāheke N-S FTN Arterial in the southeast (NoR D4), to the extent of the FUZ near Lorelei Place in the northwest. The upgrade also includes a minor realignment of a section of Ōpāheke Road

and grade separation of the NIMT with Ōpāheke Road to eliminate any crash risk between road users and existing and future rail services.

The Ōpāheke Road Urban Upgrade section of include the regrading of nine driveways along Ōpāheke Road and the upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout.

Other connections to these two proposed urban arterial roads will be made via the collector network as specified in the Drury-Ōpāheke Structure Plan.

Based on SATURN modelling, the average ADT for Ponga Road and Ōpāheke Road in 2016 and 2048+, are summarised in Table 10-3.

Table 10-3: ADT average summary for Ponga Road and Ōpāheke Road

Road	Average 2016 ADT	Average ADT 2048+ (with Project)
Ponga Road	1,600	5,400
Ōpāheke Road	1,600	6,000

As shown, there is an increase in traffic volumes from 2016 to 2048+. As the surrounding area is urbanised over time, the function of Ponga Road and Ōpāheke Road rural sections transitions from rural roads to urban arterials. Two lanes for general traffic are considered to be adequate based on the general traffic forecasts for the area for Ponga Road and Ōpāheke Road (urban and rural section)

The assessment of intersection performance for the Ponga Road/ Ōpāheke N-S FTN Arterial has been included in NoR D4. In addition to the operational effects of general traffic lanes, intersections along the route have also been analysed. Table 10-4 provides a summary of the proposed intersections along NoR D5.

Table 10-4: Intersection summary for the Ōpāheke North-South FTN Arterial (NoR D4)

Intersection	Current Form	Proposed Form	Key Outcomes
Walker Road/Ōpāheke Road	Priority Controlled	Priority Controlled	New road connection to Walker Road (and closure of a section of the existing Ōpāheke Road – replaced by the new NIMT bridge)
Ōpāheke Road/ Bellfield Estate	N/A	Roundabout	Single-lane Roundabout with protected walking and cycling facilities
Ōpāheke Road / Settlement Road	Signal	Roundabout	Single-lane Roundabout with protected walking and cycling facilities

The performance of the intersections, based on a 2048+ scenario[29], have been assessed using SIDRA Intersection Software with inputs from the SATURN models. A summary of these key performance measures is shown below in Table 10-5.

Table 10-5: Summary of intersection performance 2048+ (with Project)

Intersection	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)
Walker Road/Ōpāheke Road	Morning Peak	A	0.418	7
	Evening Peak	A	0.316	5
Ōpāheke Road / Settlement Road	Morning Peak	A	0.448	9
	Evening Peak	A	0.745	29

Overall, the proposed intersections are predicted to perform well with ample capacity for all peak periods

The assessment of mid-block performance of Ponga Road and Ōpāheke Road has been included for context and reported as a Volume over Capacity (VoC) ratio to provide an understanding of the cross-sectional constraints. For reference, a VoC ratio above 75% produces significant mid-block journey time delays.

The results of VoC performance shown in Table 10-6 suggest that the traffic increase will have a relatively minor effect on the mid-block performance. Therefore, the predicted future demand is still expected to operate satisfactorily, with relatively low mid-block congestion during all peak periods under a 2048+ scenario.

Table 10-6:Summary of mid-block performance 2048+

Mid-block section	Direction of traffic	VoC Ratio Existing	VoC Ratio 2048+ Future
Ponga Road between new Ōpāheke N-S FTN Arterial and Jack Paterson Road	Eastbound (AM Peak)	3%	8%
	Westbound (AM Peak)	6%	28%
	Eastbound (PM Peak)	7%	14%
	Westbound (PM Peak)	4%	5%
Ōpāheke Road between Lorelei Place	Eastbound (AM Peak)	9%	15%
	Westbound (AM Peak)	17%	49%

[29] 2048+ with Drury scenario is also viewed as the reference case for assessment purposes

Mid-block section	Direction of traffic	VoC Ratio Existing	VoC Ratio 2048+ Future
and Ōpāheke N-S FTN Arterial	Eastbound (PM Peak)	27%	17%
	Westbound (PM Peak)	12%	13%

The overall operational effects of the Project on general traffic can be summarised as follows:

- the grade separation of the NIMT with Ōpāheke Road will eliminate any crash risk and general traffic delay between road users and any existing and future rail services.
- the Project does not provide additional corridor capacity for general traffic, therefore the operational effect on general traffic is insignificant at corridor level.
- the centre median (flush or raised) that will separate the two directions of traffic will significantly prevent head-on crashes, resulting in positive effects for all general traffic users.

10.3.1.3 Walking and Cycling

The Project proposes to reduce the speed to 50km/h, repurpose Ponga Road and Ōpāheke Road (rural section) to an urban arterial and provide segregated walking and cycling facilities on both sides of the road to support growth, enable sustainable travel choice and combat expected safety concerns.

An assessment of the proposed walking and cycling facilities against relevant AT standards and policies is summarised in Table 10-7.

Table 10-7: NoR D5 AT standards and Policy assessment for walking and cycling facilities

Policy/Standard	Network Component	Assessment
Auckland Transport Vision Zero[30]	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 proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on NoR D5 are proposed to be 50km/hr, therefore the proposed design of the walking and cycling facilities is considered to be appropriate for these standards.
Auckland Transport	**Footpaths:** 1.8m minimum	A 1.8m footpath is proposed on all corridors and a 2.0m cycle path with a 2.3m berm. The total width of 6.8m is proposed from carriageway to road boundary. This is in accordance with the AT TDM requirements
	Cycle Paths: 2.0m minimum	

[30] Auckland Transport: Vision Zero: https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

Policy/Standard	Network Component	Assessment
Design Manual[31]		

Walking and cycling are a key component of the future environment surrounding Ponga Road and Ōpāheke Road. There are several key attractors which indicate walking and cycling will significantly increase as growth progresses in Drury and Ōpāheke. These include:

- The proposed future land use zoning in this area allows for medium density residential and is on the outskirts of the Papakura industrial area. This density implies a mixture of modal movements ranging from local to strategic.
- Ponga Road and Ōpāheke Road connects to the new Ōpāheke North-South FTN Arterial which is a proposed new four-lane FTN arterial between Hunua Road in the north and Waihoehoe Road
- Ponga Road connects to the proposed Mill Road corridor, which will provide access to a longer inter-regional route.
- Ōpāheke Road provides access to the Papakura township and Papakura rail station.

The predicted 2048+ usage of the walking and cycling facilities along this corridor as shown in Table 10-8 which provides context about the likely future demand that will benefit from these facilities. These numbers are based on average daily flows along sections of the route, extracted from the SAMM and Station Access Tool**.**

Table 10-8: Daily walking and cycling predicted movements (2048+)

Area	Direction	Walking (Daily Flows)	Cycling (Daily Flows)
Ponga Road	Eastbound and Westbound	2150	400
Ōpāheke Road	Eastbound and Westbound	1000	200

Exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided by vision zero guidance. For single-lane roundabouts, the proposed treatments are raised table crossings with zebra, paired cycling crossing facilities. For dual roundabouts, signalised active mode crossing facilities are proposed.

The operational effects of the Project on walking and cycling are:

- enables safe movement for vulnerable road users along and across Ponga Road and Ōpāheke Road and significantly reduce the likelihood and exposure to potential crashes
- provides good integration with future walking and cycling network, especially between the future Mill Road and Papakura township

[31] Auckland Transport – Transport Design Manual: https://at.govt.nz/about-us/manuals-guidelines/roads-and-streets-framework-and-the-transport-design-manual/

- the higher number of active mode trips reduces the reliance on vehicle trips, which results in positive environmental and health benefits
- provides good integration with proposed walking and cycling facilities on Ōpāheke North - South and serves as a key enabler to achieve mode shift targets.
- combats existing and likely future safety and severance issues
- supports growth of the surrounding areas and improve access to employment and social amenities.
- the grade separation of the NIMT with Ōpāheke Road will eliminate any crash risk and general traffic delay between road users and any existing and future rail services.

10.3.1.4 Public Transport

For future public transport services, there are two new bus routes[32] that will use NoR D5:

- A section of the service #374 Ōpāheke East, with a 10-minute frequency in peak. This is applicable to both Ponga Road and Ōpāheke Road

The bus routes will operate alongside general traffic along the two lanes planned for both alignments. Some of these bus routes will interlink with FTN services on the Ōpāheke North-South FTN Arterial (NoR D4).

The cross-section will provide adequate spacing to facilitate public transport. The exact location of bus stops will be defined at later stages, 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 public transport services will share facilities with general traffic. Based on the predicted general traffic volumes in 2048+, the results suggest that these services will be operationally efficient and public transport services will experience minimal delay.

The operational effects of the Project on public transport are:

- Improves integration with the future public transport network connecting Drury and Papakura, resulting in improved east-west connection between Mill Road and Papakura township and the Papakura train station
- Reduces the reliance on low-occupancy vehicle uses. This can result in positive environmental and health benefits
- Improve transport mode choice to the future urban areas.

10.3.1.5 Access

Based on the average ADT of 5,400 vehicles per day on Ponga Road and 6,000 vehicles per day on Ōpāheke Road (based on the 2048+ scenario) and the walking and cycling demand, direct property access is not recommended on to the network given the negative safety implications. The increased number of conflict points will undermine Vision Zero as vehicles using driveways will conflict with

[32] Based on the AT SGA Remix File – frequencies and routes subject to change

other modes, in addition to driver safety and active modes being compromised by merging on to the road.

As the area develops the existing properties accesses will be re-routed on to the collector road network as indicated in the Drury-Ōpāheke Structure Plan, where appropriate.

The indicative collector network is subject to change as developers progress these connections through the plan change processes. Some properties will face a minor diversion impact on the main network given that limited direct access will be permitted.

If limited direct property access is provided, the effects of the Project are:

- Decrease the conflicts between access/driveway to general traffic and active modes
- Minimise the impact to operation of through traffic which will likely result in more reliable journey time

As the proposed Ōpāheke Road bridge over the NIMT (grade separation of the existing level crossing) and proposed upgrade to Ōpāheke Road is realigned to the north of the existing Ōpāheke Road (see Figure 10-17), some existing property access will have a deviation to access the upgraded Ōpāheke Road. For the properties on the existing Ōpāheke Road this entails a small detour underneath the new NIMT bridge and onto a new link between Walker Road the upgraded Ōpāheke Road. For the properties to the north on Walker Road, the access on to Ōpāheke Road will also be via the new link. While there is a slight detour, mostly for those properties on the existing Ōpāheke Road, this will be safer access with the direct at-grade rail-road connection closed to improve safety. Overall the realignment significantly improves safety for all users and minimises conflict between vehicles and active transport (east-west) and the rail corridor (north-south).

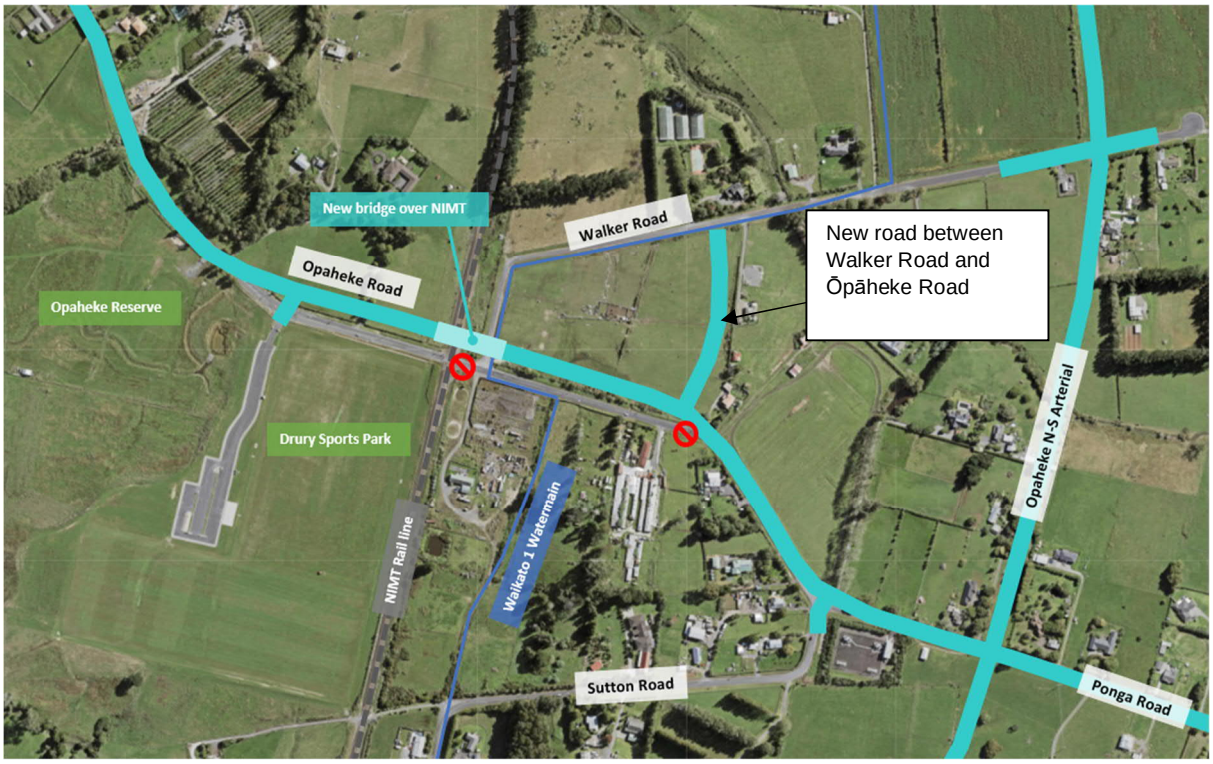


Figure 10-17. New link between Walker Road and Ōpāheke Road (Aerial imagery source: Auckland Council GeoMaps)

10.3.1.6 Freight

The existing Ōpāheke Road and Ponga Road is not classified to have a high freight function and is not expected to change in future. The designation footprint will be able to accommodate freight movements along the mid-block and through the intersections. The details are expected to be further developed in subsequent project phases.

10.3.2 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The Project provides significant positive effects and there are no operational adverse effects to mitigate.

10.3.3 Assessment of Construction Effects

This section describes the assessment of potential transport effects during construction of the Project. For the purpose of this assessment, the assessment of effects has been split into the two sections of the NoR, being the Ponga Road section and the Ōpāheke Road section (including both the Rural and Urban).

10.3.3.1 Assessment of Construction Effects – Ponga Road

The Ponga Road Upgrade will consist of road widening on the existing Ponga Road between the future Ōpāheke N- S FTN Arterial (NoR D4) to near Jack Paterson Road in the east, to be tied-in with the future Mill Road corridor. It will also include extensions of two existing culverts and two proposed stormwater wetlands.

The location of works and the construction activities proposed define the traffic management measures required. The works proposed are a mix of earthworks, utility relocation, pavement construction and drainage. Most of these works will be constructed on the existing alignment of Ponga Road and will be directly adjacent to the live traffic, so temporary traffic management measures will be required. Figure 10-18 shows the indicative extent of works.

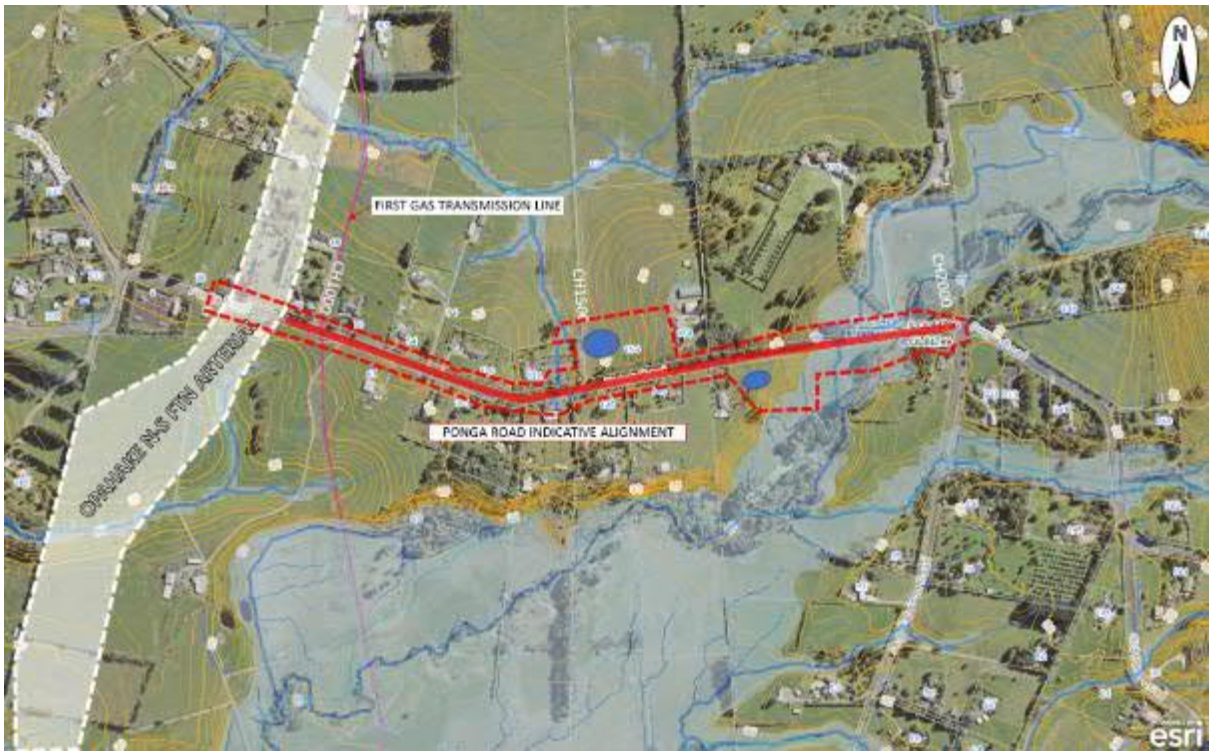


Figure 10-18: Extent of works - Ponga Road upgrade

The Ponga Road Upgrade project is estimated to take 1 to 1.5 years to complete:

- Enabling works: 3 months to 4 months
- Earthworks and Drainages: 6 months to 8 months
- Pavement and finishing works: 3 months to 6 months.

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for construction. The indicative construction method has been developed based on a concept design with consideration of using the most practical construction techniques and equipment. There are likely alternative methods in the future that could be used to complete the works, however, this document only intends to capture the traffic impacts based on the indicative construction method.

10.3.3.2 Temporary traffic management

It is anticipated that the larger part of works required for the Project will likely be adjacent to or on 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 zone, is largely dependent on the various stages of work and requirements of the construction activities.

It is expected that short term temporary road closure for nights or weekends may be required for some specific activities, such as road surfacing and traffic switches. The effect of temporary traffic management existing traffic on Ponga Road and the adjacent road network should be assessed in the future as part of the CTMP for the Ponga Road Upgrade on the basis of the current traffic environment.

It is considered that the temporary effects from the construction activities on Ponga Road can be adequately managed through the implementation of a CTMP during the construction phase of the Project. The purpose of the CTMP is to ensure the construction of the Ponga Road upgrade 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 residential properties and local activities.

If required, SSTMP should be developed to manage constraints on access to affected properties.

10.3.3.2.1 Expected construction traffic routes

The construction of the Project will require some earthworks. The estimated volumes of cut and fill are approximately 13,000m^3 based on the current indicative design. 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 the Project

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

- The routes that will be used by construction vehicles will depend on the locations of quarries and dump sites which are not yet certain.
- The exact location and extent of compound sites/lay down areas has yet to be determined.
- The timing of construction of other projects could impact on likely construction vehicle routes, especially the Ōpāheke North-South FTN Arterial (NoR D4), the Ōpāheke Road Upgrade (part of NoR D5), and the proposed Mill Road corridor.

It is anticipated that if the Ponga Road Upgrade is constructed prior to the completion of Ōpāheke North-South FTN Arterial and/or Mill Road, the most feasible construction route will be Beach Road – Ōpāheke Road. However, there will be some potential constraints to this route:

- The land use on Ōpāheke Road (just north of Boundary Road) is predominantly urban residential use, including Ōpāheke Primary School. Heavy truck movement will likely interrupt local residents and raise safety, noise and vibration concerns.
- There are a number of signalised intersections on Beach Road from the SH1 interchange to Ōpāheke Road, and the operation of these intersections might be impacted including vehicle tracking, right turn movements and delays caused by heavy vehicles.

It is noted that the access to compound sites/laydown areas and construction zone for construction vehicles, plant and materials will be via site access points on Ponga Road 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 Ōpāheke N-S FTN Arterial and/or Mill Road can be used for construction traffic if they are completed prior to the construction of Ponga Road Upgrade project. These routes will provide resilient alternatives in terms of construction routes.

The potential construction traffic routes are shown below in Figure 10-19

Figure 10-19: Potential construction routes for Ponga Road upgrade project

10.3.3.2.2 Expected construction traffic generation

The construction of the Ponga Road upgrade project will require some earthworks. The indicative programme for the construction period suggests the overall duration of work will be approximately 12 months to 18 months which includes three stages of construction works. The estimated construction movements include approximately 9,800 total trips from heavy trucks staged over 12 months to 18 months. In addition, there will be approximately 100 light vehicle movements daily from staff and contractors during the peak construction period.

To estimate the daily number of truck movements to and from the site, the following working assumption were adopted:

- Working days: 20 days construction per month
- Hours of delivering earthworks and other materials: a total of 8 hours a day. It is noted that truck movements should avoid the peak hours of traffic or alternatively specified times agreed with respective RCA.

- The duration of construction: 12 months for all 3 stages of construction works. For the assessment of construction effects, a shorter construction period of 12 months has been adopted in the assumptions, given that this will generate more trips.

The estimated daily number of construction vehicles has been calculated and summarised below in Table 10-9.

Table 10-9: Expected daily traffic movements from construction works – Ponga Road

Stages	Expected duration (approx.)	Truck movements (daily)	Light movements (daily)	Total movements (daily)	Typical vehicle movements
Stage 1: Enabling works	3 months	15 to 20	50 to 70	65 to 90	• Truck movements are likely to include low loaders for plant delivery and collection, articulated trucks/truck and trailer units/concrete units, concrete trucks. • Light vehicle movements are likely from construction staff and contractors.
Stage 2: Earthwork and Drainage	6 months	40 to 150	70 to 100	110 to 250	
Stage 3: Pavement construction	3 months	15 to 20	50 to 70	75 to 90	

In order to assess the full extent of effects from this expected construction traffic, the traffic environment at the time of construction needs to be understood. For construction of the Ponga Road Upgrade, analysing the impact of the surrounding network should be included as part of the CTMP for this project.

The current traffic volume on Ponga Road is estimated to have <2,000 vehicles per day, which is relatively low for a two-lane road. This means that the capacity of the current Ponga Road may have ample capacity to accommodate the construction traffic and it is unlikely to cause any notable impact to the existing traffic environment on Ponga Road.

The future traffic volume is significantly more than the existing volume on Ponga Road. Depending on the staging of the Ponga Road Upgrade project, an updated assessment of construction traffic shall be required prior to the time of construction, which can be used to inform the traffic management measures in the CTMP.

10.3.3.2.3 Road safety assessment during construction period

Speed Limit

Ponga Road is a high-speed rural road with a current speed limit of 80km/h. This permanent speed and the horizontal alignment will likely to cause some potential safety concerns given the longer deceleration distance required by construction trucks entering the sites. A crash between construction vehicles and normal traffic can occur when the travelling speed of vehicles suddenly changes due to construction vehicles accessing the SAPs. Given the low number of construction movements in/out of construction zones and the existing traffic volume on Ponga Road is low, the likelihood of crashes occurring due to speed is low.

However, it is recommended to implement a safe and appropriate temporary speed limit on Ponga Road 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. This recommended measure and other measures highlighted in the CTMP are expected to reduce the potential safety risk that may associated with construction traffic.

Pedestrians and Cyclists

The existing roadside facilities on Ponga Road are not user-friendly for pedestrians and cyclists given the side drains and lack of shoulders on both sides of the road. The analysis of the crash history data showed there was one serious crash involving a pedestrian in the past ten-year analysis period (2010-2019). Whilst the existing land use does suggest that the pedestrian and cyclist demand is very low, the severity of crashes that occur could be significant as there are no segregated facilities provided.

It is likely that the demand to use pedestrian and cyclist facilities will increase if urbanisation occurred prior to construction of the Project, although if this occurred, future parallel collectors could be use as alternative routes. In light of this, construction effects on pedestrians and cyclists should be assessed again prior to construction, when a greater level of detail is available about surrounding facilities and land use activities.

It is also recommended that the residents and stakeholders (such as Bike Auckland and cycling clubs) be kept informed of construction times and progress and general observations of pedestrian and cyclist activity will be used to inform appropriate traffic management measures in the CTMP.

Property access for Ponga Road residents and businesses

During construction, there will be temporary traffic management controls such as temporary concrete or steel barriers. Existing driveways that remain during construction will be required to have temporary access provision. It is anticipated that the contractor should undertake a detailed assessment of any affected driveways and will provide temporary access if required. The temporary access will ensure the ability for residents to safely access and exit the property. These requirements should be captured in the CTMP or SSCTMP, if required.

10.3.3.3 Assessment of Construction Effects – Ōpāheke Road (rural and urban)

The Ōpāheke Road Upgrade includes the rural section which is the existing Ōpāheke Road between the future Ōpāheke N-S FTN Arterial intersection to near Lorelei Place in the northwest, and the urban section which is from Ōpāheke Road rural section to Great South Road.

The rural section upgrade will include the widening of Ōpāheke Road with some sections are realigned and a grade separation bridge over the NIMT rail line.–It will also include two proposed parallel active mode bridges adjacent to the existing bridge over Slippery Creek, a new intersection connecting to Walker Road, a new roundabout at Bellfield urban development area, and two proposed stormwater wetlands. It is noted that the intersection with the future Ōpāheke N-S FTN Arterial is included within NoR D4 which is not part of this transport assessment report.

The urban section upgrade will include the construction of new footpath and cycle path on both sides of the existing Ōpāheke Road from the rural section upgrade to Great South Road. However, only the land required for the upgrade that outside of the existing road reserve is proposed to be designated. Therefore, the construction assessment only applies to those areas being designated. This includes a new roundabout at Settlement Road / Ōpāheke Road intersection and nine driveways/accesses that need regrading to provide for the upgraded walking and cycling facilities.

The location of works and the construction activities define the requirement of traffic management. The works are a mix of earthworks, utility relocation, pavement and footpath/cycle path construction and drainage. Most of these works will be constructed on the existing alignment of Ōpāheke Road and directly adjacent to the live traffic. The bridge construction will, however, being constructed off-road just north of the existing alignment. Temporary traffic management measures will therefore be required. Figure 10-20 shows the indicative extent of works.

Figure 10-20: Extent of works - Ōpāheke Road Upgrade (rural and urban)

The Ōpāheke Road Upgrade is estimated to take 2 to 2.5 years to complete:

- Enabling works: 3 months
- Eastbound carriageway widening: 9 months to 12 months
- Westbound carriageway widening: 9 months to 12 months
- Pavement and finishing works: 3 months to 4 months
- New bridge over NIMT rail line: 15 months to 18 months. This will likely to happen at the same period of widening and will be constructed off-road.
- Active mode bridges will be constructed at the same time with widening works.

The Ōpāheke Road Upgrade – urban section is estimated to take 1 to 1.5 years to complete:

- Enabling works: 3 months
- Roundabout and driveway/access construction: 8 months to 12 months
- Pavement and finishing works: 3 months

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for construction. The indicative construction method has been developed based on a concept design with consideration of using the most practical construction techniques and equipment. There are likely alternative methods in the future that could be used to complete the works, however, this document only intends to capture the traffic impacts based on the indicative construction method.

The assessment of construction effects of Ōpāheke Road assumes that the upgrade works for urban and rural section will happen in parallel. This adopted assumption means that more construction movements will be generated at a certain construction period. The assessment is based on the indicative construction programme and the nature of works required.

10.3.3.4 Temporary traffic management

The majority of the upgrade work in the rural section will be road widening on the existing Ōpāheke Road and construction of new bridge over rail line just north of the existing bridge. The construction of new bridge will be carried out without affecting live traffic but may require temporary traffic management to access the construction site. It is anticipated that the larger part of works will likely be adjacent to or on the live carriageway, which means that temporary traffic management will be required. Similarly, the work in urban section will mainly be carried out adjacent or on the live carriageway which will require temporary traffic management to execute. The scale of temporary traffic management to delineate live traffic away from the construction zones, is largely dependent on the various stages and requirements of the construction activities.

It is expected that short term temporary road closure for nights or weekends may be required for some specific activities, such as road surfacing, traffic switches and gas relocation. Other activities may require stop/go or contraflow traffic management, such as drainage, construction of footpath/cycle path, utility relocation, survey and investigation work. The effect of temporary road closure or other traffic management methods to existing traffic on Ōpāheke Road and adjacent road network should be assessed in the future as part of the CTMP for the Ōpāheke Road Upgrade project. It is recommended to include the below requirements:

- Methods to manage the effects of temporary traffic management activities on traffic and other projects occurring in the area at the same time (e.g. Ōpāheke N-S FTN, Ponga Road Project and Mill Road project).
- Identification of measures related to the interface with rail network during construction. The construction activities are required a full rail shutdown, will need the approval from KiwiRail.
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be.

It is considered that the temporary effects from the construction activities on Ōpāheke Road can be adequately managed through the implementation of a CTMP during the construction phase of the Project. The objective of the CTMP should be to ensure the construction of the upgrade 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 residential properties and local activities.

If required, SSTMP should be developed to manage constraints on access to affected properties.

10.3.3.4.1 Expected construction traffic routes

The construction of the Project will require some earthworks. The estimated volume of cut and fill are approximately 57,600m^3 based on the current indicative design. Final cut and fill volumes will be confirmed following detailed design prior to construction. It is anticipated that the majority of the earthworks will be within the upgrade works of the rural section. 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 the Project.

Given the timing of the construction of the Ōpāheke Road Rural and Urban upgrade has yet to be determined, there is a degree of uncertainty associated with any specific construction methodology and associated traffic routes. This means:

- The routes that will be used by construction vehicles will depend on the locations of quarries and dump sites which are not yet certain.
- The exact location and extent of compound sites/lay down areas has yet to be determined.
- The timing of construction of other projects could impact on likely construction vehicle routes, especially the Ōpāheke N-S FTN Arterial, the Ponga Road Upgrade and Mill Road project.

It is anticipated that if the Ōpāheke Road Rural and Urban Upgrade is constructed prior to the completion of Ōpāheke North-South FTN Arterial and/or Mill Road, the most feasible construction route will be Beach Road – Ōpāheke Road. However, there will be some potential constraints to this route:

- The land use on Ōpāheke Road (just north of Boundary Road) is predominantly urban residential use, including Ōpāheke Primary School. Heavy truck movement will likely interrupt local residents and raise safety, noise and vibration concerns.
- There are a number of signalised intersections on Beach Road from the SH1 interchange to Ōpāheke Road, and the operation of these intersections might be impacted including vehicle tracking, right turn movements and delays caused by heavy vehicles.

It is noted that the access to compound sites/laydown areas and construction zone for construction vehicles, plant and materials will be via site access points on Ōpāheke Road 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 Ōpāheke N-S FTN Arterial and/or Mill Road can be used for construction traffic if they are completed prior to the construction of Ōpāheke Road Rural and Urban Upgrade project. These routes will provide resilient alternatives in terms of construction routes.

Similar to the Ponga Road section, more options for construction traffic are provided if Ōpāheke N-S FTN Arterial and the Mill Road project are completed prior to the construction of Ōpāheke Road.

The potential construction traffic routes are shown below in Figure 10-21.

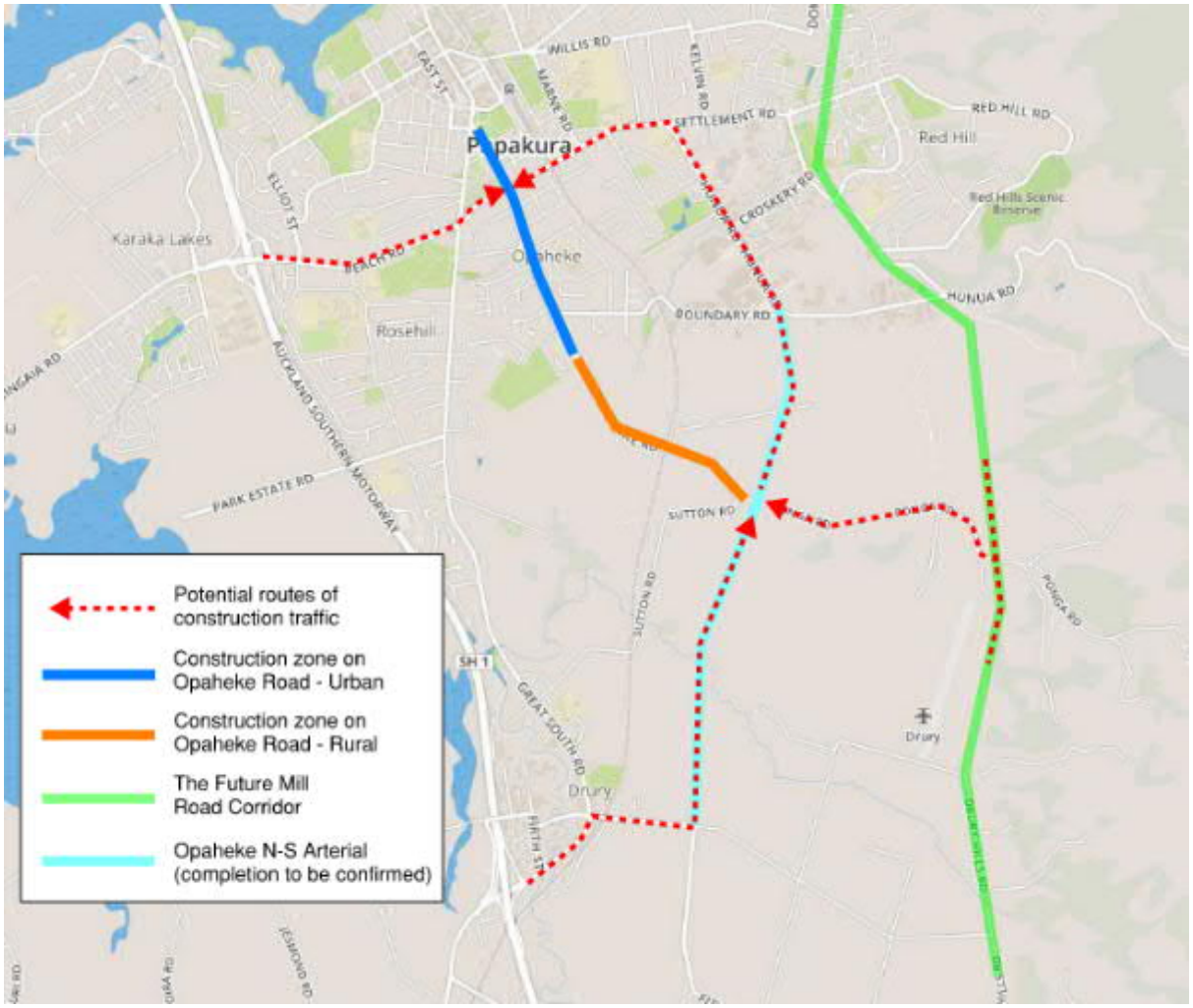


Figure 10-21: Potential construction routes for Ōpāheke Road Rural and Urban upgrade

10.3.3.4.2 Expected construction traffic generation

Construction of the Ōpāheke Road rural and urban upgrade project will require significant earthworks.[33] The indicative programme for the construction period suggests the overall duration of work will be approximately 2 to 2.5 years for the Rural section and 1 to 1.5 years for the Urban

[33] Ōpāheke Road Upgrade (A Section Of Nor D5) Construction Method Statement 31 July 2020 (ALTA)

section. The estimated construction movements include approximately 7,700 total trips from heavy trucks. In addition, there will be approximately 150 light vehicle movements per day from staff and contractors during the peak construction period.

To estimate the daily number of truck movements to and from the site, the following working assumptions were adopted:

- Working days: 20 days of construction per month
- Hours of delivering earthworks and other materials: a total of 8 hours a day. It is noted that truck movements should avoid the peak hours of traffic or alternatively specified times agreed with respective RCA.
- The duration of construction: 24 months for all 4 stages of construction works in the Rural section. The construction of the Urban section is assumed to have the duration of 12 months covering in 3 stages. For the assessment of construction effects, a shorter construction period of 24 months for rural section and 12 months for urban section has been adopted in the assumptions, given that this will generate more trips.

The estimated daily number of construction vehicles has been calculated and summarised below in Table 10-10.

Table 10-10: Expected daily traffic movements from construction works – Ōpāheke Road[39]

Stages	Expected duration (approx.)	Truck movements (daily)	Light movements (daily)	Total movements (daily)	Typical vehicle movements
Stage 1: Enabling works – both rural & urban	3 months	10 to 15	30 to 50	40 to 65	• Truck movements likely to include low loaders for plant delivery and collection, articulated trucks/truck and trailer units/concrete units, concrete trucks. • Light vehicle movements are likely from construction staff and contractors.
Stage 2: Eastbound carriageway in rural section & construction work in urban section	9 months	40 to 400	70 to 150	110 to 550	
Stage 3: Westbound carriageway	9 months	40 to 400	70 to 150	110 to 550	
Stage 4: Pavement construction	3 months	10 to 15	30 to 50	40 to 65	

In order to assess the full extent of effects from this expected construction traffic, the traffic environment at the time of construction needs to be understood. For the construction of Ōpāheke Road Rural and Urban section, analysing the impact of the surrounding network should be included as part of the CTMP for this project.

The current traffic volume on Ōpāheke Road is estimated to have between 2,000-9,000 vehicles per day which is moderate for a two-lane urban road. It is anticipated that the capacity of the current Ōpāheke Road may have ample capacity to accommodate the construction traffic and it is unlikely to cause any notable impact to the existing traffic environment on Ōpāheke Road.

Depending on the staging of the Ōpāheke Road Upgrade project, an updated assessment of construction traffic will be required prior to the time of construction, which can be used to inform the traffic management measures in the CTMP. It is anticipated that the construction effects can be better managed if the construction works of both rural and urban section are to be commenced in different stages.

10.3.3.4.3 Road safety assessment during construction period

Speed Limit

Ōpāheke Road is currently a mixture of urban and rural road connecting Great South Road to Ponga Road, and the current speed limit on Ōpāheke Road ranges from 50km/hr in the Urban section and 80km/h in the Rural section.

The majority of construction activities in the Urban section will require temporary closure of footpaths and on-street parking. It is anticipated that the existing permanent speed limit of 50km/h may need to be reviewed to ensure safety for pedestrians affected by the construction.

The permanent speed of 80km/h and the horizontal alignment in the Rural section will be likely to cause some potential safety concerns given the longer deceleration distance required by construction trucks entering the sites. Given the low number of construction movements in/out of construction zones and the existing traffic volume on Ōpāheke Road is low, the likelihood of crashes occurring due to speed is low.

To improve the safety of all road users, it is recommended to implement the safe and appropriate temporary speed limit on Ōpāheke Road 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.

Pedestrians and Cyclists

The existing roadside facilities on the section of Ōpāheke Road Rural section to be upgraded are not user-friendly for pedestrians and cyclists given the side drains and lack shoulders on both sides of the road. The analysis of the crash data did not show any current or historic incidents involving pedestrians and cyclists. Thus, it is expected that the additional construction traffic is unlikely to have a notable impact to the existing active transport modes.

The Ōpāheke Road Urban section, however, is likely to have more walking and cycling activities. Given the upgrade will be installing new footpath and cycle path on both sides of Ōpāheke Road, closure of existing footpaths is inevitable and will require traffic management to provide safe alternative options for pedestrians and cyclists.

It is recommended that the residents and stakeholders (such as Bike Auckland and cycling clubs) be kept informed of construction times and progress. General observations of pedestrian and cyclist activity will be used to inform appropriate traffic management measures in the CTMP.

Property access for Ōpāheke Road residents and businesses

During the time of construction, there will be temporary traffic management controls such as temporary concrete or steel barriers which may have impacts to property accesses. It is anticipated that the existing driveways that are remaining during construction will require temporary access to the property. It is anticipated that the contractor will have a detailed assessment of any affected

driveways and provide temporary access if required. The temporary access will ensure the ability for residents to safely access and exit the property.

10.3.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

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

a. A CTMP shall be prepared prior to the Start of Construction for a Stage of Work. Any potential construction traffic effects shall be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction.

b. 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:

   (i) Methods to manage the effects of temporary traffic management activities on traffic;

   (ii) Measures to ensure the safety of all transport users;

   (iii) 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;

   (iv) Size 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;

   (v) Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;

   (vi) Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;

   (vii) 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;

   (viii) Method that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

c. Any CTMP prepared for a Stage of Work shall be submitted to Council for information ten (10) working days prior to the Start of Construction for a Stage of Work

10.3.5 Summary of Effects (NoR D5)

The assessment of transport effects for the Ponga Road and Ōpāheke Road Upgrade (Rural and Urban section) has identified the outcomes summarised in Table 10-11.

Table 10-11: Assessment of Effects Summary for NoR D5

Operational and Construction Transport Effects	
Safety	In summary, the effects of the Project on safety are: • it prioritises facilities to support safe travel by active or public transport, which is consistent with the Vision Zero outcomes sought by AT and Waka Kotahi • significantly improved walking and cycling facilities along NoR D5, resulting in improved protection for vulnerable road users. significantly improved speed environment to a more appropriate speed of 50km/h, resulting in reduced risk of DSI's • appropriate vehicle lane widths and delineations to enhance the urban-type road environment which will improve safety • significantly reduced likelihood of head-on crashes by providing raised median to separate the two directions of traffic in rural sections. • eliminate any crash risk between road users traveling east-west crossing the existing and future rail services.
Walking and cycling	In summary, the effects of the Project on walking and cycling are: • enable safe movement for vulnerable road users along and across Ponga Road and Ōpāheke Road and significantly reduce the likelihood and exposure to potential crashes • provide good integration with future walking and cycling network, especially between the future Mill Road and Papakura township • the higher number of active mode trips reduces the reliance on vehicle trips, which results in positive environmental and health benefits • provides good integration with proposed walking and cycling facilities on proposed on the new Ōpāheke North -South FTN Arterial and serves as a key enabler to achieve mode shift targets. • enable growth of the surrounding areas and improve access to employment and social amenities. • eliminate any crash risk between walking and cycling users traveling east-west crossing the existing and future rail services.
Public Transport	In summary, the effects of the Project on public transport are: • improved integration with future public transport networks connecting Drury and Papakura, resulting in improved east-west connection between Mill Road, Papakura township and Papakura train station. • reduced reliance on low-occupancy vehicle uses. This can result in positive environmental and health benefits • improved transport mode choice to the future urban areas
General Traffic	In summary, the effects of the Project on general traffic are: • the Project does not provide additional capacity for general traffic, therefore the effect on operations are insignificant on general traffic. • the centre median (flush and raised) that separate the two directions of traffic will significantly prevent head-on crashes, resulting in positive effects for all general traffic users. • eliminate any crash risk and delay between general traffic users traveling east-west crossing the existing and future rail services

Operational and Construction Transport Effects	
Access	In summary, the effects of the Project on access are: • decreased the conflicts between access/driveway to general traffic and active modes • minimised the impact to operation of through traffic which will likely result in more reliable journey time
Construction Transport Effects	
In terms of construction effects as a result of the Project, there are several potential temporary adverse effects mainly linked to traffic management during construction, including construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users and driveways & property access. These effects can be appropriately mitigated through a CTMP prepared before construction commences.	

10.4 Conclusion (NoR D5)

The existing Ponga Road and Ōpāheke Road is not fit for purpose to support the planned future urban growth.

There are significant adverse effects expected if future growth progresses and existing transport infrastructure remains the same. The adverse effects are increased safety risk for all users, hostile and unsafe environment for active modes, decreased reliability for general traffic and public transport and would lead to several undesirable transport and land use integration outcomes. The existing high-speed environment coupled with the increase in traffic as a result of the growth and lack of dedicated walking and cycling facilities will create a hostile environment for vulnerable road users.

The Project proposes that the function of Ponga Road and Ōpāheke Road (Rural and Urban section) change from an existing rural/urban two-lane collector road to an urban two-lane arterial catering for vehicles, public transport and active modes. The proposed design includes dedicated walking and cycling facilities on both sides of the road, and central median (either flush or raised) for Ponga Road and Ōpāheke Road rural section to separate the two directions of traffic movements and include grade separation of the NIMT with Ōpāheke Road. The Ōpāheke Road (Urban section) also includes an upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout with separated walking and cycling facilities, including crossing facilities and the re-grade of nine driveways.

The assessment of operational effects (post-construction) overall concludes that the Project will have significant positive effects. The Project will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and improves access to employment and social amenities.

The Project will significantly improve transport facilities for all modes, resulting in improved safety for those that travel by car, active mode and public transport. The upgrade will also unlock safe and sustainable east-west mode choices and connects to future strategic North-South corridors (Mill Rd and the Ōpāheke North-South FTN Arterial, and to Papakura township. It will significantly improve safety for vulnerable users (additional segregated walking and cycling provision) and significantly reduce the risk for DSI's. The grade separation of the NIMT with Ōpāheke Road will eliminate any crash risk and general traffic delay between road users and any existing and future rail services.

The increased safety measures for vulnerable road users will significantly reduce the risk for DSIs for the predicted demand for walking (2200 daily) and cycling (400 daily). The upgrade integrates well with surrounding land use and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

No adverse operational effects on the transport system were identified that required mitigation.

In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended that the impact of any construction traffic effects is assessed again when greater level of details is available for construction methodology and traffic environment at the time of construction.

To remedy or mitigate potential adverse construction effects, it is proposed to manage these through Construction Traffic Management Plan conditions and what should be included to remedy or mitigate potential adverse effects.

Overall, the assessment concludes that operationally, the Project will have significant positive effects and potential adverse effects arising during construction of the Project can be appropriately mitigated.

Appendix 1. Modelling assumptions

Table 10-12: Modelling assumptions

Package	Project(s)	Base (2016)	2048+ Network	2048+ Network (Without Drury Local)
Rail DBC package	Additional rail capacity between Pukekohe and Papakura (4 tracking, electrification and associated grade separations at road/rail crossings)	Excluded	Included	Included
	New rail stations at Drury Central, Drury West and Paerata	Excluded	Included	Included
		Excluded	Included	Included
	Regional north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH1 and NIMT	Excluded	Included	Included
South Strategic DBC package	Mill Road Corridor – a new and upgraded strategic transport corridor from Manukau to Drury, including upgrades to Redoubt Road, Mill Road and Dominion Road and a new section connecting to SH1 in Drury South	Excluded	Included	Included
		Excluded	Included	Included
	New Pukekohe Expressway – alternative route to SH 22 between SH1 (east of proposed Drury South interchange) and Pukekohe (to the north-eastern connection to Pukekohe Ring Road)	Excluded	Included	Included
	New arterial connections to the Proposed Pukekohe Expressway	Excluded	Included	Included
	FTN on Porchester / Mahia / Roscommon Roads and Great South Road from Drury to Manukau	Excluded	Included	Included
		Excluded	Included	Included
SH1 Papakura-to-Bombay	Stage 1 of the P2B project includes an upgrade to the existing Drury interchange, which connects to and is interdependent with the SH 22 upgrade project. The Interchange upgrade will also need to provide for proposed rail upgrades (see Table 1-3). There is also a direct inter-relationship with the Bremner Upgrade/FTN project, as P2B will necessitate an upgrade/replacement of the existing Bremner Road crossing of SH1.	Excluded	Included	Included
SH 22 Drury-to-Paerata (Safe Network Programme)	The Safe Network Programme is in the funding application process for short-term safety improvements in the SH 22 area. Parts of this programme are being prioritised including a roundabout at the intersection of SH 22 and Glenbrook Road, and the recently completed right-turn bay into Jesmond Road.	Excluded	Included	Included
	Longer term upgrades on SH 22 between SH1 and Oira Road are being looked at by SGA as part of this Drury Local package. These upgrades are proposed to improve safety, amenity and capacity along the route to enable urbanisation of the area and are envisaged to ultimately be supplemented by a new route in the long term (the proposed Pukekohe Expressway).	Excluded	Included	Included
Drury Strategic Transport Network	State Highway 22 Upgrade (NoR D1)	Excluded	Included	Excluded
	Jesmond to Waihoehoe West FTN Upgrade (NoR D2)	Excluded	Included	Excluded
	Waihoehoe Road East Upgrade (NoR D3)	Excluded	Included	Minimal Network Change
	Ōpāheke North-South FTN Arterial (NoR D4)	Excluded	Included	Excluded
	Ponga Road and Ōpāheke Road Upgrade (NoR D5)	Excluded	Included	Minimal Network Change
Collector Network	Indicative New Collector Roads	Excluded	Included	Included
Growth	Land Use Assumptions	up to 2016	up to 2048+	up to 2048+

Appendix 2. Interdependencies with other projects

The following tables provide an overview of the interdependencies and relationships between Drury Projects and other Te Tupu Ngātahi (Table 10-13) and AT / NZ Transport Agency Projects (Table 10-14)

Table 10-13: Interdependencies with Te Tupu Ngātahi Projects

Project	Relationship and influences	SH 22	Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West	Waihoehoe Road East	Ōpāheke N-S	Ponga Road	Ōpāheke Road
Additional rail capacity between Pukekohe and Papakura (and associated grade separations at road/rail crossings)	A road rail bridge is proposed on Ōpāheke Road to cross the NIMT Rail line. The bridge is included in the Rail DBC.								✓
New rail stations at Drury Central, Drury West and Paerata	The Jesmond Road and SH 22 upgrade projects are located adjacent to and are being coordinated with the project for a proposed new rail station at Drury West. The Bremner Road FTN and Waihoehoe Road West FTN upgrade projects are located adjacent to and are being coordinated with the project for a proposed new rail station at Drury Central	✓	✓	✓	✓	✓			

Project	Relationship and influences	SH 22	Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West	Waihoehoe Road East	Ōpāheke N-S	Ponga Road	Ōpāheke Road
	to maximise access to the station.								
Regional north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH 1 and NIMT	Walking and cycling paths along the road upgrade projects in the Drury Local package will connect to this more strategic cycling route. Together these projects will help support a transformational mode shift towards walking and cycling in the South.	✓	✓	✓	✓	✓	✓	✓	✓
Mill Road Corridor – a new and upgraded strategic transport corridor from Manukau to Drury, including upgrades to Redoubt Road, Mill Road and Dominion Road and a new section connecting to SH 1 in Drury South	The Waihoehoe Road upgrade projects, Ponga/ Ōpāheke Road upgrade and the new N-S arterial through Ōpāheke are being coordinated with and will connect to the proposed Mill Road corridor project in this South Strategic package.				✓	✓	✓	✓	✓
New Pukekohe Expressway – alternative route to SH 22 between SH 1 (east of proposed	This proposed Expressway is proposed as a long-term alternative to SH 22 and hence has a direct	✓							

Project	Relationship and influences	SH 22	Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West	Waihoehoe Road East	Ōpāheke N-S	Ponga Road	Ōpāheke Road
Drury South interchange) and Pukekohe (to the north-eastern connection to Pukekohe Ring Road)	interrelationship with the SH 22 upgrade project proposed under the Drury Local package. The Expressway is intended to provide for the long-term demands for transport movements between Drury and Pukekohe, that are currently carried on SH 22.								
New arterial connections to the Proposed Pukekohe Expressway	The Jesmond Road FTN upgrade project is being coordinated with and will connect to the most northern connection to the proposed Pukekohe Expressway		✓						
FTN on Porchester / Mahia / Roscommon Roads and Great South Road from Drury to Manukau	The FTN network upgrades proposed on Jesmond, Bremner and Waihoehoe will connect into this broader FTN network		✓	✓	✓				

Table 10-14: Interdependencies with other Transport Projects

Project	Relationship and influences	SH 22	Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West	Waihoehoe Road East	Ōpāheke N-S	Ponga Road	Ōpāheke Road
SH 1 Papakura-to-Bombay	Stage 1 of the P2B project includes an upgrade to the existing Drury interchange, which connects to and is interdependent with the SH 22 upgrade project. The Interchange upgrade will also need to provide for proposed rail upgrades (see Table 1-3). There is also a direct inter-relationship with the Bremner Upgrade/FTN project, as P2B will necessitate an upgrade/replacement of the existing Bremner Road crossing of SH 1.	✓		✓					
SH 22 Drury-to-Paerata (Safe Network Programme)	The Safe Network Programme is in the funding application process for short-term safety improvements in the SH 22 area. Parts of this programme are being prioritised including a roundabout at the intersection of SH 22 and Glenbrook Road, and the recently completed right-turn bay into Jesmond Road. Longer term upgrades on SH 22 between SH 1 and Oira Road are being looked at by SGA as part of this Drury Local package.	✓							

	These upgrades are proposed to improve safety, amenity and capacity along the route to enable urbanisation of the area and are envisaged to ultimately be supplemented by a new route in the long term (the proposed Pukekohe Expressway).								

Appendix 3. CAS Data

A crash study was undertaken for the section of corridors, under investigation as part of this Project.

Table 10-15 provides summary of the Waka Kotahi Crash Analysis System (CAS) records. The CAS data analysed is for the period from January 2010 to June 2019 inclusive, which in effect will provide a summary of crashes for a ten-year period.

Table 10-15: Crash History Summary (2010 - 2019)

Road Corridor	Number of Crashes	Injuries
SH 22	78 crashes • 9 overtaking crashes • 26 loss of control/ head on • 20 rear end/ obstruction • 20 crossing/ turning movements • 2 pedestrian crashes	• 2 fatal injuries • 11 serious injuries • 20 minor injuries
Jesmond Road	4 crashes • 2 loss of control/ head on • 2 crossing/ turning movements	• 1 minor injury
Bremner Road	5 crashes • 1 overtaking crash • 2 loss of control/ head on • 2 rear end/ obstruction	• All non-injury crashes
Waihoehoe Road West	25 crashes • 1 overtaking crash • 5 loss of control/ head on • 8 rear end/ obstruction • 10 crossing/ turning movements • 1 pedestrian crash	• 1 serious injury • 7 minor injuries
Waihoehoe Road East	19 crashes • 1 overtaking crash • 8 loss of control/ head on • 1 rear end/ obstruction • 9 crossing/ turning movements	• 1 serious injury • 8 minor injuries
Sutton Road	37 crashes • 2 overtaking crashes • 23 loss of control/ head on • 1 rear end/ obstruction • 10 crossing/ turning movements • 1 pedestrian crash	• 1 fatal injury • 2 serious injuries • 14 minor injuries
Ponga Road	10 crashes • 7 loss of control/ head on • 1 rear end/ obstruction • 1 pedestrian crash	• 2 serious injuries • 2 minor injuries
Ōpāheke Road	21 crashes	• 2 serious injuries

Road Corridor	Number of Crashes	Injuries
	• 18 loss of control/ head on • 2 rear end/ obstruction • 1 crossing/ turning movement	• 7 minor injuries
Ōpāheke Road Rural & Urban	84 crashes • 27 crossing/turning crashes • 21 Bend/Lost control/Head on • 21 Rear end obstruction • 3 overtaking crash • 3 pedestrian crash • 9 Straight road lost control	• 4 serious injury • 19 minor-injury
Total	**283 crashes total**	**3 fatal injury** **23 severe injury** **78 minor injury**

The detailed summary of crashes from the year 2010-2019, associated with severity for various Project sections are tabulated below.

Table 10-16: Crash History on SH22- NoRD1

Year	Fatal	Serious Injury	Minor Injury	Non-Injury	Total
2010	0	1	2	10	**13**
2011	1	1	3	4	**9**
2012	1	2	3	6	**12**
2013	0	2	2	3	**7**
2014	0	0	1	2	**3**
2015	0	1	1	3	**5**
2016	0	0	3	6	**9**
2017	0	2	2	4	**8**
2018	0	2	1	3	**6**
2019	0	0	2	4	**6**
Total	**2**	**11**	**20**	**45**	**78**

Table 10-17: Crashes History on Jesmond Road- NoRD2

	Fatal	Serious Injury	Minor Injury	Non-Injury	Total
2010	0	0	0	0	**0**
2011	0	0	0	0	**0**
2012	0	0	0	0	**0**
2013	0	0	0	1	**1**
2014	0	0	0	0	**0**
2015	0	0	0	0	**0**
2016	0	0	0	0	**0**
2017	0	0	1	2	**3**
2018	0	0	0	0	**0**
2019	0	0	0	0	**0**
Total	**0**	**0**	1	**3**	**4**

Table 10-18: Crash History on Bremner Road- NoRD2

	Fatal	Serious Injury	Minor Injury	Non-Injury	Total
2010	0	0	0	0	**0**
2011	0	0	0	1	**1**
2012	0	0	0	1	**1**
2013	0	0	0	0	**0**
2014	0	0	0	1	**1**
2015	0	0	0	0	**0**
2016	0	0	0	0	**0**
2017	0	0	0	1	**1**
2018	0	0	0	1	**1**
2019	0	0	0	0	**0**
Total	**0**	**0**	**0**	**5**	**5**

Table 10-19: Crash History on Waihoehoe Road West- NoRD2

	Fatal	Serious Injury	Minor Injury	Non-Injury	Total
2010	0	0	0	2	**2**
2011	0	0	1	0	**1**
2012	0	1	2	2	**5**
2013	0	0	1	3	**4**
2014	0	0	0	1	**1**
2015	0	0	1	2	**3**
2016	0	0	0	3	**3**
2017	0	0	1	1	**2**
2018	0	0	1	1	**2**
2019	0	0	0	2	**2**
Total	**0**	**1**	**7**	**17**	**25**

Table 10-20: Crash History on Waihoehoe Road East- NoRD3

	Fatal	Serious Injury	Minor Injury	Non-Injury	Total
2010	0	0	1	0	**1**
2011	0	0	1	2	**3**
2012	0	0	2	0	**2**
2013	0	1	2	1	**4**
2014	0	0	1	0	**1**
2015	0	0	0	0	**0**
2016	0	0	0	2	**2**
2017	0	0	0	2	**2**
2018	0	0	1	3	**4**
2019	0	0	0	0	**0**
Total	**0**	**1**	**8**	**10**	**19**

Table 10-21: Crash History on Sutton Road- NoRD4

	Fatal	Serious Injury	Minor Injury	Non-injury	Total
2010	0	0	1	1	2
2011	0	0	2	0	2
2012	0	0	0	1	1
2013	0	0	1	2	3
2014	0	0	2	3	5
2015	0	0	1	4	5
2016	0	2	1	1	4
2017	0	0	3	3	6
2018	0	0	2	3	5
2019	1	0	1	2	4
Total	1	2	14	20	37

Table 10-22: Crash History on Ponga Road- NoRD5

	Fatal	Serious Injury	Minor Injury	Non-Injury	Total
2010	0	0	0	1	**1**
2011	0	0	0	0	**0**
2012	0	0	0	0	**0**
2013	0	1	0	0	**1**
2014	0	0	0	1	**1**
2015	0	1	0	0	**1**
2016	0	0	0	1	**1**
2017	0	0	1	1	**2**
2018	0	0	0	1	**1**
2019	0	0	1	1	**2**
Total	**0**	**2**	**2**	**6**	**10**

Table 10-23: Crash History on Ōpāheke Road- NoRD5

	Fatal	Serious Injury	Minor Injury	Non-Injury	Total
2010	0	0	0	2	**2**
2011	0	0	0	2	**2**
2012	0	1	0	1	**2**
2013	0	1	0	1	**2**
2014	0	0	1	1	**2**
2015	0	0	1	2	**3**
2016	0	0	1	1	**2**
2017	0	0	1	2	**3**
2018	0	0	3	0	**3**
2019	0	0	0	0	**0**
Total	**0**	**2**	**7**	**12**	**21**

	Fatal	Serious Injury	Minor Injury	Non-Injury	Total
2010	0	0	2	11	**13**
2011	0	0	0	9	**9**
2012	0	1	1	5	**7**
2013	0	1	0	2	**3**
2014	0	0	3	4	**7**
2015	0	1	2	5	**8**
2016	0	0	1	8	**9**
2017	0	1	2	6	**9**
2018	0	0	6	6	**12**
2019	0	0	2	5	**7**
Total	**0**	**4**	**19**	**61**	**84**

Appendix 4. Existing Road Traffic Network

Existing Corridor	Key Characteristics	Project Designation
State Highway 22	• 60kph speed limit east of the intersection with Burberry Road • 80kph speed limit west of the intersection with Burberry Road • Two-lane two-way rural state highway, with sealed shoulders on both sides of the carriageway • Large volume of mixed traffic with significant through movement (east-west) between SH1 interchange and urban areas of Pukekohe, Glenbrook and Paerata • High proportion of heavy vehicles • Over-dimension route and partially overweight route (the SH22 section between Great South Road and Victoria Street) • Corridor changes in form between sections with and without kerb and channel or side barrier in parts • No walking and cycling facilities are provided (limited to wide road shoulder shared with general traffic and sports cyclist) • No public transport services or facilities are provided	**NoR D1**
Jesmond Road	• 60kph speed limit • Rural two-lane secondary collector road and provides connection between Bremner Road and SH22 • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D1** **NoR D2**
Great South Road (Ramarama region)	• 100kph speed limit • Rural two-lane arterial road provides access to SH22 • Over-dimension and overweight route with high proportion of heavy vehicles • No walking and cycling facilities are provided • Public transport along the route, including service 376 and bus stops	**NoR D1** **NoR D2**
Oira Road	• 60kph speed limit • Rural secondary collector road without centreline marking and provides access for local residents to SH22 • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D1**
Burberry Road	• 60kph speed limit • Rural access road without centreline marking and provides access for local residents to SH22 • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D1**
McPherson Road	• 100kph speed limit • Rural two-lane primary collector road and provides access to SH22 • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D1**

Existing Corridor	Key Characteristics	Project Designation
Bremner Road	• 50kph speed limit between Jesmond Road and Bremner bridge • 50kph speed limit between Bremner bridge and Drury Centre • On the over-dimension and overweight route between Victoria Road and Firth Road • Rural two-lane secondary collector road with centreline marking and provides connection between Jesmond Road and Firth Road • Segregated walking and cycling facilities provided between the Auranga development up to the Bremner Road bridge. Footpaths provided between the bridge and the town centre. There are no facilities between Jesmond Road and the Auranga development. • No public transport services or facilities are provided	**NoR D2**
Victoria Street	• 50kph speed limit • Rural two-lane access road without a centreline marking, providing connection for local businesses to Bremner Road and SH 22 • On the over-dimension and overweight route between SH 22 and Bremner Road • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D2**
Creek Street	• 50kph speed limit • Rural two-lane secondary collector road with no centreline marking and provides connection for businesses to the Drury township • Some sections of footpaths, but overall there is no connected walking and cycling facilities provided • No public transport services or facilities are provided	**NoR D2**
Firth Street	• 50kph speed limit • Rural two-lane arterial road with no centreline marking and provides connection for businesses to the Drury township • Provides connectivity between SH22 to Norrie Road and Bremner Road • On the over-dimension and overweight route between Victoria Road and Great South Road • Footpath on one side of the road, no cycling facilities are provided • No public transport services or facilities are provided	**NoR D2**
Waihoehoe Road	• 50kph speed limit west of Flanagan • 60kph speed limit between Flanagan and Fitzgerald Road • 80kph speed limit east of Fitzgerald Road • Rural primary collector road with centreline marking and provides access to the local eastern network, including Fitzgerald Road, Fielding Road, Appleby Rd, Cossey Road and Drury Hills Road • Limited walking and cycling facilities • No public transport services or facilities are provided	**NoR D2** **NoR D3** **NoR D4**
Norrie Road	• 50kph speed limit • Rural two-lane primary collector road with centreline markings and provides a connection for businesses to the Drury town centre and Great South Road. The Norrie Road Bridge has a one-lane capacity restriction and is not wide enough to accommodate large vehicles. • Footpaths along the alignment, no cycling facilities are provided • No public transport services or facilities are provided	**NoR D2**

Existing Corridor	Key Characteristics	Project Designation
Flanagan Road	• 60kph speed limit • Rural two-lane low-volume road with no centreline markings and provides a connection for local residents to Waihoehoe Road • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D2**
Fitzgerald Road	• 80kph speed limit • Rural primary collector road with centreline marking and provides access for local residents to Waihoehoe Road and Quarry Road (leading into the existing industrial area) • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D2** **NoR D3** **NoR D4**
Fielding Road	• 80kph speed limit • Fielding Road is a rural access road without centreline marking and provides access for local residents to Waihoehoe Road and Fitzgerald Road • Appleby Road is a rural collector road with centreline marking and provides access for local residents to Waihoehoe Road and Drury Hills Road • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D3**
Appleby Road	• 80kph speed limit • Appleby Road is a rural secondary collector road with centreline marking and provides access for local residents to Waihoehoe Road and Drury Hills Road • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D3**
Cossey Road	• 80kph speed limit • Rural low volume road without centreline marking and provides access for local residents to Waihoehoe Road and Fitzgerald Road • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D3**
Drury Hills Road	• 80kph speed limit • Rural secondary collector road with centreline marking and provides access for local residents to Waihoehoe Road, Appleby Road and Fitzgerald Road • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D3**
State Highway 1	• 4-lane high volume motorway runs from north of Papakura to Bombay • Primary north-south connection with strategic importance • Mixed-vehicle composition with significant heavy vehicle percentages • Limited walking/cycling and public transport facilities	**NoR D2**
Great South Road (Ōpāheke region)	• 70kph speed limit • 2 lane Arterial road with centreline marking and provides connectivity from Papakura to Drury; Primary route alternative to SH1	**NoR D4**

Existing Corridor	Key Characteristics	Project Designation
	• No dedicated walking or cycling facilities • No public transport facilities are provided	
Ōpāheke Road	• 50kph speed limit in the urbanised northern section, 80kph speed limit from the south of Lorelei Place • Primary collector road with centreline marking and provides access for local residents to Ponga Road and further connections northbound to Papakura town centre • No walking and cycling facilities are provided from the south of Lorelei Place. Northern extent of the road becomes more urbanised with footpaths on both sides. • Route 374 uses the northern end of the road towards Papakura	**NoR D4** **NoR D5**
Ponga Road	• 80kph speed limit • Rural collector road with centreline marking and provides access for local residents to Hunua Road (Hunua Ranges) and Ōpāheke Road (towards Papakura town centre) • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D4** **NoR D5**
Walker Road	• 80kph speed limit • Local access cul-de-sac road with no centreline marking. Provides access for local residents to Ōpāheke Road • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D4** **NoR D5**
Sutton Road	• 80kph speed limit • Primary collector with centreline marking to the west of centre rail crossing; Provides main route for connection in the south-west urban Drury region • On the east of rail crossing secondary collector road, part of Ōpāheke rural region • No walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D4** **NoR D5**
Boundary Road	• 80kph speed limit • Arterial road with centreline marking and provides access for local businesses to Hunua Road and Ōpāheke Road • Footpath on one side of the road, no segregated cycling facilities are provided • Route 374 uses the western end of the road towards Papakura	**NoR D4**
Hunua Road	• 70kph speed limit • Arterial road which turns rural after Dominion Road, with centreline marking and provides access for local businesses and residents to Ōpāheke Road, Dominion Road and towards the Hunua Ranges • Footpaths varying between one and both sides of the road from Ōpāheke Road to Dominion Road. From this point onwards, no walking and cycling facilities are provided • No public transport services or facilities are provided	**NoR D4**

Appendix 5. Existing Intersections

Existing Intersection	Key Characteristics	Project Designation
State Highway 22 and Great South Road	• Priority give way T- intersection • Single lane approach from all directions, with right turn bay provided on SH 22 eastbound and left turn slip lane on Great South Road and SH 22 westbound • No pedestrian and cyclist crossing facilities are provided	**NoR D1**
State Highway 22 and Burberry Road	• Priority give way T- intersection • Single lane approach from all direction • No pedestrian and cyclist crossing facilities are provided	**NoR D1**
State Highway 22 and McPherson Road	• Priority give way T-intersection • Single lane approach from all directions, with left turn slip lanes from and to McPherson Road • No pedestrian and cyclist crossing facilities are provided	**NoR D1**
State Highway 22 and Jesmond Road	• Priority give way T- intersection • Single lane approach from all direction, with right turn bay provided on SH 22 westbound • No pedestrian and cyclist crossing facilities are provided	**NoR D1**
State Highway 22 and Oira Road	• Priority give way T- intersection • Single lane approach from all directions • No pedestrian and cyclist crossing facilities are provided	**NoR D1**
Jesmond Road and Bremner Road	• Priority give way T- intersection • Single lane approach from all directions • No pedestrian and cyclist crossing facilities are provided	**NoR D2**
Bremner Road and New Auranga Development	• Signalised intersection with three arms • Multi-lane Single lane approach from all directions • Pedestrian and cyclist crossing facilities are provided	**NoR D2**
Bremner Road and Victoria Street	• Priority give way T- intersection • Single lane approach from all directions • No pedestrian and cyclist crossing facilities are provided	**NoR D2**
Bremner Road and Creek Street	• Stop-sign four-way intersection • Single lane approach from all direction	**NoR D2**

Existing Intersection	Key Characteristics	Project Designation
	• Stops signs on approach from Creek Street • No pedestrian and cyclist crossing facilities are provided	
Bremner Road and Firth Street	• Priority give way T- intersection • Single lane approach from all directions • Right turn bay on Firth Street to continue northbound • No pedestrian and cyclist crossing facilities are provided	**NoR D2**
Norrie Road, Great South Road and Waihoehoe Road	• Roundabout with one circulating lane • Left and straight/right turn flares from Great South Road northern arm approach • Left and straight/right turn flares from Norrie Road western arm approach • No pedestrian and cyclist crossing facilities are provided	**NoR D2**
Waihoehoe Road and Flanagan Road	• Priority give way T- intersection • Single lane approach from all directions • No pedestrian and cyclist crossing facilities are provided	**NoR D2**
Waihoehoe Road and Fitzgerald Road	• Priority give way T- intersection • Single lane approach from all directions, with right turn bay provided on Waihoehoe Road eastbound • No pedestrian and cyclist crossing facilities are provided	**NoR D2** **NoR D3** **NoR D4**
Waihoehoe Road and Fielding Road/Appleby Road	• Stop sign-controlled four-leg intersection • Single lane approach from all directions • Waihoehoe Road is the major road with priority • No pedestrian and cyclist crossing facilities are provided	**NoR D3**
Waihoehoe Road and Cossey Road	• Stop sign-controlled four-leg intersection • Single lane approach from all direction • Waihoehoe Road is the major road with priority • No pedestrian and cyclist crossing facilities are provided	**NoR D3**
Waihoehoe Road and Drury Hills Road	• Stop sign-controlled T- intersection • Single lane approach from all directions • No pedestrian and cyclist crossing facilities are provided	**NoR D3**
Boundary Road/Hunua Road	• Priority give way T- intersection	**NoR D4**

Existing Intersection	Key Characteristics	Project Designation
	• Single lane approach from all directions, with a left turn bay on Hunua Road westbound and a right turn bay on Hunua Road southbound • No pedestrian and cyclist crossing facilities are provided but there is a midblock on Boundary Road	
Sutton Road/ Ōpāheke Road / Ponga Road	• Priority give way T- intersection • Single lane approach from all directions • No pedestrian and cyclist crossing facilities are provided	**NoR D5**
Walker Road/ Ōpāheke Road	• Priority give way T- intersection without give-way signs • Single lane approach from all directions • No pedestrian and cyclist crossing facilities are provided	**NoR D5**