Rolleston Access Improvements Assessment of Effects

Integrated Transport Assessment

Prepared for New Zealand Transport Agency Waka Kotahi
Prepared by Beca Limited

29 October 2024

Contents

Appendices

ACRONYMS, TERMS AND ABBREVIATIONS

AEE	Assessment of Effects on the Environment
CAS	Crash Analysis System
CAST	Christchurch Assignment and Simulation Traffic
CSM	Christchurch Southern Motorway
CSM2	Christchurch Southern Motorway Stage 2
CRETS	Christchurch Rolleston and Environs Transportation Study
CRPS	Canterbury Regional Policy Statement
CTMP	Construction Traffic Management Plan
DBC	Detailed Business Case
DSIs	Death and Serious Injuries
GPS	Government Policy Statement
LoS	Level of Service
LTP	Long Term Plan
MCA	Multi-Criteria Analysis
MoU	Memorandum of Understanding
NLTP	National Land Transport Programme
NoR	Notice of Requirement
NOF	Network Operating Framework
NZTA	New Zealand Transport Agency Waka Kotahi
NZUP	New Zealand Upgrade Programme
ODP	Outline Development Plan
Package 1	Package 1 of Rolleston Access Improvements
Package 2	Package 2 of Rolleston Access Improvements
P&R	Park and Ride
Project	State Highway 1 Rolleston Access Improvements (inclusive of Package 1 and Package 2)
RIZ	Rolleston Industrial Zone3
RLTP	Regional Land Transport Plan
RoNS	Roads of National Significance
RoRS	Roads of Regional Significance
RTC	Regional Transport Committee
SDC	Selwyn District Council
SH1	State Highway 1
SUP	Shared Use Path
Vpd	Vehicles per day

Revision History

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2	Zoe Chen/Hayden Trumper	Issue for Package 1 Resource Consent Lodgement	29/10/2024

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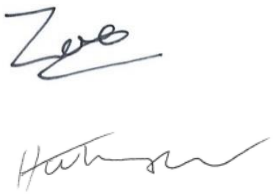
Prepared by	Zoe Chen / Hayden Trumper		29/10/2024
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on behalf of	Beca Limited		

Executive Summary

This report has been prepared by Beca Limited (**Beca**) to inform the Assessment of Environmental Effects (**AEE**) for the Notice of Requirements (**NoR**) being sought by New Zealand Transport Agency Waka Kotahi (**NZTA**) in Rolleston. It considers the anticipated effects of the Rolleston Access Improvements Project within the context of the Greater Christchurch Settlement Plan.

Rolleston is one of the fastest growing towns in New Zealand and is experiencing transport pressures to keep the community connected and state highway intersections safe. There are areas of high growth identified in the southeast Rolleston residential development area, the Rolleston Industrial Zone (**RIZ - including Iport and IZone**) commercial development areas, and traffic travelling to/from Christchurch.

This report identifies the following key issues:

- Overall, the current road network is anticipated to operate well in 2028. However, there is predicted to be significant deterioration in network performance after 2028 due to land use development. Thereafter, the high traffic volumes along SH1 will result in long delays, particularly at the SH1 / Hoskyns Road and SH1 / Rolleston Drive (north) traffic signals that also create operational and safety risks related to the at-grade rail level crossing on Hoskyns Road.
- The SH1 / Dunns Crossing Road / Walkers Road and SH1 / Tennyson Street priority-controlled intersections are high-risk intersections. Based on the forecasted traffic volumes of Rolleston, the safety risks associated with these intersections is expected to worsen requiring more significant changes to improve the safety at these intersections.

The Detailed Business Case (**DBC**) for the Rolleston Access Improvements confirmed the need for investment in this part of the SH1 / Rolleston transport network and has seen it recognised as a Road of Regional Significance (**RORS**) in the Government Policy Statement, with the Rolleston Access Improvements Project (**the Project**) included as part of the 'Canterbury Package'. As such, a NoR is being sought by NZTA for the Project comprising two staged packages to be delivered sequentially as follows:

- **Package 1** of the Project includes the construction of a new roundabout at the SH1 / Dunns Crossing Road / Walkers Road intersection and associated works.
- **Package 2** of the Project includes the construction of an Overpass from Rolleston Drive (north) to Jones Road and the balance of the works.

The Project includes a number of safety and efficiency improvements (reducing deaths and serious injuries, providing greater travel choices, and reduced travel times), on SH1 and adjacent local roads in Rolleston. The objectives of the Project are to:

- Improve the safety and efficiency of travel along the State Highway.
- Improve safety and accessibility for goods and people travelling between the residential and industrial areas of Rolleston for all transport modes.
- Improve safety and accessibility for goods and people travelling to the Rolleston residential and industrial areas from the State Highway.

The Project sits within a broader strategic context seeking to improve the safety and efficiency of transport networks. This includes the following strategies and studies:

- National Land Transport Strategies (Government Policy Statement on Land Transport (GPS) 2024-2034 and NZTA's Arataki).
- Canterbury Regional Land Transport Strategies (Canterbury Regional Policy Statement, Christchurch Transport Strategic Plan, and Canterbury Regional Land Transport Plan).

- Rolleston Transport Strategies and Studies (Christchurch Rolleston and Environs Transportation Study, Christchurch Southern Motorway Stage 2, Selwyn District Council Walking and Cycling Strategy, Tennyson Street and Brookside Road Intersections Scheme Assessment and Rolleston Access Improvements Detailed Business Case).

The Project will provide significant improvements to the transport network around Rolleston. At a local level the Project demonstrates a 5.0%-14.6% reduction in total vehicle hours travelled during each of the time periods modelled in 2038. The Project improves the existing bus stops on Kidman Street, retains the existing bus stops on Jones Road and improves bus journey times by alleviating congestion at busy intersections along the bus routes.

The Project is consistent with the objectives discussed in **Section 1.3** in that:

- There is increasing growth on the Rolleston and Lincoln areas that is predicted to result in a significant deterioration in the network performance by 2038. The high traffic volumes along SH1 result in high delays at intersections including SH1 / Hoskyns Road, SH1 / Rolleston Drive (north), and SH1 / Dunns Crossing Road / Walkers Road. Queues from these intersections regularly extend upstream, resulting in network wide congestion.
- The Project removes the traffic signals located at SH1 / Hoskyns Road and SH1 / Rolleston Drive (north) resulting in increased efficiency along SH1. This provides a 3-6 minute decrease in State Highway travel time from Hornby/Christchurch to the west of Rolleston and up to a 2-minute decrease in State Highway travel time from the west of Rolleston to Hornby/Christchurch in 2038 AM and PM peak periods.
- The Project results in an improvement in safety on the network with a predicted 40% reduction in deaths and serious injuries. The primary driver of this improvement is the closure of two high-risk intersections on SH1, and the modification of two intersections to provide safer layouts.
- The removal of the SH1 / Hoskyns Road signals and changes to Hoskyns Road will remove the risk of traffic queuing back from the level crossing onto the State Highway and risks associated with downstream queues from the SH1 / Hoskyns Road intersection blocking the level crossing. These changes remove the risk associated with queuing from the SH1 / Hoskyns Road intersection that has resulted in, on average, two near misses between trains and vehicles each year for the past 5 years.
- There are significant improvements in travel times to and from the RIZ. This is particularly noticeable in the PM peak period where there is significant congestion leaving the RIZ through the existing SH1 / Hoskyns Road traffic signals. The Project substantially mitigates congestion in this area, resulting in travel time savings of up to 8 minutes from the Industrial area to Rolleston Residential and Town Centre, and up to 6 minutes to Christchurch during the PM peak in 2038.
- Heavy vehicles accessing the RIZ via SH1 can currently turn right on and off SH1 at the Hoskyns Road signalised intersection, which is a high-risk manoeuvre at a high-speed signalised intersection. The Project provides safer alternatives for heavy vehicles to right turn on and off SH1 via the Weedons Road interchange and the proposed SH1 / Dunns Crossing Road / Walkers Road roundabout.
- Similarly, the Project improves travel time and safety for vehicles travelling between the Rolleston residential area to the south of SH1 and the RIZ to the north of SH1. The Project provides an overpass that directly connects the Rolleston residential area and the RIZ, eliminating the need for high-risk right turn movements at high-speed signalised intersection. This also reduces the travel times across SH1 between these two areas by 4-8 minutes in 2038.
- The Project improves travel time reliability to and from Rolleston and Christchurch compared to the Do Minimum scenario, most notably in the 2038 PM peak period, by reducing congestion along SH1.

This transport assessment identifies some potential effects of the Project on the transport system including:

- The Project will affect the existing accesses for eight residential properties as part of Package 1 and four residential properties and six commercial properties as part of Package 2. The accesses affected as part of Package 1 will be provided with improved safety with no notable disbenefits. Alternative access will be

provided, where practical, to properties whose existing access is affected by Package 2 of the Project. Typically, these will involve modified access arrangements that result in additional travel to access properties from some directions.

- Changes in the State Highway access and land use growth in southeast Rolleston will see additional traffic resulting in the Levi Road / Weedons Road intersection being overcapacity during the AM peak. Selwyn District Council (**SDC**) propose a roundabout for this intersection in the RLTP and SDC LTP although timing is unclear at this stage. In the interim, it is recommended that the performance of this intersection is monitored in partnership with SDC, and mitigation measures introduced if necessary.
- Construction Traffic Management Plans (**CTMPs**) will be required to manage the effects on the transport system during construction, via an overarching Project CTMP and supported by individual Site-Specific Traffic Management Plans (**SSTMPs**).
- The Project will increase traffic volumes on Dunns Crossing Road, increasing the volume of traffic travelling past West Rolleston School. SDC has a programme to provide a school speed zone and safety improvements on Dunns Crossing Road prior to the completion of construction. These measures will manage student and pedestrian safety considering the increase in traffic volumes expected along Dunns Crossing Road.

Overall, it is considered the proposed Project will provide a number of significant positive benefits in relation to the safe and efficient functioning of the Rolleston transportation network, while the identified mitigation measures will avoid, remedy, or reduce to acceptable levels the adverse transportation related environmental effects.

1 Introduction

1.1 Purpose of this Report

This report has been prepared by Beca Limited (**Beca**) to inform the Assessment of Environmental Effects (**AEE**) for the Notice of Requirements (**NoR**) being sought by New Zealand Transport Agency Waka Kotahi (**NZTA**). This report considers the anticipated effects of the Rolleston Access Improvements Project within the context of the Greater Christchurch Settlement Plan.

While the Rolleston Access Improvements Project (**the Project**) comprises two staged packages to be delivered sequentially, this assessment considers the effects of the Project.

Package 1 of the Project includes the construction of a new roundabout at the State Highway 1 (**SH1**) / Dunns Crossing Road / Walkers Road intersection and associated works.

Package 2 of the Project includes the construction of an Overpass from Rolleston Drive (north) to Jones Road and balance of works.

Together the packages respond to both existing transport deficiencies as well as provide for the forecast future traffic in the area.

This report will specifically consider the construction and operational effects of the Project as it relates to the transport effects and recommendations to mitigate effects.

This report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works.

These have been reviewed by the author of this Report and have been considered as part of this assessment of transport effects.

Where a description of an activity is necessary to understand the potential effects, it has been included in this report for clarity.

1.2 Report Structure

The remainder of this report is structured as follows:

- Section 1 Provides a description of the Project.
- Section 2 Describes the broader context of the Project.
- Section 3 Summarises the development of the Project through the Detailed Business Case and subsequent design refinements.
- Section 4 Outlines the methodology for the assessment of effects
- Section 5 Describes the existing environment used as the baseline for effects assessment.
- Section 6 Describes the expected operational effects of the Project.
- Section 7 Describes the expected effects during construction.
- Section 8 Provides a summary of the effects assessment.

1.2.1 Overview

Rolleston is one of the fastest growing towns in New Zealand and is experiencing transport pressures to keep the community connected and state highway intersections safe. In addition, there are increasing conflicts at road/rail level crossings as a result of increasing residential and commercial activities within Rolleston.

The need for investment in the strategic network and local network in Rolleston has seen it recognised as a Road of Regional Significance (**RoRS**), with the Rolleston Access Improvements Project part of the 'Canterbury Package'.

The Project includes a number of safety and efficiency improvements (reducing deaths and serious injuries, providing greater travel choices and reduced travel times) on State Highway 1 and adjacent local roads in Rolleston. The Objectives of the Project are to:

- Improve the safety and efficiency of travel on the State Highway and intersections with the State Highway through Rolleston,
- Provide safer connections and access for goods and people travelling between the residential and industrial areas of Rolleston enabling transport choices,
- Improve the safety and travel time reliability of the regional journey between Rolleston and Christchurch.

The process undertaken to develop the Project is detailed further in later **Section 3**.

The Project is being delivered in two packages:

- **Package 1** – SH1 / Dunns Crossing Road Roundabout and associated works,
- **Package 2** – Overpass and balance of the works.

Although the Project expected to be implemented in two packages, this report assesses the effects of both packages together due to the interdependencies between the two packages. Package 1 and 2 will be discussed throughout this report.

1.2.2 Package 1 Scope

Package 1 of the Project involves the construction of a new roundabout and associated works to support the safe movement of people and goods along SH1, Dunns Crossing and Walkers Roads.

The associated works includes the provision of a new pedestrian/cycle subway. The subway will provide for a safe active mode crossing of the State Highway at the Walkers Road / Dunns Crossing Road roundabout. The subway connects to the proposed Burnham Cycleway (along Runners Road) with the Rolleston residential area and the proposed shared path provides a walking and cycling connection to the expanding industrial area and shared use paths along Walkers Road and Two Chain Road.

The intersection will be shifted southwest of its current location to accommodate the proposed roundabout, along with a westward realignment of Walkers Road and Dunns Crossing Road.

The existing part of Dunns Crossing Road will be retained to provide property access to existing properties, as indicated in Figure 1-1 below.

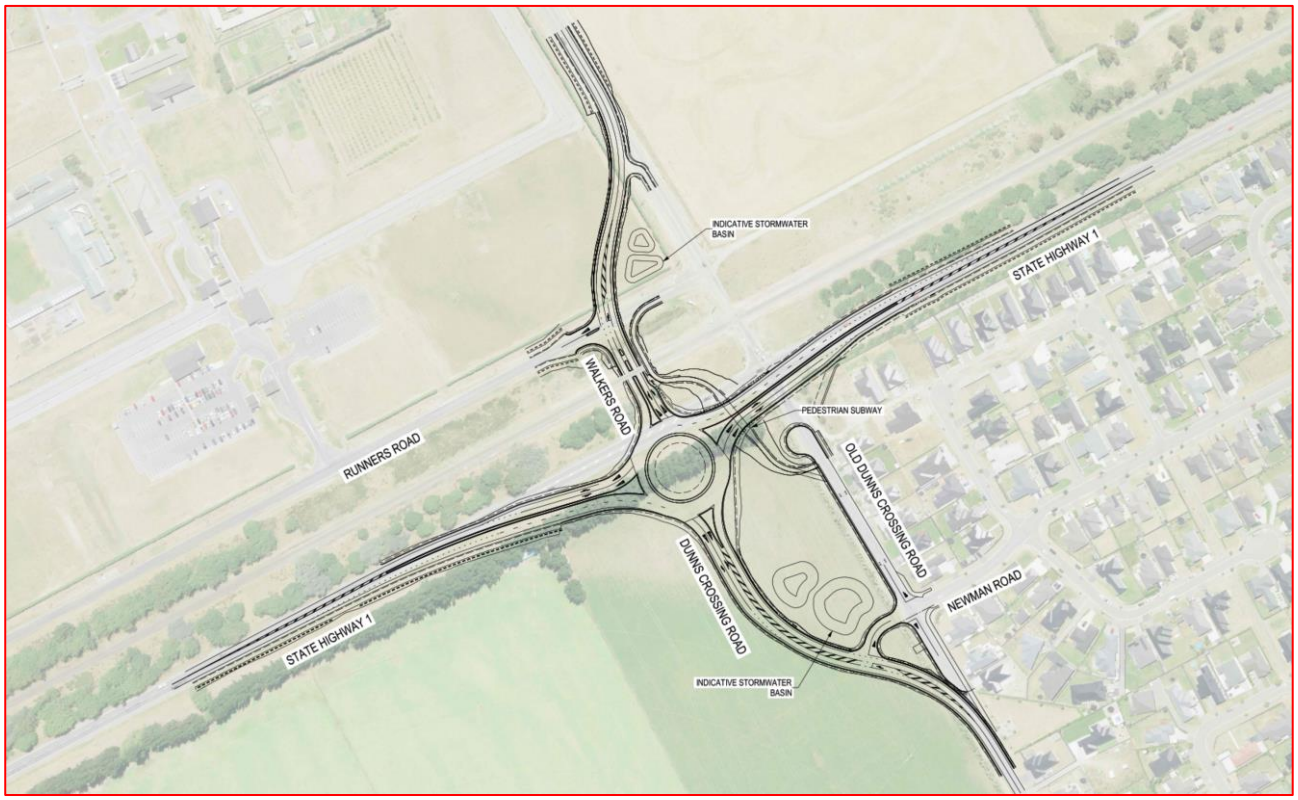


Figure 1-1: Package 1 SH1 / Dunns Crossing Road / Walkers Road Intersection

1.2.3 Package 2 Scope

Package 2 of the Project involves removal of the two existing signalised intersections on SH1 and construction of a new multi-modal overpass that will connect the residential and industrial areas of Rolleston. The overpass will provide improved facilities for walking and cycling.

The key elements are described below and shown conceptually in Figure 1-2:

- Removal of the traffic signals on SH1 at Rolleston Drive (north) and Hoskyns Road,
- Upgrade of Jones Road / Hoskyns Road, Hoskyns Road / SH1 and Rolleston Drive (north) / Kidman Street intersections,
- Safety improvements to intersections along SH1 through Rolleston, with a range of improvements to reduce deaths and serious injuries and better manage the forecasted traffic volumes,
- Extending second southbound lane from Christchurch Southern Motorway Stage 2 (**CSM2**),
- Wire rope median barrier from CSM2 to just south of Brookside Road,
- Left in / left out at SH1 / Rolleston Drive (south),
- Safer access, via a westbound exit and service lane, to the town centre and businesses alongside SH1,
- Roundabout metering and an additional northbound lane on the southern approach at the Weedons Road / SH1 off/on ramp (south) roundabout.

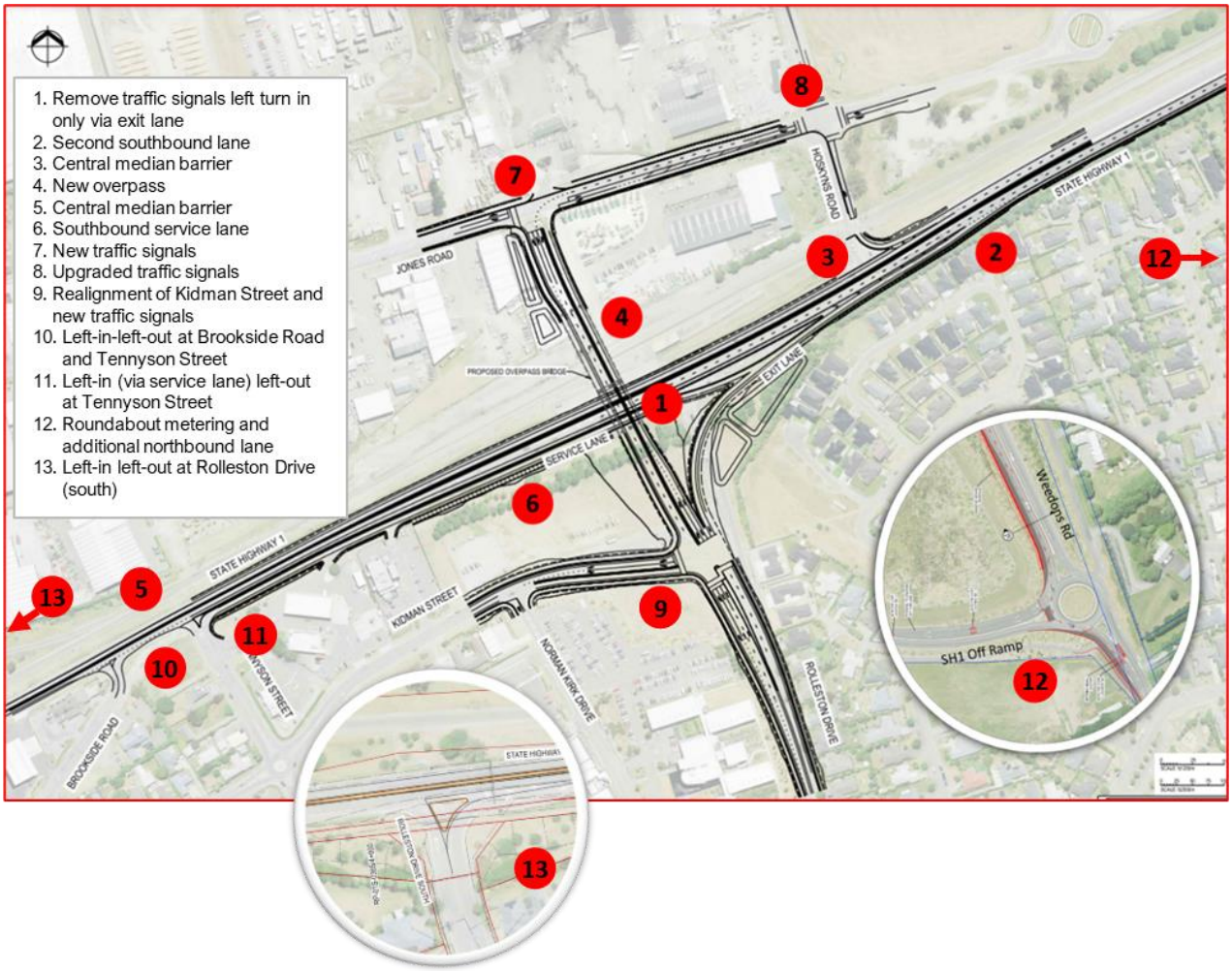


Figure 1-2: Package 2 Elements

The existing and proposed changes to SH1 access are summarised in the following Table 1-1:

Table 1-1 Proposed Changes to Intersections on SH1

Access	Current Configuration	Proposed Configuration
SH1 / Hoskyns Road	All movements, traffic signals	Left out only
SH1 / Rolleston Drive (north)	All movements, traffic signals	Left in only via SH1 exit lane
SH1 / Tennyson Street	All movements, give-way	Left in (via service lane) and left out only
SH1 / Brookside Road	All movements, give-way	Left in and left out only
SH1 / Rolleston Drive (south)	All movements, give-way	Left in and left out only

1.3 Project Objectives

The objectives of the Project are to:

- Improve the safety and efficiency of travel on the State Highway and intersections with the State Highway through Rolleston,
- Provide safer connections and access for goods and people travelling between the residential and industrial areas of Rolleston enabling transport choices,
- Improve the safety and travel time reliability of the regional journey between Rolleston and Christchurch.

These objectives have been developed taking into account both the national strategic context, local context and land use planning carried out in the region. This context is discussed in **Section 2**.

2 Area Wide Context

This section outlines the broader policy and strategy context to the Project. More detail on the development of the Project through the DBC process and subsequent design modifications are detailed in **Section 3**.

2.1 Local Context

Selwyn has been New Zealand's fastest growing district over the past 5 years with the 2023 census confirming a 29% growth in population over the 5 years compared with a 6.3% average growth across New Zealand over the same period.

Rolleston continues to accommodate the majority of this growth. New residential subdivisions continue to be built, and to keep pace Selwyn District Council (SDC) are making strides to help deliver community facilities that makes the town a more sustainable and livable place.

Along with a revitalised Town Centre, new medical centers, child day-care, cafes, shops and schools have been built recently to support Rolleston's population growth. As a reference - in 2012, there was one primary school; now there are seven schools - including a high school that opened in 2016.

Cars dominate as the preferred mode of transport – especially for journeys to work. The main reason is that almost 80% of the employed population work outside of Rolleston (mostly in Christchurch) and private vehicle is currently the most appealing option (used for almost 95% of commutes). Bus services are currently available to travel between Rolleston, Christchurch, Lincoln and Burnham although bus usage is relatively low.

Whilst Rolleston seeks to become a more self-sustaining community (i.e. where most people live and work in the same town) and to improve mode choice through public transport and active modes, it is likely that for the foreseeable future most people will continue to commute to Christchurch via private vehicles.

To the north of the State Highway and Rail corridor, the Rolleston Industrial Zone continues to grow with the IZone and Iport developments including two inland container ports as well as manufacturing and distribution centers.

Rolleston is well suited as a transport hub and distribution center at the juncture of the Main South Rail Line and Midland Line and the of end of the Christchurch Southern Motorway.

The RIZ is expected to grow and in doing so, more localised employment opportunities will be created. Future plans for the RIZ include:

- A big box retail park accessed from Jones Road and Hoskyns Road,
- A new industrial development named Tāwhiri at the northern extent of the RIZ, being led by Ngāi Tahu.

The RIZ's employment will grow to more than 2,000 jobs when development is fully completed supporting local economic growth and job creation.

Overall, growth in industrial employment will increase local travel demand to cross SH1 and the rail line, conflicting with the increase in both road and rail freight volumes on these corridors. This reinforces the need to resolve the existing access constraints and safety issues which will gradually worsen in time (if population and employment growth continues).

The **Burnham Military Camp** is also looking to expand, with military personnel expected to be living in Rolleston and commuting to work in Burnham. Given the relatively short distance, the Ministry of Defence is very keen to see provision of a safe active mode connection between the town and the Military Camp.

SDC are looking to develop a Burnham Cycleway along Runners Road and seeking a safe crossing of the State Highway to connect with the Rolleston residential area.

2.2 Strategic Context

2.2.1 Overview

The Rolleston Access Improvements Project sits within a broader strategic context seeking to improve the safety and efficiency of the State Highway network. This section sets out some of the key strategies that have guided the development of the Project.

SH1 is high-volume corridor of strategic importance and as such is identified as an inter-regional connector in the One Network Framework[1]. These are national State Highways that make it safe, reliable, and efficient to move people and goods between and within regions. State Highways often run through farmland and natural areas so there are low levels of roadside activity. State Highways carry significant levels of motor vehicle traffic, including freight.

There are several SDC roads that connect to the State Highway throughout the Project extents with most of these roads being classified as Arterial Roads in the Selwyn District Council Partially Operative District Plan, as shown in Figure 2-1. There are also two Collector Road and one Local Road that connect to SH1. Arterial Roads are intended to accommodate most of the local road traffic as the Partially Operative District Plan states they *"connect areas of district importance not already provided by State Highways. They also connect the districts townships and other important places and activities together, including across district boundaries."*

Figure 2-1 Summary of SDC Road Hierarchy Adjoining the Project Extents

The strategic context for the Project identifies how the Project will deliver on the wider regional and national outcomes sought from the SH1 corridor.

[1] As shown in NZTA MegaMaps GIS viewer (Accessed 12 September 2024)

2.2.2 Government Policy Statement

Delivery of this network improvement was initially included as part of the Canterbury Package of the NZUP, announced in 2020, and reflected in the Government Policy Statement on Land Transport 2021. A DBC was commissioned to develop the Rolleston Access Improvements Project which was completed in 2023.

The Project was subsequently adopted as a Road of Regional Significance in the Government Policy Statement (**GPS**) on Land Transport 2024-2034 released in June 2024.

The GPS outlines the government's strategy for investment in land transport over the next 10 years, implemented by NZTA via the National Land Transport Programme (NLTP). The GPS focuses on achieving the following four key strategic priorities:

- Economic growth and productivity,
- Increased maintenance and resilience,
- Safety,
- Value for Money.

The GPS identified seventeen Roads of National Significance (**RoNS**) and eleven Roads of Regional Significance (**RoRS**), including the Rolleston Access Improvements Project identified as a RoRS. The Government committed to investment in RoRS, which represent a region's most essential corridors to reduce congestion, improve safety, support housing development, boost economic growth, and provide a more resilient roading network within a region.

2.2.3 Arataki

Arataki is NZTA's view on how to deliver the Government objectives for land transport system, and guides implementation through the actions through a wide range of plans, policies and processes led by NZTA and investment partners. The regional summary for Canterbury notes:

- The region has a poor safety record in terms of Deaths and Serious Injuries (**DSIs**), particularly around the Christchurch urban area and SH1 between Christchurch and Timaru,
- Continuing residential growth on the edges of Christchurch and surrounding communities' risks locking residents into increased dependence on private vehicles to access employment and essential services,
- Growth in greater Christchurch also provides opportunities to increase use of public transport, walking and cycling in urban areas,
- Regional and rural communities will look for improved connections to greater Christchurch for people to access education and work. The major funding and financing challenge facing the region will be how to fund new infrastructure and services to keep pace with expected growth in greater Christchurch,
- While Christchurch will remain the primary South Island freight hub, the Port of Timaru will play a greater role in the freight system. It will be important to maintain safe and reliable road and rail freight access to the Lyttleton Port, Prime Port in Timaru and associated connections to the inland port in Rolleston,
- Maintaining strong freight connections to the West Coast will be critical for its communities and economy.

The focus areas that relate to Rolleston and the Project are to significantly reduce harm, including high-risk intersections on SH1 and infrastructure improvements for walking and cycling. There is opportunity to grow use of public transport, walking and cycling in Rolleston. There is desire to strengthen freight access to Lyttleton, Timaru and West Coast.

2.2.4 Canterbury Regional Policy Statement, Christchurch Transport Strategic Plan and Canterbury Regional Land Transport Plan.

At a regional and local level there is a clear desire and focus to create a more balanced transport system by enabling greater use of alternative modes to the private vehicle, as signaled within the Canterbury Regional Policy Statement (**CRPS**) and Christchurch Transport Strategic Plan.

This includes the need to make sure that land transport decision making is aligned to land-use outcomes. A desire for greater integration of transport planning and land use is being sought through the Greater Christchurch Partnership, enabled through greater residential intensification in existing urban areas.

The Canterbury Regional Land Transport Plan (**RLTP**) sets out the current state of our transport network, the challenges we face, and the priorities for future investment. This RLTP was developed by the Canterbury Regional Transport Committee (**RTC**) and took effect from 1 July 2024. The RTC is a joint committee of the region's councils as well as NZTA. The Plan sets out:

- the context in which the transport system operates,
- the vision and strategic objectives for the transport system,
- the priorities for investment – key areas where further investment is required in order to achieve the vision and objectives, and
- a prioritised regional programme of transport activities.

The vision for Canterbury's transport system in this RLTP is "an innovative, resilient, low emissions transport system that helps Canterbury thrive for generations".

The RLTP has also been mindful of the planning and investment work completed by NZTA in Arataki, the 30-year view of what is needed to deliver on the government's current priorities and long-term objectives for the land transport system.

2.2.5 SDC Walking and Cycling Strategy

SDC's Walking and Cycling Strategy (2018) is highlighted in the network plan for Rolleston including several strategic routes. This Strategy's main purpose is to inform and guide the ongoing provision of walking and cycling activities within and between Selwyn's townships to Christchurch City and any other links and networks where this would be beneficial to the citizens of Selwyn.

Most of the focus centers on reducing short trips in the range of 5-7km made by private cars and to instead get more people walking and cycling.

The current cycling facilities provided near the Projects extents are summarised further in **Section 5.7**. There are several planned cycling projects relevant to the Project area, as outlined in the SDC Walking and Cycling Strategy 2018. These include:

- A new cycleway from Rolleston to connect onto the 'South Express' major cycle route at Templeton through an extension along Jones Road to connect with the existing Manion Road and Weedons cycle routes,
- Planning to extend the short section of cycleway on Hoskyns Road further north towards West Melton,
- Rolleston to Burnham Shared Use Path (**SUP**). This is shown to go along Jones Road, Two Chain Road, Walkers Road and Runners Road – connecting the industrial area in Rolleston to the Prison.

A more recent plan change (PC80) includes an Outline Development Plan (**ODP**) that shows a SUP along Two Chain and Walkers Road, hence providing more clarity on how this may eventuate.

The intent is that these cycleways could carry through and connect to the proposed flyover, which would mean that the cycle network would broadly mirror the vehicle transport network.

2.2.6 Public Transport Futures Business Case

SDC has a strategic desire to support mode shift towards public transport. Currently three Metro bus routes serve Rolleston (Nos. 5, 820 and 85), plus two Park'n'Ride (**P&R**) facilities – one on Kidman Street (close to the proposed overpass) and a second located on the edge of Foster Park. The majority (84%) of bus passengers from Rolleston go to Christchurch. The recent introduction of direct bus services to Christchurch has improved travel time and therefore usage.

The recommended programme from NZTA's Public Transport Futures Business Case includes all day services from Rolleston at 10 minute peak frequency and 20 minute inter-peak frequency to aim for better travel time parity with car travel time (a significant improvement from the current 30 minute frequency). SDC have provided P&R facilities near the Kidman Street bus stops and are exploring opportunities for further expansion, including near the bus stop on Jones Road near Hoskyns Road.

The Project supports the desired outcomes of the Public Transport Futures Business Case. To this end, the proposed overpass which would deliver improved access to both the industrial (via Jones Road) and residential (via Kidman Street) allows for the need to support improved connectivity for public transport services. This may mean providing bus pre-emption at intersections, helping improve reliability for bus services or supporting the introduction of a new P&R service.

2.2.7 Project Background

The Project has been developed in the context a series of earlier studies and projects that give effect to the wider strategies. This section sets out some of the earlier studies and projects that have set the foundation for the development of the Project.

CRETS, developed in 2007, considered the transportation investment that may be required to support growth in Christchurch and Rolleston across a 25-year horizon. This study is directly relevant to the Project, and numerous network upgrades for the short, medium, and long term. This study has formed the basis of much of the future planning by SDC and NZTA for Rolleston. This includes investment in transport infrastructure that was delivered through previous Long-Term Plans, such as local intersection upgrades (rural and urban) and speed management areas.

NZTA commissioned a Scheme Assessment Report to investigate options to improve safety at the Tennyson Street and Brookside Road intersections on SH1 (Main South Road) in Rolleston. The Tennyson Street and Brookside Road intersections are closely spaced, full movement intersections which have had several near misses and reported crashes over the previous five years, especially involving right turning movements. The assessment undertook public consultation to investigate upgrading the intersections and improving the movement of vehicles in the vicinity.

The Christchurch Southern Motorway Stage 2 (**CSM2**), opened in 2020, ends immediately north of Rolleston at Hoskyns Road. This provides a high speed, median separated connection between Rolleston and Christchurch. A Memorandum of Understanding (**MoU**) was signed between SDC and NZTA to "proactively work together to deliver one transport network for the Rolleston Area Network" at a future date, recognising the increasing pressure on SH1 and its connections with the Rolleston local road network.

The MoU records the intention to integrate with land use and community needs to make sure value for money and achieve optimal One Network outcomes.

Speed and Infrastructure Programme was an initiative that aimed to reduce DSIs across New Zealand's state highway and local road networks. Rolleston lies within the SH1 Templeton to Selwyn River package that is aiming for a safe system transformation. Specifically, this package includes the following proposed projects on SH1 between Burnham and Rolleston:

- Rural roundabout at the SH1 / Burnham Road / Aylesbury Road intersection (access to Burnham Camp), assumed to include speed thresholds and rail level crossing upgrade,
- Median separation along SH1, between Burnham Road / Aylesbury Road and Brookside Road.

These improvements target the SH1 safety and connectivity issues specifically. In addition, the Burnham Road roundabout creates a safer connection for vehicles from the Burnham Military Camp and further west.

The Rolleston Access Improvements DBC was developed in 2022 which assessed options to improve the current network. The DBC undertook optioneering and public engagement to develop several interventions

to improve safety and connectivity of the State Highway around Rolleston. This included further refinement and value engineering of previous interventions identified in previous studies to provide holistic package of works. The development of the Project from the DBC is further discussed in **Section 3.2**.

3 Project Development

This section summarises the development of the Project through the DBC process, and the subsequent design changes adopted for the AEE.

3.1 Network Framework

To gain an appreciation of the desired transport network for Rolleston, and the potential points of conflict for various modes the DBC developed a 'Network Operating Framework' (**NOF**) for the area.

The NOF shows how the transport network will work, and how the Rolleston Access Improvements will better help bring together the two sides of Rolleston which are separated by the State Highway and Rail Corridor.

Improvements along the State Highway support the desired transport network for Rolleston and enable various road corridors to function as they are intended by keeping the right traffic on the right roads e.g. the peripheral ring arterial roads outlined in SDC's road hierarchy.

This allows for better management of the movement of people and goods, a safer network and makes Rolleston a more liveable place by having quieter local streets.

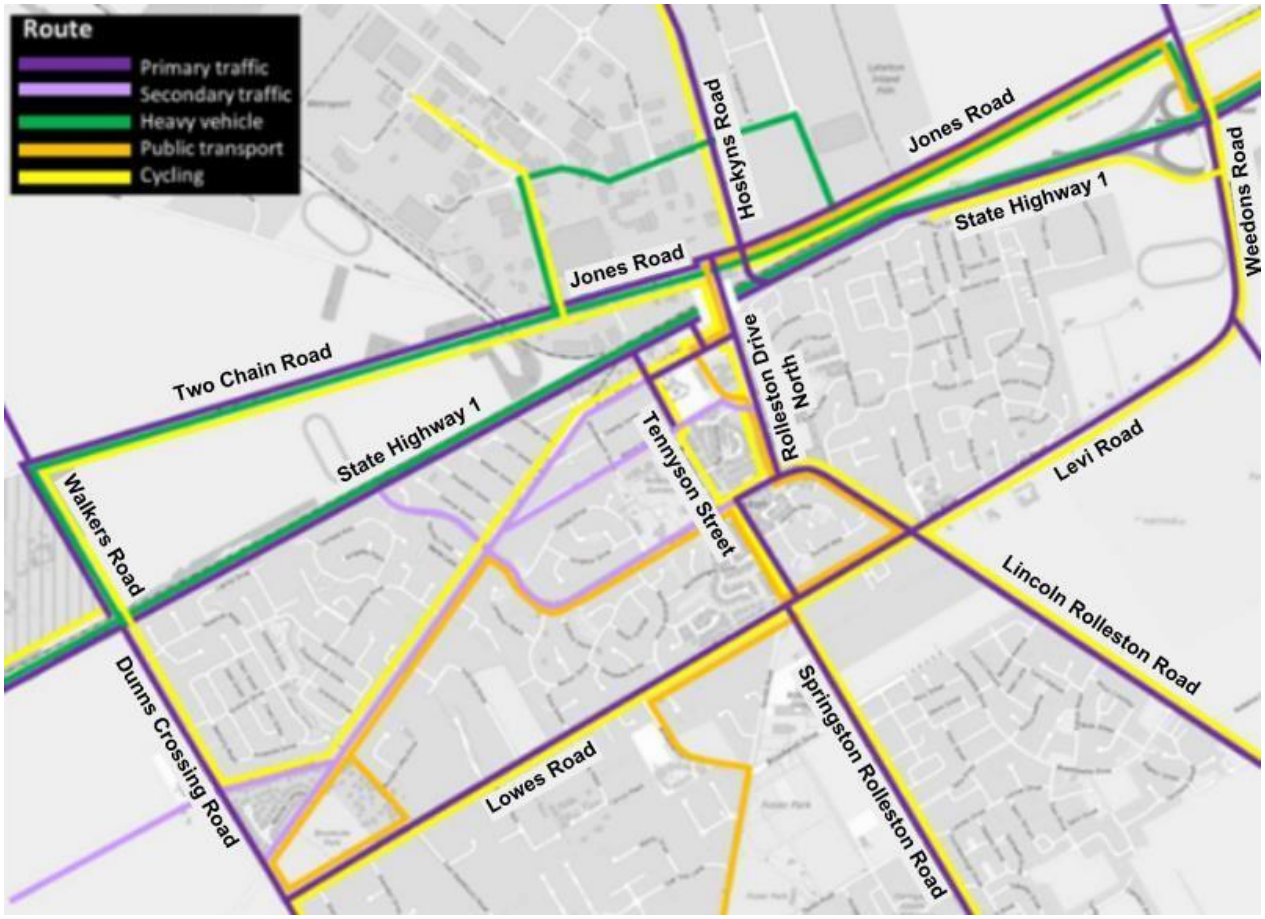


Figure 3-1 Rolleston Strategic Network Plan (from the Detailed Business Case)

This Strategic Network Plan map demonstrates the following:

- The role of Dunns Crossing Road and Walkers Road as a key cross-district route, part of the peripheral arterial ring road system,

- Walkers Road-Two Chain Road and Jones Road are the primary west facing freight route to the Rolleston Industrial Zone,
- The importance of a direct multi-modal connection from the town centre to Jones Road for connectivity between the township and the industrial zone, as well as the commercial centres in the town centre and proposed large format retail area on Jones Road,
- Rolleston Drive (north) is reinforced as a main vehicle route to and from the wider Rolleston township,
- The desire for Tennyson Street to be a low speed, local access, route (i.e., to the Town Centre) only,
- A strategic desire to reduce the number of local road conflicts with the high-volume strategic road,
- The Weedons Road interchange is the primary entrance to Rolleston from the east, especially for access to the industrial area and access to the township side via Levi Road and Lowes Road,
- Levi Road / Lowes Road are reinforced as a more central arterial connection through the township area,
- Additional State highway access to/from Christchurch is provided via Hoskyns Road and the SH1 exit to Rolleston Drive (north) and the Service Road / Tennyson Street.

3.2 DBC Option Development

This AEE provides an overview of the assessment of alternatives methodology used to develop and assess design options as part of the DBC. Broadly, this included the following key steps:

- **Technical analysis** - Consideration of problems and system performance, and assessment of the merits of various options. This involved extensive transport modelling and other technical considerations for the option assessments,
- **Public Engagement** - NZTA presented the NZUP programme and asked the public what they thought.
- **Assessment of all Options** - Not all the feedback received from the first round of engagement was positive, and subsequent to this, NZTA investigated some alternatives – most notably in relation to the overpass alignment. NZTA therefore took a step back to make sure we had robustly explored all the options,
- **Long List, Short List, Technically Preferred Options** - This took the form of a multi-criteria analysis (MCA) that was informed by various technical assessments including traffic modelling and concept designs. The outcome was a set of technically preferred options that had acceptance from all the Project partners – NZTA, SDC and KiwiRail,
- **Public Engagement** - NZTA asked the public what they thought of the refined programme. There were however some issues that the public raised, particularly regarding improving safety on local roads that would see more traffic,
- **Refinement of Preferred Options** - NZTA took on board the feedback, undertook technical analysis and made some changes which looked to address the main feedback received. NZTA then completed technical assessments, design, cost estimates, safety audits and the overall business case.

The DBC identified the following preferred solution to address the problems identified within the Project extents:

- A new multi-modal overpass between Rolleston Drive (north) and Jones Road,
- A roundabout at the SH1 / Dunns Crossing Road / Walkers Road intersection including a walking and cycling underpass,
- Safety improvements to intersections along SH1 through Rolleston.

3.3 Post-DBC Option Development

3.3.1 Exit Ramp Arrangement Refinement

The Project team undertook a safety and efficiency review of the concept layout developed as part of the DBC that identified operational improvements for the Rolleston Drive Off-ramp arrangement. This included

review of alternative designs to provide a more efficient and safer solutions for the Rolleston Drive (north) area.

This resulted in a modification to the westbound off-ramp to connect directly into Rolleston Drive (north) without the loop. This change removed the ability of users of the off-ramp to then head north over the new bridge to access the industrial area, with such movements instead encouraged to exit SH1 at the Weedons Road interchange and use the arterial road network on Jones Road, Weedons Road and Weedons Ross Road. An alternative route is possible via the lane to Tennyson Street and Kidman Street. However, this route is not encouraged as these roads are collector roads within residential and commercial areas where the movement of traffic has less importance.

The resulting layout provides an exit ramp arrangement that simplifies the Kidman Street / Rolleston Drive (north) intersection, requires a smaller footprint to construct, provides a safer arrangement of the exit ramp and safer Kidman Street / Rolleston Drive (north) intersection approaches and would be lower cost.

Initial modelling of the refined design identified higher traffic flows using the Weedons Road interchange with consequential increases in delays and queues at the southern roundabout (westbound on/off-ramps). The following mitigation measures were subsequently identified at the Weedons Road / SH1 off/on ramp (south):

- Metering signals on the southern approach on Weedons Road,
- Additional northbound lane on the southern approach.

The optioneering process is documented in the AEE Alternatives Assessment.

The revised ramp design, along with the identified mitigation at the Weedons Road interchange were then confirmed by NZTA as the preferred Project configuration for use in this assessment.

The assumptions adopted for the Weedons Road interchange intersections are discussed further in **Section 5.2** regarding the Existing Environment.

3.3.2 Rolleston Drive Extension / Jones Road Intersection Refinement

The Project undertook a review of the Rolleston Drive Extension / Jones Road intersection to reduce the impact on adjacent properties but also provide similar network performance. This process is documented in the AEE Alternatives Assessment.

This alternative layout of Jones Road was found to provide similar or better overall intersection delays compared with the DBC layout and alternative overpass ramp layout. This option reduces the impact of the Project by reducing the land acquisition required near the Rolleston Drive Extension / Jones Road intersection while maintaining similar network performance.

3.4 Project Interdependencies

3.4.1 SDC Projects

The Project sits within a broader programme seeking to improve the safety and efficiency of transport networks within Rolleston, while also improving the amenity of urban areas. This programme is to support ongoing growth and to integrate the Project into the wider road network.

This section sets out some of the other key projects that are occurring alongside the Project. Figure 3-2 shows the suite of planned wider local transport improvements identified in the DBC for the next 10+ years.

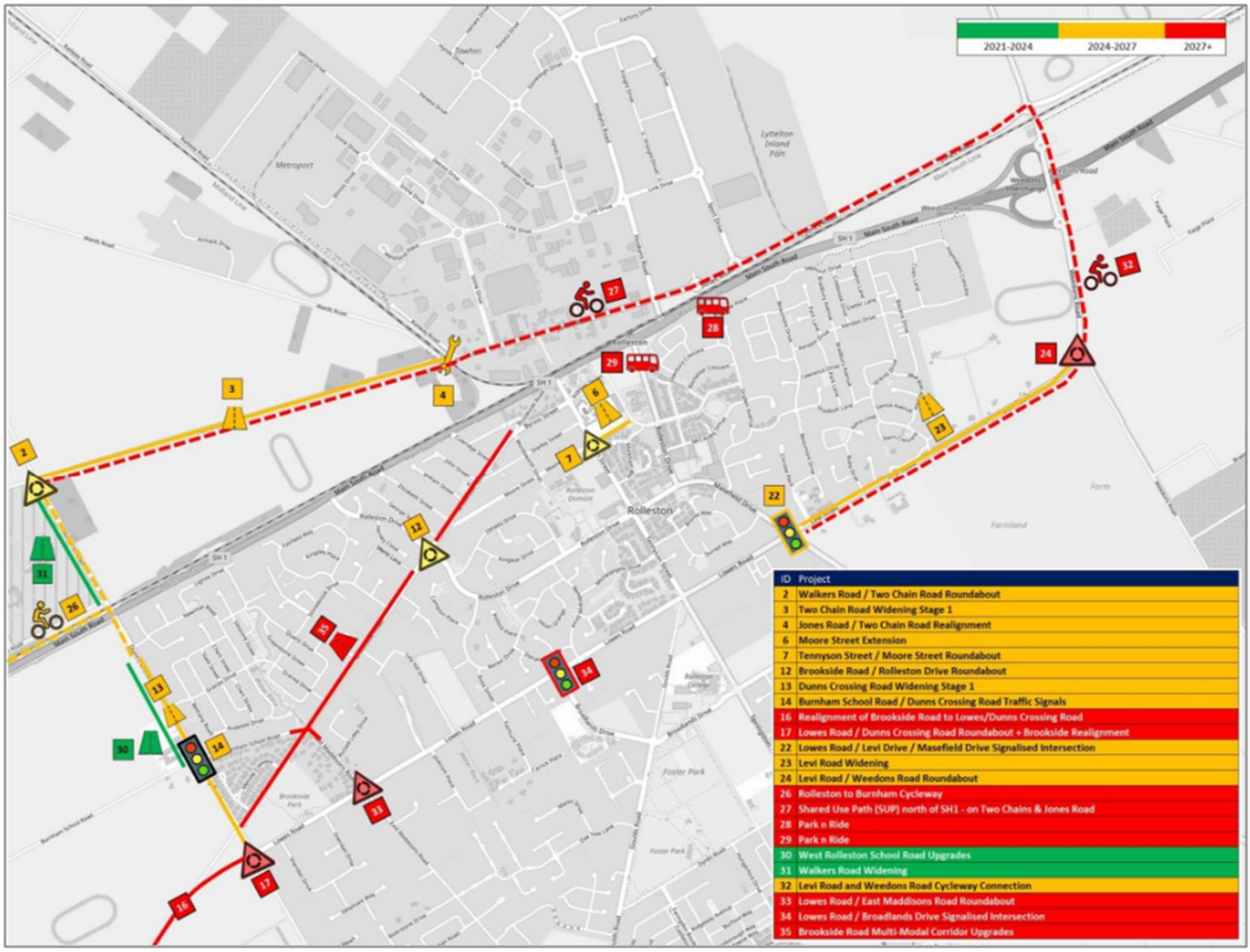


Figure 3-2: Local Transport Improvements Identified as part of the Detailed Business Case (extracted from Detailed Business Case)

SDC also has several local road improvements in their Long Term Plan (**LTP**), but at this stage the only projects with committed funding are:

- Roundabout at Rolleston Drive (south) / Brookside Road,
- Signalisation of the existing roundabout at Lowes Road / Levi Road / Masefield Drive.

The following upgrades have been identified in the SDC Draft LTP and expected year of implementation (subject to funding):

- Financial Year 2024/2025
  - Burnham School Road / Dunns Crossing Road Traffic Signals (ID:14)
  - Lowes Road / Levi Drive / Masefield Drive Signalised Intersection (ID:22) – Under Construction
  - Levi Road Widening (ID:23)
- Financial Year 2025/2026
  - Walkers Road / Two Chain Road Roundabout (ID:2)
  - Two Chain Road Widening Stage 1 (ID:3)
- Financial Year 2026/2027
  - Jones Road / Two Chain Road Realignment (ID:4)
  - Moore Street Extension (ID:6)
  - Tennyson Street / Moore Street Roundabout (ID:7)
  - Brookside Road / Rolleston Drive (south) Roundabout (ID:12)

  - Dunns Crossing Road Widening Stage 1 (ID:13)
- Financial Year 2027/2028
  - Rolleston to Burnham Cycleway (ID:26)
- Financial Year 2028/2029
  - Levi Road and Weedons Road Cycleway Connection (ID:32)
- Financial Year 2029/2030
  - Lowes Road / Dunns Crossing Road Roundabout + Brookside Realignment (ID:17)
  - Shared Use Path (SUP) north of SH1 - on Two Chains & Jones Road (ID:27)
  - Kidman Street Park n Ride (ID:28)
- Financial Year 2030/2031
  - Realignment of Brookside Road to Lowes/Dunns Crossing Road (ID:16)
  - Lowes Road / Broadlands Drive Signalised Intersection (ID:34)
- Financial Year 2032/2033
  - Levi Road / Weedons Road Roundabout (ID:24)
  - Rolleston Park n Ride (ID:29)
- Financial Year 2033/2034
  - Lowes Road / East Madisons Road Roundabout (ID:33)
- Financial Year 2034/2035
  - Brookside Road Multi Modal Corridor Upgrades (ID:35)

As part of the DBC, it was identified that an upgrade to the existing give-way at the Weedons Road / Levi Road intersection was needed to support the increased traffic volumes in Lincoln and Rolleston, and that this should be progressed as a stand-alone project by SDC.

The specific design of that upgrade has not been confirmed, however, a roundabout has been suggested. Implementation of the upgrade is currently programmed to occur after the implementation of the Project. The interaction between the Project and this intersection upgrade are discussed further in regard to defining the existing and future environments (**Section 5**) and via sensitivity testing in the model discussed in **Section 6.10.**

4 Assessment Methodology

This section described the methodology adopted for assessing the effects of the Project both during construction and once operational.

4.1 Assessment Overview

This report details the expected effects on the transportation system resulting from the construction and operation of the Rolleston Access Improvements Project. Assessment of these expected effects has been undertaken both quantitatively and qualitatively, depending upon the transportation mode or element being assessed.

The **operational effects** on the transport system are assessed by comparison against the 'existing' environment. However, the expected increase in traffic and impact of wider changes in land use and transport system changes means that the current transport environment is likely to change, regardless of this Project proceeding. The Network Operating Framework reinforces the need for the peripheral ring arterial road system with key accesses onto the state highway to support the expected traffic growth.

This means that operational effects of the Project are best compared against a future environment that includes those wider changes but excludes this specific Project. For consistency with the DBC terminology, the future environment without the Project is referred here as the **Do Minimum** scenario.

The use of transportation models is a standard approach to estimate both the future environment without the Project as well as the specific operational effects of the Project. The modelling approach and assessment matters are summarised in **Section 4.2** to **Section 4.4**.

The approach to the **effects of construction** were based on the following considerations:

- It is recognised that there will inevitably be temporary effects on the transport system during construction, such as temporary road closures, diversions, alternative property accesses, construction traffic using the wider network and potential disruption to public transport services and walking/cycling connections.
- Specific details of construction methodologies, material sources, haul routes, times of operation are not known in detail and will be subject to detailed development by NZTA and its contractor.
- To enable innovation and flexibility in construction methodologies it is intended to avoid highly prescriptive conditions that constrain alternative methods.
- Those potential effects would occur on the existing network so don't require assessment on future year scenarios.
- Construction matters and impacts have been considered in the Project design to assist management of these potential effects, such as:
  - Identification of a construction methodology to complete the roundabout construction (Package 1) prior to construction of Package 2 to minimise significant impacts on traffic.
  - Avoiding a central pier on the overpass bridge to enable traffic signals to remain operational until the overpass bridge is operational.
- The use of Construction Traffic Management Plans (**CTMP**) is a common and industry-standard approach to managing effects of construction traffic and is recommended here to manage the potential effects.

The construction effects have therefore been assessed on the basis that a CTMP will be developed by the contractor to manage each stage of construction. Therefore, focus of the assessment, provided in **Section 7**, is therefore on the specific considerations required for such a CTMP.

4.2 Transport Modelling Approach

The Rolleston Paramics Microsimulation traffic model used in the DBC was also used to assess the wider traffic effects of the Project, along with targeted intersection-specific assessment using SIDRA (for roundabout) and LinSig (for traffic signal operations) models. The Paramics model was developed as part of the DBC, including a base year validation model for 2021 and future year forecasts for 2028 and 2038. The model covers the broader Rolleston Area indicated in **Figure 4-1**, with vehicle demand patterns (in the form of origin-destination trip tables) sourced from the Christchurch Assignment and Simulation Traffic Model (**CAST**). The model was independently peer reviewed for the DBC.

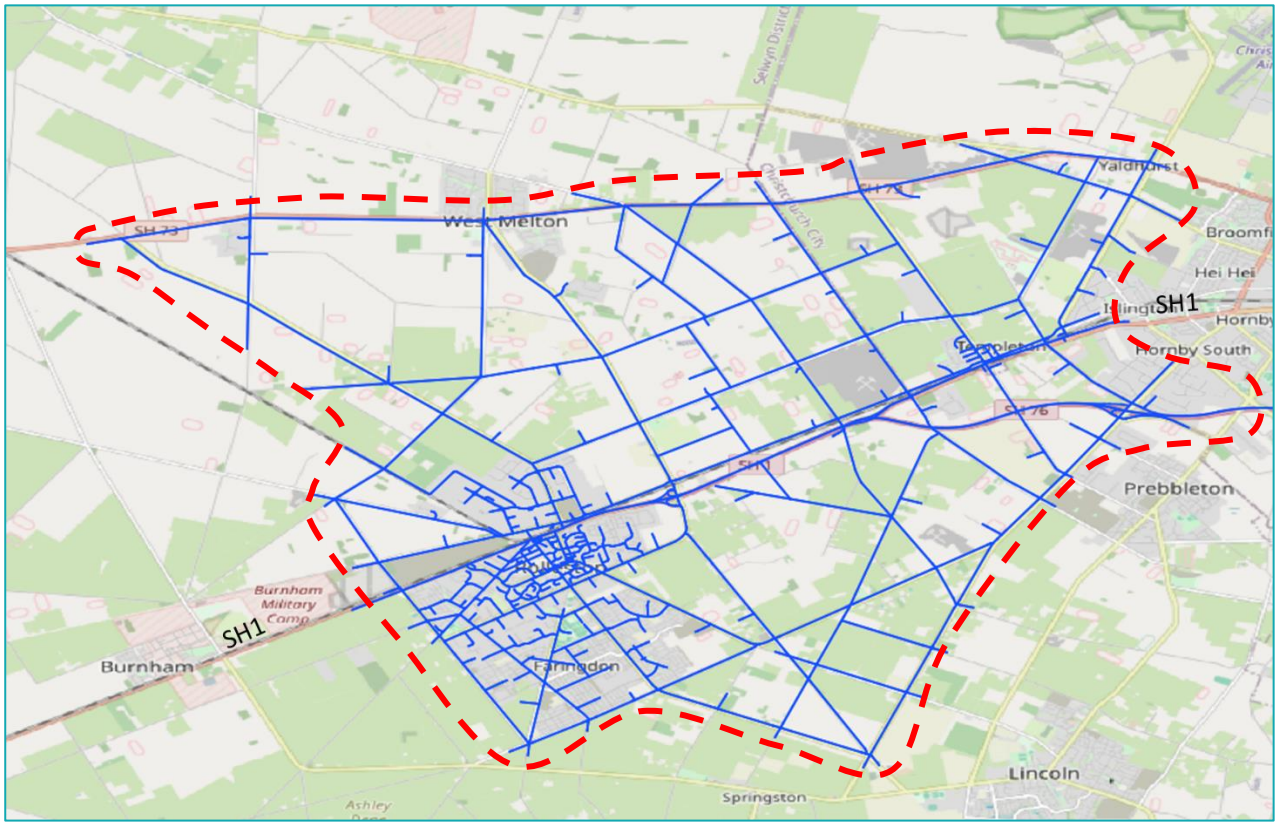


Figure 4-1 Extent of Rolleston Traffic Model

The modelled time periods are:

- AM: 6:00 – 9:30 with a peak hour of 7:30 – 08:30,
- IP: 10:30 – 13:30 with a peak hour of 11:30 – 12:30,
- PM: 14:30 – 18:00 with a peak hour of 16:00 – 17:00.

The models for the 2028 and 2038 Do Minimum scenarios developed as part of the DBC were adopted for this transportation assessment. The Do Minimum network assumptions are described further in **Section 5.2.** Due to inherent variability of the simulation aspect in each model run, slight differences in the model outputs (such as delays, travel times, etc.) compared to the Do Minimum results reported in the DBC are noted.

The Rolleston Access Improvements were incorporated into the model to form the Project scenario for assessment and compared against the Do Minimum scenarios. As noted in **Section 3.3**, the Project design differs from that in the DBC in regard to the westbound connection from SH1 to Rolleston Drive (north), Rolleston Drive Extension / Jones Road intersection layout and Jones Road / Hoskyns Road layout.

A localised LinSig traffic model capturing the Kidman Street / Rolleston Drive (north), Rolleston Drive Extension / Jones Road and Jones Road / Hoskyns Road was developed to determine optimal coordinated signal phasing and timings for this group of intersections. Signal timings from the LinSig model have then

been incorporated into the Paramics model to provide green wave progression for vehicles coming from Rolleston Drive (north) accessing SH1 via Hoskyns Road.

SIDRA models were used to test different forms of the Levi Road / Weedons Road intersection as discussed later in **Section 6.10.** The testing indicated similar results to the initial Paramics modelling, so the SIDRA modelling tests have not been used in the effects assessment.

As noted in **Section 5.3,** initial modelling analysis indicated that the Project resulted in increased use and resulting congestion at the Weedon's Interchange (specifically on the southern roundabout). Subsequently, mitigation was identified and included in the transport models for the Project Scenario.

4.3 Approach to Recent Plan Changes since the DBC

The purpose of this Integrated Transport Assessment is to assess the effects of the Project on the transport network. This included the approved land-use changes at the time of the DBC, including those defined in Map A of the CRPS, depicted below. At the time of the DBC there were other Plan Changes being proposed and these were considered as the Project options were being optimised for network performance.

There are nearby Private Plan Changes that have recently become operative (Private Plan Change 80) or are under consideration (Private Plan Change 73, Private Plan Change 81 and Private Plan Change 82) that are not included within CRPS. These Private Plan Changes assumed that earlier variants of the Project were in place as part of their assessment of effects. The effects of the Private Plan Changes on the transport network have been assessed and considered independently of this Project, and on the assumption that this Project would be implemented.

In order not to conflate this Project assessment with the effects of the plan changes themselves (which for PC80 have been assessed and approved), this assessment was undertaken without the above Plan Changes included on the transport models. The approved plan changes will add more vehicle movements to the network, however those effects have already been assessed. The modelling presented here shows spare capacity at the new intersections to accommodate additional traffic.

The Project design has considered future growth in the context of the tight constraints of the railway and built environment. This approach is considered acceptable given that the assessment of the Plan Changes explicitly included the improved transport elements assessed here (albeit on earlier design variants).

4.4 Assessment Matters

The key matters to be considered for operational effects and the general methodology adopted for the assessment is outlined in the following **Table 4-1**.

Table 4-1 Operational Assessment Matters and Methodology

System Element	Methodology
Walking/cycling facilities	Identification of direct impact on routes and facilities
Road Safety	Assessment of expected impact with estimate of quantified impact using crash-prediction models
General Traffic and freight movements	Assessment of predicted changes between the future year Do Minimum and Project scenarios, including: • Change in traffic flows in the local network and alignment with Rolleston Strategic Network Plan • Change in travel times for key movements • Change in Level of Service at key intersections • Reliability of journeys between Christchurch and Rolleston to assess the Project against the specific Project objectives

System Element	Methodology
Property access	Assessment of directly impacted properties
On-street Parking	Identification of direct impacts on on-street parking
Public transport	Identification of direct impact on routes and facilities and estimation on impact on services times via future year transport models of the Do Minimum and Project scenarios

The performance on road network is based on the future year model scenarios and has been assessed based on the following measures:

- Network efficiency – **Section 6.2.1**
- Sector-to-Sector travel time – **Section 6.2.3**
- Intersection Level of Service (Los) – **Section 6.3**
- Queue lengths – **Section 6.3**
- Travel time reliability – **Section 6.4**

LoS is a graduated scale from A to F which categorises the operation of each movement where LoS A represents almost free-flow conditions with minimal delay and LoS F represents flow-breakdown or over-capacity conditions with significant queueing and delays. **Table 4-2** presents the delay criteria for each LoS category.

Table 4-2: LoS Delay Bands

LoS	Delay Bands (s)	
	Signals & Roundabout	Priority
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

The assessment of the construction impacts differs, due to the different methodologies and level of detail available as outlined in **Section 4.1**. The assessment specifically focuses on the existing network (rather than a future year scenario) and on the matters to be addressed in a CTMP rather than specific and detailed quantification of potential effects.

5 Existing Environment

This section describes the existing and anticipated future transport environment without the Project. Some quantification of the system performance is provided, however most modelling metrics are provided in the subsequent section to provide a direct comparison against the outcomes expected with the Project.

5.1 Existing Road Network

Figure 5-1 below shows the existing road network with the existing intersection forms on SH1 indicated.

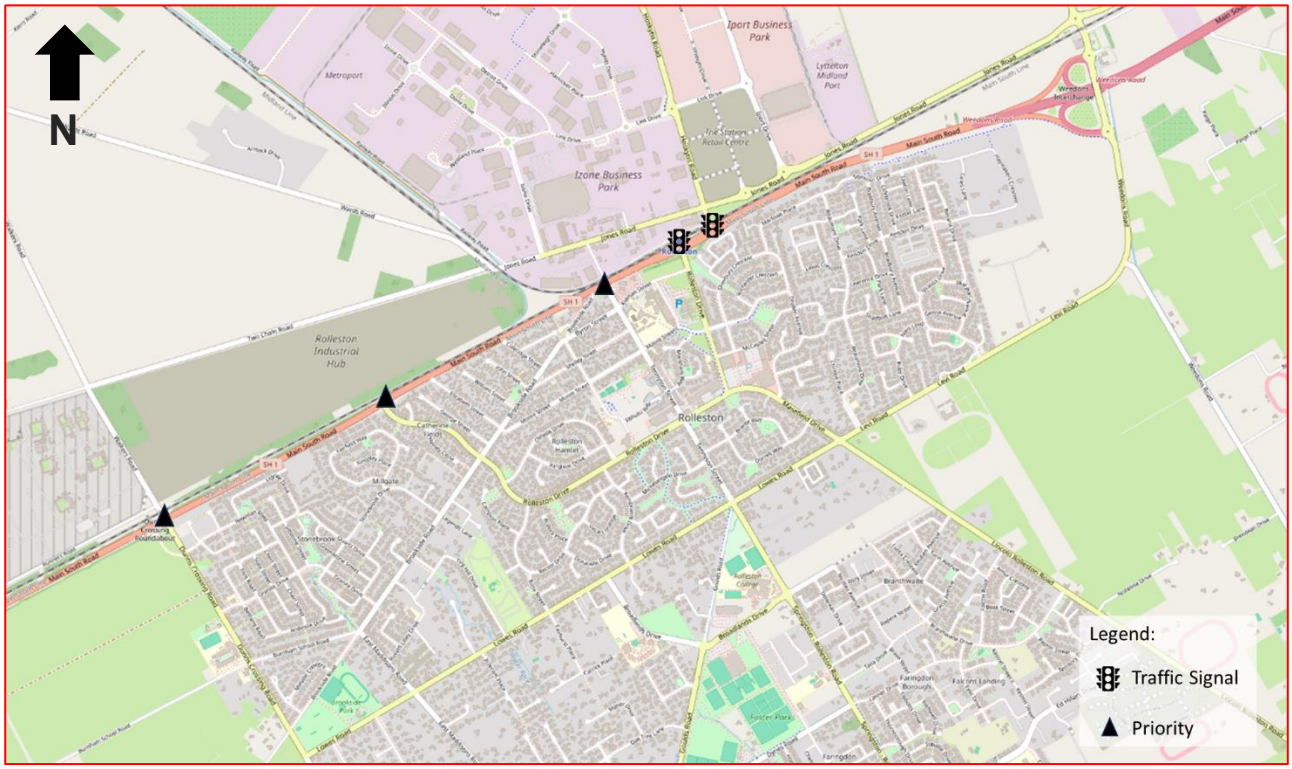


Figure 5-1: Existing Road Network

SH1 is the primary route connecting Christchurch and Rolleston. SH1 runs east west through Rolleston and bisects Rolleston Town Centre and residential area in the south and the RIZ in the north. The current speed limit on SH1 is 80km/h from west of Brookside Road to east of Hoskyns Road and 100km/h outside these extents.

The primary access to and from the Rolleston Town Centre and residential area is via the existing traffic signals at the SH1 / Rolleston Drive (north) intersection. The primary access to and from the RIZ is via the existing traffic signals at the SH1 / Hoskyns Road intersection. These two intersections are located approximately 180m apart and require vehicles on the SH1 to stop to allow traffic from Rolleston to access SH1. These signalised intersections are within an 80km/h speed limit area and are part the terminus of the Christchurch Southern Motorway (CSM) presents a safety concern for traffic at these intersections.

A series of priority intersections are also located along SH1 that provide alternative access onto SH1 including at Dunns Crossing Road, Rolleston Drive (south), Brookside Road and Tennyson Street. These intersections allow right turns onto SH1 and these movements typically experience high delays due to the high conflicting volumes on SH1. An Intersection Speed Zone is to be operational at the SH1 / Dunns Crossing Road / Walkers Road intersection by the end of October 2024 where the speed limit on SH1 at this intersection will reduce to 60km/h when turning traffic is present. This is a temporary safety improvement measure until the Project is implemented so will not be included as part of the Do Minimum scenario.

5.2 Assumed Do Minimum Future Network and Land Use

5.2.1 Overview

The Do Minimum scenario represents the minimum level of expenditure to maintain a minimal transport level of service and includes other committed and funded projects. The 2028 and 2038 Do Minimum scenarios developed as part of the DBC were adopted for this assessment.

5.2.2 Demand Growth

The future year vehicle demand patterns are sourced from the regional CAST model[2]. The development of the future year models is documented in the DBC and summarised below.

Table 5-1 presents the anticipated increase in traffic between 2021 to 2028 and 2038 for each peak period.

Table 5-1: Anticipated traffic changes between 2021 to 2028 and 2021 to 2038 [3]

Vehicle	2021 to 2028 Growth (%)			2021 to 2038 Growth (%)		
	AM	IP	PM	AM	IP	PM
LV	25%	25%	24%	45%	52%	43%
HV	5%	9%	5%	17%	17%	15%
Total	23%	23%	22%	42%	48%	41%

High growth areas are identified in the southeast Rolleston residential development area, the RIZ (including Iport and IZone) commercial development areas and between the external CSM2 route to/from Christchurch.

5.2.3 Network

The following infrastructure assumptions were identified in the DBC and are included in the Do Minimum scenarios (these same assumptions were also included in the Project scenario):

1. Rolleston Town Centre links / improvements (Wordsworth Street extension, Moore Street extension).
2. Tennyson Street / Moore Street roundabout
3. Lowes Road / Levi Road / Masefield Drive, upgrade from roundabout to signals (Construction expected 2025)
4. Brookside Road / Rolleston Road, upgrade from priority intersection to roundabout.
5. Broadlands Drive extension, between Springston Rolleston Road and Lincoln Rolleston Road.
6. Southwest Connector, extending between Weedons Road and Dunns Crossing (identified as “New Collector Road” in CRETS study).
7. Goulds Road / East Maddison Road, upgrade from off-set priority to roundabout which provides sensible linkage/structure around the Southwest Connector (not in SDC Rolleston 2028 model).
8. Selwyn Road / Weedons Road, upgrade from priority to roundabout.

[2] The CAST model in turn sources vehicle demand patterns from the regional transport model (CTM), based on agreed regional land use forecasts.

[3] Retrieved from NZTA, Rolleston Access Improvements Technical Note – Preferred Project Assessment Transport Modelling and Approach to Economics Report, June 2023, page 8.

9. Selwyn Road / Lincoln Rolleston Road, upgrade to seagull priority (noting SDC advice that this is improvement is paired with the roundabout upgrade above).
10. Jones Road / Two Chain Road re-alignment (design underway).
11. Two Chain Road / Walkers Road, upgrade from priority to roundabout.
12. Speed limit from end of CSM2 to Brookside Drive set to 60kph (aligns with current Safe and Appropriate Speed for this section).
13. Speed limit from Brookside Drive to Burnham set to 80kph (aligns with current Safe and Appropriate Speed for this section.

The Kidman Street / Rolleston Drive (north) intersection has been modelled as a simple signalised intersection in 2038 to manage queueing in the network and reduce blocking back in the 2038 AM Do Minimum scenario.

No changes were made to the Do Minimum network assumptions adopted in the DBC.

The Levi Road / Weedons Road intersection has been identified for upgrade in the RLTP and SDC LTP to a roundabout but was not included in the Do Minimum assumptions in the DBC. The timing of the upgrade is currently programmed for 2032/2033, after completion of the Project, but timing is dependent on funding availability.

For the purpose of this assessment, the main modelling assumed that the upgrade is not included in the Do Minimum scenario. However, a sensitivity test considering the timing of the roundabout upgrade has been assessed in **Section 6.10.**

5.3 Network Performance

Congestion heatmaps for the 2028 and 2038 Do Minimum scenario have been used to identify key intersections of concern. The congestion heatmaps have been provided in **Appendix A.**

5.3.1 2028

Figure 5-2 to Figure 5-4 presents the intersection LoS plots for the AM, IP and PM peak hour for 2028 for the key intersections.

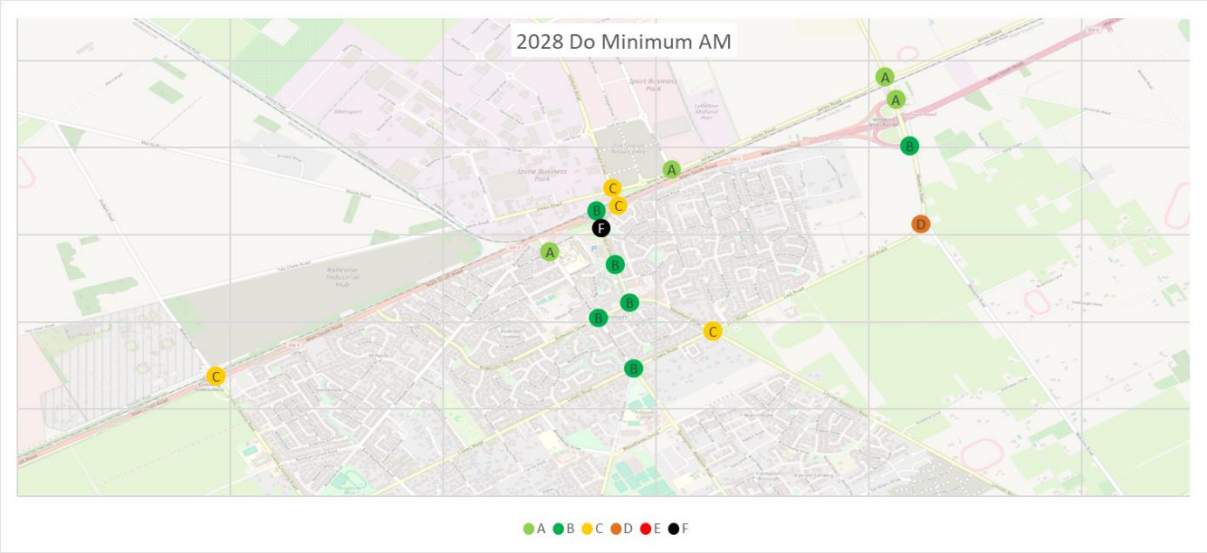


Figure 5-2: 2028 Do Minimum AM LOS plot

Figure 5-3: 2028 Do Minimum IP LOS Plot

Figure 5-4: 2028 Do Minimum PM LOS plot

The overall network generally operates well in 2028 in all three peak periods. Some congestion is expected in the PM peak along SH1, particularly at the SH1 / Hoskyns Road intersection.

The Kidman Street / Rolleston Drive (north) intersection operates at LoS F in the AM and PM peak due to the give way priority form of the intersection. The congestion is limited to the western approach where high northbound and southbound traffic volumes on Rolleston Drive (north) make it difficult for drivers on Kidman Street to find safe gaps.

It should be noted that whilst the overall intersection performance of the SH1 / Dunns Crossing Road / Walkers Road intersection remains within acceptable levels (LoS C), the minor approaches (Dunns Crossing Road and Walkers Road) begin to experience high delays up to 130s in the AM peak and up to 160s in the PM peak. This is anecdotally observed where many people are avoiding this intersection during the peaks due to the challenges and safety risks. The Dunns Crossing Road approach experiences high delays in the AM peak due to high conflicting volumes westbound on SH1. Conversely, the Walkers Road approach experiences high delays in the PM peak, due to high conflicting volumes eastbound on SH1.

The Levi Road/Weedons Road intersection is approaching capacity, operating at LoS D during the morning peak. Drivers on the minor arm from Weedons Road (south) experience delays of up to 30 seconds when turning right.

5.3.2 2038

Figure 5-5 to Figure 5-7 presents the intersection LoS plots for the AM, IP and PM peak hour for 2038 for the key intersections.

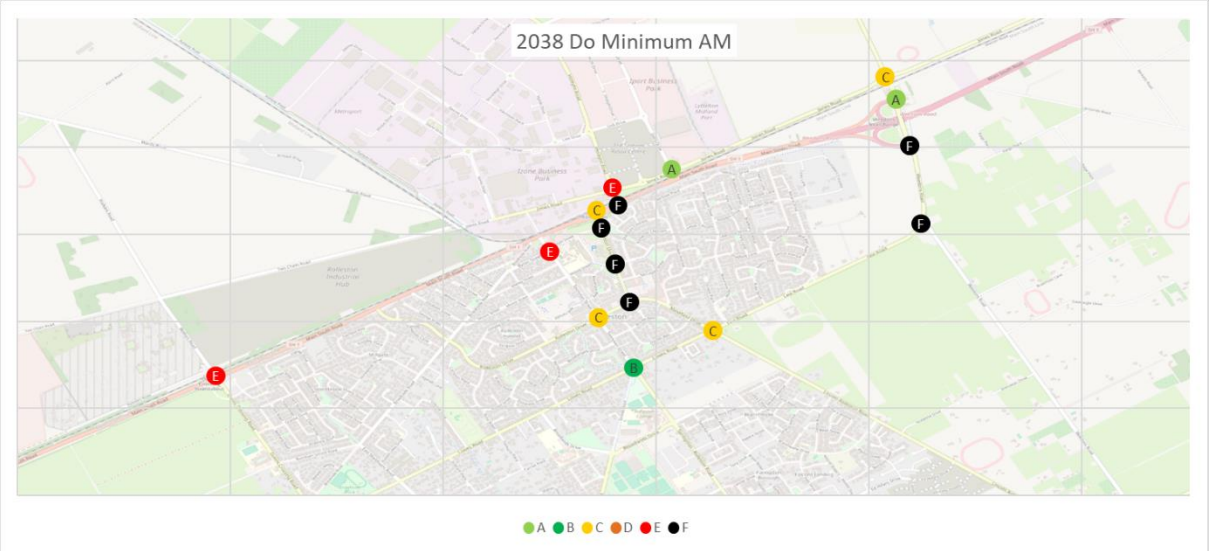


Figure 5-5: 2038 Do Minimum AM LOS plot

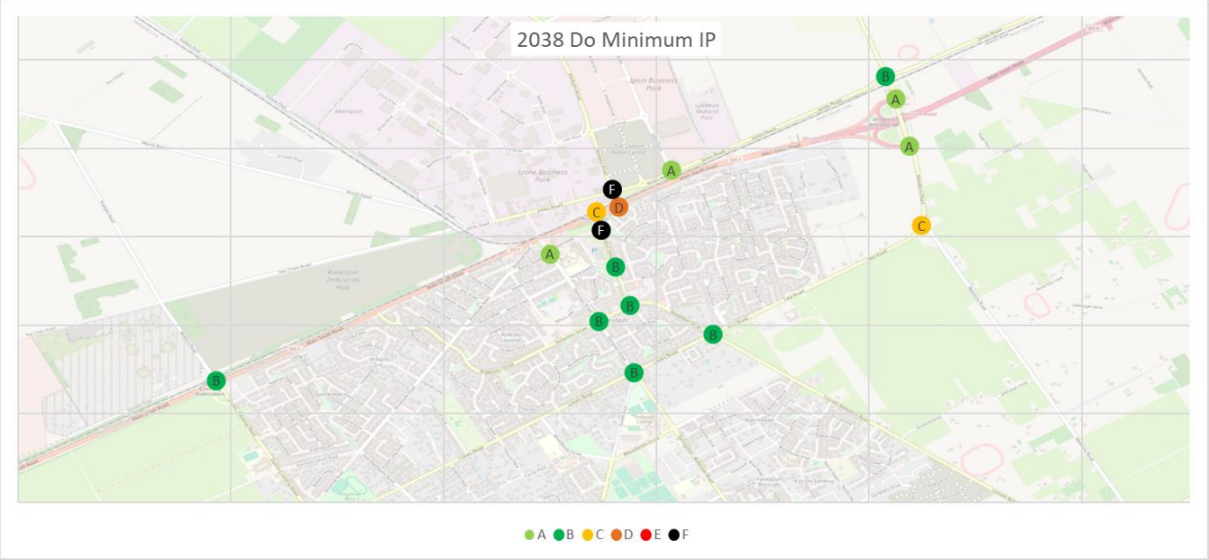


Figure 5-6: 2038 Do Minimum IP LOS plot

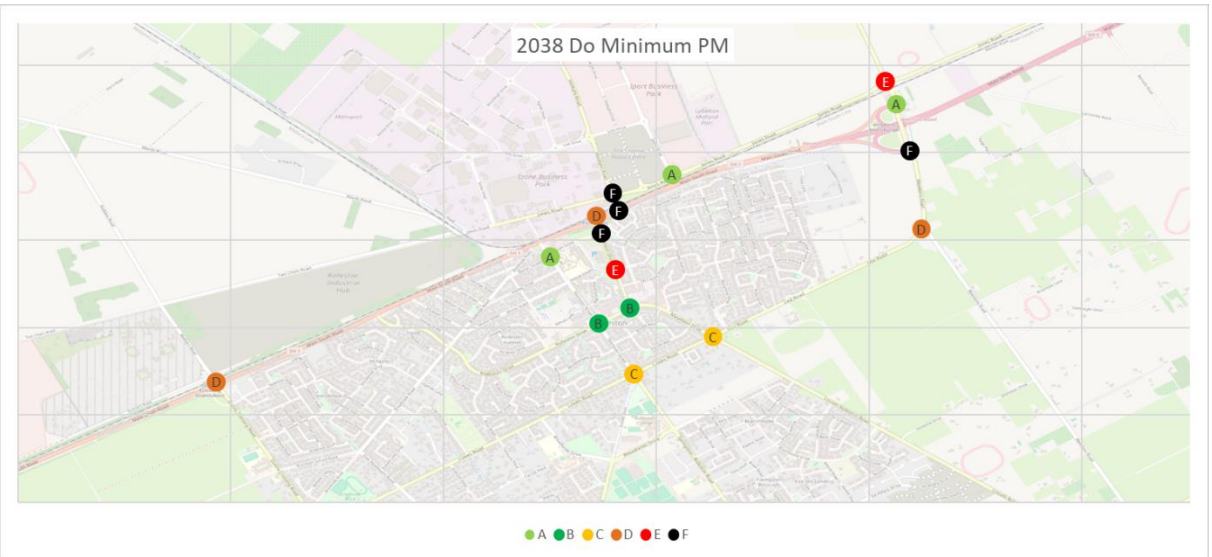


Figure 5-7: 2038 Do Minimum PM LOS plot

As a result of increasing traffic volumes in the Rolleston and Lincoln areas (and traffic using SH1), there is predicted to be significant deterioration in the network performance by 2038 with many key intersections performing at LOS E or F. The high traffic volumes along SH1 result in high delays at intersections intercepting SH1 including SH1 / Hoskyns Road, SH1 / Rolleston Drive (north) and SH1 / Dunns Crossing Road / Walkers Road intersection. Queues from these intersections regularly extend upstream, resulting in network wide congestion.

The following observations have been noted about the 2038 network performance:

- SH1 / Hoskyns Road
  - There are high delays to movements on SH1 at the SH1 / Hoskyns Road intersection. Delays for the right turn from SH1 into Hoskyns Road are expected to be in the order of 350s in the AM peak and 450s in the PM peak.
- Weedons Road / SH1 off/on ramp (south)
  - There are high delays on the Weedons Road off-ramp (west) in both the AM and PM peak. Delays for the right turn from the off-ramp exceed 200s in both peak periods.
  - Queues from the off-ramp regularly extend back to SH1 in the PM peak, with the 95th percentile queue on the off-ramp expected to be around 1.8km.
- Kidman Street / Rolleston Drive (north)
  - The intersection is over-capacity in 2038 even when modelled as a signalised intersection in both the AM and PM peak. The high conflicting movements between the south and west approach, as well as downstream queues from the SH1 / Rolleston Drive (north) intersection, results in high delays at the intersection. Vehicles on the southern approach experience up to 220s in the AM peak and 290s in the PM peak.
  - Queues on the southern approach of the Kidman Street / Rolleston Drive (north) are expected to be around 345m in both peak periods and regularly extend back to Norman Kirk Drive (upstream intersection).
- SH1 / Dunns Crossing Road / Walkers Road:
  - The minor approaches (Dunns Crossing Road and Walkers Road) experience up to 420s delays in the AM peak and up to 470s in the PM peak with very little opportunity in the traffic stream to turn onto SH1.
- Weedons Road / Levi Road
  - By 2038, the Levi Road/Weedons Road intersection is operating over-capacity (LOS F) in the AM peak. The high volume along Levi Road makes it difficult for drivers to turn out of Weedons Road (south) and

drivers are expected to experience delay of up to 60s when turning right. This supports the need for the intersection upgrade planned by SDC at this location, regardless of the Project.

5.4 Key Journey Reliability

Travel time reliability refers to the consistency and predictability of travel times on a given route at a certain time of day. A reliable route allows travellers to predict their journey duration with some certainty, ensuring they reach their destination on time consistently. Travel times can vary due to a range of factors including traffic congestion, weather, fluctuations in traffic volume, and crashes on the network.

To understand the performance of the existing network against the Project objective for travel time reliability of the journey between Rolleston and Christchurch, the modelled maximum and minimum travel times between Rolleston and Christchurch have been assessed using the Paramics model of the Do-minimum network. It should be noted that the Paramics model only considers variability in terms of the demand arrival patterns and does not consider other environment factors such as adverse weather or road crashes. Regardless, the range of modelled travel times is considered a suitable measure to represent the likely improvements in travel time reliability.

Table 5-2 presents the travel time variation (difference between the maximum and minimum modelled travel times) between key areas to/from Christchurch and Rolleston for 2038.

Table 5-2: 2038 Do Minimum Travel Time Variation (difference between max and min modelled travel times)

Description	AM Peak (min)	IP Peak (min)	PM Peak (min)
Industrial Area (RIZ) to Hornby / Templeton	4	3	21
Hornby / Templeton to Industrial Area (RIZ))	5	2	7
Industrial Area (RIZ) to Christchurch	4	5	15
Christchurch to Industrial Area (RIZ)	5	2	10
Rolleston Residential & Town Centre to Hornby / Templeton	3	1	3
Hornby / Templeton to Rolleston Residential & Town Centre	2	0	9
Rolleston Residential & Town Centre to Christchurch	7	1	4
Christchurch to Rolleston Residential & Town Centre	3	1	10

As previously mentioned, the 2038 DM network experiences significant congestion, especially during the PM peak period. This congestion stems from the over-capacity signals at Rolleston Drive (north) and Hoskyns Road on SH1. When congested, these intersections cause significant travel time variations, as drivers on SH1 frequently need to accelerate/decelerate due to the traffic signals.

The model indicates that travel times from the Industrial area is highly variable during the PM peak. The travel time from the Industrial Area to Horney / Templeton may vary from 12 to 33 minutes during the PM peak, with a potential variation of up to 21 minutes. Similarly, travel time from the Industrial area to Christchurch can vary by up to 15minutes.

Travel times are generally more consistent in the AM and IP periods compared to the PM peak.

5.5 Safety

5.5.1 Overview

The existing Christchurch Southern Motorway extends southwest from Christchurch City and ends to the east of Rolleston. This means that for westbound traffic on SH1 the environment quickly changes from a 100km/h motorway to 80km/h peri-urban area to the east of the signalised Hoskyns Road and Rolleston Drive (north) intersections. This results in the traffic signals being in a high-speed environment, increasing the risk

of high severity right-angle crashes. Similarly, elsewhere along SH1 through Rolleston, right turn movements occur at high-speed priority-controlled intersections resulting in high-risk movements that are becoming increasingly likely as traffic volumes increase.

NZTA MegaMaps is a geospatial tool that calculates a Safe and Appropriate Speed limit for every road and street in New Zealand as well as displaying key safety measures across the road network. NZTA MegaMaps shows that SH1 has a varying level of crash risk, as presented in **Table 5-3.** Collective Risk is a measure of the total number of fatal and serious injury crashes per kilometre over a section of road.

Table 5-3: Corridor Crash Risk (megamaps)

SH1 Section	Direction	Collective Risk	Personal Risk
North of Weedons Road	Eastbound	Low	Low
	Westbound	Medium	Low-Medium
Between Weedons Road to Rolleston Drive (north)	Eastbound	Low-Medium	Low-Medium
	Westbound	Low	Low
Rolleston Drive (north) to 100km/h Section	Both	Low-Medium	Low-Medium
Rolleston 100km/h threshold to 1km west of Dunns Crossing Road	Both	**Medium-High**	Low-Medium

The primary section of concern is the westernmost section from the 100km/h speed threshold to approximately 1.0km west of Dunns Crossing Road[4].This section has a medium-high collective risk which is reflective of its high speed, high volume undivided nature.

The sections east of Rolleston Drive (north) are fully separated which is a likely contributor towards its lower low-medium to low collective risk. Personal risk is generally low/low-medium, due to the high volume of traffic on this corridor.

The corridor and wider network collective risk is also shown in **Figure 5-8.** Intersection crash data is contained within each corridor and therefore crash risk at intersections is not presented.

[4] RS/RP 01S-350/6.0

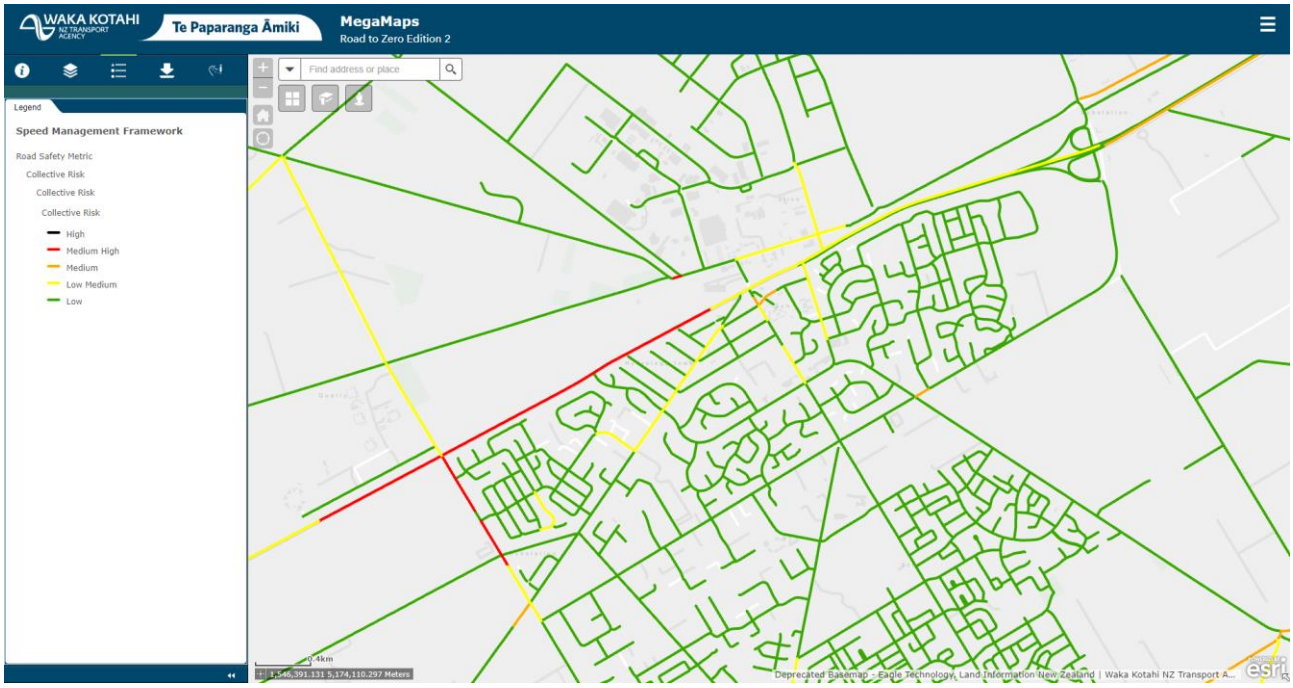


Figure 5-8: Rolleston Road Network Collective Risk

The crashes for the past 5 years (2019-2023) have been extracted from NZTA's Crash Analysis System (**CAS**). This has been assessed and updated to include modelled traffic volumes for the 2021 base year and forecasted crashes for both the 2028 and 2038 Do Minimum scenarios.

5.5.2 SH1 Midblock & Intersections

Table 5-4 summarises the most recent five-year crash history (2019-2023), and the calculated Do Minimum DSI equivalents for 2028 and 2038 for the midblock sections of SH1.

Table 5-4: SH1 Midblock Crash History & Do Minimum DSI Casualties (per five years)

Corridor	Crashes			DSI Casualty	DSI Casualties	
	Fatal	Serious Injury	Minor Injury		2028	2038
SH1 600m south of Dunns Crossing Road to Rolleston Drive (south)	0	0	0	0	0	0
SH1 Rolleston Drive (south) to 80km/h	0	0	0	0	0	0
SH1 80km/h to Brookside Road	0	2	0	2	2.16	2.50
SH1 Brookside Road to Rolleston Drive (north)	1	0	0	1	0.79[1]	0.91[1]
SH1 Rolleston Drive (north) to Hoskyns Road	0	0	0	0	0	0
SH1 Hoskyns Road to 100 km/h	0	0	0	0	0	0
SH1 100 km/h to SH1 200m east of Weedon Road overpass	0	3	3	3	3.23	3.52

Corridor	Crashes			DSI Casualty	DSI Casualties	
	Fatal	Serious Injury	Minor Injury		2028	2038
Total – SH1 Corridor	**1**	**5**	**3**	**6**	**6.19**	**6.93**

1 - Crash reduction due to speed limit reduction to match SAAS in Do minimum scenario

As shown above, there is an approximate 12% increase anticipated in midblock DSI equivalents in the Do minimum scenario from 2028 to 2038. This is primarily associated with the modelled increase in traffic volumes.

Table 5-5 presents the crash history at intersections along SH1 for the same crash period. The analysis indicates that SH1 / Dunns Crossing Road / Walkers Road and SH1 / Tennyson Street intersections are considered the highest risk intersections along the corridor, both being significantly higher than the 1.6 DSI Equivalent threshold for being considered a high collective risk.

Table 5-5: SH1 Intersection Crash History and Do Minimum DSI Equivalents (per five years)

Intersection	DSI Casualty	2028 Do Minimum		2038 Do Minimum	
		DSI Equivalent	Collective Risk	DSI Equivalent	Collective Risk
SH1 / Dunns Crossing Road / Walkers Road[2]	4	1.43	Medium-High	1.66	High
SH1 / Brookside Road	0	0.37	Low-Medium	0.46	Low-Medium
SH1 / Tennyson Street	0	1.48	Medium-High	1.89	High
SH1 / Rolleston Drive (north)	0	0	Low	0	Low
SH1 / Rolleston Drive (south)	2	0.10	Low	0.09	Low
SH1 / Hoskyns Road	0	0.74	Medium	0.87	Medium
Total – SH1 Intersections	**6**	**4.12**	**-**	**4.97**	**-**

2 - Excludes Intersection Speed Zone as this is a temporary measure prior to the implementation of the Project

As shown above, there is minimal change in the collective risk across the do minimum scenarios with two intersections considered Medium-High Risk (SH1 / Dunns Crossing Road / Walkers Road and SH1 / Tennyson Street). In accordance with the High-Risk Intersection Guide, SH1 / Dunns Crossing Road / Walkers Road and SH1 / Tennyson Street would be considered High Risk, requiring transformational change.

5.5.3 Rolleston Drive (north) / Kidman Street

The Rolleston Drive (north) / Kidman Street Intersection is set to be replaced by a new signalised intersection at the intersection of the realigned Rolleston Drive (north) and Kidman Street. There is no recent five-year crash history at the intersection, however approximately 90m south of the intersection, a serious crash occurred due to a medical event where a vehicle hit a queue back from the Rolleston Drive (north) / Norman Kirk Drive / Dryden Avenue Intersection (resulting in 1 DSI). West of the intersection, a pedestrian was hit crossing Kidman Street to get to the nearby bus stop.

5.5.4 Jones Road

Jones Road connects the wider Rolleston industrial area (and northern side of railway line) with SH1. The resulting crash history has led to a mix of Low-Medium, Medium-High and Low Collective Risk sections

depending on the crash locations (as shown in **Figure 5-8**). Recent five-year crash history along this corridor shows one serious and one minor crash.

Two minor crashes are recorded at the Jones Road / Hoskyns Road intersection. Both crashes are associated with turning movements at the intersection, with one minor crash caused by red light running. This results in a Low Collective Risk, across all assessed timeframes.

5.5.5 Level Crossings

There has been one non-injury crash at the Hoskyns Road level crossing recorded in the recent five-year crash history. There are approximately two near misses recorded by KiwiRail between trains and vehicles each year over the past five years at the Hoskyns Road level crossing. There are currently no plans for KiwiRail to improve the safety of the existing level crossings outside of what is to be provided as part of the Project. However, the Jones Road / Two Chain Road level crossing will be upgraded by SDC (via NZTA) as part of the Two Chain Road / Wards Road intersection upgrades.

Given the expected increase in traffic volumes around Rolleston, there is expected to be a reduction in safety of the level crossings on Walkers Road, Jones Road and Hoskyns Road should the Project not progress.

5.5.6 Summary

When assessing the current situation and the modelled Do Minimum scenarios, the forecast DSI on the midblock sections are expected to increase by approximately 12% between 2028 and 2038. This is primarily associated with increasing traffic volumes throughout the network. Across all intersections, the modelled Do Minimum is anticipated to increase intersection DSI by approximately 19% between 2028 and 2038 due to increasing congestion. This demonstrates that the intersection DSIs increase at a higher rate than the corridors based on the anticipated increase in traffic volumes. Unless infrastructure is upgraded to within safe system tolerances, increases in DSI are expected to continue to occur.

5.6 Public Transport

There are currently three bus services that serve the Rolleston area:

- Route 820 between Burnham to Lincoln, operating every 60 minutes,
- Route 5 between Rolleston to New Brighton, operating approximately every 30 minutes,
- Route 85 operating every 15 to 30 minutes from Rolleston to Christchurch Direct Express only during the AM peak (6:45am to 7:40am) and Christchurch to Rolleston Direct Express only during the PM peak (4:50pm-6:00pm).

Figure 5-9 shows the routes of these bus services.

Figure 5-9: Existing Bus Services

Bus route 85 was not included in the Do Minimum models provided.

The Do Minimum modelling analysis indicates that bus travel times for both routes within the Rolleston area shown above are expected to be around 21 to 23 minutes in 2028 in all peak periods. Increasing congestion in 2038 results in some deterioration in bus performance by 2038. The impact is most notable in the PM Peak where bus route 5 towards Rolleston is expected to take around 31 minutes and bus route 820 towards Burnham is expected to take around 36 minutes in the PM peak (i.e. an approximately 50% increase in bus travel times due to congestion).

5.7 Active Modes

The following walking and cycling facilities are currently located within the Project area:

- A shared path on the western side of Rolleston Drive (north) between SH1 and Masefield Drive,
- A SH1 shared path between Seymour Drive and Weedon Ross interchange,
- The Dunns Crossing Road shared path from 382 Dunns Crossing Road to West Rolleston Primary School,
- Pedestrian crossing of SH1 at the Rolleston Drive (north) Traffic Signals,
- A footpath alongside SH1 between the Railway Station and Hoskyns Road.

Figure 5-10 presents the future walking and cycling network proposed by the SDC Walking and Cycling Strategy.

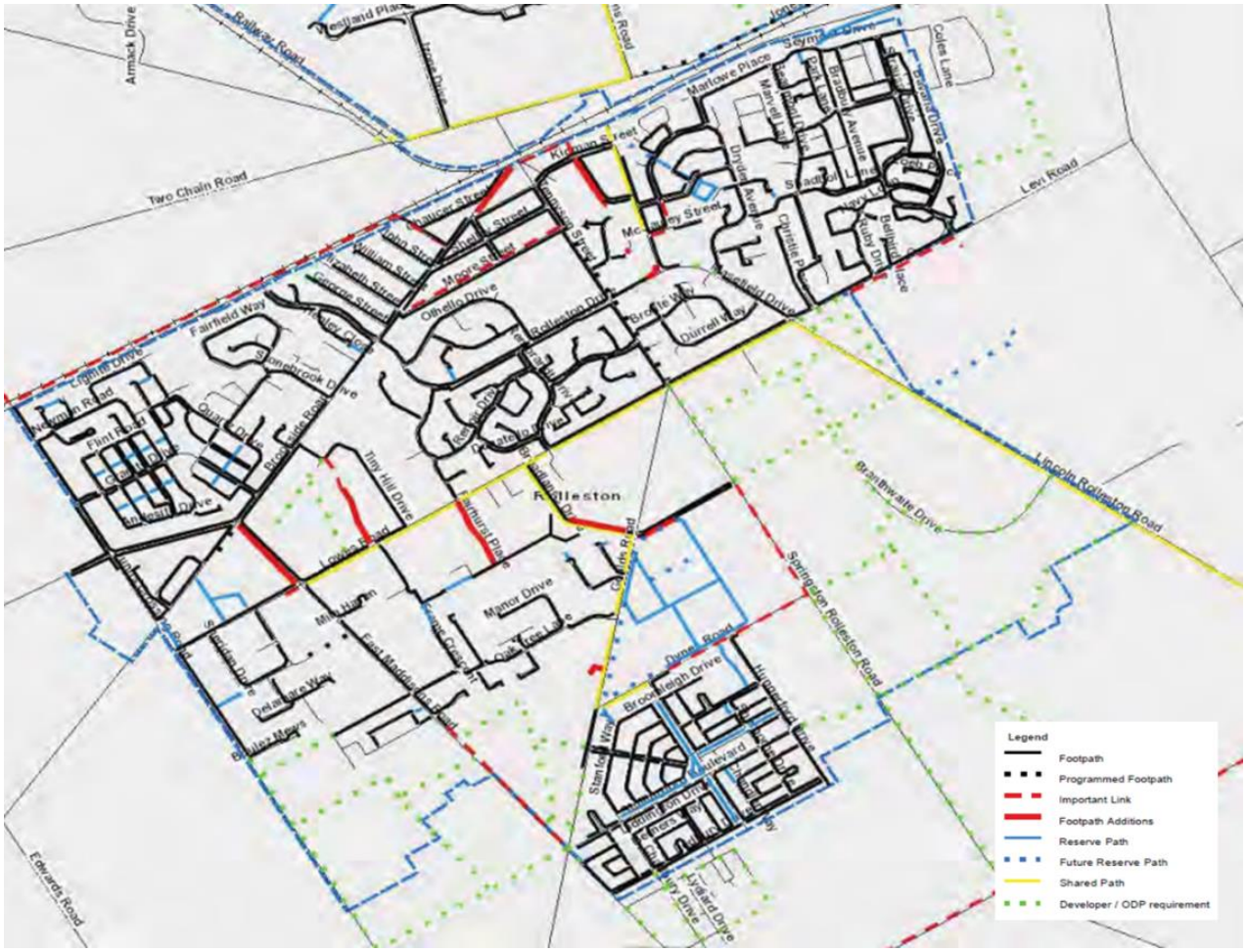


Figure 5-10: SDC Walking and Cycling Strategy, Rolleston Township Network Plan. [5]

The following future walking and cycling connections have been identified within the Walking and Cycling Strategy:

- Rolleston to Templeton (Jones Road),
- Rolleston to West Melton (Hoskyns Road),
- Rolleston to Burnham (Jones Road / Two Chain Road).

The strategy also provides connections with the existing Christchurch Major Cycleway Programme which is under development. The strategy identifies a future reserve path that runs parallel to SH1 however, there are no routes identified that cross SH1.

[5] Retrieved from SDC Walking and Cycling Strategy 2018, https://www.selwyn.govt.nz/__data/assets/pdf_file/0011/282566/Final-2018-Walking-and-Cycling-Appendices-V4-Adopted-Resized.pdf

6 Operational Project Effects

This section describes the assessed effects of the Project, as compared to the future year Do Minimum scenarios.

6.1 SH1 Access Changes

Right turning conflicts on and off the State Highway have been identified as creating serious crash risks. This is being addressed by installing median barriers or creating left in left out intersection forms. The removal of the existing right turns along SH1 will require a change in access routes to both Rolleston Township south of SH1 and the Industrial area to the north. These routes are described in the following **Table 6-1**, and shown diagrammatically in the subsequent Figures. The access routes not indicated in the table will remain as per the Do Minimum scenario. The route lengths for each movement are dependent on the specific location chosen within either Rolleston or the RIZ, so the route lengths indicated in the table are shown to represent the scale of change only. This table only shows route distance, with the changes in movement travel times provided later in **Section 6.2.3.** That travel time assessment better reflects the delay and congestion expected on each route in the future years.

Table 6-1 Changes in Access Routes to/from SH1

Access Movement	Current Route	Typical Length, km	Proposed Route	Typical Length, km
SH1 West to Rolleston	Right turn in at SH1 / Rolleston Drive (north or south)	3.8	Right turn at SH1/Dunns Crossing Road	3.9
Rolleston to SH1 East	Right turn out at SH1 / Rolleston Drive (north or south)	1.0	New overbridge to Jones Road then left turn to SH1 via Hoskyns Road or Levi Road to Weedons Road interchange	1.4
Rolleston to Industrial area	Right out at Rolleston then left in at Hoskyns intersection	0.8	New overbridge	0.8
SH1 East to Industrial Area	Right turn in at SH1 / Hoskyns Road	2.5	Exit at Weedons Road interchange to use Jones Road	3.4
Industrial Area to SH1 West	Right out at Hoskyns Road	3.3	Jones Road, Two-chain Road then Walkers Road to SH1	4.1
Industrial area to Rolleston	Right out at Hoskyns then left in at Rolleston Drive (north)	0.8	New overbridge	0.8

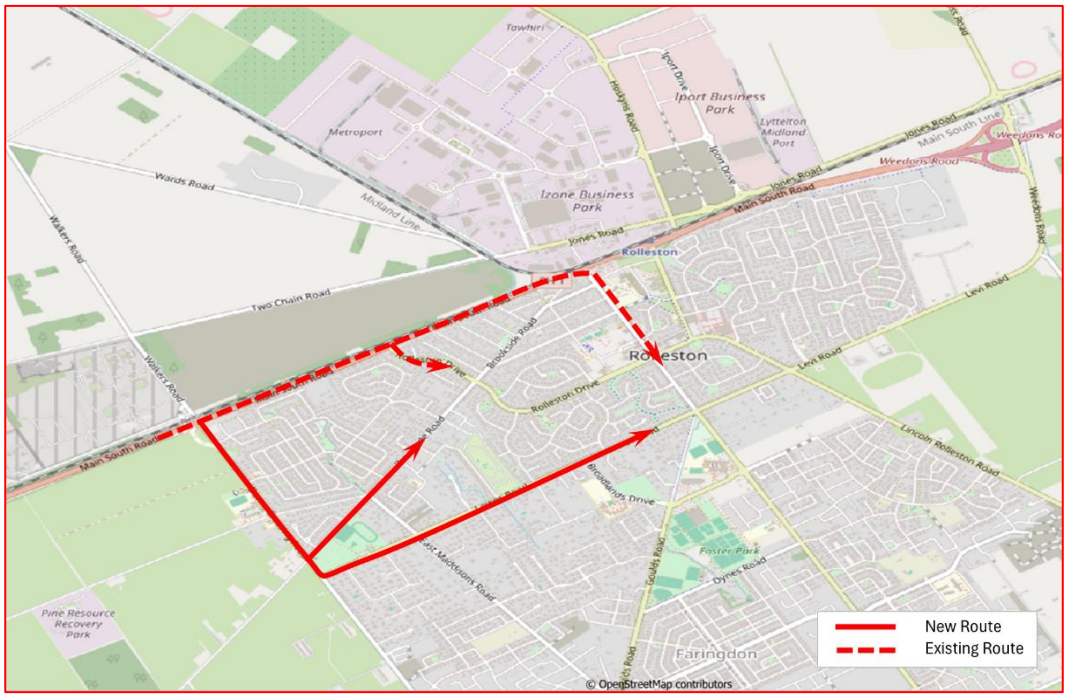


Figure 6-1 Change in Access Route: SH1 (south) to Rolleston

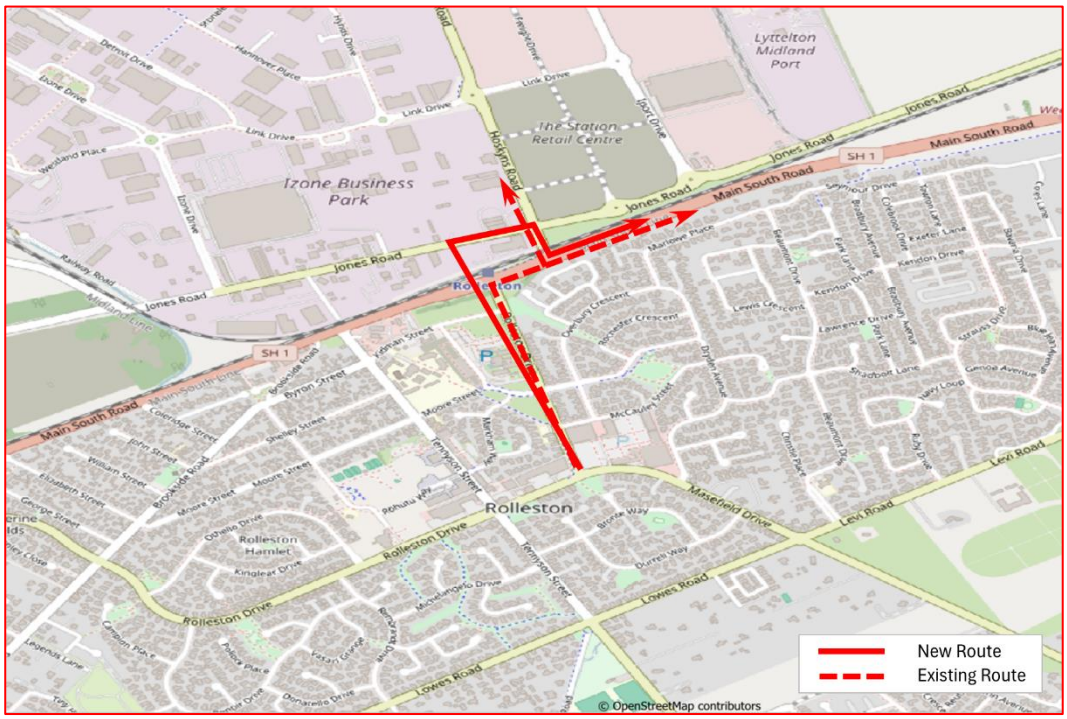


Figure 6-2 Change in Access Route: Rolleston to SH1 East and Industrial Area

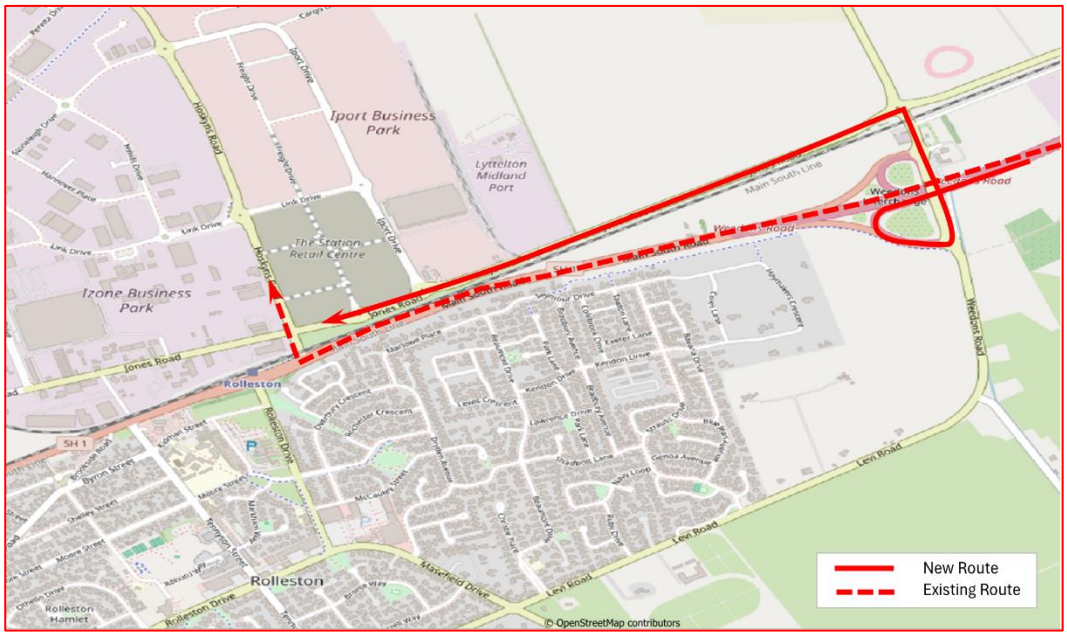


Figure 6-3 Change in Access: SH1 East to Industrial Area

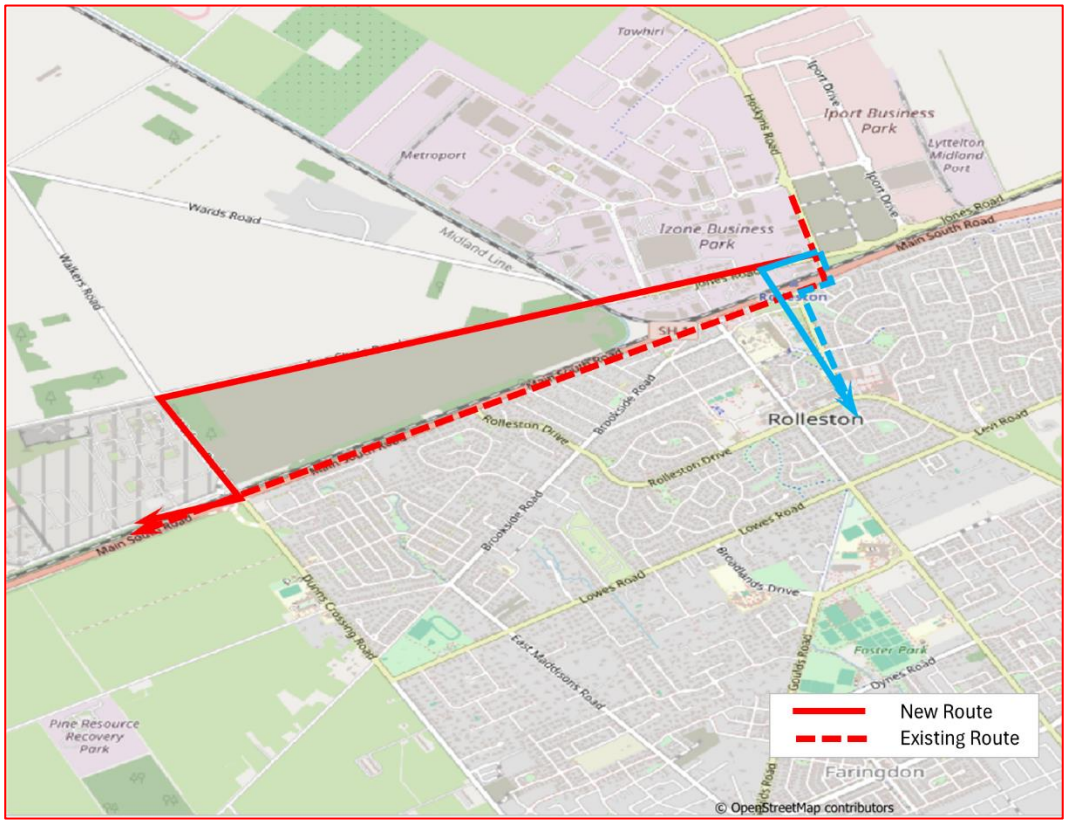


Figure 6-4 Change in Access: Industrial Area to SH1 West (Red) and Rolleston (Blue)

Table 6-1 shows that most movements between SH1, Rolleston and the RIZ have minor changes in the access length (<500m), with the exception of the access into the RIZ from the SH1 east and from the RIZ to SH1 west. These two movements use existing established roads with new typical route lengths less than 1km longer than the existing typical routes. As shown in **Section 6.2.3**, the travel times for these movements are predicted to be quicker (2038 models), even though they have a slightly longer route. This reflects the delay and congestion that is expected at the at-grade intersections in the future.

When combined with the reduced travel time and improved safety, the change in access routes to and Rolleston and the Industrial area is considered to represent improved accessibility.

6.2 Network Performance

6.2.1 Overall Network Outcomes

Table 6-2 and **Table 6-3** present comparisons of total vehicle kilometres travelled (**VKT**) and total vehicle hours travelled (**Veh-Hr**) between the Project and the Do Minimum scenarios.

Table 6-2: 2028 Network Statistics

2028	VKT (km)				Veh-Hr			
	Do Min	Project	Diff	% Diff	Do Min	Project	Diff	% Diff
AM	429,800	432,700	2,900	+0.7%	6,480	6,480	0	0%
IP	280,200	281,800	1,600	+0.6%	4,190	4,150	-40	-0.9%
PM	509,800	511,100	1,200	+0.2%	8,190	7,840	-350	-4.2%

Table 6-3: 2038 Network Statistics

2038	VKT (km)				Veh-Hr			
	Do Min	Project	Diff	% Diff	Do Min	Project	Diff	% Diff
AM	505,300	507,800	2,400	+0.5%	8,530	7,970	-560	-6.5%
IP	338,100	338,700	500	+0.1%	5,340	5,080	-270	-5.0%
PM	597,700	594,800	-2,800	-0.5%	11,470	9,800	-1,670	-14.6%

These results show that the overall traffic benefits at the beginning of its operational life (2028 models) are much less than those in future years (2038 models). This indicates that in 2028 the benefits of reduced traffic signal delay and more direct connections over SH1 are somewhat offset by the longer access routes for some movements.

The 2028 Project scenario demonstrates a reduction in vehicle hours travelled during the IP and PM Peak periods. The most significant improvement is seen during the PM Peak period, where there is a 4.2% reduction in vehicle hours travelled. This suggests that people are travelling further with the Project but experience less congestion. The network travel times in the AM peak period remain essentially unchanged compared to the Do Minimum scenario. It is noted that these metrics are only on total hours of travel for all vehicle movements and don't distinguish between types of travel (e.g. between recreational/discretionary travel versus strategic freight movement). In terms of economic value and productivity it is expected that there would be overall improvement in system efficiency.

The Project has noticeably higher system efficiency benefits in 2038. As described previously, there is more significant overall deterioration in the Do Minimum network performance and higher delays in 2038. Whilst the Do Minimum network provides direct access on to SH1 at Rolleston Drive (north) and Hoskyns Road, by 2038 the delays on these movements are more significant. The Project provides a significant reduction in vehicle hours travelled during each of the model time periods. In the AM peak period there is a 6.5% reduction in vehicle hours travelled and a very slight increase in VKT. In the IP period there is a 5% reduction in vehicle hours travelled and a very slight increase in VKT. In the PM peak period there is a 14.6% reduction in vehicle hours travelled and a slight reduction in VKT. These results demonstrate the significant travel time saving benefits provided by the Project in 2038.

These results demonstrate that the Project is expected to generate a more efficient transport system in this area.

6.2.2 Traffic Flow Changes

Figure 6-5 shows the predicted change in daily[6] traffic flows (vpd) on the network between the Project and the Do Minimum scenario for 2038. The figure indicates the direction of change (red reflecting a reduction in traffic flow is predicted whilst blue indicates an increase), as well as the scale of change (reflected in the relative width of the lines). A very similar pattern of change was indicated in the 2028 models so is not repeated here.

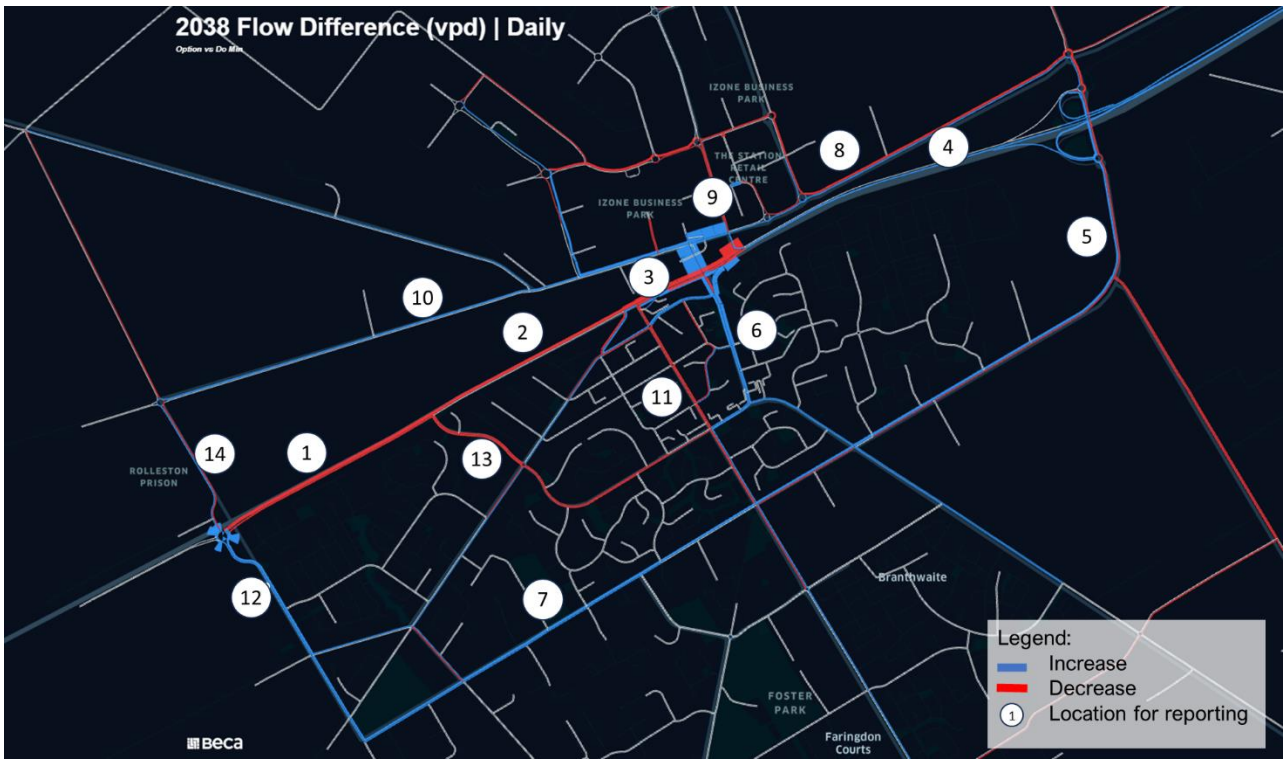


Figure 6-5: Flow Difference Plot – 2038 Daily (key locations for reporting shown).

The tables below provide the two-way daily traffic volumes on key links in the network for 2038, using the reference numbers identified in **Figure 6-5**.

Table 6-4: 2038 Daily Two-Way Key Link Volumes

Site	Section	Do Min	Option	Diff	% Diff
1	SH1 between Dunns Crossing Road and Rolleston Drive (south)	23,200	19,300	-3900	-17%
2	SH1 between Rolleston Drive (south) and Brookside Road	21,800	18,900	-2900	-13%
3	SH1 between Tennyson Street and Rolleston Drive (north)	27,700	20,000	-7700	-28%
4	SH1 between Hoskyns Road and Weedons Road interchange	39,500	40,400	+900	+2%
5	Weedons Road between Levi Road and SH1 Interchange	21,100	21,900	+800	+4%

[6] The same annualization methodology from the DBC has been adopted for this assessment. Refer to section 6.3.2 of NZTA, Rolleston Access Improvements Technical Note – Preferred Option Assessment Transport Modelling and Approach to Economics Report, June 2023, page 32

Site	Section	Do Min	Option	Diff	% Diff
6	Rolleston Drive (north) between Kidman Street and Norman Kirk Drive	17,000	22,200	+5200	+30%
7	Lowes Road between Tiny Hill Drive and Waterbridge Way	7,700	10,000	+2300	+30%
8	Jones Road between Iport Drive and Weedons Ross Road	6,900	5,900	-1000	-15%
9	Jones Road between Rolleston Drive Extension and Hoskyns Road	8,600	22,700	+14100	+164%
10	Two Chain Road between Walkers Road and Wards Road	1,300	2,400	+1100	+89%
11	Tennyson Street between Rolleston Drive (north) and Moore St	6,400	4,900	-1500	-24%
12	Dunns Crossing Road between SH1 and Brookside Road	5,500	8,100	+2600	+48%
13	Rolleston Drive (south) between SH1 and Brookside Road	2,600	700	-1900	-75%
14	Walkers Road between Two Chain Road and SH1	4,000	4,100	+100	+3%

By 2038, there is significant congestion at the SH1 / Rolleston Drive (north) and SH1 / Hoskyns Road intersections in the Do Minimum scenario. The Project provides a faster alternative to access SH1 and therefore increases in traffic flow northbound on Rolleston Drive (north) and eastbound on Jones Road are observed. These roads have been identified as Primary Traffic roads as part of the Rolleston Strategic Network Plan so an increase in traffic on these roads is consistent with the Rolleston Strategic Network Plan. Lower traffic flows on SH1 between Dunns Crossing Road and Rolleston Drive (north) is anticipated in both 2028 and 2038 due to the restricted right turn movements onto SH1 at Tennyson St, Rolleston Drive (south), Brookside Drive and Hoskyns Road.

Vehicles coming from the west are now required to use Dunns Crossing Road to access Rolleston, resulting in an increase in traffic along the outer edge of Rolleston including increases on Dunns Crossing Road, Levi Road and Weedons Road. These roads have been identified as arterial traffic routes and are key links in the peripheral arterial ring road system and the growth within Rolleston means that these roads are expected to get much busier in the future. The predicted increase in traffic with the Project is considered acceptable given this intended function of the road.

The Project provides a reduction in traffic volumes on Tennyson Street and Rolleston Drive (south) between SH1 and Brookside Road. This provides quieter streets with less through traffic within the residential heart of west Rolleston and along the commercial heart of the Rolleston.

The Project is projected to result in an increase of approximately 2,000vpd along Dunns Crossing Road adjacent to West Rolleston Primary School (site 12) in 2028, with this number rising to around 2,500vpd by 2038. This equates to an additional 220vph and 330vph in 2028 and 2038 respectively in the AM peak (when the school would be operating). West Rolleston Primary School has an office access and secondary pedestrian access onto Dunns Crossing Road. The expected increase is considered appropriate as when combined with the additional safety improvements being undertaken by SDC along Dunns Crossing. The effect on safety due to the increase in traffic is discussed further in **Section 6.6.7.**

Similar patterns are observed in 2028. The full set of 2028 flow difference results are provided in **Appendix B.**

Overall, the removal of traffic signals on SH1 results in fewer short, local trips using SH1 through Rolleston but increases traffic on key roads such as Jones Road, Levi Road, and Rolleston Drive (north). However, these roads are identified as arterial roads deemed suitable for through traffic and aligns with the Rolleston Strategic Network Plan.

6.2.3 Key Movement Travel Times

Sector analysis has been carried out to understand how the Project effect travel time between key areas of the network. The network has been grouped into seven areas, as defined in the DBC, as follows:

1. "SH1 south" and Burnham
2. Rolleston Industrial Zone (RIZ)
3. Rolleston town centre and the immediate surrounding residential area
4. Southern residential area and external network to the south
5. Hornby and Templeton area
6. Travel to/from Christchurch via the Christchurch Southern Motorway CSM2
7. Northern rural area and external network to the north

Figure 6-6 presents the sector boundaries.

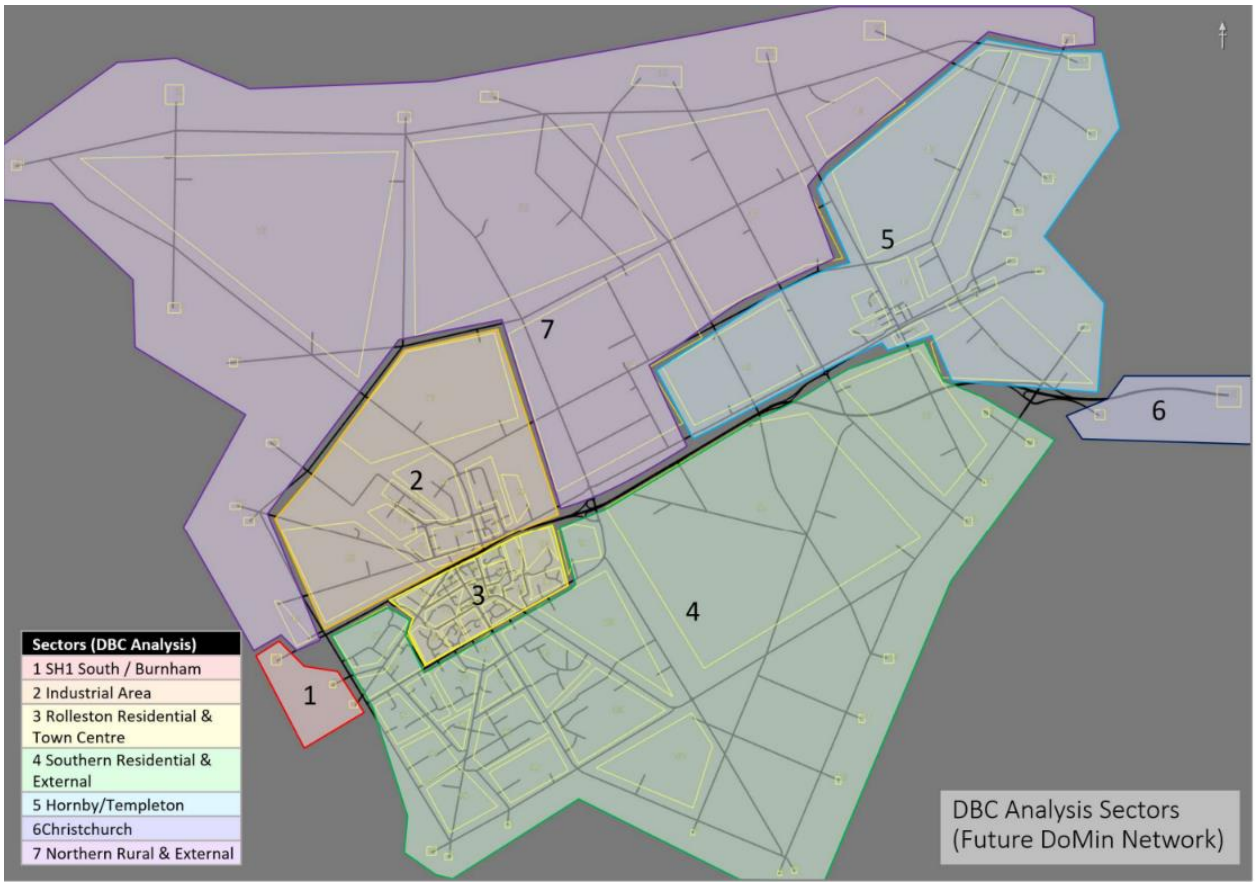


Figure 6-6: Model Sector System.[7]

[7] Retrieved from NZTA, Rolleston Access Improvements Technical Note – Preferred Project Assessment Transport Modelling and Approach to Economics Report, June 2023, page 12.

Table 6-5 to **Table 6-6** compares the average sector-to-sector travel times between the Project and the Do Minimum scenario for 2038 for key sectors for the AM and PM peak periods. These key sectors relate to travel time through Rolleston as well access in and out of the RIZ. The travel time results for the IP period and for 2028 show similar trends and have not been repeated here.

Travel times for all sectors for the AM, IP and PM peak periods can be found in **Appendix C.**

Table 6-5: 2038 Sector-to-Sector Travel Times – AM peak hour

Sector Movements	Description	Do Min	Project	Diff (min)	% Diff
1 to 6	"SH1 South" / Burnham to Christchurch	13.0	12.4	-0.6	-4%
6 to 1	Christchurch to "SH1 South" / Burnham	16.1	12.4	-3.7	-23%
1 to 5	SH1 South / Burnham to Hornby / Templeton	13.9	13.5	-0.4	-3%
5 to 1	Hornby / Templeton to "SH1 South" / Burnham	17.1	13.4	-3.7	-22%
2 to 1	Industrial Area (RIZ) to "SH1 South" / Burnham	9.3	6.2	-3.1	-34%
1 to 2	"SH1 South" / Burnham to Industrial Area (RIZ)	8.2	6.4	-1.9	-23%
2 to 3	Industrial Area (RIZ) to Rolleston Residential & Town Centre	9.4	4.9	-4.4	-47%
3 to 2	Rolleston Residential & Town Centre to Industrial Area (RIZ)	11.4	5.7	-5.7	-50%
2 to 4	Industrial Area (RIZ) to Southern Residential & External	12.0	8.9	-3.1	-26%
4 to 2	Southern Residential & External to Industrial Area (RIZ)	15.3	9.6	-5.7	-37%
2 to 5	Industrial Area (RIZ) to Hornby / Templeton	14.2	12.6	-1.6	-11%
5 to 2	Hornby / Templeton to Industrial Area (RIZ))	15.2	13.9	-1.3	-8%
2 to 6	Industrial Area (RIZ) to Christchurch	14.1	11.9	-2.1	-15%
6 to 2	Christchurch to Industrial Area (RIZ)	16.9	13.5	-3.3	-20%

Table 6-6: 2038 Sector-to-Sector Travel Times – PM peak hour

Sector Movements	Description	Do Min	Project	Diff (min)	% Diff
1 to 6	"SH1 South" / Burnham to Christchurch	14.2	12.5	-1.7	-12%
6 to 1	Christchurch to "SH1 South" / Burnham	18.9	12.9	-6.0	-32%
1 to 5	"SH1 South" / Burnham to Hornby / Templeton	14.5	12.9	-1.6	-11%
5 to 1	Hornby / Templeton to "SH1 South" / Burnham	20.4	14.3	-6.1	-30%
2 to 1	Industrial Area (RIZ) to "SH1 South" / Burnham	11.2	7.0	-4.2	-37%
1 to 2	"SH1 South" / Burnham to Industrial Area (RIZ)	6.2	6.4	+0.2	+4%
2 to 3	Industrial Area (RIZ) to Rolleston Residential & Town Centre	13.3	5.4	-7.9	-59%
3 to 2	Rolleston Residential & Town Centre to Industrial Area (RIZ)	9.7	5.4	-4.3	-44%
2 to 4	Industrial Area (RIZ) to Southern Residential & External	15.7	9.0	-6.7	-43%
4 to 2	Southern Residential & External to Industrial Area (RIZ)	13.3	9.4	-3.9	-29%
2 to 5	Industrial Area (RIZ) to Hornby / Templeton	18.2	12.2	-6.0	-33%
5 to 2	Hornby / Templeton to Industrial Area (RIZ))	17.4	14.2	-3.2	-18%
2 to 6	Industrial Area (RIZ) to Christchurch	18.1	12.0	-6.1	-34%
6 to 2	Christchurch to Industrial Area (RIZ)	19.7	13.7	-5.9	-30%

The tables above indicate that in 2038, there are significant improvements in travel times as a result of the Project for travel to and from the RIZ. This is particularly noticeable in the PM peak period where there is significant congestion in the Do Minimum scenario leaving the Industrial area through the existing SH1 / Hoskyns Road traffic signals. The implementation of the Project substantially mitigates congestion in this area, resulting in travel time savings of 8 minutes from the Industrial area to Rolleston Residential and Town Centre, and 6 minutes to Christchurch during the PM peak.

As shown in **Appendix C,** there is a 10% to 11% increase in travel time from "SH1 South" / Burnham to Rolleston Residential & Town Centre in the AM and PM peak and a 20% increase in the IP due to the restricted right turn movements onto SH1 at Tennyson Street and Brookside Drive. Vehicles coming from the west are now required to use Dunns Crossing Road to access Rolleston, resulting in longer travel times. This is consistent with the flow difference plots shown above. There is an increase in the travel time from "SH1 South" / Burnham to the industrial area in the IP and PM of around 12s due to the required re-routing as part of the removal of the left turn movement from SH1 (south) into Hoskyns Road. These travel time increases are not considered significant in relation to the other travel time savings observed and the safety benefits associated with the intersection changes.

6.2.4 Freight Performance

There are no specific infrastructure or operational priorities proposed for trucks, freight vehicles so these vehicles are expected to experience similar benefits as general traffic reported in **Table 6-5** and **Table 6-6** above. Most industrial development within Rolleston occurs with the RIZ with the key freight routes for the Rolleston anchored around trucks accessing the RIZ to/from the east.

Heavy vehicles are expected to experience travel time savings to/from the Industrial area to all key sectors, except when travelling from "SH1 South" / Burnham to the Industrial area which experiences a minor increase in travel time of 12 second. The following key travel time savings are anticipated for heavy vehicles to/from the industrial area in 2038:

- A 2 to 3-minute travel time saving to/from the Industrial area and Christchurch in the AM peak and 6 minute travel time saving in the PM peak
- A 4 to 6 minute travel time saving to/from the Industrial area and the Rolleston Residential and Town Centre in the AM peak and a 4 to 8 minute travel time saving in the PM peak

The removal of the traffic signals on SH1 (SH1 / Hoskyns Road and SH1 / Rolleston Drive (north)) improves the travel times for regional freight journeys travelling through Rolleston on SH1. The Project provides a notable improvement in travel time on SH1 from Christchurch / Hornby through Rolleston to the west with travel time improvements of by up to 4 minutes in the AM peak up to 6 minutes in the PM peak.

The grade separation over the rail corridor at Hoskyns Road also removes the significant safety hazard at the level crossing for large vehicles which are constrained by traffic queues and the close proximity of the level crossing to the traffic signals on SH1.

Overall, freight movement is expected to be safer, quicker and more reliable in this area.

6.3 Intersection Performance

The full Paramics modelling results comparing traffic volumes, delays and queue lengths between the Project and Do Minimum scenario are provided in **Appendix D** for 2028 and 2038.

As shown in **Appendix D,** the network performs well with the Project improvements in 2028 with most intersections operating at LOS D or better. Most of the intersections perform better than the Do Minimum scenario.

There is an increase in delay at the Levi Road / Weedons Road intersection in the AM peak. Increases in traffic along Levi Road make it more challenging for vehicles turning out of the southern approach at the Levi Road / Weedons Road intersection to find gaps. There is a small volume of right turning traffic from Weedons Road that experience around a 50s increase in delay which results in the overall intersection performing at LOS F compared to LOS D in the Do Minimum scenario. The intersection has been identified for an upgrade in the RLTP and SDC LTP and these delays are considered acceptable in the interim until the upgrade is implemented.

The 2038 intersection performance has been summarised below in **Table 6-7.**

Table 6-7: 2038 Intersection Performance

Intersection	AM				IP				PM			
	DM		Project		DM		Project		DM		Project	
	Delay	LoS	Delay	LoS	Delay	LoS	Delay	LoS	Delay	LoS	Delay	LoS
Rolleston Drive Extension / Jones Road	-	-	19	B	-	-	13	B	-	-	16	B
Jones Road / Hoskyns Road	59	E	19	B	101	F	15	B	169	F	26	C
Jones Road / Weedons Ross Road	20	C	14	B	11	B	9	A	57	E	17	B
Weedons Road / SH1 off/on ramp (north)	6	A	8	A	4	A	4	A	7	A	7	A
Weedons Road / SH1 off/on ramp (south)	114	F	58	E	7	A	8	A	83	F	56	E
Kidman Street / Rolleston Drive (north)	221	F	25	C	103	F	22	C	292	F	18	B
Kidman Street / Tennyson Street	69	E	3	A	4	A	2	A	7	A	3	A
SH1 / Dunns Crossing	58	E	12	B	14	B	11	B	44	D	15	B
SH1 / Rolleston Drive (north)	22	C	-	-	23	C	-	-	44	D	-	-
SH1 / Hoskyns Road	120	F	13	B	52	D	15	B	147	F	16	B
Levi Road / Weedons Road	60	F	669	F	20	C	23	C	26	D	30	D
Lowes Road / Masefield Road	28	C	27	C	19	B	19	B	27	C	24	C
Masefield Road / Rolleston Drive (north)	170	F	21	C	15	B	16	B	19	B	28	C
Lowes Road / Tennyson Street	19	B	35	D	15	B	16	B	20	C	23	C
Rolleston Drive (north) / Tennyson Street	34	C	18	B	16	B	15	B	20	B	22	C
Norman Kirk Drive / Rolleston Drive (north)	191	F	20	B	16	B	16	B	75	E	22	C
Jones Road / Iport Drive	3	A	4	A	2	A	4	A	3	A	4	A

Figure 6-7 to **Figure 6-8** compares the intersection performance between the Project and the Do Minimum in the 2038 AM peak.

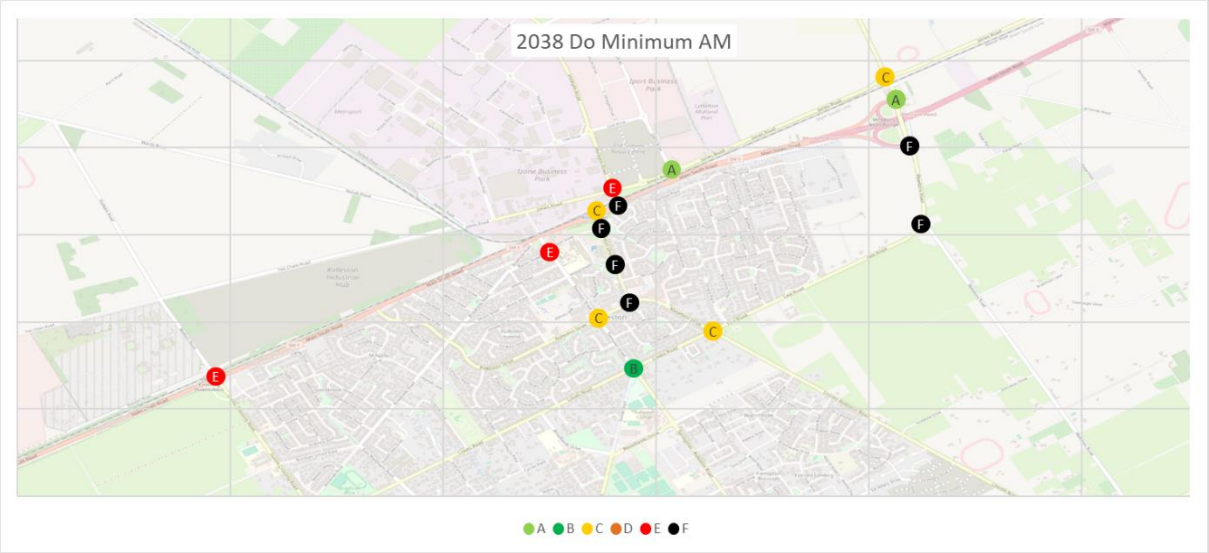


Figure 6-7: 2038 Do Minimum AM LOS plot

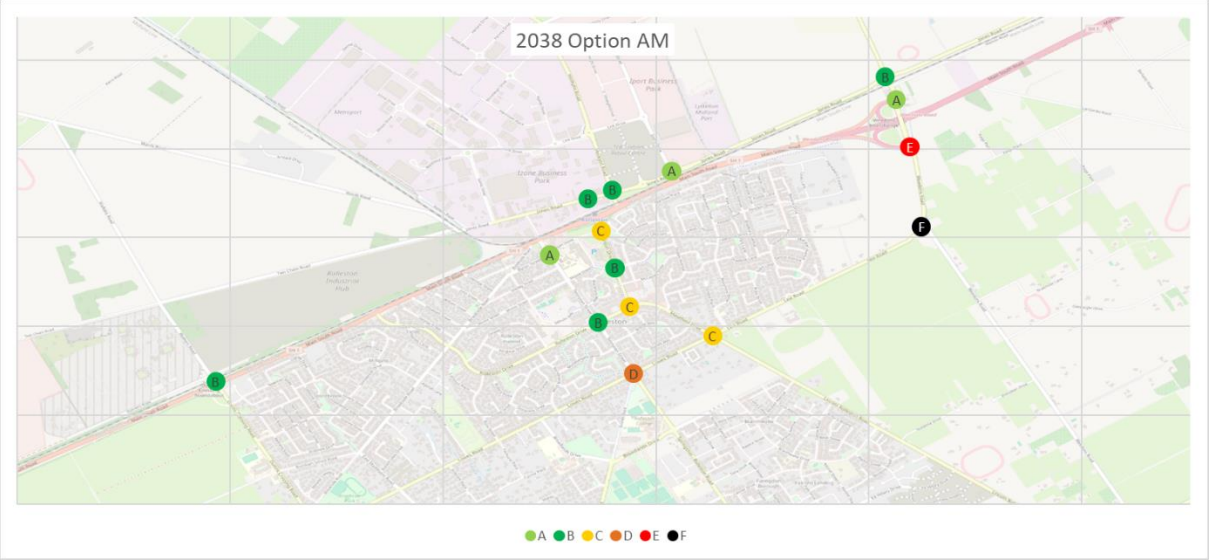


Figure 6-8: 2038 Project AM LOS plot

The network performs well in 2038 AM peak period compared to the Do Minimum scenario and the Project effectively addresses the congestion issues identified in the Do Minimum scenario. A number of intersections along Rolleston Drive (north) that were performing at LOS F in the Do Minimum scenario now perform much better.

It should be noted that by 2038 the Levi Road / Weedons Road intersection will be over-capacity and experiences high delays in the Project scenario with the minor approach experiencing delays up to 700s. The intersection is already operating at capacity in 2038 in the Do Minimum network and would need an upgrade regardless of the Project, as identified under the RLTP and SDC LTP. The intersection performance with the Project further supports the need for a roundabout upgrade.

A sensitivity test with the roundabout in the Do Minimum and Project has been undertaken for the 2038 AM peak and is discussed further in **Section 6.10.** The intersection performs well in both the Do Minimum and Project scenario with a possible roundabout upgrade.

Figure 6-9 to **Figure 6-10** compares the intersection performance between the Project and the Do Minimum in the 2038 PM peak.

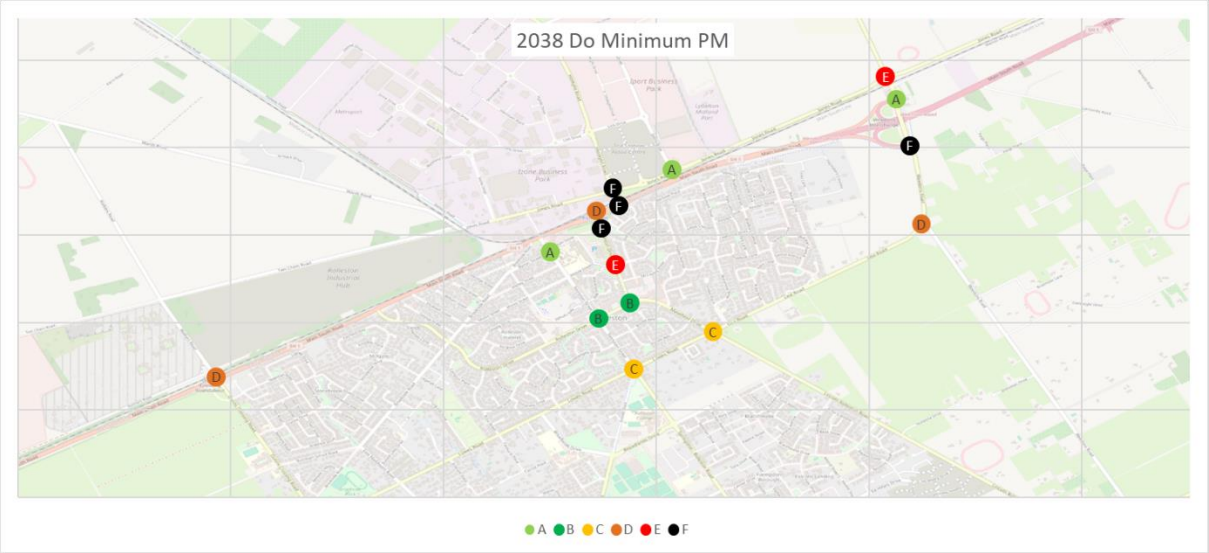


Figure 6-9: 2038 Do Minimum PM LOS plot

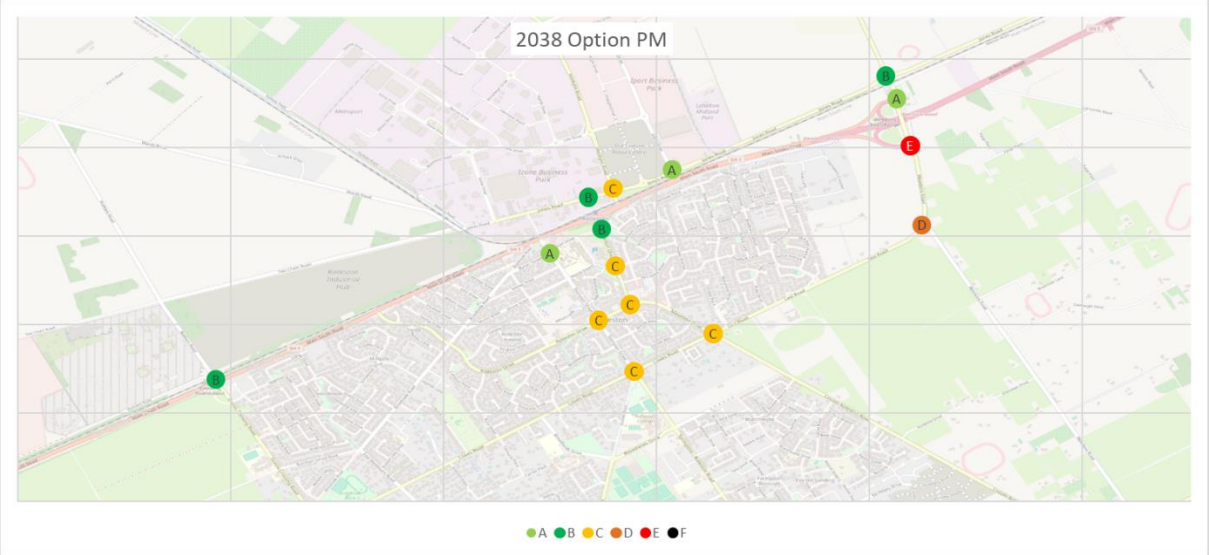


Figure 6-10: 2038 Project PM LOS plot

The network operates efficiently under the Project in the PM peak period in 2038 with all intersections, except the Levi Road / Weedons Road intersection experience an improvement in LoS. The congestion that was identified at the SH1 / Rolleston Drive (north) and SH1 / Hoskyns Drive intersection in the Do Minimum scenario is resolved by the Project. A roundabout improvement is currently programmed for the Levi Road / Weedons Road intersection and is in **Section 6.10.1**.

There is some congestion at the SH1 / Weedons Road (south) roundabout, but the intersection performs better than the Do Minimum and queues on the off-ramp reduce from 1.8km to 390m. The queues on the off-ramp no longer extend back to SH1.

6.4 Key Journey Reliability

The travel time reliability of the key journeys between Rolleston and Christchurch have been assessed using the Paramics model. Although there are various definitions and measures for travel time variability, the modelled maximum and minimum travel times from the model have been used to indicate variability. **Figure**

6-11 and **Figure 6-12** compares the travel time variability between the Project and the Do Minimum for key sectors between Rolleston and Christchurch for 2038 AM and PM peak.

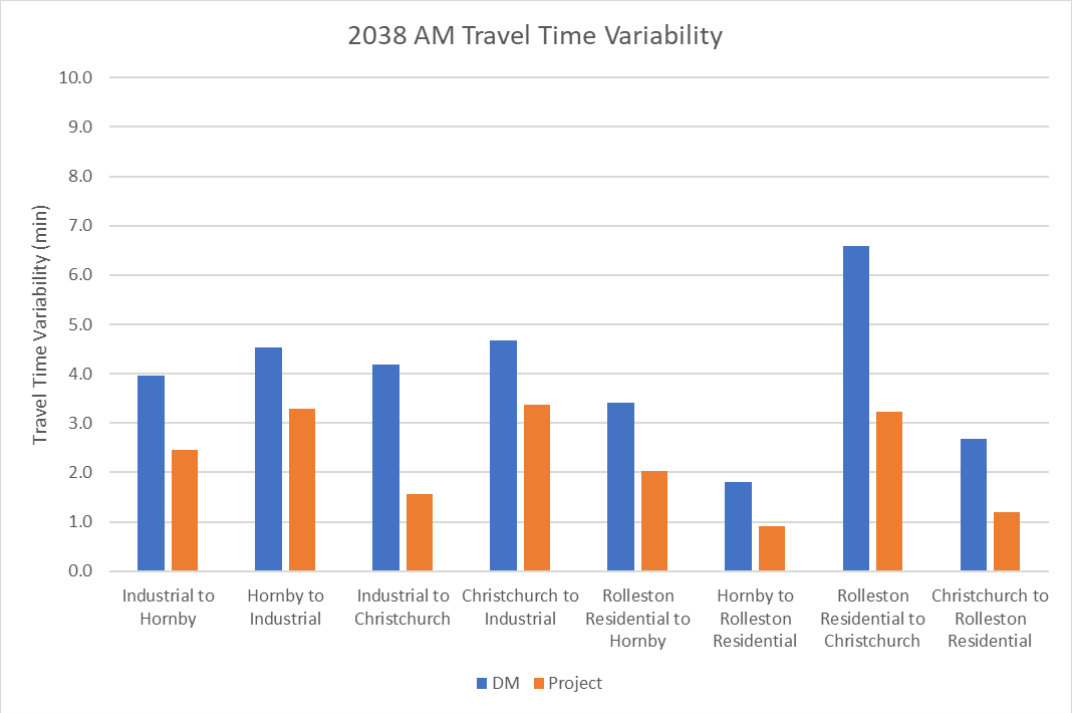


Figure 6-11: 2038 AM Travel time variability comparison

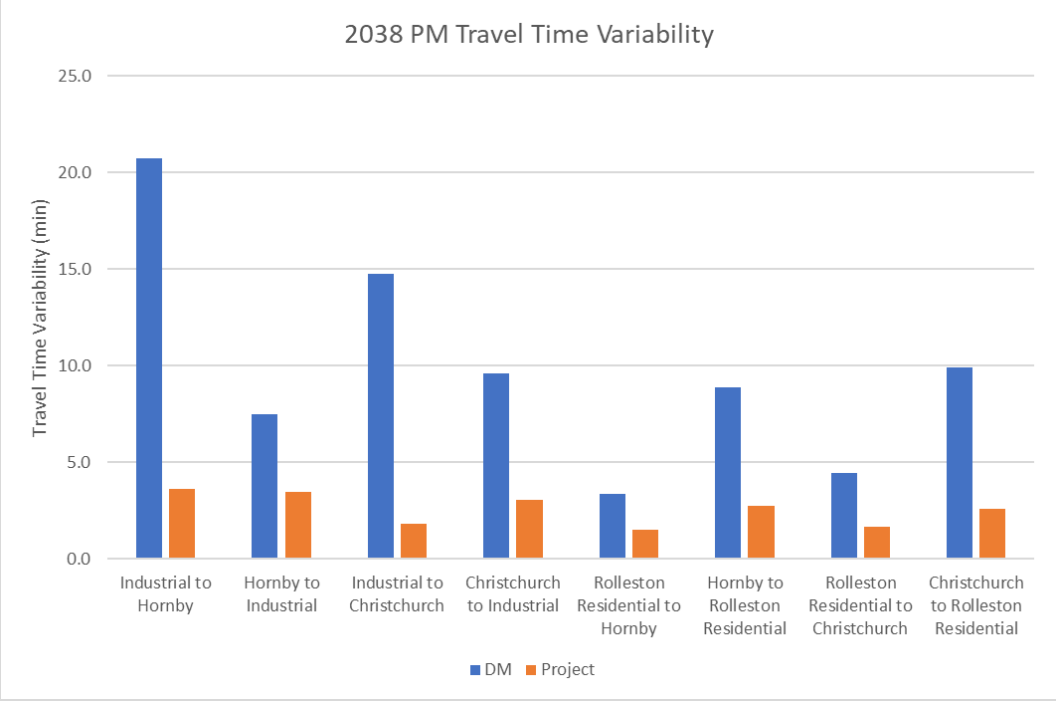


Figure 6-12: 2038 PM Travel Time variability comparison

The Project reduces travel time variability across all key sector movements between Rolleston and Christchurch, with the most noticeable improvement in the PM peak. Travel between the RIZ to Hornby / Templeton sees a notable reduction in travel time variation from 21 minutes to 4 minutes. Travel from the RIZ to Christchurch also sees a large reduction in travel time variation from 15minutes to 2 minutes.

Similarly, other journeys between Rolleston and Christchurch, experience reductions in travel time variability of 2-7 minutes.

Some reduction in travel time variability is observed in the AM and IP but is not as significant as the PM where the heavy congestion in the Do Minimum scenario results in high variability.

The improvement is associated with the removal of the over-capacity signals along SH1 at Rolleston Drive (north) and Hoskyns Road which. Drivers travelling east west along SH1 no longer need to stop at various signalised intersections. The Project improves access from the Industrial Area to Christchurch by allowing drivers to connect directly onto SH1 via Hoskyns Road on-ramp.

6.5 Property Access Changes

Figure 6-13 shows the locations where property access is affected as part of each Package to be delivered by the Project.

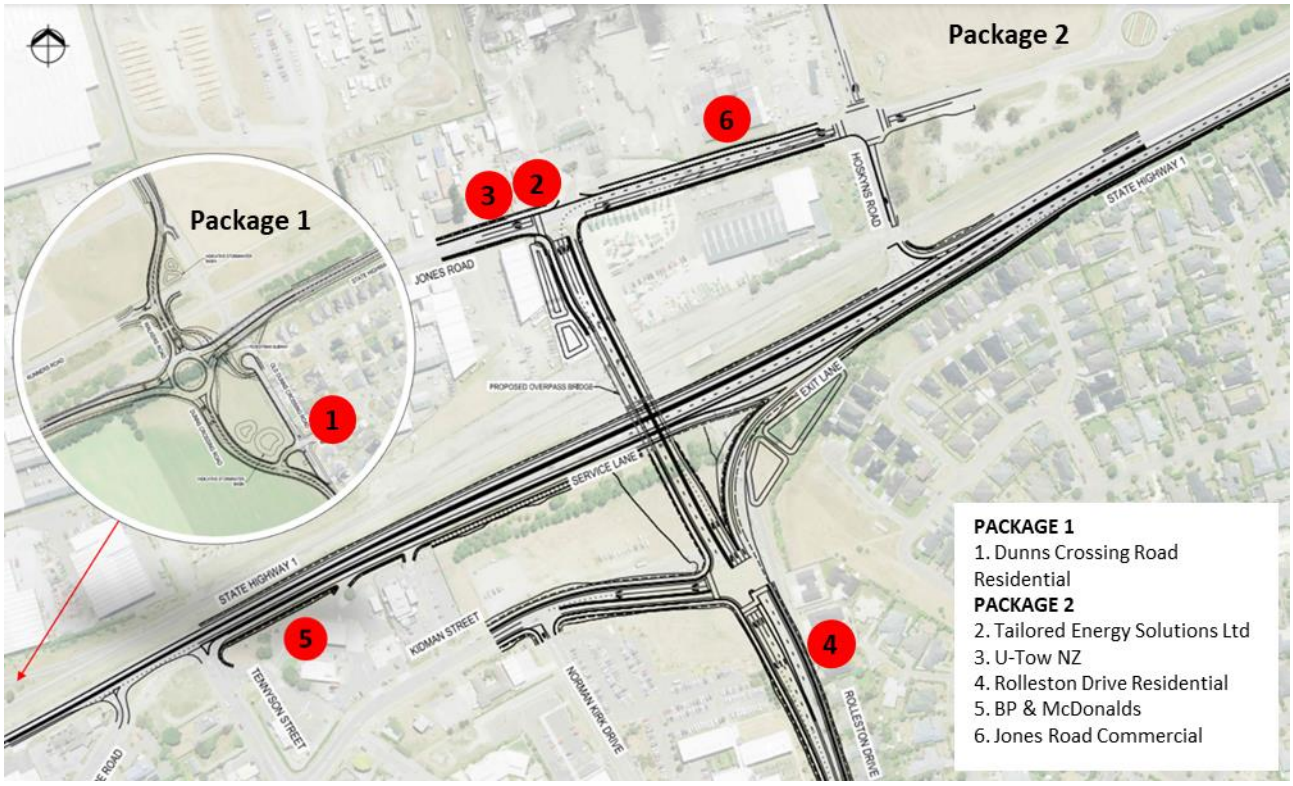


Figure 6-13: Property Access Changes

Each of these areas are discussed further below.

6.5.1 Package 1 – Dunns Crossing Road Residential Access

Package 1 of the Project involves the construction of a new roundabout and associated works at the intersection of SH1, Dunns Crossing and Walkers Roads. The intersection will be shifted west of its current location, along with a south-westward realignment of the northern part of Dunns Crossing Road.

As a result of the realignment, a total of four residential properties from 382 – 392 Dunns Crossing Road will have vehicle access from a shared access lane / driveway off Newman Road. **Figure 6-14** shows the proposed access arrangements.

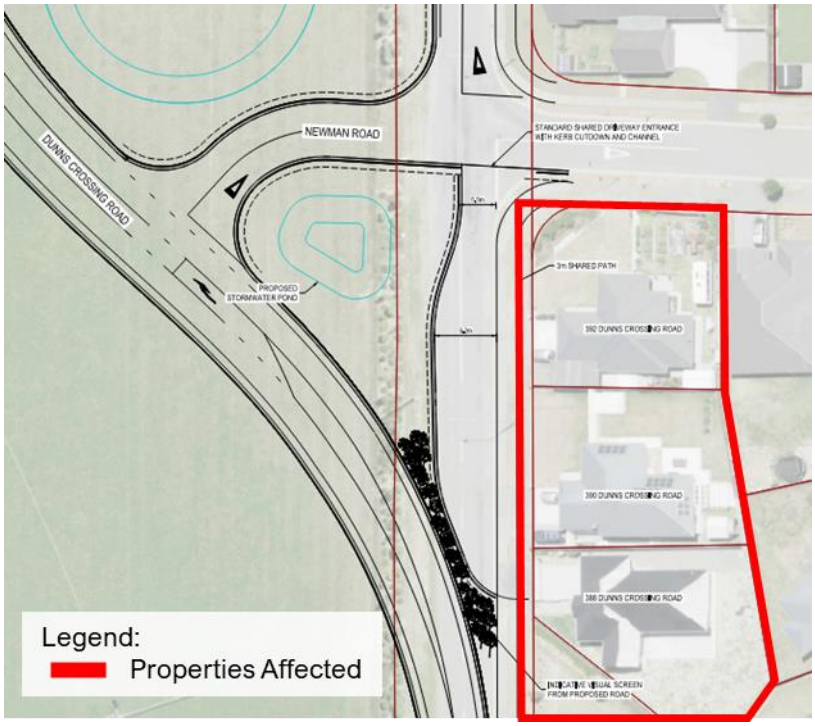


Figure 6-14: Property access for 382 – 392 Dunns Crossing Road

The existing northern part of Dunns Crossing Road will be retained and converted to a cul-de-sac road to provide property access to five residential properties from 398 – 406 Dunns Crossing Road. **Figure 6-15** shows the access arrangements for these properties.

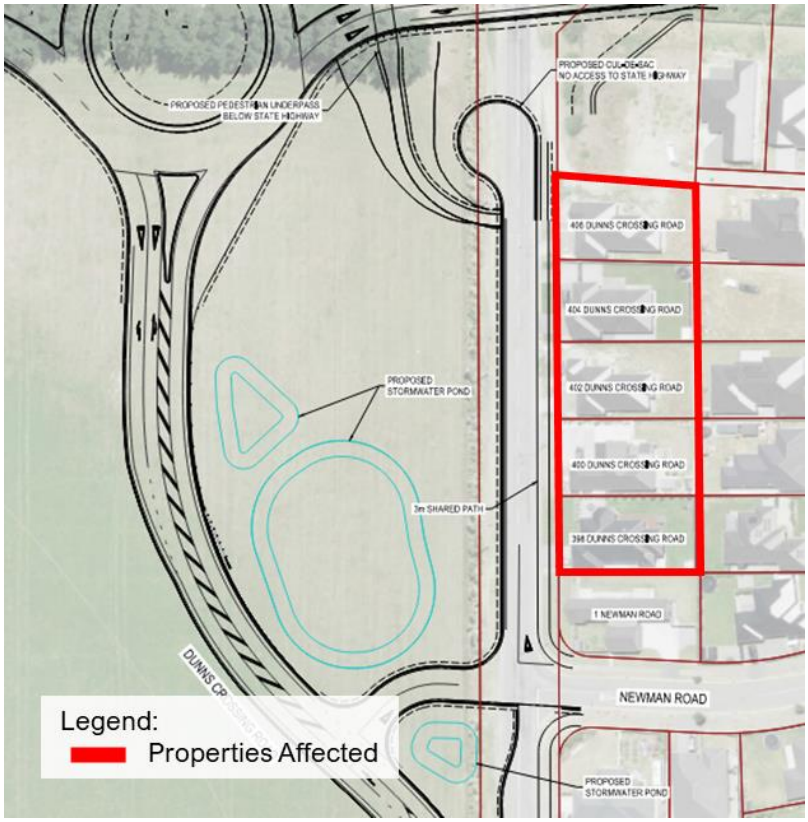


Figure 6-15: Property access for 398 – 406 Dunns Crossing Road

The residential properties mentioned above will still have access to the wider network via Dunns Crossing Road with improved safety, reduced traffic volumes on Dunns Crossing Road with no noticeable disbenefits.

6.5.2 Package 2 – Tailored Energy Solutions Ltd

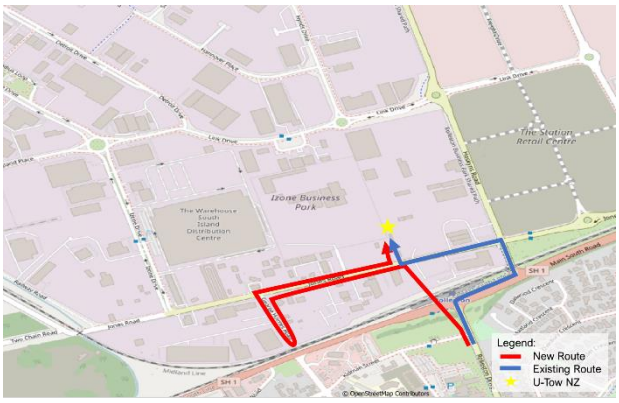
There are currently two accesses formed on Jones Road for Tailored Energy Solution Ltd (804 Jones Road). The new overbridge will connect to Jones Road directly outside the western access to Tailored Energy Solutions. The Tailored Energy Solutions western access will be provided with a traffic signal controlled access on the northern side of the Rolleston Drive Extension / Jones Road signalised intersection. All movements to and from the western property access will be retained as part of the proposed traffic signals. The eastern access will be unchanged and retain the ability for all movement to and from this access. A flush median is provided on Jones Road on the approach to the eastern access where vehicles turning right into the site can wait.

6.5.3 Package 2 – U-Tow NZ

U-Tow NZ (808 Jones Road) is located immediately adjacent to the new Rolleston Drive Extension / Jones Road signalised intersection, with the existing driveway located immediately west of the intersection.

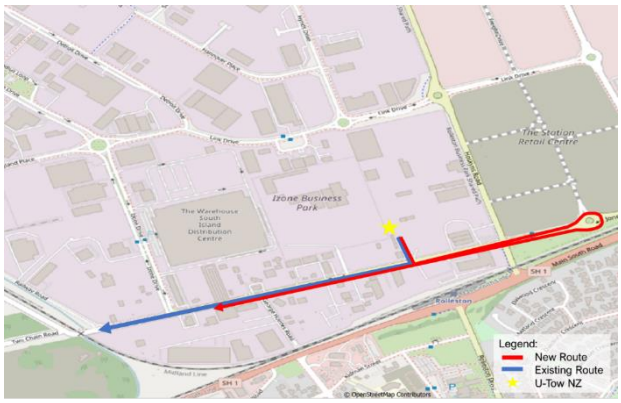
During peak periods where high traffic flows are expected, this access will be difficult to turn right in and out of. The property owners and customers will be encouraged to undertake left in / left out movement only. The difficulty of these right turns will require a change in access routes into and from U-Tow NZ. These routes are shown diagrammatically in the **Figure 6-16** and **Figure 6-17.**

Access from the East

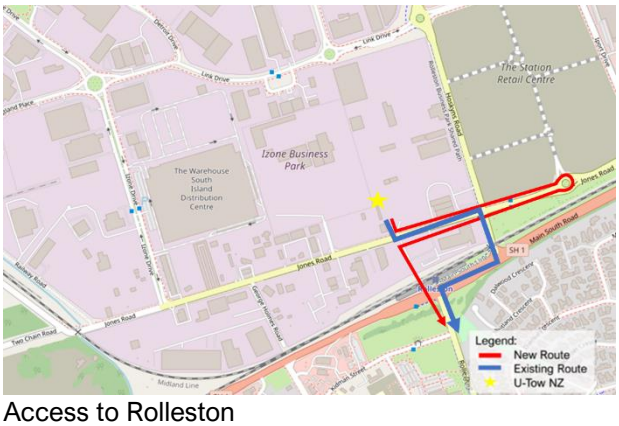


Access from Rolleston

Figure 6-16: Change in access route: from east to U-Tow NZ and from Rolleston



Access to the West



Access to Rolleston

Figure 6-17: Change in access route: from U-Tow NZ to west

SDC are constructing a turning head for the nearby cul-de-sac road at George Holmes Road that can be used as a safe turnaround facility. Vehicles accessing U-Tow NZ from the east and Rolleston can utilise

George Holmes Road as a safe turnaround facility to enable these vehicles to safely turn left into U-Tow NZ. This represents an additional 1.1km when travelling from the east and 700mm when travelling from Rolleston.

Vehicles travelling from U-Tow NZ to the west and to Rolleston will require vehicles to undertake a U-turn at the Jones Road roundabout. This represents an additional 1km when travelling to the east and 650m when travelling to Rolleston equating to approximately two minutes additional travel time.

Traffic generation of U-Tow NZ will be low and those effected by the change in access will still experience safety and travel time benefits from the Project. While this extra route time will be inconvenient for this property, the changes are required for safety reasons for other road users and are considered acceptable. Discussions with this business are ongoing to consider options to further reduce the impact of Package 2 of the Project on this access.

6.5.4 Package 2 – 13A-19B Rolleston Drive

In order to construct the new Overbridge between Rolleston Drive (north) and Jones Road, a realignment of Rolleston Drive (north) and Kidman Street is required. A 60m long solid median is proposed on Rolleston Drive (north) between Kidman Street and Norman Kirk Drive. Consequently, access for the six residential properties on 13A to 19B Rolleston Drive will be restricted to left in / left out.

Figure 6-18 shows the properties that will be affected by the solid median.

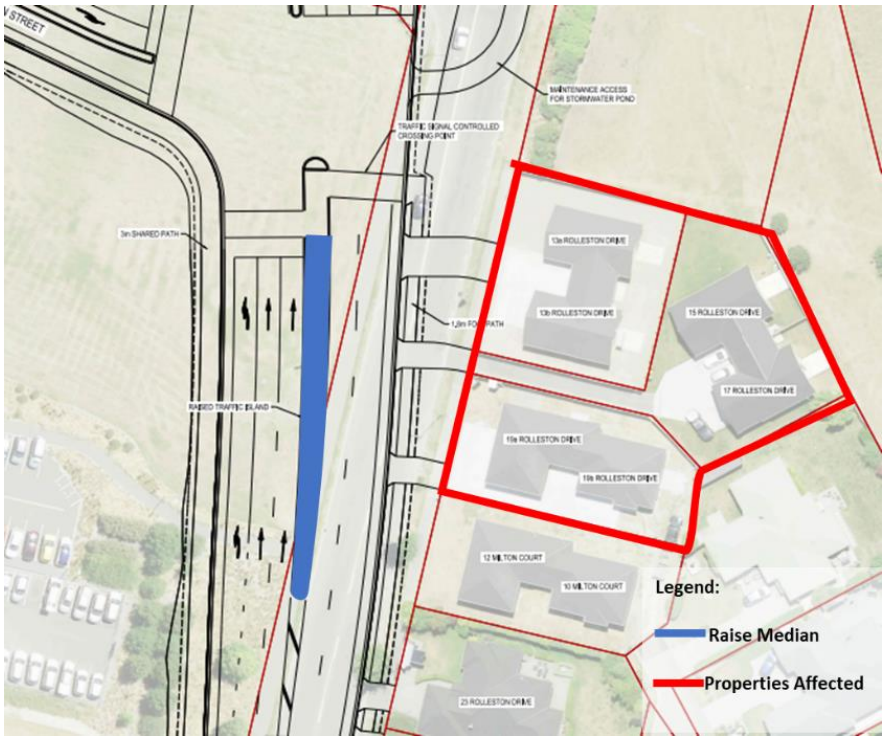


Figure 6-18: Access Restrictions for 13A-19B Rolleston Drive

The removal of the existing right turns will require a change in access routes into and from the residential properties. These routes are shown diagrammatically in the **Figure 6-19** and **Figure 6-20**.

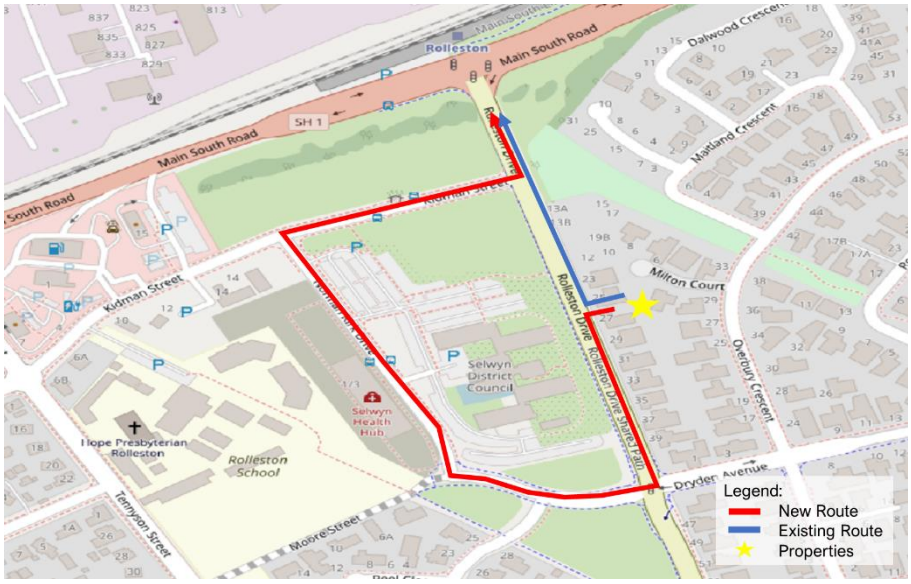


Figure 6-19: Change in access route: from residential properties to north

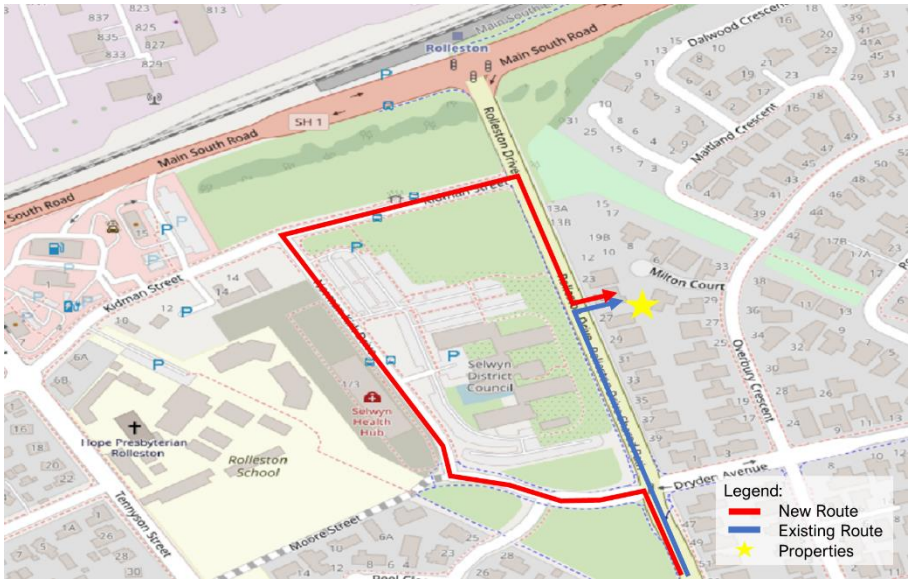


Figure 6-20: Change in access route: to residential properties from the south

Access from the south to the residential properties and access from the residential properties to the north will require vehicles to loop around Norman Kirk Drive and Kidman Street. This represents an additional 500 to 700m and approximately two minutes additional travel time. The additional distance is not considered significant compared to the overall safety and travel time benefits from the Project. Furthermore, traffic modelling indicates that by 2038 (without the Project) there will be significant congestion and queueing on Rolleston Drive (north) such that drivers are likely to experience high delays and safety risks when turning right into and out of the properties regardless.

6.5.5 Package 2 – BP & McDonalds

The BP service station and McDonalds currently have westbound access directly off SH1. The Project proposes to provide a westbound service lane off SH1 via the Rolleston Drive off-ramp from Hoskyns Road to Tennyson Street via the Rolleston Drive off-ramp for access instead. The service lane will provide entry into the BP service station and McDonalds. Eastbound vehicles on SH1 are currently able to access the BP service station and McDonalds via the SH1 / Tennyson Street. These movements are no longer possible as part of the Project with eastbound vehicles on SH1 required to detour an additional 1300m and

approximately three minutes of additional travel time via Dunns Crossing Road and Brookside Road as shown in **Figure 6-21**. Vehicles will continue to exit onto Kidman Street. While this extra travel time will be inconvenient for these properties, the changes are required for safety reasons and are considered acceptable.

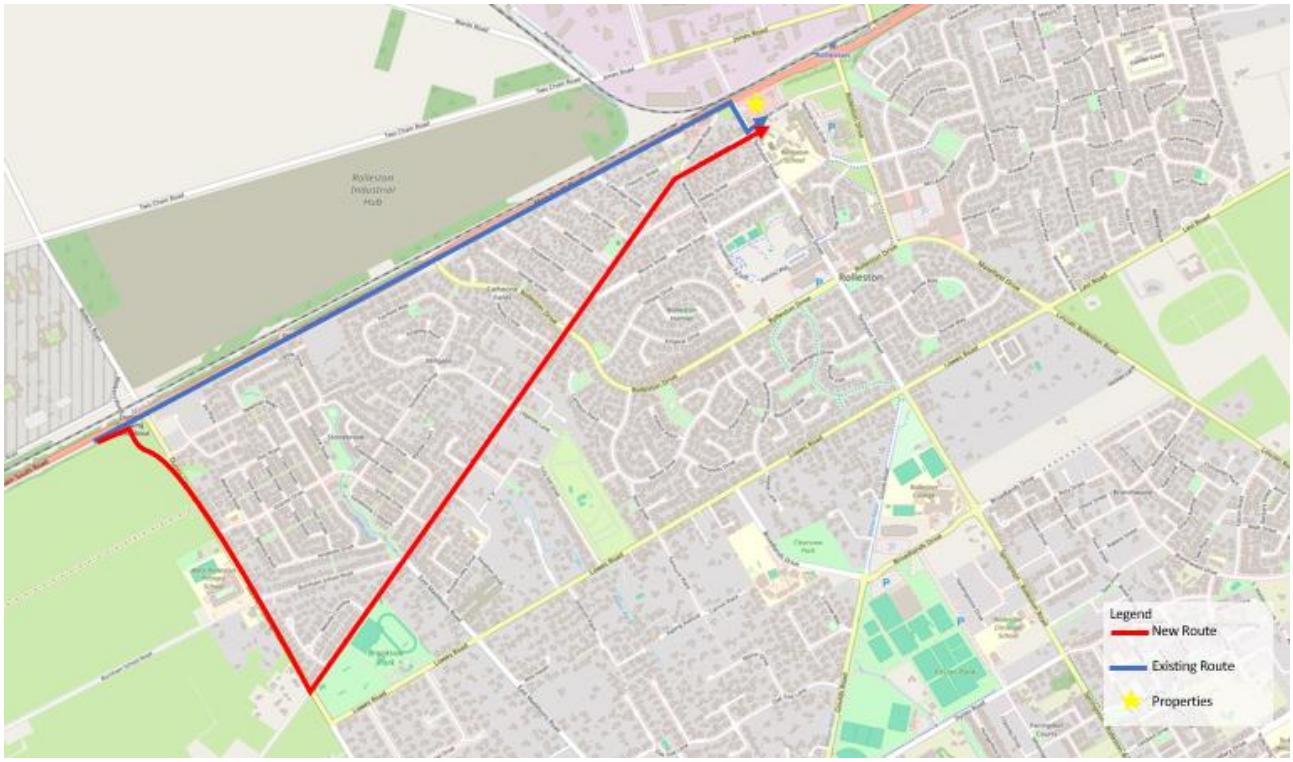


Figure 6-21: Change in access route: to BP and McDonalds from the south

6.5.6 Package 2 – Jones Road Commercial

There are two commercial properties on Jones Road (790 Jones Road and 799 Jones Road) between the proposed overpass and Hoskyns Road. The existing accesses onto Jones Road will remain unchanged with all movements permitted from these accesses. The Project provides a flush median for vehicles accessing these properties to wait in when turning right into these businesses. As a result, the impact of the Project on these businesses is low aside from the changes in traffic volumes on this section of Jones Road. The Project provide additional traffic lanes through this section to accommodate the additional traffic.

6.5.7 Summary of Property Access Effects

Overall, the Project will improve access arrangements for eight residential properties on Dunns Crossing Road as part of Package 1 of the Project. These residential properties will be provided with improved vehicle access safety with no notable disbenefits.

There are diversions required for U-Tow, BP & McDonalds that require change route to access these sites for specific movements as part of Package 2. However, these changes are only required to facilitate safer movements to and from SH1 as part of Package 2. The access needs of these properties have been evaluated, and alternative arrangements have been provided wherever feasible to enable continued access. In cases where existing access arrangements cannot be maintained, safe alternative routes are available.

6.6 Safety

6.6.1 Key Movement Restrictions and Changes

The following changes to the road network by the Project have been considered when evaluating the safety effects associated with the Project:

- SH1 / Dunns Crossing Road / Walkers Road – replaced by a roundabout.
- SH1 / Rolleston Drive (south) – becomes left-in and left out only.
- SH1 / Brookside Road - becomes left-in and left out only.
- SH1 / Tennyson Street - becomes left-in (via service lane) and left-out
- SH1 / Rolleston Drive (north) (via SH1 westbound off-ramp) – becomes left-in only.
- SH1 / Hoskyns Road – becomes left-out only.
- Rolleston Drive Extension / Jones Road – new signalised intersection at the northern end of the Overpass.
- Kidman Street / Rolleston Drive (north) – new signalised intersection layout that replaces the current priority intersection.

Movements that are no longer possible as a result of the Project such as right turns onto SH1 are expected to redistribute across the network, including using the new overpass.

6.6.2 SH1 Corridor Safety Performance (Weedons Road interchange to Dunns Crossing Road)

The modelled traffic volumes have been used to forecast crashes for the Do Minimum scenarios and Project scenario for the 2028 and 2038 periods. **Table 6-8** presents the safety assessment for the SH1 corridor between Weedons Road and Dunns Crossing Road.

Table 6-8: SH1 Corridor Assessed Change in DSI

Corridor	DSI Casualties					
	Do Minimum		Project		% Reduction	
	2028	2038	2028	2038	2028	2038
SH1 01S-365/5.8 to Rolleston Drive (south)	0	0	0	0	0	0
SH1 Rolleston Drive (south) to 80km/h	0	0	0	0	0	0
SH1 80km/h to Tennyson Street	2.16	2.50	1.97	2.21	9%	11%
SH1 Tennyson Street to Rolleston Drive (north)	0.79	0.91	0.90	0.97	-14%[1]	-6%[1]
SH1 Rolleston Drive (north) to Hoskyns Road	0	0	0	0	0	0
SH1 Hoskyns Road to 100 km/h	0	0	0	0	0	0
SH1 100 km/h to 01S-350/7.0	3.23	3.52	3.11	3.59	4%	-2%[2]
Total – SH1 Corridor through Rolleston	**6.19**	**6.93**	**5.98**	**6.77**	**3%**	**2%**

1- DSI increase to retention of 80km/h speed limit rather than 60km/h SaAS speed limit

2 - DSI increase due minor increase in modelled traffic volumes, not considered to be statistically significant

The assessment indicates an overall 7-8% reduction in DSI equivalents on the corridors assessed when compared with the Do Minimum scenario (annual savings of 0.52 DSI). The primary reductions in DSI are associated with the SH1 section between Tennyson Street to Rolleston Drive (north) which decrease by as much as 24%.

6.6.3 Intersection Safety Performance

Table 6-9 presents the safety assessment for the key intersections along SH1. It should be noted that the individual intersection performance is not directly comparable between the Do Minimum and the Project due to network changes and road closures. Instead, a comparison of the performance of the intersections as a whole needs to be undertaken to understand the overall intersection safety performance for the Project.

Table 6-9 Intersection Assessed change in DSI

Intersection	DSI Equivalents					
	Do Minimum		Project		% Reduction	
	2028	2038	2028	2038	2028	2038
SH1 / Dunns Crossing Road / Walkers Road	1.43	1.66	0.05	0.06	96%	97%
SH1 / Brookside Road	0.37	0.46	0	0	100%	100%
SH1 / Tennyson Street	1.48	1.89	0	0	100%	100%
SH1 / Rolleston Drive (north)	0	0	0	0	N/A	N/A
SH1 / Rolleston Drive (south)	0.10	0.09	0	0	100%	100%
SH1 / Hoskyns Road	0.74	0.87	0	0	100%	100%
Jones Road / Hoskyns Road	0.20	0.20	0.42	0.45	-111%	-127%
Jones Road / Rolleston Drive Extension	0	0	0.09	0.09	N/A	N/A

Intersection	DSI Equivalents					
	Do Minimum		Project		% Reduction	
	2028	2038	2028	2038	2028	2038
Rolleston Drive (north) / Kidman Street	0	0	0.08	0.08	N/A	N/A
Total	**4.32**	**5.17**	**0.64**	**0.69**	**85%**	**87%**

It can be seen in **Table 6-9** that an overall reduction in DSI of 85-87% is achieved by the Project at intersections (approximately 4.5 DSI's saved per year in 2038). The primary driver of this improvement is due the closure of four intersections, of which two are replaced by safer intersection layouts.

When assessing the combined intersection and corridor improvements of the Project (as presented in **Table 6-10**), overall DSI are expected to reduce by approximately 39-40% for both the 2028 and 2038 years (5 DSIs saved per year in 2038).

Table 6-10: Summary of Project Safety Outcomes

Component	Do Minimum		Project		% Reduction	
	2028	2038	2028	2038	2028	2038
Intersections	4.32	5.17	0.64	0.69	85%	87%
Corridors	6.50	7.29	5.98	6.77	8%	7%
Total Project	**10.83**	**12.46**	**6.63**	**7.46**	**39%**	**40%**

6.6.4 Rail Level Crossings

The level crossings affected by the Project are to be retained with safety improvements to be agreed with KiwiRail as part of the LCSIA process for the affected level crossings. The Project provides a left out only from Hoskyns Road onto SH1 as a free flowing lane gain with the removal of the SH1 / Hoskyns Road signalised intersection. This will remove the risks of traffic queuing back from the level crossing onto the State Highway and remove the risk of downstream queues from the SH1 Hoskyns Road intersection queuing through the level crossing when a train is approaching. The Project is removing the risks that have resulted in several near-misses occurring each year at this level crossing.

The level crossing at Walkers Road will be replaced and upgraded as part of the new roundabout, with a realignment south of the current location and provides more than the minimum 30m separation to the rail line with additional space for run-out areas for queuing vehicles to clear the level crossing. There is residual risk that traffic queues back from the Walkers Road level crossing to the SH1 / Dunns Crossing Road / Walkers Road roundabout that results in vehicles queuing on other approach lanes. However, there are two through lanes provided on SH1 so vehicles are able to queue whilst not obstructing other movements from SH1, albeit with temporarily reduced capacity. Vehicles queuing on Dunns Crossing Road may obstruct right turning vehicles on SH1. However, Dunns Crossing Road is low speed urban environment, so any crash risk is likely to be minimal during this queuing. This is considered acceptable as this issue was not observed in the modelling undertaken with the low train volumes (up to 14 trains per day) so queuing at this level crossing is expected to be rare.

6.6.5 Rolleston Drive (north) / Kidman Street

The revised intersection is located southwest of its current location and is configured to connect both the SH1 offramp and the new overpass. Generally, the overall function of this intersection is not anticipated to change, however as the new intersection will be signalised, a significant safety improvement is expected, particularly for pedestrians crossing Rolleston Drive (north). A two-stage signalised crossing will provide a much safer crossing point in addition to a more urbanised cross section that will improve speed limit

compliance, particularly for drivers exiting SH1. It is noted that in the five year crash period no crashes were recorded by the Police hence no crash saving can be demonstrated by the Project.

6.6.6 Jones Road (Rolleston Drive Extension – Hoskyns Road – SH1)

Jones Road will function as the connection with the new overpass and SH1, with a new signalised intersection being proposed with Jones Road and Rolleston Drive Extension. The Jones Road / Hoskyns Road intersection will also be upgraded to reflect the anticipated revised traffic flows, and Hoskyns Road will become left-out only onto SH1 with a free flowing lane gain for Christchurch-bound traffic.

The removal of two-way traffic flow on Hoskyns Road (northbound traffic) will significantly simplify intersection movements and remove the need to consider any vehicle queues back to the level crossing.

6.6.7 West Rolleston School & Burnham School Road

The West Rolleston Primary School is located on Dunns Crossing Road portion of the local road network designated for commuter and freight routes in response to the access consolidations on SH1. The Project is projected to result in an additional 2,000vpd in 2028 and an additional 2,600vpd in 2038 compared to the Do minimum volumes (a 39-48% increase from the 2028 and 2038 Do minimum traffic volumes). This equates to an additional 220vph and 330vph in 2028 and 2038 respectively in the AM peak (when the school would be operating). The narrow nature of the road, combined with the presence of parked cars, is likely to result in slow-moving traffic along this section of Dunns Crossing Road.

A SUP is currently provided on the eastern side of Dunns Crossing Road between 382 Dunns Crossing Road and Burnham School Road. The Project will a greenway cycleway on the Dunns Crossing Road cul-de-sacs to the north of the existing SUP to create a safe cycle connection from the West Rolleston Primary School to Newman Road and remaining houses on Dunns Crossing Road to the north.

A kea crossing is currently provided outside the school on Dunns Crossing Road, offering a safer crossing point for children. It is noted that the main school pick-up and drop-off occurs on Burnham School Road.

There are currently ‘no parking’ lines on the eastern side of 382 Dunns Crossing Road to Burnham School Road. The Project will extend the ‘no parking’ lines to the north to SH1 so parents dropping off students on Dunns Crossing Road will be on the same side of the road as the school, minimising the number of students required to cross this busy road.

The following additional safety improvements around West Rolleston School, to be delivered by SDC, were identified as part of DBC in partnership with SDC and are expected to be in place prior to the opening of the Project:

- A 30km/h school speed zone (shown in **Figure 6-22**) during pick-up and drop-off time to be implemented by April 2025 as specified in the SDC Interim Speed Management Plan.
- Dunns Crossing Road / Burnham School Road safety improvements. This includes signalisation of this intersection and safety improvements at this intersection. This is expected to be implemented by April 2025

Figure 6-22: West Rolleston Primary School 30km/h School Speed Zone Extents

It is anticipated that the current road layout and changes to Dunns Crossing Road proposed by the Project combined with the additional improvements to be undertaken by SDC should appropriately manage student and pedestrian safety considering the increase in traffic volumes along Dunns Crossing Road. It is recommended that behaviour around West Rolleston Primary School is monitored, and these mitigation measures reviewed in the future.

6.7 Public Transport

Table 6-11 to **Table 6-12** present a comparison of the bus travel times between the Do Minimum and the Project for 2038 AM and PM.

Table 6-11: AM Peak Period Bus Travel Time (min)

PT Services	2038		
	DM (Min)	Project (Min)	Diff (Min)
Route 5 to Christchurch	26.8	20.8	-6.0
Route 5 to Rolleston	27.3	23.7	-3.6
Route 820 to Burnham	22.2	21.0	-1.2
Route 820 to Lincoln	23.1	20.3	-2.7

Table 6-12: PM Peak Period Bus Travel Time (min)

PT Services	2038		
	DM (Min)	Project (Mins)	DM (Min)
Route 5 to Christchurch	26.1	23.0	-3.1
Route 5 to Rolleston	30.8	27.8	-3.0
Route 820 to Burnham	36.1	23.2	-12.9
Route 820 to Lincoln	28.4	21.6	-6.8

The Project does not include any specific public transport infrastructure improvements. However, the Project does alleviate congestion at busy intersections along the bus routes such as at SH1 / Rolleston Drive (north) which results in bus travel time savings compared to the Do Minimum scenario. The bus travel time savings are consistent with the general vehicle travel time performance reported previously.

There are currently bus stops provided on Kidman Street near the P&R facility. The Project provides a like-for-like replacement of the existing bus stops on Kidman Street so there will be no deterioration in service for bus users at this bus stop.

The Project provides an opportunity to further improve amenity and connectivity for bus users in the future by improving the pedestrian connectivity between the P&R facilities and the bus stops provided on Kidman Street. The signal phasing and lane arrangements on the Kidman Street approach to the Rolleston Drive (north) / Kidman Street intersection allows for the integration of bus jumps for buses at this intersection in the future.

6.8 Active Modes

The Project provides new and/or improved proposed walking and cycling facilities, which includes approximately 500m of new SUP, 200m of greenway cycleway and 250m of improved SUP that integrate with the existing and proposed network in Rolleston. This includes the following improvements:

- Dunns Crossing Road / SH1 roundabout – new subway facility to provide for pedestrians and cyclists crossing SH1 in this location. This includes a new level crossing for pedestrians and cyclists at the rail crossing.
- Walkers Road – new pedestrian / cycle crossing just north of the new level crossing to provide west-east connection in the future for a SUP to be developed by SDC.
- New greenway along new Dunns Crossing Road from 406 Dunns Crossing Road to 388 Dunns Crossing Road, including a formalised cycle crossing across Newman Road.
- Existing SUP on the west side to Rolleston Drive (north) to be relocated to match the revised alignment for the extent of works.
- 4m wide SUP on the west side of the overbridge to provide north -south connectivity.
- Widen the existing footpath to form a 3m wide SUP on the north side of Jones Road between the Overpass and Hoskyns Road.

- 4m wide shared use crossings at the new traffic signals and widen the existing crossings at the Jones Road / Hoskyns Road intersection.
- Retain the connection from the future P&R site on Jones Road (east of the Jones Road / Hoskyns Road intersection) across the signalised intersection and the connection from Jones Road across the rail crossing on Hoskyns Road to the rail station.
- Upgrade the pedestrian crossing at the Hoskyns Road level crossing.

There are currently or planned cycleways/shared use path networks within Rolleston on the northern and southern side of SH1. These cycle networks also provide cycling connections to Lincoln, West Melton and Christchurch. The only dedicated cycle facilities provided to safely cross SH1 are grade separated facilities located at the Weedons Road interchange, which requires a large diversion for Rolleston cyclists to utilise. The high traffic volumes and high traffic speeds on SH1 effectively result in SH1 severing the northern and southern sides of the Rolleston cycle network. The Project will provide grade separated cycling connections across SH1 to enable a network that is more convenient for cyclists. The connections across SH1 will mirror the road network connections across SH1 resulting in a cycle network similar to that shown in **Figure 6-23**. The project forms a key link in the Rolleston cycle network to enable cycle connections to expand the contiguous cycle network in Rolleston and beyond.

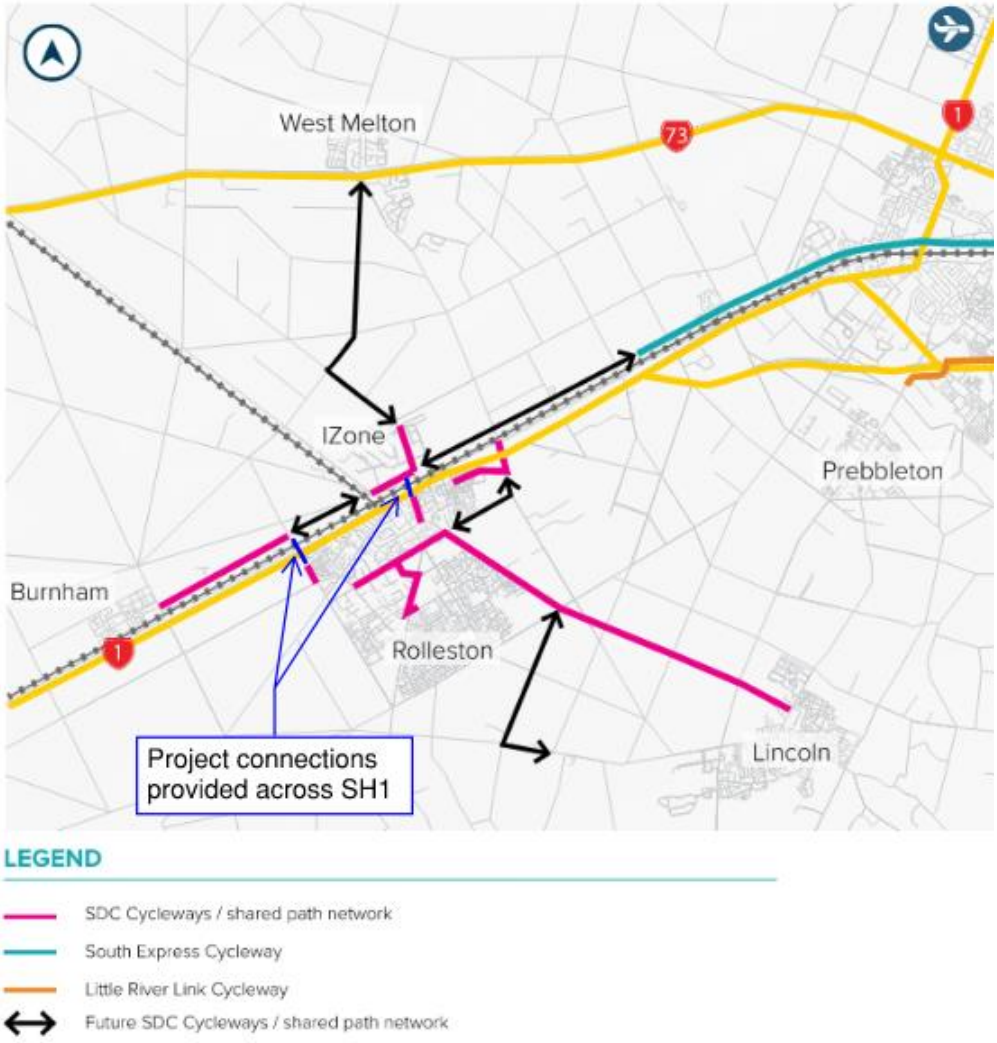


Figure 6-23: Key Cycling Connection provided across SH1 and Integration with SDC Cycleway/Shared Path Network

6.9 Project Staging

The Project is to be delivered in the following two distinct packages that are to be delivered sequentially:

- Package 1 - SH1 / Dunns Crossing Road / Walkers Road Roundabout and associated works.
- Package 2 - Overpass and balance of the works.

Package 1 will provide improved access and safety for right turners on and off SH1 as well as those crossing SH1. We expect there will be some minor rerouting to Dunns Crossing Road and Walkers Road between the completion of Package 1 and the completion of Package 2. However, the increased traffic will be less than predicted for the full Project as there will not be any turn restrictions in place until Package 2 is being constructed.

The modelling undertaken as part of this ITA includes the completion of Package 1 and Package 2 where the most significant changes to the transport network, particularly for SH1 access are implemented. As a result, the modelling undertaken as part of this ITA includes more traffic using the SH1 / Dunns Crossing Road / Walkers Road intersection than Package 1 in isolation. The modelling shows that the intersection performs well upon the completion of Package 2 so there is capacity available to accommodate the changes should only Package 1 be implemented. This staging allows the Project to provide safety benefits at a high risk intersection early and allowing for improved access at the SH1 / Dunns Crossing Road / Walkers Road intersection.

6.10 Sensitivity Testing

6.10.1 Levi Road / Weedons Road

High delays are expected at the Levi Road / Weedons Road intersection in 2038 if retained in its existing priority-controlled form. However, the Levi Road / Weedons Road intersection has been identified for upgrade to a roundabout in the RLTP and SDC LTP. This upgrade is currently programmed for 2032/2033, after completion of the Project, but timing is dependent on funding availability. A sensitivity test considering a roundabout at the Levi Road / Weedons Road intersection in 2038 AM has been carried out.

The model results show some localised rerouting in the order of 150vph between Levi Road and Weedons Road but limited traffic volume changes elsewhere in the network.

The intersection performance for the Levi Road / Weedons Road intersection is shown below.

Table 6-13: 2038 AM – Sensitivity Test

			Do Minimum			**Project**		
Intersection	**Approach**	**Turn**	**Volume** *vph*	**Delay** *seconds*	**LOS**	**Volume** *vph*	**Delay** *seconds*	**LOS**
Levi Rd / Weedons Rd (Roundabout)	N	L	155	3	A	125	3	A
		T	295	3	A	310	4	A
	S	L	40	15	C	35	16	C
		R	265	24	C	205	26	D
	W	T	760	9	A	1,095	17	C
		R	20	6	A	25	10	A

The modelling analysis shows that the Levi Road / Weedons Road roundabout performs well in 2038 AM with negligible increase in delay between the Project and the Do Minimum scenario.

The priority intersection operates well in the IP and PM and no operational issues are expected with a roundabout in those time periods. This means that the Project will not have a material adverse impact at this location if it is upgraded as planned by SDC. It is recommended the upgrade to this intersection is coordinated with the Project where possible.

6.10.2 Rolleston Industrial Zone development

The DBC included a sensitivity test of the land use assumptions associated with the Rolleston Industrial Zone. This resulted in increased traffic utilising Jones Road, with notable increases in traffic for the movements shown in **Figure 6-24.**

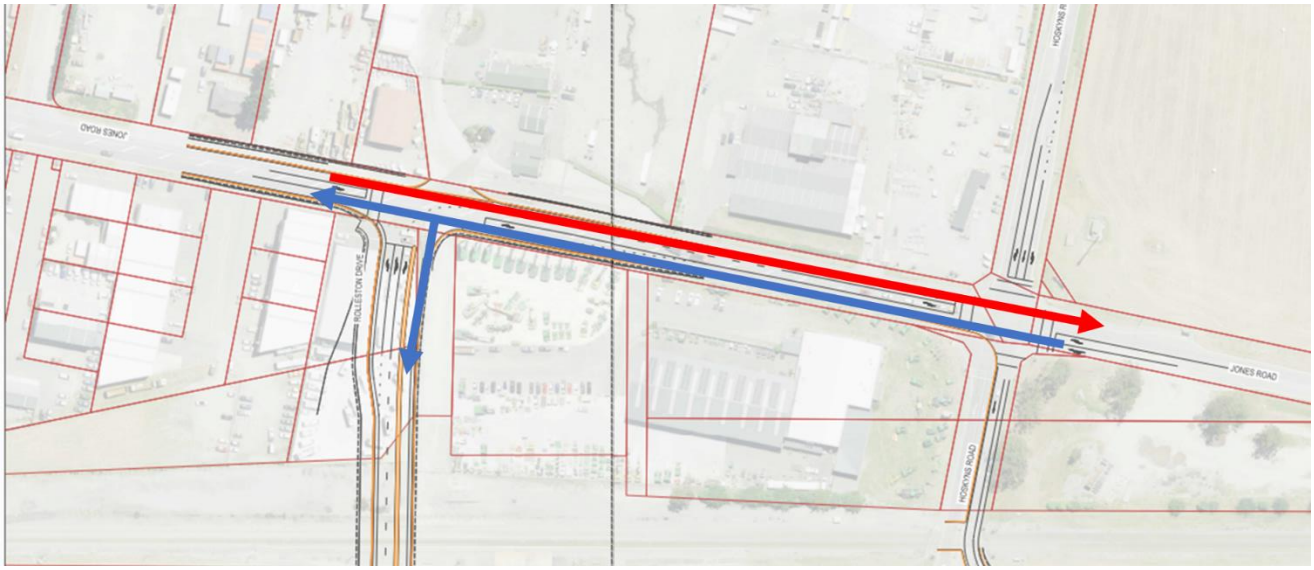


Figure 6-24: Notable increases in movement traffic volumes from Rolleston Industrial Area sensitivity test

The effect of the sensitivity test on the proposed Project layout has been considered below.

The sensitivity test undertaken by the DBC showed that whilst there was an increase in delay on these approaches, there were no concerns highlight regarding the overall performance of the intersection.

The proposed Project has similar traffic volumes for these approaches as the DBC. However, there is a difference in the intersection layout at the Rolleston Drive Extension / Jones Road intersection between the DBC and the option which is shown in **Figure 6-25** and **Figure 6-26**.

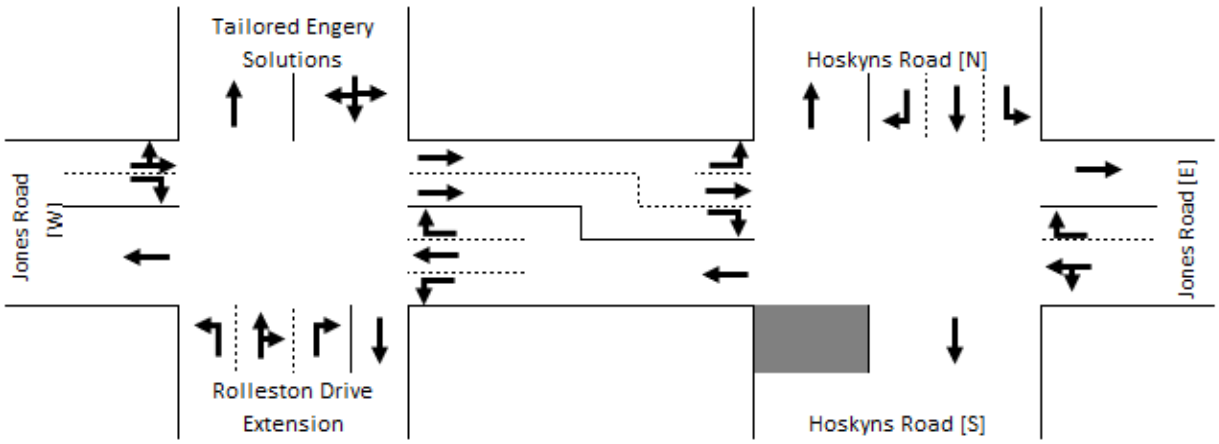


Figure 6-25: Jones Road Alignment – DBC

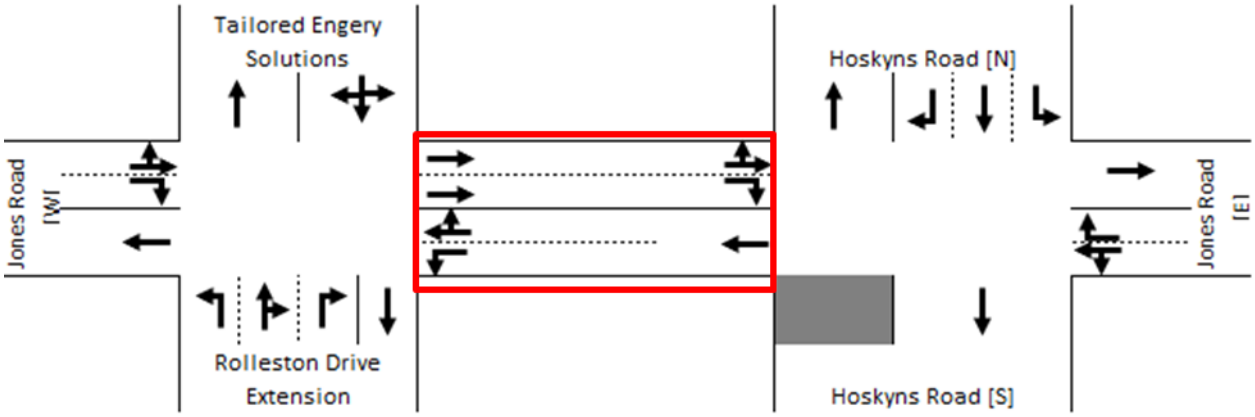


Figure 6-26: Jones Road Alignment - Project

Rolleston Drive Extension / Jones Road

The Project proposes a shared through and right lane on the eastern approach of the Rolleston Drive Extension / Jones Road intersection. Occasionally trucks turning right into Tailored Energy Solutions will block through traffic on Jones Road. Traffic counts undertaken at the Tailored Energy Solutions accesses showed that the models included more traffic using these accesses than that observed (i.e. the modelling provides a conservative view of the utilisation of the access). The modelling undertaken shows that even with this occasional queue, the delays on this approach are less than the DBC. Therefore, given the relatively low conflict, the performance of the Project under increased Jones Road traffic volumes is expected to be similar or better than the DBC sensitivity test. The performance of this intersection is expected to remain acceptable as the increase in traffic occurs on movements that would not increase conflict on Jones Road.

Jones Road / Hoskyns Road

Similar traffic volumes are observed at the Jones Road / Hoskyns Road intersection in the Project compared to the DBC. The only change at this intersection being the shared left turn and though lane on the western approach. Whilst there is an increase in eastbound traffic on Jones Road, the Project provides LOS B for shared left turn and through lane with similar delays as the DBC. The level of service is unlikely to differ significantly from the DBC sensitivity test outcomes.

The increased traffic volume could increase queuing in the combined through and left lane, however, most queuing observed in the model is related to the right turn which is unchanged from the DBC layout. Therefore, as per the DBC outcome, the Jones Road / Hoskyns Road intersection is expected to continue operating effectively under increased traffic volumes with sufficient stacking space provided for the shared left turn and through lane.

In summary, the increase in traffic on Jones Road does not result in movements that would increase conflict in the Project above what was forecast as part of the DBC sensitivity tests.

6.10.3 Wider Network

The Project will result in an increase in vehicles coming from Christchurch using the Weedons Road interchange. Additional capacity improvements have been provided as the Weedons Road interchange to accommodate the additional traffic, resulting in a better performance compared with the DBC. As such, this takes pressure off the Rolleston Drive Extension / Kidman Street exit by simplifying the arrangement and reducing the number of phases that will improve the intersection performance under the sensitivity test conditions relative to the DBC. As such, the sensitivity test is not expected to result in elevated concerns regarding performance of the wider transport network.

7 Construction Traffic Effects and Mitigation Measures

7.1 Introduction

This section sets out a high-level qualitative assessment of the potential traffic and transportation effects expected to arise during the construction phases of the Project. There has been no contractor involvement regarding the construction traffic management at this stage, so the sequences set out in this section represent a potential and feasible construction sequence only.

It is expected that the Contractor will develop their own methodology for the Project which will include more detail both of the sequence and the plan to minimise effects. However, the procurement process will set the high-level objectives outlined in this methodology as a baseline for Contractors to use in developing their methodology.

7.2 Overall Philosophy

This Transportation Assessment also identifies construction and staging strategies to minimise the disruption caused during construction. These include:

- An overarching Construction Traffic Management Plan, supported by individual site-specific temporary traffic management plans.
- An overall philosophy to construct offline works first, to minimise the impact on the travelling public.
- To construct and open Package 1 (SH1 / Dunns Crossing Road / Walkers Road roundabout and other associated works) prior to affecting traffic movements at the SH1 / Rolleston Drive (north) and SH1 / Hoskyns Road Intersections. Completion of these works will reduce the impact of any effects from Package 2 (overpass) and it is essential that the roundabout is operational before any turning movement are removed at the SH1 / Rolleston Drive (north) or SH1 / Hoskyns Road intersection.
- The existing number of lanes (1 sealed lane in each direction as well as dual lane approaches to the signals and turning lanes / right turn bays) will be maintained as far as possible to preserve the capacity of all roads and minimise the impact for the travelling public.

The duration of construction for the Project is expected to be between three and four years. Package 1 is expected to be constructed first in 2025 and 2026 with Package 2 to follow from 2026 to 2028. Package 1 (and associated SDC projects) will provide improved access to both Rolleston residential and industrial areas and will need to be open prior to any significant impacts from the construction of Package 2.

Construction is anticipated to take place in the following order:

7.3 Package 1

7.3.1 Scope and Indicative Construction Sequence

Package 1 of the Project involves the construction of a new roundabout and associated works to support the safe movement along SH1, Dunns Crossing and Walkers Roads. The associated works includes the provision of a new pedestrian/cycle subway, a new at grade rail level crossing for pedestrians and cyclists and a shared path and greenway to connect to the existing shared path on Dunn Crossing Road to Runners Road. The cycle subway and rail level crossing will provide for a safe crossing of State Highway 1 at the SH1 / Dunns Crossing Road / Walkers Road intersection and across the rail level crossing. The subway connects the proposed Burnham Cycleway (along Runners Road) with the Rolleston residential area and a walking and cycling connection to the expanding industrial area and shared use paths along Walkers Road and Two Chain Road. The indicative Package 1 construction sequence is provided in **Appendix E** and **Figure 7-1**.

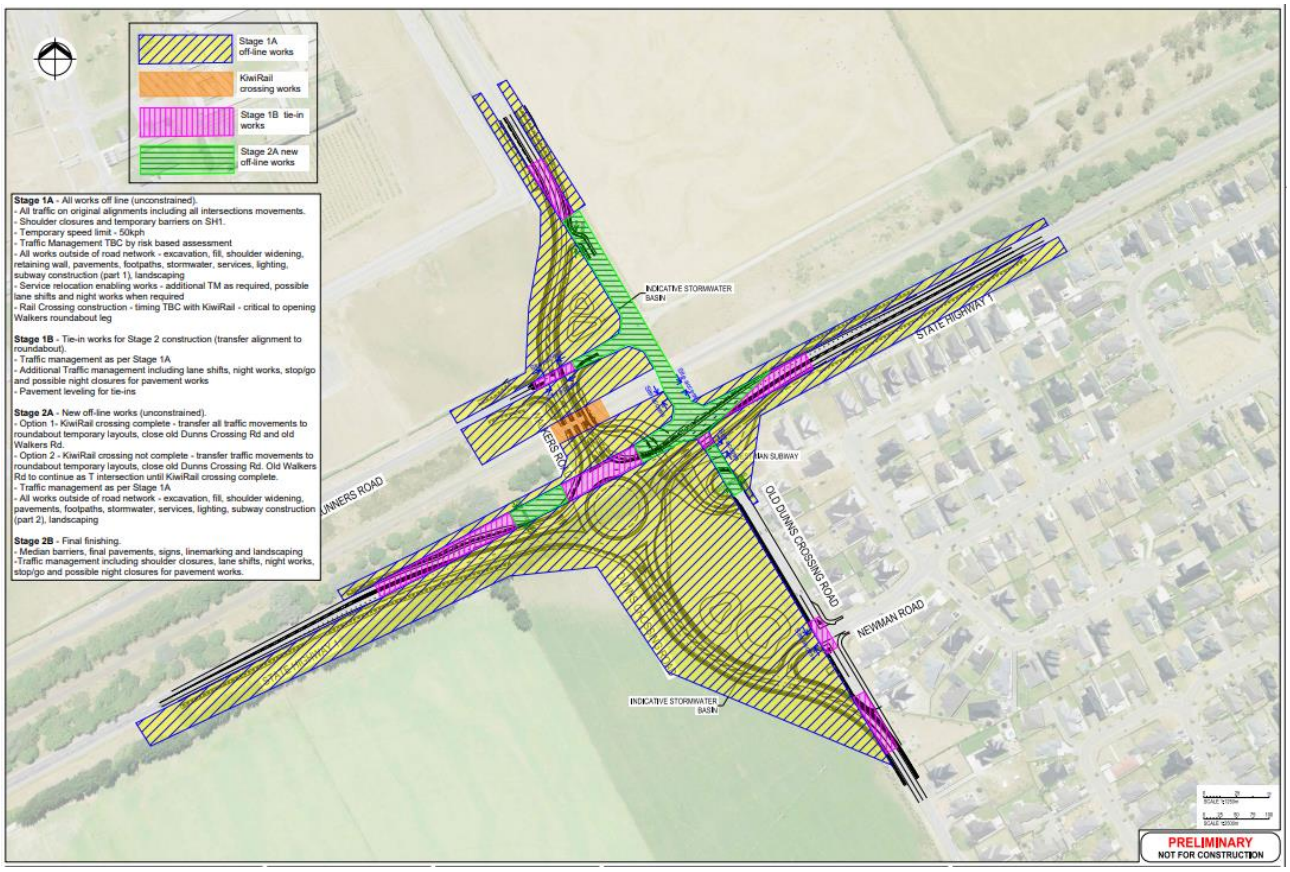


Figure 7-1: Package 1 Indicative Construction Sequencing

This construction sequence can be summarised as:

- **Stage 1A** - All works off line (unconstrained).
  - All traffic on original alignments including all intersections movements.
  - Shoulder closures and temporary barriers on SH1.
  - Temporary speed limit as appropriate- 30-50kph.
  - All works outside of road network - excavation, fill, shoulder widening, retaining wall, pavements, footpaths, stormwater, services, lighting, subway construction (part 1), landscaping.
  - Service relocation enabling works - additional TM as required, possible lane shifts and night works when required.

  - Rail Crossing construction - timing to be confirmed with KiwiRail - critical to opening Walkers roundabout leg.
- **Stage 1B** - Tie-in works for Stage 2 construction (transfer alignment to roundabout).
  - Traffic management as per Stage 1A
  - Additional Traffic management including lane shifts, night works, stop/go and possible night closures for pavement works
  - Pavement levelling for tie-ins
- **Stage 2A** - New off-line works (unconstrained).
  - Option 1- KiwiRail crossing complete - transfer all traffic movements to roundabout temporary layouts, close old Dunns Crossing Road and old Walkers Road.
  - Option 2 - KiwiRail crossing not complete - transfer traffic movements to roundabout temporary layouts, close old Dunns Crossing Rd. Old Walkers Road to continue as T intersection until KiwiRail crossing complete.
  - Traffic management as per Stage 1A
  - All works outside of road network - excavation, fill, shoulder widening, pavements, footpaths, stormwater, services, lighting, subway construction (part 2), landscaping
- **Stage 2B** - Final finishing.
  - Median barriers, final pavements, signs, line-marking and landscaping
  - Traffic management including shoulder closures, lane shifts, night works, stop/go and possible night closures for pavement works.

This may involve short-terms closures of turning movements at Dunns Crossing Road and Walkers Road with appropriate mitigation determined by the contractor in consultation with the Road Controlling Authority.

Alternatives can include opening the roundabout in a temporary form and diverting Dunns Crossing Road onto the new alignment earlier or completing the level crossing upgrade and opening Walkers ahead of reconstructing the existing highway.

7.3.2 Assessment of Transport Effects During Construction

The potential traffic effects during construction associated with Package 1 are summarised in Table 7-1. This table also outlines the indicative impact of the works and the proposed mitigation measures (in addition to standard temporary traffic management) to minimise the anticipated effects.

Table 7-1: Summary of Package 1 Construction Traffic Effects

Stage	Activity	Effect	Mitigation
Stage 1A - All works off line (unconstrained). Stage 1B – Tie-in works for Stage 2 construction (transfer alignment to roundabout).	Dunns Crossing Road. Walkers Road, Runners Road	Increased travel times due to temporary reduced speed limits through work zones. Additional delays from stop/go single lane operation for short durations. Effects likely to be minor as new alignments are largely away from the existing road	Construct as much as possible off-line to minimise the traffic exposed to reduced speed limits Schedule stop/go operations during periods of reduced traffic to minimise travel time disruption.
	Widening SH1 Main South Road	Increased travel times due to temporary speed limits through work zones. Improved safety due to lower speeds especially for turning traffic.	Construct as much as possible off-line to minimise the traffic exposed to reduced speeds.

Stage	Activity	Effect	Mitigation
		Travel time disbenefits expected minor and short in duration	
	Construction of new KiwiRail road crossing	KiwiRail design and build all aspects of the rail crossing including requirements for line blocks and working in the rail corridor. All rail impacts managed by KiwiRail for their own project works. KiwiRail normally schedule high intensity construction over a short period when block of rail lines are required. Expected to be 2-3 days disruption to rail. No effects anticipated on the road networks – All work is offline in greenfield area. Rail effects during construction to be managed by KiwiRail.	No effects on road network anticipated. Contractor to liaise with KiwiRail to coordinate access and work programming.
Stage 2A – Reconstruction of Main South Road	Reconstruction Main South Road	Traffic diverted to newly constructed SH1 widening. Increased travel time due to temporary speed limits through work zones. Travel time disbenefits expected to be minor. Improved safety due to lower speeds especially for turning traffic.	Public communications to advise of increased travel time.
	Closure of turning movements at Dunns Crossing Road to facilitate tie-ins.	Traffic diverted to alternative intersections for short periods of time.	Public communications and signed detour routes. Mitigation at other intersections e.g. temporary speed limit at Rolleston Drive (south). Safer alternatives are available.
	Closure of turning movements at Walkers Road. Likely to be short term and limited to closures of right turns	Traffic diverted to alternative intersections.	Public communications and signed detour routes. Mitigation at other intersections. Closure of right turn out to be carefully planned to avoid diverting traffic to a less safe intersection.

Stage	Activity	Effect	Mitigation
	Tie ins on Walkers Road and Dunns Crossing Road	Additional delays from stop/go single lane operation for short durations. Effects likely to be minor as these are low volume roads and new alignments are largely away from the existing road.	Public communications to advise of increased travel time. Schedule stop/go operations during periods of reduced traffic to minimise travel time disruption. All works in the rail corridor are to be consulted with KiwiRail for methodology, timing and duration to minimise effects.
Stage 2B – Final finishing	Median barriers, final pavements, signs, line-marking and landscaping	Increased travel times due to temporary reduced speed limits through work zones. Additional delays from stop/go single lane operation for short durations.	Schedule works to minimise time where temporary speed limits are in place. Schedule stop/go operations during periods of reduced traffic to minimise travel time disruption.
Interdependencies	Two Chain Road upgrades	May reduce attractiveness of intersection during construction but are essential for opening the roundabout	Work with SDC on integrated programme and coordinated traffic management planning.

7.3.3 Construction Traffic Routing

Construction traffic for this package of work is dependent on the phase of works. Site access is expected to be via Runners Road, Walkers Road and Dunns Crossing Road with access to these roads via SH1 and Two Chain Road.

7.4 Package 2

7.4.1 Scope and Construction Sequence

Package 2 of the Project involves the construction of:

- A new multi-modal flyover that will connect the residential and industrial areas of Rolleston. The overpass will provide improved facilities for walking and cycling.
- Safer access, via a westbound off-ramp and service lane, to the town centre and service businesses alongside SH1.
- Upgrade of Jones Road / Hoskyns Road, SH1 / Hoskyns Road and Rolleston Drive (north) / Kidman Street intersections together with removal of the traffic signals at SH1 / Rolleston Drive (north) and SH1 / Hoskyns Road.
- Safety improvements to intersections along SH1 through Rolleston, with a range of improvements to reduce DSIs and better manage the forecast future traffic volumes.
- Extending second westbound lane on SH1.
- Wire rope median barrier from CSM2 to just west of Brookside Road

- Left in / left out at Rolleston Drive (south).

The indicative Package 2 construction sequence is provided in **Appendix E** and **Figure 7-2**.

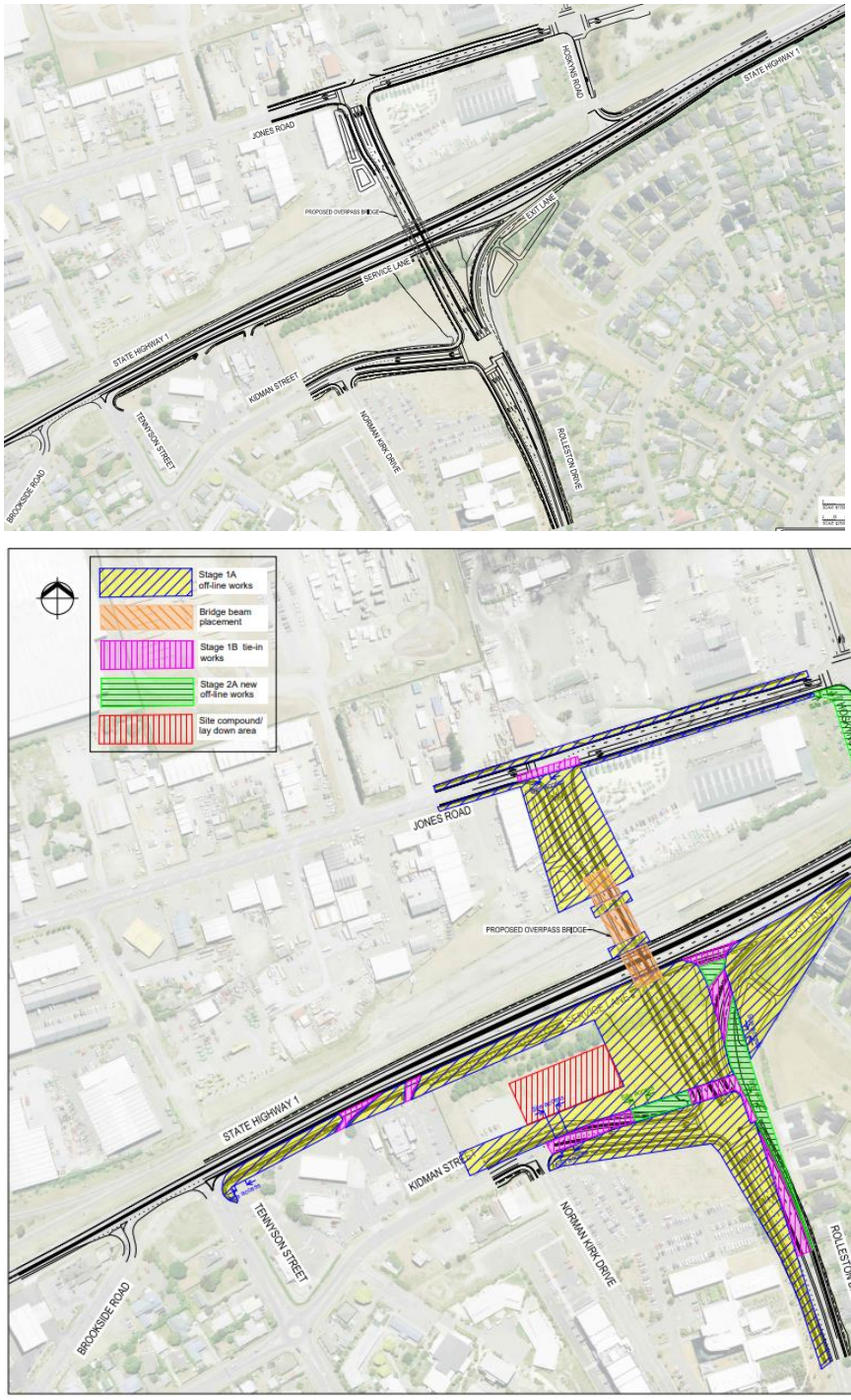


Figure 7-2: Package 2 Indicative Construction Sequencing

The key constructability principles are to:

- Complete Package 1 in advance of any significant traffic restrictions around Package 2. Package 1 provides additional safe and efficient access into Rolleston township and industrial area at the west end reducing the impacts of changes at the SH1 / Rolleston Drive (north) or SH1 / Hoskyns Road intersections.

This sequence can be summarised as:

- **Stage 1A** - All works offline (unconstrained).
  - All traffic on original alignments including all intersections movements.
  - Shoulder closures and temporary barriers on SH1.
  - Temporary speed limit – 30-50kph
  - Possible option to close Kidman Street for construction efficiency, quality and safety. Potential to open new Kidman Street alignment earlier.
  - All works outside of road network - excavation, fill, piers, abutments, embankments, retaining walls, shoulder widening, pavements, footpaths, stormwater, services, traffic signals, lighting, landscaping.
  - Bridge beam and barrier placement during SH1 night closures (detour via Walkers, Two Chain, Jones, Hoskyns Roads or Tennyson, Kidman Streets, Rolleston Drive (north)). Bridge deck construction continues as unconstrained.
  - Service relocation enabling works - additional traffic management as required, possible lane shifts and night works when required.
- **Stage 1B** - Tie-in works for Stage 2 construction (transfer alignment to Bridge).
  - Traffic management as per Stage 1A
  - Additional Traffic management including lane shifts, night works, stop/go and possible night closures for pavement works.
  - Pavement levelling for tie-ins
- **Stage 2A** - New off-line works (unconstrained).
  - Traffic moved to final layout, overpass in use, Hoskyns Road left turn exit only, Rolleston Drive (north) left turn entry only, SH1 traffic lights decommissioned, Jones Road traffic lights commissioned.
  - Traffic management as per Stage 1A
  - All works outside of road network - excavation, fill, shoulder widening, pavements, footpaths, stormwater, services, lighting, landscaping.
- **Stage 2B** - Median barriers, final pavements, signs and line-marking
  - Traffic management including shoulder closures, lane shifts, night works, stop/go and possible night closures for pavement works.

7.4.2 Assessment of Transport Effects

The potential traffic effects associated with Package 2 are summarised in **Table 7-2**. This table also outlines the indicative impact of the works and the proposed mitigation measures (in addition to standard temporary traffic management) to minimise the anticipated effects.

Table 7-2: Summary of Main South Road Construction Traffic Effects

Stage	Activity	Effect	Mitigation
Stage 1A – All works offline (unconstrained).	Overpass and approaches	Piling and piers completed largely offline. Beam and barrier placement will require closure of the State Highway expected to be completed during a series of nights with traffic diversion via Walkers Road, Two Chain Road and Jones Road. Effects likely to be minor as most works are offline and safe diversions can be provided for night closures	Public communications to advise of diversion. Schedule diversion during periods of reduced traffic to minimise travel time disruption. Block of rail line closures are to be consulted with KiwiRail for timing and duration to minimise effects.

Stage	Activity	Effect	Mitigation
		Beam and barrier placement will require closure of the rail line and is expected to be completed over a series of block of line closures.	
	Widening SH1	Increased travel time due to temporary speed limits through work zones. Travel time disbenefits expected to be minor. Improved safety due to lower speeds.	Schedule works to minimise time where temporary speed limits are in place.
	Jones Road Widening	Increased travel time and additional delay from temporary speed limits through work zones and stop/go single lane operation for short durations. Effects likely to be minor as works can be completed as shoulder closures or short-term stop-go operations. May have minor impacts on access to adjacent business.	Schedule works to minimise time where temporary speed limits are in place. Schedule stop/go operations during periods of reduced traffic to minimise travel time disruption. Liaise with affected businesses to develop a plan to maintain access during construction. Public communications to advise of changes to access to businesses.
	Rolleston Drive (north) Widening	Increased travel time and additional delays for temporary speed limits through work zones and stop/go single lane operation for short durations. Effects likely to be minor as new alignments are largely away from the existing road.	Schedule works to minimise time where temporary speed limits are in place. Schedule stop/go operations during periods of reduced traffic to minimise travel time disruption.
Stage 1B – Tie-in works for Stage 2 construction (transfer alignment to Bridge).	Off ramp exit	Short term diversion of traffic via Service Lane and Tennyson Street to allow construction. Effects likely to be minor.	Public communications and signed detour routes. Safer alternatives are available.
	Rolleston Drive (north)	Temporary closure of Kidman Street with diversion via Norman Kirk Drive Effects likely to be minor.	Public communications and signed detour routes. Safer alternatives are available.
	Kidman Street	Temporary closure of Kidman Street with diversion via Norman Kirk Drive. Diversion of bus routes on Kidman Street to Norman	Public communications and signed detour routes. Safer alternatives are available.

Stage	Activity	Effect	Mitigation
		Kirk Road and temporary closure of Kidman Street bus stops. Effects likely to be minor.	Will require coordination with bus operators about route and temporary bus stops.
Stage 2A – New off-line works (unconstrained).	Reconstruction SH1	Increased travel time due to traffic diverted to one side and the other to allow staged pavement construction. Effects likely to be minor. Improved safety due to lower speeds.	Maintain one lane in each direction at all times. Schedule works to minimise time where temporary speed limits are in place.
	Reconstruction of Rolleston Drive (north)	Increased travel time due to traffic diverted to one side and the other to allow staged pavement construction. Effects likely to be minor. Improved safety due to lower speeds.	Maintain one lane in each direction at all times. Schedule works to minimise time where temporary speed limits are in place.
	Reconstruction of Hoskyns Road and level crossings	Increased travel time due to traffic diverted to one side and the other to allow staged pavement construction. Effects likely to be minor. Improved safety due to lower speeds.	Maintain one lane in each direction at all times. Schedule works to minimise time where temporary speed limits are in place. All works in the rail corridor are to be consulted with KiwiRail for methodology, timing and duration to minimise effects.
Stage 2B	Median barriers, final pavements, signs, line-marking and landscaping	Increased travel times due to temporary reduced speed limits through work zones. Additional delays from stop/go single lane operation for short durations.	Schedule works to minimise time where temporary speed limits are in place. Schedule stop/go operations during periods of reduced traffic to minimise travel time disruption.

7.4.3 Construction Traffic Routing

Construction traffic for this package of work is dependent on the phase of works. Site access is expected to be via Jones Road, Rolleston Drive (north) and Kidman Street with access to these roads via SH1 and Hoskyns Road.

7.5 Construction Traffic Management Plan

7.5.1 Overview

The Project will utilise an overall CTMP to manage the potential effects during the construction works. It will outline the procedures for the production of Site-Specific Traffic Management Plans (SSTMPs) and the relevant standards, objectives and/or outcomes that the CTMP should achieve related to the effect that must be complied with.

The CTMP will be supported by multiple SSTMPs detailing the specific traffic management set ups at each worksite as well as any mitigation measures for identified effects of the works. Each SSTMP will allow for pedestrian and cyclist movements through the work site with temporary foot and cycle paths.

SSTMPs will be required for each of the work areas to minimise the effects of the construction activities on existing traffic and to provide a safe working environment for contractors.

7.5.2 Temporary Traffic Management Objectives, Requirements and Special Considerations

The key requirements, objectives and special considerations for the SSTMPs for construction are as follows.

Requirements

The SSTMPs will be required to be developed in line with the current New Zealand Guide to Temporary Traffic Management (NZGTTM) which applies at the time of preparing and implementing the plans. The NZGTTM sets out the requirements for the planning, design and implementation of temporary traffic management. The following documents will be used to supplement NZGTTM, as appropriate:

- NZTA Geometric Design Manual;
- NZTA Traffic Control Devices Manual;
- AustRoads Guide to Road Design; and
- AustRoads Guide to Traffic Management.
- The SSTMPs will be submitted to the appropriate Road Controlling Authorities for approval.

Objectives

The objectives of temporary traffic management for the construction of the Project are:

- Adherence to the standards set out in NZGTTM wherever reasonably practicable. Engineering Exception Decisions (EEDs), which authorise temporary traffic management measures, will need to gain approval and be signed-off by the Road Controlling Authority or authorised representatives.
- Minimise disruption on the State Highway and local roads as far as is practicable and maintain existing flows and travel times;
- Minimise the number of construction vehicle trips and their effects on local roads and seek to avoid residential areas where practicable;
- Minimise the effects of construction vehicle parking;
  - Develop traffic management plans that have consideration of all key stakeholders, including Selwyn District Council and Residents;
- Gain approval of SSTMPs at least five working days ahead of implementation;
- Provide for effective communication and the gathering of feedback from key affected parties; and
- Provide a safe environment for the general public and construction staff.

Coordination of Traffic Management

An overarching construction sequencing plan will be prepared by the contractor that identifies the various activities that will take place and when these will occur. The outline details of the temporary traffic management will be included in the construction sequencing plan in order to identify the potential cumulative traffic effects associated with several construction locations being active at the same time. One aim of the sequencing plan will be to avoid and/or mitigate significant cumulative traffic effects arising from multiple construction activities (which individually would only result in minimal effects). Controls will be placed on the Contractor to restrict impact on the surrounding areas, such as predetermined haul routes and site access points or amendments to NZGTTM to impose a greater lead in time for submissions of SSTMPs. Any controls will be agreed by all RCA's.

Traffic Effects

Traffic modelling would be required of some temporary traffic management activities to identify potential delays. Alternative methodologies may need to be considered or mitigation measures to minimise the effects, such as:

- Undertaking works at times of low traffic flow (school holidays or night works); and
- Advanced communication of the works to pre-warn the public or enable them to think of alternative routes.

Site Access

The construction site accesses will need to be considered as part of the SSTMPs. These accesses will need to operate in a safe manner that does not cause undue disruption to general traffic flows. The SSTMPs will need to consider the following with regard to site accesses:

- Signage to identify the accesses for delivery vehicles and suppliers;
- Permitted vehicles (trucks/articulated trucks/cars) and permitted uses (visitors/deliveries/staff);
- Permitted movements and/or movement restrictions e.g. left in/left out;
- Pedestrian, cyclist and public safety; and
- Deceleration and acceleration requirements to minimise traffic disruption and provide for safe access/ egress.

Diversions

Road closures are anticipated to be required on some of the local roads to enable the construction of the Project. These closures and the proposed diversion routes will be discussed with the Road Controlling Authorities prior to implementation. The diversion routes would utilise arterial roads and avoid residential areas where possible.

It is expected that any diversions would take place during the night when traffic flows on the State Highway and local road networks are lowest. For any diversions that would take place over consecutive days, the diversions would be run as a series of night works with ‘make good’ works to reinstate traffic during the day. The largest diversion route anticipated is Walkers Rd/Two Chain Rd/Jones Rd to Weedons Rd interchange via Walkers Road and Jones Road. This adds approximately 1.6km to the journey.

Property Access

The SSTMPs will include measures to minimise the effects on property access (including turning restrictions) and on-site parking/ manoeuvring. Consultation will be undertaken with affected property owners to identify the impact on their access, duration and date of work. All reasonable steps to maintain property access or a satisfactory alternative route will be implemented.

Passenger Transport

All practical steps will be taken to minimise the effects of the SSTMPs on passenger transport services. The activities that are likely to affect bus services are those taking place on Kidman Street, Rolleston Drive (north) and Jones Road.

The P&R carpark access is on Norman Kirk Drive with the main bus stops Kidman Street. There is currently an informal, partially gravelled and grass area to the north of Kidman St, that is used for parking. The gravelled area is expected to be available for parking, while there is also an additional open grass area on the south of Kidman Street (SDC land), which could be utilised for a temporary P&R facility if demand required.

There is not expected to be a notable impact on the bus stops located on Jones Road as the works around the Jones Road / Hoskyns Road intersection is expected to be minor.

Any bus stop or route changes during construction will be consulted with Environment Canterbury and Selwyn District Council. Consultation will be undertaken early in the construction planning stage to identify the potential passenger transport effects. This consultation will include:

- Environment Canterbury;
- Selwyn District Council;
- Passenger Transport Operators; and
- Ministry of Education (with regard to school bus services)

Walking and Cycling

Pedestrian and cyclist requirements (including the mobility impaired) will be considered when preparing the SSTMPs and the likely effects identified. Suitable alternative access will be incorporated into the SSTMPs, which may include the following:

- Temporary access in accordance with NZGTTM;
- Temporary diversions or routes;
- Safety fencing and protection barriers from traffic; and
- Temporary bridges across uneven surfaces.
- Long-term closures or diversions will be discussed and agreed with the appropriate Road Controlling Authority.

7.5.3 Summary

This section has set out a high-level qualitative assessment of the potential traffic and transport effects during the construction phase of the Project. This is indicative only because there has been no contractor involvement to date and construction methodologies will be developed by the selected contractor.

The key principles are to:

- Complete Package 1 in advance of any significant traffic restrictions and impacts on rail crossings around Package 2. Package 1 provides additional safe and efficient access into Rolleston township and industrial area from the south that reduces any impacts from changes at the SH1 / Rolleston Drive (north) or SH1 / Hoskyns Road intersections.

The Package 1 sequence can be summarised as:

- Stage 1A - All works offline (existing alignment unconstrained)
- Stage 1B - Tie-in works for Stage 2 construction (transfer alignment to roundabout)
- Stage 2A - New off-line works (new alignment unconstrained)
- Stage 2B - Final finishing

The Package 2 sequence can be summarised as:

- Stage 1A - All works offline (existing alignment unconstrained)
- Stage 1B - Tie-in works for Stage 2 construction (transfer alignment to Bridge)
- Stage 2A - New off-line works (new alignment unconstrained)
- Stage 2B - Median barriers, final pavements, signs and line-marking

The overall philosophy is to construct off-line work first with minimal impact on the existing road users.

This approach will minimise the disruption experienced by road users and residents, although it will not be possible to eliminate all adverse effects on road users due to the need to make changes to the existing, road network.

The specific details of the CTMP and SSTMPs are yet to be determined, but the requirements and objectives have been outlined. The CTMP and SSTMP are to be focused on minimising traffic congestion, maintaining accessibility through the works and providing a safe environment for road users, residents and contractors.

Overall, it is considered that with an appropriate Project CTMP supported by individual SSTMPs, can manage the impacts of construction of the Project on the road network as far as is reasonably practicable.

8 Conclusion

Rolleston is one of the fastest growing towns in New Zealand and is experiencing transport pressures to keep the community connected and state highway intersections safe. The following key issues for the Do Minimum road network (i.e. without the Project in place) have been identified:

- Overall, the current road network is anticipated to operate well in 2028. However, there is predicted to be significant deterioration in network performance after 2028 due to land use development.
- Beyond 2028, the high traffic volumes along SH1will result in long delays, particularly at the SH1 / Hoskyns Road and SH1 / Rolleston Drive (north) traffic signals that also create operational and safety risks related to the at-grade rail level crossing on Hoskyns Road.
- The SH1 / Dunns Crossing Road / Walkers Road and SH1 / Tennyson Street priority-controlled intersections are high-risk intersections. Based on the forecasted traffic volumes of Rolleston, the safety risks associated with these intersections is expected to worsen requiring more significant changes to improve the safety at these intersections.

The network performs well with the Project improvements in 2028 with most intersections operating at LOS D or better. Similarly, the network performs well in 2038 compared to the Do Minimum network with the Level of Service improving at all key intersections except one. The Project effectively addresses the congestion issues identified in the Do Minimum network. The Project also provides notable improvements in safety for SH1 traffic as well as improving the safety of the rail level crossing at Hoskyns Road and Walkers Road.

The Integrated Transport Assessment demonstrates the Project is consistent with the Project objectives (as discussed in **Section 1.3**) in that:

- The Project removes the traffic signals located at SH1 / Hoskyns Road and SH1 / Rolleston Drive (north) resulting in increased efficiency along SH1. The Project results in a 4-6 minute decrease in State Highway travel time from Hornby/Christchurch to the west of Rolleston and a 0.5-2 minutes decrease in State Highway travel time from the west to Hornby/Christchurch in the 2038 AM and PM peak periods.
- The Project results in overall reduction in DSIs of 39-40% in the 2028 and 2038 assessment years. The primary driver of this improvement is due to the closure of two high-risk intersections on SH1, and the modification of three intersections to provide safer intersection layouts. The proposed roundabout provides transformational change for the SH1 / Dunns Crossing Road / Walkers Road to address the poor crash history at this intersection.
- The removal of the SH1 / Hoskyns Road signals and changes to Hoskyns Road will remove the risk of traffic queuing back from the level crossing onto the State Highway and risks associated with downstream queues from the SH1 / Hoskyns Road intersection blocking the level crossing. These changes to the Hoskyns Road level crossing remove the risks that have resulted in on-average two near misses between trains and vehicles each year for the past 5 years.
- There are significant improvements in travel times as a result of the Project for travel to and from the RIZ. This is particularly noticeable in the PM peak period where there is significant congestion in the Do Minimum scenario leaving the RIZ via the existing SH1 / Hoskyns Road traffic signals. Construction of the Project substantially mitigates congestion in this area, resulting in travel time savings of 8 minutes from the Industrial area to Rolleston Residential and Town Centre, and 6 minutes to Christchurch during the PM peak.
- Heavy vehicles accessing the RIZ via SH1 can currently turn right on and off SH1 at the Hoskyns Road signalised intersection, which is a high-risk manoeuvre at a high-speed signalised intersection. The Project provides safer alternatives for heavy vehicles to right turn on and off SH1 via the Weedons Road interchange and the proposed SH1 / Dunns Crossing Road / Walkers Road roundabout.

- Similarly, the Project improves travel time and safety for vehicles travelling between the Rolleston residential area to the south of SH1 and the RIZ. The Project provides an overpass that directly connects the Rolleston residential area and the RIZ, eliminating the need for high-risk right turn movements in a high-speed area. This also reduces the travel times across SH1 between these two areas by 4-8 minutes during the AM and PM peak periods in 2038.
- The Project improves travel time reliability to and from Rolleston and Christchurch compared to the Do Minimum scenario, most notably in the 2038 PM peak period, by reducing congestion along SH1. Travel between Industrial Area (RIZ) to Hornby / Templeton sees a notable reduction in travel time variation from 21 minutes to 4 minutes. Travel from the Industrial Area (RIZ) to Christchurch also sees a large reduction in travel time variation from 15minutes to 2 minutes.

This Integrated Transport Assessment identifies some potential effects of the Project on the transport system, including:

- The Project will affect the existing accesses for eight residential properties as part of Package 1 and four residential properties and six commercial properties as part of Package 2. The accesses affected as part of Package 1 will be provided with improved safety with no notable disbenefits. Alternative access will be provided, where practical, to properties whose existing access is affected by Package 2 of the Project. Typically, these will involve modified local arrangements with additional travel to access properties from some directions.
- There are expected to be short term construction impacts on access for properties on Dunns Crossing Road, Rolleston Drive (north) and Jones Road. CTMPs will be required to manage the effects on the transport system during construction, via an overarching Project CTMP and supported by individual SSTMPs. Access to properties is to be managed, in consultation with affected properties, as part of the Project CTMP, supported by individual SSTMPs as required.
- Changes in the State Highway access and land use growth in southeast Rolleston will see additional traffic resulting in the Levi Road / Weedons Road intersection being overcapacity during the AM peak. Selwyn District Council (SDC) propose a roundabout for this intersection in the RLTP and SDC LTP although timing is unclear at this stage. In the interim, it is recommended that the performance of this intersection is monitored in partnership with SDC, and mitigation measures introduced if necessary.
- The Project will increase traffic volumes on Dunns Crossing Road, increasing the volume of traffic travelling past West Rolleston School. SDC has a programme to provide a school speed zone and safety improvements on Dunns Crossing Road prior to the completion of construction. These measures will appropriately manage student and pedestrian safety considering the increase in traffic volumes expected along Dunns Crossing Road.
- The construction of the Project could have a negative impact on the road network if not properly managed and staged. These impacts can include the restriction of movements, detours, reduced efficiency from speed limit change detours, and increased safety risk for traffic and construction workers. This is to be managed through an overarching Project CTMP, supported by individual SSTMPs to reduce the impacts of the Project on the road network.

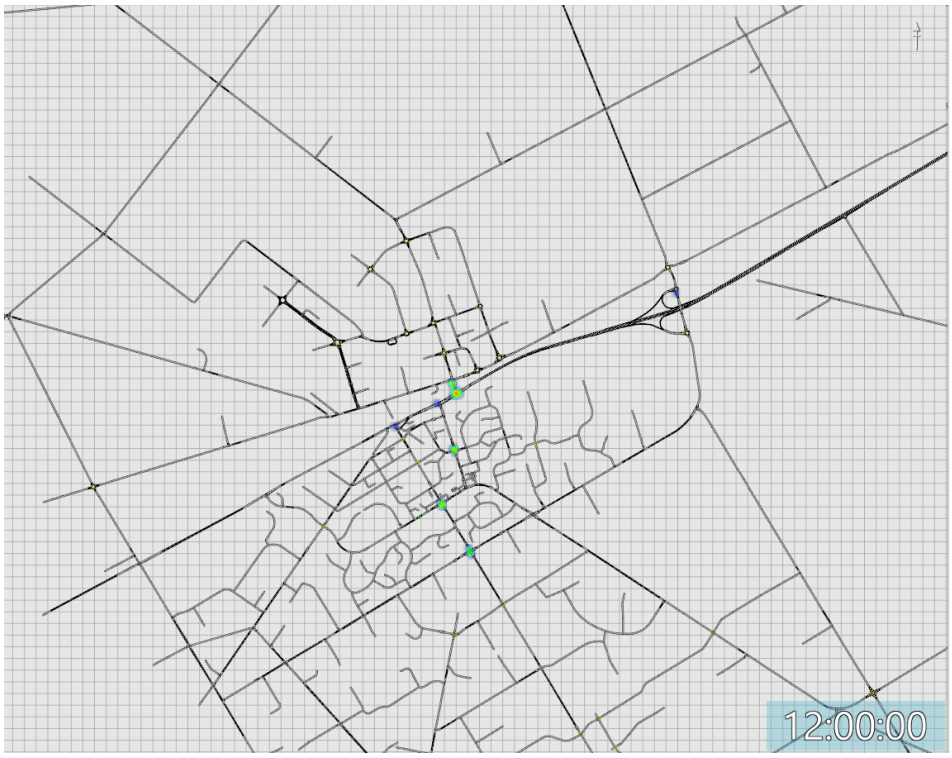
Overall, it is considered the proposed Project will provide a number of significant positive benefits in relation to the safe and efficient functioning of the Rolleston transportation network, while the identified mitigation measures will avoid, remedy, or reduce to acceptable levels the adverse transportation related effects.

A

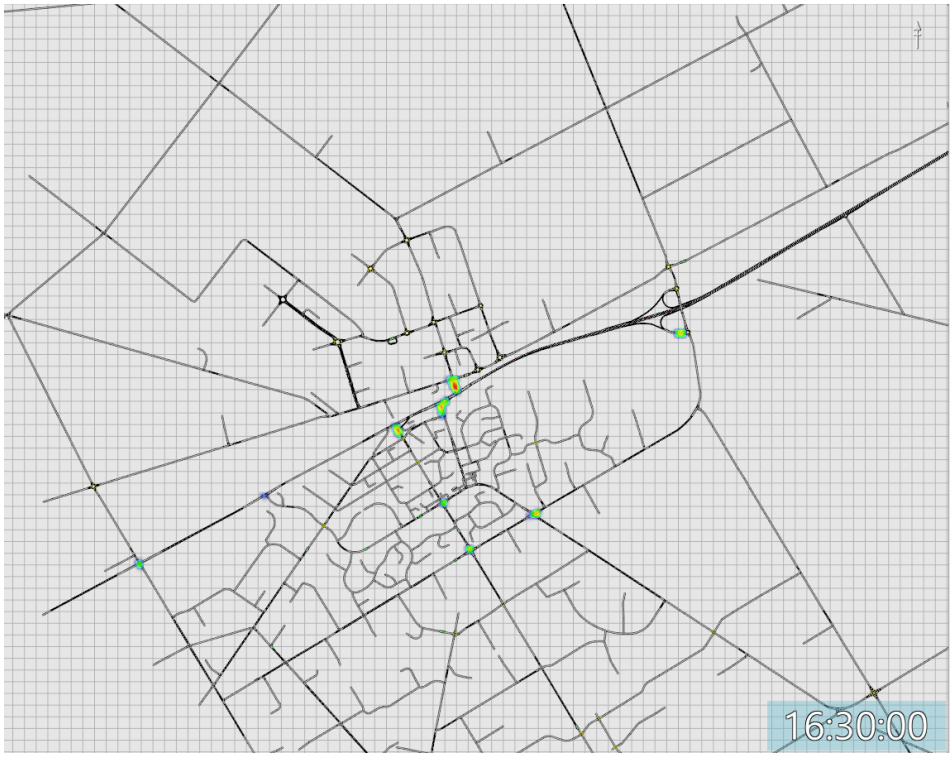
Appendix A – Congestion Heat Maps

2028 Do Minimum AM

2028 Do Minimum IP



2028 Do Minimum PM



2028 Project AM

2028 Project IP

2028 Project PM

2038 Do Minimum AM

2038 Do Minimum IP

2038 Do Minimum PM

2038 Project AM

2038 Project IP

2038 Project PM

B

Appendix B – 2028 Paramics Modelling Results

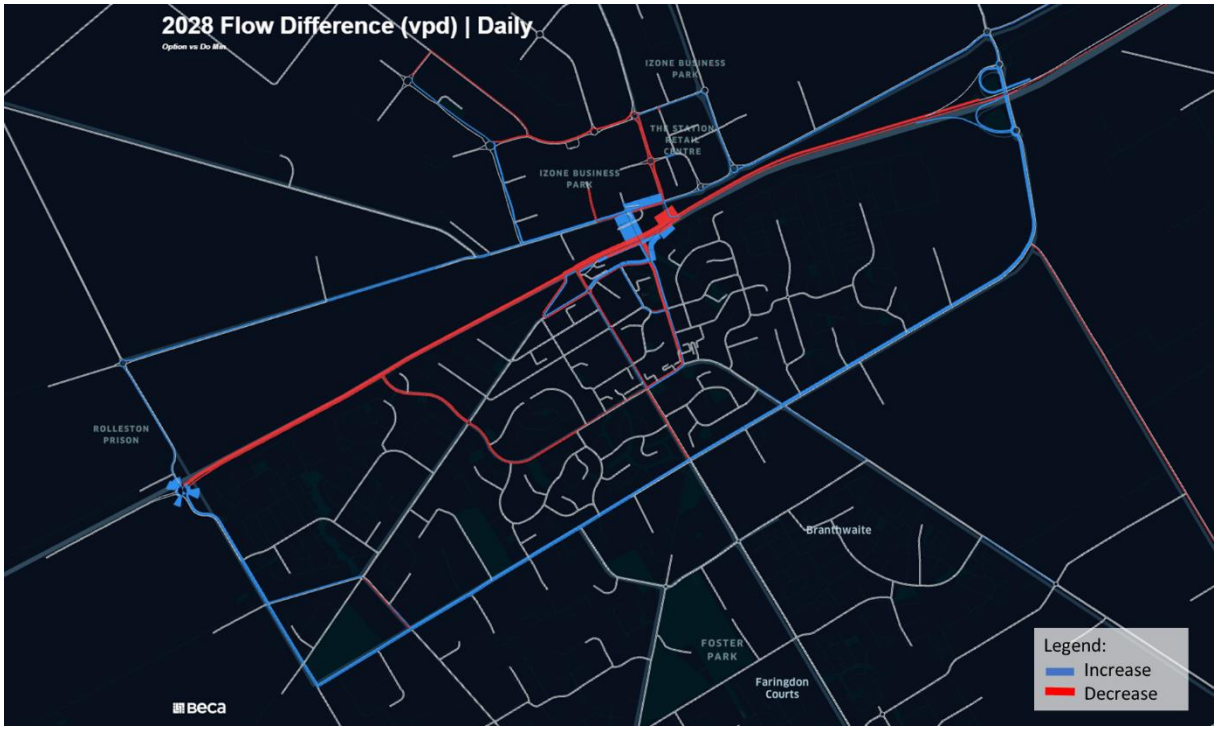


Figure 8-1: Flow Difference Plot – 2028 Daily

Table 8-1: 2028 Daily Two-Way Key Link Volumes

Site	Section	Do Min	Option	Diff	% Diff
1	SH1 between Dunns Crossing Road and Rolleston Dr	20,165	16,670	-3,495	-17%
2	SH1 between Rolleston Drive (south) and Brookside Road	19,060	16,245	-2,815	-15%
3	SH1 between Tennyson Street and Rolleston Dr	24,445	17,235	-7,210	-29%
4	SH1 between Hoskyns Road and Weedons Road interchange	37,080	34,660	-2,420	-7%
5	Weedons Road between Levi Road and SH1 Interchange	17,035	19,305	+2,270	+13%
6	Rolleston Drive (south) between Kidman Street and Norman Kirk Dr	18,205	17,405	-800	-4%
7	Lowes Road between Tiny Hill Drive and Waterbridge Way	6,245	8,500	+2,255	+36%
8	Jones Road between Iport Drive and Weedons Ross Road	2,755	3,650	+895	+32%
9	Jones Road between Rolleston Drive Extension and Hoskyns Road	8,885	15,855	+6,970	+78%
10	Two Chain Road between Walkers Road and Wards Road	925	1,855	+930	+101%
11	Tennyson Street between Rolleston Drive (north) and Moore St	4,835	4,330	-505	-10%
12	Dunns Crossing Road between SH1 and Brookside Road	5,195	7,235	+2,040	+39%
13	Rolleston Drive (north) between SH1 and Brookside Road	1,875	650	-1,225	-65%
14	Walkers Road between Two Chain Road and SH1	2,805	3,110	+305	+11%

Table 8-2: 2028 Sector-to-Sector Travel Times – AM peak hour

Sector Movements	Description	Do Min	Project	Diff (min)	% Diff
1 to 6	“SH1 South” / Burnham to Christchurch	12.8	12.4	-0.5	-4%
6 to 1	Christchurch to “SH1 South” / Burnham	12.8	12.4	-0.5	-4%

Sector Movements	Description	Do Min	Project	Diff (min)	% Diff
1 to 5	“SH1 South” / Burnham to Hornby / Templeton	13.3	12.9	-0.5	-3%
5 to 1	Hornby / Templeton to “SH1 South” / Burnham	13.4	12.9	-0.5	-4%
2 to 1	Industrial Area to “SH1 South” / Burnham	6.5	6.0	-0.5	-8%
1 to 2	“SH1 South” / Burnham to Industrial Area	7.2	5.9	-1.3	-18%
2 to 3	Industrial Area to Rolleston Residential & Town Centre	6.2	5.0	-1.3	-20%
3 to 2	Rolleston Residential & Town Centre to Industrial Area	6.2	5.4	-0.8	-13%
2 to 4	Industrial Area to Southern Residential & External	9.9	8.8	-1.2	-12%
4 to 2	Southern Residential & External to Industrial Area	9.3	8.8	-0.5	-5%
2 to 5	Industrial Area to Hornby / Templeton	12.0	12.0	-0.0	-0%
5 to 2	Hornby / Templeton to Industrial Area	12.3	12.9	+0.6	+5%
2 to 6	Industrial Area to Christchurch	12.0	12.1	+0.1	+0%
6 to 2	Christchurch to Industrial Area	12.4	13.3	+0.9	+8%

Table 8-3: 2028 Sector-to-Sector Travel Times – IP peak hour

Sector Movements	Description	Do Min	Project	Diff (min)	% Diff
1 to 6	“SH1 South” / Burnham to Christchurch	12.7	12.2	-0.5	-4%
6 to 1	Christchurch to “SH1 South” / Burnham	12.7	12.3	-0.3	-3%
1 to 5	“SH1 South” / Burnham to Hornby / Templeton	12.7	12.2	-0.5	-4%
5 to 1	Hornby / Templeton to “SH1 South” / Burnham	12.3	12.0	-0.4	-3%
2 to 1	Industrial Area to “SH1 South” / Burnham	5.9	5.8	-0.0	-1%
1 to 2	“SH1 South” / Burnham to Industrial Area	6.1	6.4	+0.2	+4%
2 to 3	Industrial Area to Rolleston Residential & Town Centre	5.7	5.1	-0.6	-10%
3 to 2	Rolleston Residential & Town Centre to Industrial Area	5.6	4.8	-0.8	-14%
2 to 4	Industrial Area to Southern Residential & External	9.1	8.5	-0.7	-7%
4 to 2	Southern Residential & External to Industrial Area	9.3	8.8	-0.5	-6%
2 to 5	Industrial Area to Hornby / Templeton	11.3	11.3	-0.0	-0%
5 to 2	Hornby / Templeton to Industrial Area	12.7	13.0	+0.4	+3%
2 to 6	Industrial Area to Christchurch	11.8	11.7	-0.1	-1%
6 to 2	Christchurch to Industrial Area	12.3	13.1	+0.8	+6%

Table 8-4: 2028 Sector-to-Sector Travel Times – PM peak hour

Sector Movements	Description	Do Min	Project	Diff (min)	% Diff
1 to 6	“SH1 South” / Burnham to Christchurch	12.9	12.4	-0.5	-4%
6 to 1	Christchurch to “SH1 South” / Burnham	14.1	12.7	-1.4	-10%
1 to 5	“SH1 South” / Burnham to Hornby / Templeton	13.0	12.5	-0.4	-3%
5 to 1	Hornby / Templeton to “SH1 South” / Burnham	15.0	13.7	-1.3	-9%
2 to 1	Industrial Area to “SH1 South” / Burnham	7.3	6.7	-0.7	-9%
1 to 2	“SH1 South” / Burnham to Industrial Area	5.4	5.9	+0.5	+10%

Sector Movements	Description	Do Min	Project	Diff (min)	% Diff
2 to 3	Industrial Area to Rolleston Residential & Town Centre	6.9	5.3	-1.6	-23%
3 to 2	Rolleston Residential & Town Centre to Industrial Area	6.3	5.2	-1.1	-17%
2 to 4	Industrial Area to Southern Residential & External	10.1	8.5	-1.6	-16%
4 to 2	Southern Residential & External to Industrial Area	10.0	9.1	-1.0	-10%
2 to 5	Industrial Area to Hornby / Templeton	12.1	11.8	-0.3	-2%
5 to 2	Hornby / Templeton to Industrial Area	14.2	13.4	-0.7	-5%
2 to 6	Industrial Area to Christchurch	12.6	12.1	-0.5	-4%
6 to 2	Christchurch to Industrial Area	14.4	13.3	-1.1	-7%

Table 8-5: AM Peak Period Bus Travel Time (min)

PT Services	2028		
	DM	Project	Diff
Route 5 to Christchurch	21.1	19.9	-1.2
Route 5 to Rolleston	22.3	21.6	-0.8
Route 820 to Burnham	21.5	20.6	-0.9
Route 820 to Lincoln	21.2	20.1	-1.1

Table 8-6: IP Peak Period Bus Travel Time (min)

PT Services	2028		
	DM	Project	Diff
Route 5 to Christchurch	20.9	20.2	-0.8
Route 5 to Rolleston	21.9	21.6	-0.3
Route 820 to Burnham	21.3	20.9	-0.5
Route 820 to Lincoln	20.6	20.4	-0.2

Table 8-7: PM Peak Period Bus Travel Time (min)

PT Services	2028		
	DM	Project	Diff
Route 5 to Christchurch	22.4	21.2	-1.2
Route 5 to Rolleston	23.9	22.6	-1.3
Route 820 to Burnham	22.7	21.0	-1.7
Route 820 to Lincoln	22.4	20.7	-1.6

C

Appendix C – Sector to Sector Travel Times

2028

AM Peak

% Difference

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0%	-18%	+13%	-4%	-3%	-4%	-3%	-3%
Industrial Area	-8%	+8%	-20%	-12%	-0%	**+0%**	-2%	-2%
Rolleston Residential & Town Centre	+1%	-13%	+8%	+1%	+1%	-1%	-0%	+1%
Southern Residential & External	-8%	-5%	+3%	-0%	+3%	+1%	+1%	+1%
Hornby / Templeton	-4%	+5%	-2%	-0%	+1%	-1%	+1%	+1%
Christchurch	-4%	+8%	-2%	-2%	+3%	0%	+0%	+0%
Northern Rural & External	-3%	+1%	-2%	-1%	-0%	-0%	-1%	-1%
Total	-5%	+1%	-1%	-1%	+2%	+0%	+1%	+0%

Difference (min)

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0.00	-1.31	0.64	-0.30	-0.46	-0.47	-0.37	-0.31
Industrial Area	-0.53	0.27	-1.25	-1.17	0.00	**0.05**	-0.18	-0.22
Rolleston Residential & Town Centre	0.05	-0.81	0.23	0.08	0.10	-0.08	-0.06	0.09
Southern Residential & External	-0.54	-0.48	0.16	0.00	0.25	0.17	0.07	0.07
Hornby / Templeton	-0.51	0.62	-0.24	-0.04	0.04	-0.03	0.04	0.06
Christchurch	-0.46	0.95	-0.23	-0.21	0.18	0.00	0.03	0.02
Northern Rural & External	-0.39	0.08	-0.22	-0.12	-0.01	-0.07	-0.05	-0.12
Total	-0.53	0.12	-0.04	-0.07	0.16	0.01	0.08	0.02

IP Peak

% Difference

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0%	+4%	+21%	+1%	-4%	-4%	-3%	-0%
Industrial Area	-1%	+4%	-10%	-7%	-0%	**-1%**	-0%	-4%
Rolleston Residential & Town Centre	+3%	-14%	+5%	-0%	-1%	+0%	+0%	-1%
Southern Residential & External	-1%	-6%	+2%	+0%	-0%	-1%	-1%	-0%
Hornby / Templeton	-3%	+3%	-2%	-1%	+0%	-1%	-0%	-1%
Christchurch	-3%	+6%	-3%	-0%	-0%	0%	-1%	-1%
Northern Rural & External	-3%	-2%	-2%	-0%	-1%	+0%	-0%	-1%
Total	-2%	-3%	+1%	-1%	-1%	-1%	-1%	-1%

Difference (min)

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0.00	0.22	1.06	0.04	-0.46	-0.48	-0.34	-0.05
Industrial Area	-0.05	0.13	-0.56	-0.66	-0.03	**-0.11**	-0.01	-0.37
Rolleston Residential & Town Centre	0.13	-0.80	0.12	-0.02	-0.08	0.02	0.01	-0.09
Southern Residential & External	-0.06	-0.54	0.10	0.01	-0.02	-0.08	-0.11	-0.01
Hornby / Templeton	-0.36	0.37	-0.26	-0.07	0.01	-0.04	-0.03	-0.04
Christchurch	-0.33	0.76	-0.30	-0.06	-0.02	0.00	-0.08	-0.09
Northern Rural & External	-0.38	-0.14	-0.22	-0.03	-0.05	0.01	-0.01	-0.05
Total	-0.23	-0.23	0.06	-0.08	-0.06	-0.14	-0.05	-0.07

PM Peak

% Difference

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0%	+10%	+13%	-3%	-3%	-4%	-3%	-2%
Industrial Area	-9%	+3%	-23%	-16%	-2%	**-4%**	-3%	-8%
Rolleston Residential & Town Centre	+7%	-17%	+2%	-0%	-0%	-1%	-1%	-1%
Southern Residential & External	-3%	-10%	-1%	-0%	-1%	-1%	-1%	-1%
Hornby / Templeton	-9%	-5%	-11%	-2%	-3%	-4%	-0%	-3%
Christchurch	-10%	-7%	-13%	-4%	+0%	-4%	-3%	-7%
Northern Rural & External	-9%	-8%	-9%	-4%	+0%	-2%	-0%	-3%
Total	-7%	-8%	-8%	-3%	-0%	-2%	-1%	-3%

Difference (min)

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0.00	0.54	0.60	-0.24	-0.45	-0.53	-0.45	-0.17
Industrial Area	-0.66	0.10	-1.62	-1.62	-0.29	**-0.47**	-0.26	-0.80
Rolleston Residential & Town Centre	0.32	-1.06	0.05	-0.02	-0.04	-0.16	-0.14	-0.05
Southern Residential & External	-0.18	-0.98	-0.03	-0.02	-0.07	-0.10	-0.19	-0.10
Hornby / Templeton	-1.31	-0.74	-1.50	-0.27	-0.12	-0.20	-0.03	-0.27
Christchurch	-1.40	-1.08	-1.71	-0.53	0.00	-0.15	-0.47	-0.97
Northern Rural & External	-1.41	-0.61	-1.12	-0.58	0.03	-0.31	-0.03	-0.28
Total	-0.84	-0.76	-0.63	-0.29	-0.01	-0.22	-0.10	-0.30

2038

AM Peak

% Difference

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0%	-23%	+11%	-4%	-3%	-4%	-12%	-5%
Industrial Area	-34%	-3%	-47%	-26%	-11%	**-15%**	-9%	-18%
Rolleston Residential & Town Centre	-35%	-50%	-29%	-4%	-13%	-15%	-14%	-17%
Southern Residential & External	-35%	-37%	-21%	-2%	-2%	-7%	-4%	-10%
Hornby / Templeton	-22%	-8%	-22%	-11%	+5%	+1%	-1%	-8%
Christchurch	-23%	-20%	-25%	-16%	+4%	0%	-16%	-20%
Northern Rural & External	-21%	-8%	-19%	-6%	+0%	-2%	-2%	-4%
Total	-27%	-24%	-23%	-7%	-3%	-8%	-5%	-11%

Difference (min)

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0.00	-1.87	0.62	-0.31	-0.39	-0.56	-1.70	-0.60
Industrial Area	-3.14	-0.11	-4.42	-3.11	-1.59	**-2.13**	-1.07	-2.00
Rolleston Residential & Town Centre	-2.69	-5.70	-1.28	-0.25	-2.07	-2.28	-2.27	-1.78
Southern Residential & External	-3.93	-5.72	-1.66	-0.12	-0.22	-1.10	-0.75	-1.05
Hornby / Templeton	-3.72	-1.29	-3.45	-1.22	0.23	0.04	-0.05	-0.73
Christchurch	-3.69	-3.34	-3.78	-2.27	0.25	0.00	-2.79	-3.06
Northern Rural & External	-3.83	-0.83	-2.72	-0.82	0.01	-0.39	-0.13	-0.42
Total	-3.61	-3.31	-2.13	-0.57	-0.25	-1.12	-0.55	-1.13

IP Peak

% Difference

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0%	+4%	+20%	-4%	-5%	-5%	-5%	-2%
Industrial Area	-33%	-12%	-46%	-30%	-18%	**-20%**	-12%	-26%
Rolleston Residential & Town Centre	-1%	-24%	+2%	-1%	-3%	-3%	-5%	-6%
Southern Residential & External	-3%	-13%	+1%	-0%	-2%	-2%	-2%	-2%
Hornby / Templeton	-4%	-4%	-4%	-1%	-1%	-1%	+0%	-2%
Christchurch	-4%	-3%	-4%	-1%	+0%	0%	-2%	-2%
Northern Rural & External	-7%	-4%	-6%	-2%	-0%	-2%	-0%	-2%
Total	-4%	-11%	-5%	-6%	-3%	-6%	-2%	-5%

Difference (min)

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0.00	0.23	1.06	-0.28	-0.60	-0.61	-0.60	-0.25
Industrial Area	-3.10	-0.43	-4.21	-3.68	-2.53	**-2.93**	-1.33	-2.93
Rolleston Residential & Town Centre	-0.03	-1.53	0.04	-0.05	-0.41	-0.38	-0.52	-0.41
Southern Residential & External	-0.14	-1.30	0.05	0.00	-0.16	-0.24	-0.26	-0.13
Hornby / Templeton	-0.52	-0.57	-0.40	-0.14	-0.02	-0.04	0.01	-0.12
Christchurch	-0.48	-0.39	-0.45	-0.08	0.02	0.00	-0.25	-0.28
Northern Rural & External	-0.84	-0.38	-0.62	-0.29	-0.02	-0.35	-0.03	-0.13
Total	-0.42	-0.95	-0.30	-0.49	-0.25	-0.68	-0.19	-0.43

PM Peak

% Difference

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0%	+4%	+10%	-6%	-11%	-12%	-10%	-8%
Industrial Area	-37%	-62%	-59%	-43%	-33%	**-34%**	-24%	-38%
Rolleston Residential & Town Centre	-11%	-44%	-7%	-1%	-13%	-13%	-13%	-10%
Southern Residential & External	-20%	-29%	-5%	-3%	-4%	-5%	-6%	-7%
Hornby / Templeton	-30%	-18%	-30%	-12%	+7%	+4%	+2%	-11%
Christchurch	-32%	-30%	-36%	-21%	-18%	-22%	-22%	-27%
Northern Rural & External	-28%	-21%	-23%	-11%	+4%	-10%	-3%	-9%
Total	-29%	-29%	-27%	-14%	-9%	-13%	-7%	-16%

Difference (min)

From Sector	SH1 South / Burnham	Industrial Area	Rolleston Residential & Town Centre	Southern Residential & External	Hornby / Templeton	Christchurch	Northern Rural & External	Total
SH1 South / Burnham	0.00	0.24	0.48	-0.47	-1.58	-1.74	-1.53	-0.82
Industrial Area	-4.21	-5.51	-7.86	-6.68	-6.01	**-6.10**	-3.32	-5.88
Rolleston Residential & Town Centre	-0.70	-4.28	-0.24	-0.04	-1.90	-1.97	-1.83	-0.78
Southern Residential & External	-1.59	-3.88	-0.38	-0.15	-0.41	-0.66	-0.88	-0.63
Hornby / Templeton	-6.07	-3.22	-5.54	-1.54	0.31	0.21	0.16	-1.15
Christchurch	-6.04	-5.93	-6.42	-3.81	-1.37	-1.22	-4.47	-4.82
Northern Rural & External	-6.06	-2.19	-3.72	-1.93	0.31	-1.70	-0.25	-1.00
Total	-4.31	-3.89	-2.82	-1.49	-0.83	-1.70	-0.78	-1.75

D

Appendix D – Intersection Performance Results

Table A1: 2028 AM flow, delay, LOS and queue statistics

Intersection	Approach	Turn	Do Minimum					Rolleston Access Improvements Project				
			Volume *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Rolleston Drive Extension / Jones Road (Signals)	E	L	-	-	-	-	-	120	2	A	45	55
		T	-	-	-			60	26	C		
	S	L	-	-	-	-	-	380	8	A	50	60
		R	-	-	-			935	10	B		
	W	T	-	-	-	-	-	210	26	C	70	80
		R	-	-	-			90	23	C		
Jones Road / Hoskyns Road (Signals)	N	L	5	7	A	30	40	5	26	C	50	60
		T	230	14	B			115	30	C		
		R	10	17	B			105	24	C		
	E	L	30	25	C	35	40	15	27	C	55	65
		T	40	20	C			90	29	C		
		R	5	16	B			15	22	C		
	W	L	10	15	B	45	55	300	4	A	60	135
		T	65	21	C			130	10	B		
		R	155	32	C			705	15	B		
	S	L	445	23	C	105	120	-	-	-	-	-
		T	405	16	B			-	-	-		
		R	55	17	B			-	-	-		
Jones Road / Weedons Ross Road (Roundabout)	N	L	10	4	A	25	40	10	7	A	25	45
		T	335	12	B			315	13	B		
		R	10	7	A			15	8	A		
	E	L	30	17	B	20	30	25	16	B	25	30
		T	70	16	B			115	17	B		
		R	5	8	A			5	10	A		
	S	L	25	6	A	20	55	85	8	A	25	65
		T	345	7	A			355	7	A		
		R	40	6	A			35	8	A		
	W	L	10	5	A	10	30	15	6	A	20	25
		T	40	8	A			50	9	A		
		R	25	12	B			25	12	B		
Weedons Road / SH1 off/on ramp (north) (Roundabout)	N	T	200	5	A	15	35	175	6	A	20	35
		R	195	5	A			195	5	A		
	S	L	850	2	A	25	30	1,080	5	A	30	40
		R	315	6	A			400	9	A		
	W	L	95	5	A	20	25	75	7	A	25	30
		T	10	3	A			30	5	A		
Weedons Road / SH1 off/on ramp (south) (Roundabout)	N	T	155	3	A	20	25	145	4	A	20	25
		R	55	3	A			65	4	A		
	S	L	45	13	B	50	95	85	27	C	40	60
		T	1,080	15	B			1,295	30	C		
	W	L	75	5	A	45	90	165	16	B	55	85
		R	185	47	D			250	40	D		

Table A1: 2028 AM flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Kidman Street / Rolleston Drive (Signals)	N	T	400	1	A	25	30	170	6	A	35	45
		R	75	15	C			50	11	B		
	Off Ramp*	L	-	-	-	-	-	320	8	A	45	55
		R	-	-	-			-	-	-		
	S	L	30	7	A	45	70	25	11	B	65	80
		T	1,000	18	C			700	34	C		
	W	L	190	137	F	65	155	530	13	B	95	115
		R	30	118	F			10	23	C		
Kidman Street / Tennyson Street (Roundabout)	N	L	45	1	A	15	25	130	1	A	10	30
		T	70	2	A			10	2	A		
		R	25	2	A			5	3	A		
	E	L	15	1	A	Less than 5m	20	5	1	A	Less than 5m	20
		T	30	2	A			20	1	A		
		R	5	15	B			30	2	A		
	S	L	20	2	A	15	20	25	3	A	15	20
		T	65	9	A			105	3	A		
		R	55	3	A			55	3	A		
	W	L	80	8	A	20	25	15	2	A	20	25
		T	155	3	A			300	4	A		
		R	35	2	A			50	3	A		
SH1 / Dunns Crossing (Roundabout)	N	L	65	9	A	20	25	25	3	A	Less than 5m	25
		T	30	42	D			40	5	A		
		R	10	48	D			15	5	A		
	E	L	25	7	A	25	55	20	8	A	30	35
		T	810	14	B			715	16	B		
		R	90	14	B			80	13	B		
	S	L	120	102	F	40	155	205	5	A	30	30
		T	50	128	F			80	7	A		
		R	110	130	F			105	8	A		
	W	L	10	4	A	25	35	45	7	A	25	30
		T	500	9	A			360	9	A		
		R	55	16	B			155	9	A		
SH1 / Rolleston Drive North (Signals)	E	L	445	5	A	-	-	-	-	-	-	-
		T	770	21	C			-	-	-		
	S	L	180	8	A	60	85	-	-	-	-	-
		R	1,055	23	C			-	-	-		
	W	T	825	20	C	55	70	-	-	-	-	-
		R	35	79	E			-	-	-		
SH1 / Hoskyns Rd (Signals)	N	L	245	23	C	70	90	-	-	-	-	-
		R	190	90	F			-	-	-		
	E	T	1,020	33	C	105	135	-	-	-	-	-
		R	415	78	E			-	-	-		
	W	L	485	15	B	-	-	-	-	-	-	-
		T	1,395	20	C			-	-	-		
Levi Rd / Weedons Rd (Priority)	N	L	85	1	A	Less than 5m	Less than 5m	85	2	A	Less than 5m	Less than 5m
		T	260	2	A			310	2	A		
	S	L	25	13	B	35	45	30	26	D	50	75
		R	195	30	D			145	78	F		
	W	T	855	4	A	10	20	1,175	4	A	15	25
		R	25	3	A			25	3	A		

Table A1: 2028 AM flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Lowes Rd / Masefield Rd (Roundabout)	NW	L	70	26	C	35	40	105	27	C	40	50
		T	80	26	C			65	26	C		
		R	10	22	C			10	19	B		
	E	L	75	12	B	50	60	75	12	B	50	60
		T	165	28	C			170	28	C		
		R	65	30	C			115	49	D		
	SE	L	30	18	B	50	55	40	19	B	50	55
		T	230	21	C			225	21	C		
		R	175	29	C			205	30	C		
	W	L	30	16	B	60	70	10	14	B	70	80
		T	380	21	C			615	23	C		
		R	35	7	A			50	8	A		
Masefield Rd / Rolleston Dr (Signals)	N	L	115	19	B	-	-	100	20	C	-	-
		R	215	24	C			230	25	C		
	E	T	80	9	A	-	-	95	9	A	-	-
		R	255	41	D			245	27	C		
	W	L	610	2	A	-	-	425	2	A	-	-
		T	85	8	A			110	8	A		
Lowes Rd / Tennyson St (Signals)	N	L	20	12	B	-	-	20	12	B	-	-
		T	230	13	B			210	13	B		
		R	55	23	C			55	19	B		
	E	L	85	22	C	-	-	85	23	C	-	-
		T	95	17	B			115	18	B		
		R	10	13	B			15	16	B		
	S	L	60	13	B	-	-	70	17	B	-	-
		T	595	10	A			455	12	B		
		R	245	23	C			330	40	D		
	W	L	155	22	C	-	-	145	24	C	-	-
		T	185	17	B			310	19	B		
		R	40	19	B			60	21	C		
Rolleston Dr / Tennyson St (Signals)	N	L	10	23	C	-	-	15	19	B	-	-
		T	70	23	C			35	24	C		
		R	10	17	B			5	10	A		
	E	L	165	5	A	-	-	180	6	A	-	-
		T	90	21	C			85	22	C		
		R	55	22	C			85	19	B		
	S	L	85	14	B	-	-	50	11	B	-	-
		T	190	16	B			185	13	B		
		R	485	27	C			380	16	B		
	W	L	30	13	B	-	-	25	12	B	-	-
		T	120	15	B			90	15	B		
		R	40	15	B			30	17	B		
Norman Kirk Dr / Rolleston Dr (Signals)	N	L	35	14	B	35	40	35	13	B	35	45
		T	330	13	B			330	14	B		
		R	70	27	C			130	30	C		
	E	L	5	23	C	30	35	5	18	B	30	35
		T	5	13	B			10	15	B		
		R	15	10	B			15	9	A		
	S	L	40	7	A	40	55	55	8	A	40	45
		T	820	17	B			580	15	B		
		R	35	20	B			40	19	B		
	W	L	15	18	B	35	45	5	8	A	35	40
		T	5	20	B			5	17	B		
		R	10	10	B			5	6	A		
Jones Rd / Iport Dr (Roundabout)	N	L	25	2	A	Less than 5m	Less than 5m	20	1	A	Less than 5m	Less than 5m
		R	5	1	A			5	1	A		
	E	T	55	2	A	Less than 5m	25	95	3	A	20	30
		R	40	2	A			115	4	A		
	W	L	40	1	A	Less than 5m	20	30	2	A	Less than 5m	35
		T	90	2	A			110	3	A		

Table A2: 2028 IP flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Rolleston Drive Extension / Jones Road (Signals)	E	L	-	-	-	-	-	165	17	B	45	50
		T	-	-	-			55	9	A		
	S	L	-	-	-	-	-	185	12	B	45	50
		R	-	-	-			560	14	B		
	W	T	-	-	-	-	-	150	17	B	60	65
		R	-	-	-			210	18	B		
Jones Road / Hoskyns Road (Signals)	N	L	5	7	A	35	40	5	14	B	50	55
		T	315	14	B			95	25	C		
		R	10	13	B			135	21	C		
	E	L	50	17	B	30	40	10	19	B	55	65
		T	25	14	B			95	24	C		
		R	5	9	A			10	18	B		
	W	L	10	13	B	50	65	255	3	A	45	55
		T	30	15	B			75	8	A		
		R	225	26	C			375	9	A		
	S	L	250	21	C	60	75	-	-	-	-	-
		T	300	12	B			-	-	-		
		R	45	16	B			-	-	-		
Jones Road / Weedons Ross Road (Roundabout)	N	L	5	2	A	20	30	5	1	A	20	30
		T	150	9	A			150	10	A		
		R	10	3	A			10	4	A		
	E	L	20	13	B	15	30	20	13	B	20	25
		T	30	11	B			55	13	B		
		R	5	6	A			5	10	A		
	S	L	15	6	A	Less than 5m	30	65	6	A	20	45
		T	165	5	A			170	5	A		
		R	25	4	A			20	5	A		
	W	L	10	4	A	Less than 5m	20	15	4	A	Less than 5m	20
		T	15	5	A			15	5	A		
		R	20	9	A			20	12	B		
Weedons Road / SH1 off/on ramp (north) (Roundabout)	N	T	110	5	A	Less than 5m	25	110	5	A	Less than 5m	30
		R	80	5	A			80	6	A		
	S	L	280	1	A	15	25	370	2	A	20	30
		R	155	3	A			215	4	A		
	W	L	50	3	A	Less than 5m	25	40	4	A	Less than 5m	30
		T	10	2	A			20	3	A		
Weedons Road / SH1 off/on ramp (south) (Roundabout)	N	T	95	4	A	20	25	100	4	A	20	25
		R	20	3	A			35	3	A		
	S	L	35	3	A	20	25	60	2	A	20	30
		T	385	4	A			475	4	A		
	W	L	55	5	A	30	35	110	6	A	40	55
		R	295	9	A			320	14	B		

Table A2: 2028 IP flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Kidman Street / Rolleston Drive (Signals)	N	T	520	1	A	20	30	330	15	B	55	65
		R	60	6	A			60	18	B		
	Off Ramp*	L	-	-	-	-	-	250	14	B	55	65
		R	-	-	-			-	-	-		
	S	L	40	4	A	50	85	25	5	A	50	55
		T	500	27	D			450	27	C		
	W	L	100	32	D	35	45	250	12	B	65	70
		R	45	19	C			15	15	B		
Kidman Street / Tennyson Street (Roundabout)	N	L	35	1	A	15	20	45	1	A	Less than 5m	20
		T	70	1	A			10	1	A		
		R	35	1	A			5	1	A		
	E	L	20	2	A	15	25	5	1	A	15	20
		T	45	2	A			45	2	A		
		R	5	2	A			15	2	A		
	S	L	30	2	A	15	25	30	2	A	15	20
		T	55	4	A			50	3	A		
		R	40	3	A			40	3	A		
	W	L	40	2	A	15	25	10	1	A	15	20
		T	85	2	A			140	3	A		
		R	25	2	A			35	2	A		
SH1 / Dunns Crossing (Roundabout)	N	L	35	10	A	20	30	15	3	A	Less than 5m	20
		T	15	23	C			25	6	A		
		R	5	19	B			10	3	A		
	E	L	50	8	A	20	35	40	8	A	25	30
		T	485	13	B			480	13	B		
		R	55	12	B			50	10	B		
	S	L	40	7	A	30	30	45	3	A	25	35
		T	35	22	C			40	5	A		
		R	70	24	C			40	5	A		
	W	L	10	3	A	20	25	25	5	A	25	30
		T	505	9	A			380	9	A		
		R	55	10	B			160	8	A		
SH1 / Rolleston Drive North (Signals)	E	L	540	7	A	-	-	-	-	-	-	-
		T	675	12	B			-	-	-		
	S	L	100	15	B	70	85	-	-	-	-	-
		R	535	58	E			-	-	-		
	W	T	660	8	A	35	40	-	-	-	-	-
		R	40	44	D			-	-	-		
SH1 / Hoskyns Rd (Signals)	N	L	215	17	B	65	95	-	-	-	-	-
		R	380	44	D			-	-	-		
	E	T	840	32	C	75	105	-	-	-	-	-
		R	210	64	E			-	-	-		
	W	L	385	7	A	-	-	-	-	-	-	-
		T	810	20	B			-	-	-		
Levi Rd / Weedons Rd (Priority)	N	L	65	1	A	Less than 5m	Less than 5m	65	2	A	Less than 5m	Less than 5m
		T	325	2	A			355	2	A		
	S	L	15	11	B	20	25	20	12	B	25	30
		R	80	19	C			65	20	C		
	W	T	315	3	A	Less than 5m	20	450	3	A	Less than 5m	10
		R	20	2	A			20	3	A		

Table A2: 2028 IP flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Lowes Rd / Masefield Rd (Roundabout)	NW	L	75	21	C	35	40	95	24	C	35	40
		T	120	17	B			105	17	B		
		R	10	24	C			10	25	C		
	E	L	95	10	B	55	60	90	11	B	50	55
		T	200	23	C			205	24	C		
		R	50	22	C			75	25	C		
	SE	L	30	16	B	35	40	30	17	B	35	40
		T	125	18	B			130	17	B		
		R	55	23	C			60	24	C		
	W	L	10	13	B	40	45	10	9	A	45	50
		T	155	17	B			270	17	B		
		R	30	6	A			45	6	A		
Masefield Rd / Rolleston Dr (Signals)	N	L	145	18	B	-	-	120	17	B	-	-
		R	330	17	B			365	15	B		
	E	T	50	13	B	-	-	60	13	B	-	-
		R	125	23	C			140	23	C		
	W	L	295	4	A	-	-	265	4	A	-	-
		T	90	11	B			100	11	B		
Lowes Rd / Tennyson St (Signals)	N	L	20	12	B	-	-	25	12	B	-	-
		T	360	14	B			340	13	B		
		R	70	20	B			80	19	B		
	E	L	100	16	B	-	-	105	16	B	-	-
		T	110	14	B			110	14	B		
		R	10	15	B			10	13	B		
	S	L	35	14	B	-	-	40	14	B	-	-
		T	360	14	B			315	13	B		
		R	90	20	C			125	21	C		
	W	L	110	15	B	-	-	125	15	B	-	-
		T	100	14	B			180	14	B		
		R	40	16	B			55	16	B		
Rolleston Dr / Tennyson St (Signals)	N	L	10	20	B	-	-	15	18	B	-	-
		T	95	25	C			45	23	C		
		R	10	17	B			5	10	A		
	E	L	260	9	A	-	-	295	9	A	-	-
		T	95	13	B			100	14	B		
		R	50	15	B			60	16	B		
	S	L	45	11	B	-	-	40	12	B	-	-
		T	125	13	B			120	14	B		
		R	270	18	B			250	16	B		
	W	L	15	10	B	-	-	15	10	A	-	-
		T	80	14	B			75	14	B		
		R	35	18	B			30	19	B		
Norman Kirk Dr / Rolleston Dr (Signals)	N	L	60	13	B	40	45	55	12	B	35	35
		T	445	13	B			450	12	B		
		R	60	16	B			90	13	B		
	E	L	5	11	B	35	40	5	19	B	35	35
		T	5	10	A			5	12	B		
		R	15	16	B			15	18	B		
	S	L	35	10	A	40	40	40	8	A	40	40
		T	365	19	B			310	19	B		
		R	60	27	C			60	29	C		
	W	L	0	11	B	35	40	5	24	C	35	40
		T	5	10	A			5	13	B		
		R	10	8	A			5	8	A		
Jones Rd / Iport Dr (Roundabout)	N	L	10	1	A	Less than 5m	20	10	1	A	Less than 5m	Less than 5m
		R	5	2	A			5	2	A		
	E	T	35	2	A	Less than 5m	Less than 5m	75	3	A	Less than 5m	25
		R	20	2	A			55	4	A		
	W	L	40	1	A	Less than 5m	20	35	2	A	Less than 5m	25
		T	35	1	A			45	2	A		

Table A3: 2028 PM flow, delay, LOS and queue statistics

Intersection	Approach	Turn	Do Minimum					Rolleston Access Improvements Project				
			Volume *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Rolleston Drive Extension / Jones Road (Signals)	E	L	-	-	-	-	-	260	4	A	50	60
		T	-	-	-			60	23	C		
	S	L	-	-	-	-	-	240	8	A	40	50
		R	-	-	-			540	10	B		
	W	T	-	-	-	-	-	280	25	C	75	85
		R	-	-	-			255	27	C		
Jones Road / Hoskyns Road (Signals)	N	L	5	17	B	55	150	10	25	C	60	70
		T	520	28	C			185	27	C		
		R	10	18	B			215	24	C		
	E	L	115	31	C	40	70	20	31	C	55	65
		T	60	16	B			115	28	C		
		R	10	14	B			10	21	C		
	W	L	30	33	C	95	385	195	4	A	80	120
		T	65	39	D			85	12	B		
		R	285	99	F			525	23	C		
	S	L	250	22	C	60	70	-	-	-	-	-
		T	225	20	B			-	-	-		
		R	35	27	C			-	-	-		
Jones Road / Weedons Ross Road (Roundabout)	N	L	5	12	B	40	75	5	7	A	35	50
		T	395	17	B			390	15	B		
		R	20	11	B			20	9	A		
	E	L	95	25	C	30	60	85	22	C	25	35
		T	75	21	C			65	19	B		
		R	5	15	B			5	6	A		
	S	L	50	5	A	20	40	55	7	A	25	50
		T	250	7	A			250	6	A		
		R	35	6	A			35	5	A		
	W	L	10	7	A	25	35	15	6	A	20	30
		T	100	10	B			95	9	A		
		R	75	15	B			60	14	B		
Weedons Road / SH1 off/on ramp (north) (Roundabout)	N	T	360	6	A	25	45	335	6	A	20	40
		R	200	6	A			195	6	A		
	S	L	360	1	A	25	25	440	3	A	25	30
		R	265	5	A			285	6	A		
	W	L	70	4	A	20	25	55	5	A	20	30
		T	20	3	A			30	4	A		
Weedons Road / SH1 off/on ramp (south) (Roundabout)	N	T	345	28	C	55	200	315	19	B	45	90
		R	35	25	C			55	18	B		
	S	L	20	3	A	20	30	45	14	B	30	45
		T	525	5	A			595	17	B		
	W	L	105	18	B	135	255	135	10	A	160	245
		R	765	57	E			720	48	D		

Table A3: 2028 PM flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Kidman Street / Rolleston Drive (Signals)	N	T	855	1	A	25	25	450	9	A	60	70
		R	115	7	A			85	12	B		
	Off Ramp*	L	-	-	-	-	-	615	11	B	60	80
		R	-	-	-			-	-	-		
	S	L	40	5	A	55	90	25	11	B	50	60
		T	530	24	C			440	29	C		
	W	L	110	49	E	45	90	285	13	B	70	85
		R	50	104	F			15	30	C		
Kidman Street / Tennyson Street (Roundabout)	N	L	55	1	A	20	25	100	1	A	15	25
		T	140	2	A			20	2	A		
		R	105	2	A			5	2	A		
	E	L	25	2	A	20	25	10	1	A	15	20
		T	80	4	A			60	3	A		
		R	5	7	A			25	3	A		
	S	L	45	3	A	20	30	50	3	A	15	25
		T	45	10	B			75	4	A		
		R	35	4	A			35	3	A		
	W	L	40	10	A	15	45	10	1	A	20	25
		T	85	3	A			155	3	A		
		R	30	3	A			45	2	A		
SH1 / Dunns Crossing (Roundabout)	N	L	85	50	D	40	145	35	3	A	25	25
		T	45	158	F			70	7	A		
		R	5	161	F			25	8	A		
	E	L	130	10	A	25	35	120	15	B	40	50
		T	645	13	B			625	20	B		
		R	75	16	B			65	16	B		
	S	L	65	18	B	30	45	85	4	A	25	35
		T	40	74	E			50	5	A		
		R	35	84	F			35	5	A		
	W	L	10	3	A	35	105	40	7	A	30	35
		T	790	10	B			550	11	B		
		R	160	22	C			365	11	B		
SH1 / Rolleston Drive North (Signals)	E	L	890	40	D	-	-	-	-	-	-	-
		T	1,155	19	B			-	-	-		
	S	L	120	12	B	65	105	-	-	-	-	-
		R	545	54	D			-	-	-		
	W	T	810	9	A	40	45	-	-	-	-	-
		R	85	44	D			-	-	-		
SH1 / Hoskyns Rd (Signals)	N	L	405	22	C	105	225	-	-	-	-	-
		R	520	62	E			-	-	-		
	E	T	1,580	94	F	150	245	-	-	-	-	-
		R	200	204	F			-	-	-		
	W	L	310	7	A	-	-	-	-	-	-	-
		T	1,050	24	C			-	-	-		
Levi Rd / Weedons Rd (Priority)	N	L	190	2	A	Less than 5m	Less than 5m	170	2	A	Less than 5m	Less than 5m
		T	900	3	A			850	2	A		
	S	L	15	12	B	25	30	20	12	B	30	35
		R	110	20	C			95	23	C		
	W	T	395	3	A	20	25	510	3	A	10	25
		R	35	5	A			40	5	A		

Table A3: 2028 PM flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Lowes Rd / Masefield Rd (Roundabout)	NW	L	100	25	C	50	60	105	25	C	50	55
		T	215	26	C			185	26	C		
		R	35	32	C			35	34	C		
	E	L	285	12	B	75	140	285	10	B	75	85
		T	500	29	C			465	25	C		
		R	110	33	C			95	34	C		
	SE	L	45	20	B	45	50	50	19	B	40	45
		T	155	21	C			155	20	C		
		R	75	26	C			80	26	C		
	W	L	15	17	B	45	50	10	13	B	55	60
		T	185	22	C			290	23	C		
		R	45	11	B			85	11	B		
Masefield Rd / Rolleston Dr (Signals)	N	L	270	15	B	-	-	230	18	B	-	-
		R	560	12	B			690	17	B		
	E	T	95	18	B	-	-	85	18	B	-	-
		R	155	37	D			150	35	D		
	W	L	315	4	A	-	-	275	5	A	-	-
		T	100	17	B			115	19	B		
Lowes Rd / Tennyson St (Signals)	N	L	45	10	B	-	-	40	10	B	-	-
		T	620	12	B			610	13	B		
		R	170	19	B			180	18	B		
	E	L	235	26	C	-	-	230	26	C	-	-
		T	250	20	C			240	20	C		
		R	20	16	B			15	15	B		
	S	L	60	17	B	-	-	70	16	B	-	-
		T	370	17	B			340	17	B		
		R	100	44	D			120	51	D		
	W	L	100	17	B	-	-	115	19	B	-	-
		T	140	16	B			250	18	B		
		R	60	23	C			100	25	C		
Rolleston Dr / Tennyson St (Signals)	N	L	10	15	B	-	-	15	25	C	-	-
		T	195	31	C			110	26	C		
		R	20	22	C			10	15	B		
	E	L	445	8	A	-	-	535	10	A	-	-
		T	205	13	B			225	15	B		
		R	85	14	B			110	15	B		
	S	L	65	14	B	-	-	60	12	B	-	-
		T	135	15	B			140	15	B		
		R	250	33	C			235	24	C		
	W	L	20	10	A	-	-	25	9	A	-	-
		T	90	13	B			80	13	B		
		R	55	29	C			35	30	C		
Norman Kirk Dr / Rolleston Dr (Signals)	N	L	70	13	B	50	50	70	15	B	60	80
		T	725	14	B			835	18	B		
		R	110	17	B			175	20	C		
	E	L	5	13	B	35	40	10	17	B	35	40
		T	10	19	B			15	20	B		
		R	20	15	B			15	14	B		
	S	L	35	8	A	40	45	40	7	A	35	40
		T	420	20	B			335	19	B		
		R	25	34	C			35	33	C		
	W	L	5	14	B	35	40	5	11	B	35	35
		T	5	10	B			5	11	B		
		R	20	12	B			15	12	B		
Jones Rd / Iport Dr (Roundabout)	N	L	55	2	A	Less than 5m	20	50	2	A	Less than 5m	Less than 5m
		R	5	2	A			5	2	A		
	E	T	125	2	A	Less than 5m	20	95	4	A	Less than 5m	30
		R	40	2	A			65	4	A		
	W	L	35	1	A	Less than 5m	30	30	2	A	Less than 5m	35
		T	65	1	A			65	2	A		

Table B1: 2028 intersection delay and LOS statistics

	AM				IP				PM			
	Do Minimum		Project		Do Minimum		Project		Do Minimum		Project	
Intersection	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**
Rolleston Drive Extension / Jones Road (Signals)	0	A	12	B	0	A	15	B	0	A	15	B
Jones Road / Hoskyns Road (Signals)	20	C	16	B	17	B	12	B	39	D	21	C
Jones Road / Weedons Ross Road (Roundabout)	10	A	11	B	7	A	8	A	14	B	12	B
Weedons Road / SH1 off/on ramp (north) (Roundabout)	4	A	6	A	3	A	3	A	4	A	5	A
Weedons Road / SH1 off/on ramp (south) (Roundabout)	16	B	27	C	6	A	7	A	33	C	29	C
Kidman Street / Rolleston Drive (Signals)	137	F	34	D	32	D	18	B	104	F	15	B
Kidman Street / Tennyson Street (Roundabout)	4	A	3	A	2	A	2	A	3	A	2	A
SH1 / Dunns Crossing (Roundabout)	29	C	11	B	12	B	10	A	20	C	13	B
SH1 / Rolleston Drive North (Signals)	19	B	0	A	20	C			28	C		
SH1 / Hoskyns Rd (Signals)	33	C	13	B	28	C	14	B	64	E	16	B
Levi Rd / Weedons Rd (Priority)	30	D	78	F	19	C	20	C	20	C	23	C
Lowes Rd / Masefield Rd (Roundabout)	23	C	25	C	18	B	19	B	24	C	22	C
Masefield Rd / Rolleston Dr (Signals)	15	B	14	B	14	B	13	B	14	B	17	B
Lowes Rd / Tennyson St (Signals)	16	B	21	C	15	B	15	B	18	B	19	B
Rolleston Dr / Tennyson St (Signals)	19	B	14	B	15	B	14	B	18	B	16	B
Norman Kirk Dr / Rolleston Dr (Signals)	16	B	16	B	16	B	15	B	16	B	18	B
Jones Rd / Iport Dr (Roundabout)	2	A	3	A	1	A	3	A	2	A	3	A

Table A4: 2038 AM flow, delay, LOS and queue statistics

Intersection	Approach	Turn	Do Minimum					Rolleston Access Improvements Project				
			Volume *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Rolleston Drive Extension / Jones Road (Signals)	E	L	-	-	-	-	-	225	1	A	45	65
		T	-	-	-			90	30	C		
	S	L	-	-	-	-	-	415	16	B	70	170
		R	-	-	-			1,230	22	C		
	W	T	-	-	-	-	-	275	25	C	80	90
		R	-	-	-			105	22	C		
Jones Road / Hoskyns Road (Signals)	N	L	10	55	D	60	110	10	19	B	65	75
		T	295	97	F			185	37	D		
		R	25	32	C			190	31	C		
	E	L	70	226	F	45	75	40	35	D	70	85
		T	105	22	C			140	34	C		
		R	10	20	B			15	28	C		
	W	L	20	39	D	80	140	475	5	A	65	200
		T	125	50	D			225	9	A		
		R	105	279	F			800	19	B		
	S	L	400	21	C	105	120	-	-	-	-	-
		T	510	20	C			-	-	-		
		R	140	27	C			-	-	-		
Jones Road / Weedons Ross Road (Roundabout)	N	L	10	20	C	50	90	10	8	A	40	60
		T	480	21	C			430	16	B		
		R	30	16	B			35	12	B		
	E	L	75	48	D	35	75	35	26	C	30	45
		T	185	47	D			160	28	C		
		R	5	30	C			5	17	B		
	S	L	95	9	A	25	60	155	9	A	30	70
		T	390	9	A			395	10	A		
		R	30	12	B			25	6	A		
	W	L	20	8	A	25	40	35	7	A	20	30
		T	80	11	B			55	10	B		
		R	155	15	B			60	16	B		
Weedons Road / SH1 off/on ramp (north) (Roundabout)	N	T	360	7	A	25	35	245	6	A	20	40
		R	340	6	A			280	7	A		
	S	L	945	2	A	30	55	1,140	6	A	45	65
		R	420	14	B			485	16	B		
	W	L	95	7	A	20	30	90	8	A	25	30
		T	10	6	A			40	7	A		
Weedons Road / SH1 off/on ramp (south) (Roundabout)	N	T	315	3	A	20	30	200	5	A	25	30
		R	55	3	A			80	5	A		
	S	L	35	81	F	145	335	85	66	E	40	195
		T	1,235	83	F			1,350	71	E		
	W	L	90	168	F	130	240	245	21	C	75	170
		R	170	554	F			280	82	F		

Table A4: 2038 AM flow, delay, LOS and queue statistics

Intersection	Approach	Turn	Do Minimum					Rolleston Access Improvements Project				
			Volume *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Kidman Street / Rolleston Drive (Signals)	N	T	390	9	A	30	35	245	7	A	40	45
		R	70	28	D			95	13	B		
	Off Ramp*	L	-	-	-	-	-	345	9	A	50	55
		R	-	-	-			-	-	-		
	S	L	25	207	F	340	345	20	13	B	80	115
		T	580	221	F			910	43	D		
	W	L	520	85	F	110	210	630	18	B	115	135
		R	35	76	F			10	32	C		
Kidman Street / Tennyson Street (Roundabout)	N	L	60	6	A	20	35	175	1	A	20	30
		T	70	8	A			10	2	A		
		R	25	13	B			5	1	A		
	E	L	15	2	A	15	30	10	1	A	15	20
		T	25	5	A			25	2	A		
		R	5	107	F			45	3	A		
	S	L	35	30	C	40	115	25	2	A	15	25
		T	65	121	F			100	3	A		
		R	230	39	D			80	4	A		
	W	L	65	191	F	60	150	15	3	A	25	30
		T	220	103	F			330	5	A		
		R	30	104	F			50	4	A		
SH1 / Dunns Crossing (Roundabout)	N	L	110	66	E	35	150	45	3	A	20	25
		T	45	152	F			55	5	A		
		R	30	157	F			25	5	A		
	E	L	25	7	A	25	50	20	8	A	30	40
		T	845	14	B			775	18	B		
		R	115	15	B			90	15	B		
	S	L	75	351	F	110	225	195	5	A	30	35
		T	35	403	F			90	9	A		
		R	90	424	F			145	9	A		
	W	L	10	3	A	25	35	55	8	A	25	35
		T	570	9	A			415	11	B		
		R	65	19	B			170	11	B		
SH1 / Rolleston Drive North (Signals)	E	L	420	6	A	-	-	-	-	-	-	-
		T	805	22	C			-	-	-		
	S	L	160	11	B	310	570	-	-	-	-	-
		R	1,085	28	C			-	-	-		
	W	T	975	21	C	65	80	-	-	-	-	-
		R	40	96	F			-	-	-		
SH1 / Hoskyns Rd (Signals)	N	L	235	88	F	175	250	-	-	-	-	-
		R	235	208	F			-	-	-		
	E	T	1,040	204	F	160	395	-	-	-	-	-
		R	460	350	F			-	-	-		
	W	L	605	17	B	-	-	-	-	-	-	-
		T	1,455	22	C			-	-	-		
Levi Rd / Weedons Rd (Priority)	N	L	145	2	A	Less than 5m	Less than 5m	125	2	A	Less than 5m	Less than 5m
		T	330	2	A			360	2	A		
	S	L	35	30	D	50	100	20	513	F	115	405
		R	230	60	F			135	669	F		
	W	T	955	6	A	15	40	1,235	8	A	20	55
		R	30	4	A			30	5	A		

Table A4: 2038 AM flow, delay, LOS and queue statistics

Intersection	Approach	Turn	Do Minimum					Rolleston Access Improvements Project				
			Volume *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Lowes Rd / Masefield Rd (Roundabout)	NW	L	95	27	C	40	40	110	26	C	40	45
		T	70	27	C			75	26	C		
		R	10	25	C			10	28	C		
	E	L	80	12	B	55	75	80	13	B	55	65
		T	230	31	C			210	30	C		
		R	75	43	D			135	70	E		
	SE	L	70	38	D	50	250	50	19	B	55	65
		T	185	39	D			275	22	C		
		R	185	31	C			245	31	C		
	W	L	35	24	C	65	85	15	13	B	75	80
		T	465	22	C			655	23	C		
		R	45	8	A			50	8	A		
Masefield Rd / Rolleston Dr (Signals)	N	L	130	20	C	-	-	125	21	C	-	-
		R	205	24	C			290	28	C		
	E	T	90	146	F	-	-	110	9	A	-	-
		R	170	714	F			305	56	E		
	W	L	445	100	F	-	-	545	3	A	-	-
		T	75	18	B			110	8	A		
Lowes Rd / Tennyson St (Signals)	N	L	30	13	B	-	-	25	13	B	-	-
		T	240	14	B			250	13	B		
		R	60	28	C			70	22	C		
	E	L	105	25	C	-	-	105	24	C	-	-
		T	130	17	B			135	19	B		
		R	60	41	D			20	20	B		
	S	L	70	15	B	-	-	60	38	D	-	-
		T	700	13	B			520	36	D		
		R	285	34	C			350	85	F		
	W	L	175	25	C	-	-	180	27	C	-	-
		T	220	17	B			335	19	B		
		R	40	19	B			60	21	C		
Rolleston Dr / Tennyson St (Signals)	N	L	10	21	C	-	-	15	20	C	-	-
		T	70	23	C			35	22	C		
		R	10	19	B			5	13	B		
	E	L	165	6	A	-	-	230	9	A	-	-
		T	80	21	C			95	23	C		
		R	75	22	C			100	20	B		
	S	L	115	27	C	-	-	45	12	B	-	-
		T	395	35	C			205	15	B		
		R	415	61	E			470	23	C		
	W	L	65	12	B	-	-	30	12	B	-	-
		T	55	26	C			100	15	B		
		R	50	15	B			30	16	B		
Norman Kirk Dr / Rolleston Dr (Signals)	N	L	35	12	B	35	40	40	15	B	40	50
		T	320	13	B			420	15	B		
		R	75	20	C			140	57	E		
	E	L	5	14	B	30	35	5	14	B	30	35
		T	25	13	B			10	9	A		
		R	10	94	F			20	11	B		
	S	L	25	191	F	220	290	55	8	A	40	50
		T	535	346	F			765	17	B		
		R	15	232	F			35	21	C		
	W	L	5	198	F	40	50	5	10	A	35	40
		T	5	111	F			5	13	B		
		R	10	12	B			5	15	B		
Jones Rd / Iport Dr (Roundabout)	N	L	70	2	A	15	25	25	2	A	Less than 5m	20
		R	5	3	A			5	2	A		
	E	T	150	3	A	25	35	130	4	A	25	30
		R	145	3	A			210	5	A		
	W	L	130	3	A	20	35	105	4	A	25	40
		T	175	3	A			135	4	A		

Table A5: 2038 IP flow, delay, LOS and queue statistics

Intersection	Approach	Turn	Do Minimum					Rolleston Access Improvements Project				
			Volume *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Rolleston Drive Extension / Jones Road (Signals)	E	L	-	-	-	-	-	375	2	A	40	55
		T	-	-	-			65	13	B		
	S	L	-	-	-	-	-	210	14	B	55	65
		R	-	-	-			805	16	B		
	W	T	-	-	-	-	-	185	17	B	60	65
		R	-	-	-			220	19	B		
Jones Road / Hoskyns Road (Signals)	N	L	10	60	E	80	125	5	22	C	60	70
		T	460	87	F			145	26	C		
		R	15	39	D			275	25	C		
	E	L	75	509	F	95	115	25	25	C	70	75
		T	45	24	C			175	29	C		
		R	10	10	A			10	23	C		
	W	L	20	133	F	135	200	405	5	A	50	80
		T	50	159	F			165	8	A		
		R	125	448	F			410	12	B		
	S	L	255	21	C	75	90	-	-	-	-	-
		T	430	20	C			-	-	-		
		R	130	30	C			-	-	-		
Jones Road / Weedons Ross Road (Roundabout)	N	L	5	7	A	30	40	5	3	A	25	35
		T	240	13	B			210	11	B		
		R	15	9	A			15	5	A		
	E	L	25	18	B	25	30	25	13	B	20	30
		T	65	17	B			80	14	B		
		R	5	12	B			5	5	A		
	S	L	75	6	A	20	45	130	7	A	25	60
		T	235	6	A			225	7	A		
		R	25	6	A			20	7	A		
	W	L	10	6	A	25	30	20	6	A	20	25
		T	40	9	A			25	6	A		
		R	170	14	B			40	12	B		
Weedons Road / SH1 off/on ramp (north) (Roundabout)	N	T	265	5	A	20	40	165	5	A	15	40
		R	175	5	A			115	5	A		
	S	L	320	1	A	20	30	410	2	A	25	35
		R	260	5	A			315	5	A		
	W	L	70	5	A	20	30	60	5	A	20	30
		T	10	2	A			25	4	A		
Weedons Road / SH1 off/on ramp (south) (Roundabout)	N	T	230	5	A	25	30	145	4	A	20	25
		R	45	5	A			45	4	A		
	S	L	40	4	A	20	25	75	2	A	25	35
		T	490	5	A			565	4	A		
	W	L	90	6	A	35	45	165	6	A	55	70
		R	345	12	B			360	20	C		

Table A5: 2038 IP flow, delay, LOS and queue statistics

Intersection	Approach	Turn	Do Minimum					Rolleston Access Improvements Project				
			Volume *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Kidman Street / Rolleston Drive (Signals)	N	T	560	14	B	50	55	510	20	B	85	95
		R	70	23	C			95	18	B		
	Off Ramp*	L	-	-	-	-	-	275	15	B	60	70
		R	-	-	-			-	-	-		
	S	L	30	79	F	165	250	25	6	A	65	70
		T	495	103	F			625	33	C		
	W	L	155	42	E	60	70	315	13	B	75	85
		R	50	26	D			15	15	B		
Kidman Street / Tennyson Street (Roundabout)	N	L	50	1	A	15	25	60	1	A	Less than 5m	20
		T	105	2	A			10	1	A		
		R	45	2	A			5	1	A		
	E	L	25	2	A	15	20	10	1	A	15	25
		T	40	3	A			70	3	A		
		R	5	2	A			20	2	A		
	S	L	30	2	A	20	25	30	3	A	15	25
		T	65	12	B			50	3	A		
		R	65	4	A			50	3	A		
	W	L	40	11	B	20	30	10	1	A	20	25
		T	95	3	A			160	3	A		
		R	20	3	A			35	2	A		
SH1 / Dunns Crossing (Roundabout)	N	L	65	11	B	20	30	20	3	A	20	25
		T	40	42	D			30	5	A		
		R	10	36	D			10	5	A		
	E	L	80	8	A	25	35	65	10	A	30	35
		T	555	14	B			550	15	B		
		R	80	13	B			70	12	B		
	S	L	40	11	B	30	45	45	4	A	25	35
		T	45	40	D			50	6	A		
		R	80	44	D			55	6	A		
	W	L	10	3	A	25	30	35	6	A	25	30
		T	585	9	A			445	10	A		
		R	65	13	B			175	9	A		
SH1 / Rolleston Drive North (Signals)	E	L	595	10	B	-	-	-	-	-	-	-
		T	840	16	B			-	-	-		
	S	L	100	20	C	145	260	-	-	-	-	-
		R	690	55	E			-	-	-		
	W	T	805	11	B	45	50	-	-	-	-	-
		R	40	45	D			-	-	-		
SH1 / Hoskyns Rd (Signals)	N	L	190	75	E	205	235	-	-	-	-	-
		R	470	122	F			-	-	-		
	E	T	970	37	D	135	155	-	-	-	-	-
		R	245	150	F			-	-	-		
	W	L	570	10	A	-	-	-	-	-	-	-
		T	925	26	C			-	-	-		
Levi Rd / Weedons Rd (Priority)	N	L	160	2	A	Less than 5m	Less than 5m	105	2	A	Less than 5m	Less than 5m
		T	415	2	A			400	2	A		
	S	L	20	12	B	25	30	25	13	B	25	35
		R	110	20	C			95	23	C		
	W	T	380	3	A	Less than 5m	25	505	3	A	Less than 5m	15
		R	25	3	A			20	3	A		

Table A5: 2038 IP flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Lowes Rd / Masefield Rd (Roundabout)	NW	L	100	21	C	35	40	115	24	C	40	45
		T	115	16	B			125	16	B		
		R	15	27	C			15	22	C		
	E	L	90	10	B	60	65	85	10	A	60	60
		T	265	25	C			250	24	C		
		R	70	24	C			95	28	C		
	SE	L	30	15	B	35	40	30	18	B	35	40
		T	130	18	B			145	18	B		
		R	55	25	C			60	25	C		
	W	L	15	10	B	40	45	10	10	A	50	55
		T	190	17	B			315	17	B		
		R	30	7	A			45	7	A		
Masefield Rd / Rolleston Dr (Signals)	N	L	150	20	C	-	-	160	18	B	-	-
		R	380	18	B			505	17	B		
	E	T	65	13	B	-	-	65	15	B	-	-
		R	145	25	C			175	33	C		
	W	L	315	5	A	-	-	310	5	A	-	-
		T	90	10	B			110	11	B		
Lowes Rd / Tennyson St (Signals)	N	L	25	13	B	-	-	25	13	B	-	-
		T	440	14	B			480	14	B		
		R	90	23	C			105	23	C		
	E	L	140	17	B	-	-	135	17	B	-	-
		T	135	14	B			130	13	B		
		R	15	13	B			10	15	B		
	S	L	40	12	B	-	-	40	12	B	-	-
		T	420	14	B			380	14	B		
		R	105	24	C			145	32	C		
	W	L	125	15	B	-	-	140	16	B	-	-
		T	110	13	B			195	14	B		
		R	40	15	B			55	17	B		
Rolleston Dr / Tennyson St (Signals)	N	L	10	16	B	-	-	15	19	B	-	-
		T	130	26	C			60	25	C		
		R	10	16	B			5	13	B		
	E	L	315	10	A	-	-	425	11	B	-	-
		T	105	14	B			110	14	B		
		R	55	15	B			65	16	B		
	S	L	45	12	B	-	-	45	11	B	-	-
		T	175	14	B			135	14	B		
		R	300	20	C			305	18	B		
	W	L	15	10	B	-	-	15	11	B	-	-
		T	80	14	B			75	13	B		
		R	35	21	C			30	23	C		
Norman Kirk Dr / Rolleston Dr (Signals)	N	L	60	13	B	45	50	65	12	B	35	40
		T	490	14	B			625	11	B		
		R	65	17	B			115	15	B		
	E	L	5	14	B	35	40	5	7	A	35	40
		T	10	18	B			5	18	B		
		R	15	16	B			20	17	B		
	S	L	85	11	B	40	45	40	9	A	40	45
		T	370	20	C			440	20	B		
		R	65	26	C			55	40	D		
	W	L	5	14	B	35	40	5	30	C	35	35
		T	5	12	B			5	12	B		
		R	10	12	B			10	10	A		
Jones Rd / Iport Dr (Roundabout)	N	L	85	2	A	Less than 5m	30	15	1	A	Less than 5m	25
		R	5	2	A			5	1	A		
	E	T	60	3	A	20	30	105	4	A	25	25
		R	90	3	A			120	4	A		
	W	L	130	2	A	20	35	115	3	A	25	35
		T	85	2	A			60	3	A		

Table A6: 2038 PM flow, delay, LOS and queue statistics

Intersection	Approach	Turn	Do Minimum					Rolleston Access Improvements Project				
			Volume *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Rolleston Drive Extension / Jones Road (Signals)	E	L	-	-	-	-	-	440	4	A	50	55
		T	-	-	-			90	21	C		
	S	L	-	-	-	-	-	260	13	B	50	70
		R	-	-	-			760	16	B		
	W	T	-	-	-	-	-	340	23	C	80	95
		R	-	-	-			265	24	C		
Jones Road / Hoskyns Road (Signals)	N	L	10	111	F	175	250	10	23	C	80	95
		T	705	111	F			290	33	C		
		R	15	61	E			340	29	C		
	E	L	180	153	F	95	160	50	34	C	75	90
		T	85	22	C			200	31	C		
		R	15	23	C			10	16	B		
	W	L	10	625	F	400	590	370	6	A	100	170
		T	20	497	F			175	12	B		
		R	145	1,124	F			550	35	D		
	S	L	225	25	C	80	95	-	-	-	-	-
		T	330	32	C			-	-	-		
		R	105	58	E			-	-	-		
Jones Road / Weedons Ross Road (Roundabout)	N	L	5	35	C	95	480	5	11	B	50	75
		T	510	78	E			465	21	C		
		R	35	85	F			35	16	B		
	E	L	160	173	F	90	315	120	33	C	35	60
		T	110	135	F			100	30	C		
		R	5	67	E			5	20	C		
	S	L	125	8	A	25	65	100	9	A	25	75
		T	320	8	A			320	8	A		
		R	35	7	A			35	7	A		
	W	L	15	12	B	35	80	30	9	A	25	30
		T	145	16	B			115	11	B		
		R	250	18	B			90	15	B		
Weedons Road / SH1 off/on ramp (north) (Roundabout)	N	T	595	8	A	30	135	440	7	A	25	40
		R	305	8	A			240	7	A		
	S	L	460	2	A	35	50	495	4	A	35	45
		R	410	10	A			385	10	A		
	W	L	70	6	A	25	30	75	7	A	25	25
		T	15	4	A			35	6	A		
Weedons Road / SH1 off/on ramp (south) (Roundabout)	N	T	570	33	C	85	350	420	30	C	60	145
		R	40	33	C			60	28	C		
	S	L	20	4	A	25	45	55	15	B	25	35
		T	750	6	A			710	19	B		
	W	L	125	118	F	320	1780	170	40	D	240	390
		R	635	216	F			700	119	F		

Table A6: 2038 PM flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Kidman Street / Rolleston Drive (Signals)	N	T	800	10	B	60	65	585	11	B	75	85
		R	120	17	C			140	17	B		
	Off Ramp*	L	-	-	-	-	-	675	12	B	65	80
		R	-	-	-			-	-	-		
	S	L	30	276	F	240	345	25	11	B	60	70
		T	385	292	F			570	35	C		
	W	L	180	59	F	60	85	375	13	B	85	100
		R	65	35	D			15	29	C		
Kidman Street / Tennyson Street (Roundabout)	N	L	65	2	A	20	35	135	1	A	20	60
		T	150	4	A			25	2	A		
		R	95	3	A			10	2	A		
	E	L	30	3	A	20	25	20	2	A	20	65
		T	75	5	A			90	4	A		
		R	5	16	B			30	5	A		
	S	L	50	3	A	20	30	55	3	A	20	155
		T	65	26	C			70	6	A		
		R	70	6	A			50	4	A		
	W	L	35	30	C	20	65	10	3	A	20	360
		T	110	6	A			175	3	A		
		R	30	5	A			45	3	A		
SH1 / Dunns Crossing (Roundabout)	N	L	115	278	F	90	420	40	4	A	25	30
		T	40	474	F			75	9	A		
		R	10	447	F			35	9	A		
	E	L	115	9	A	30	65	110	16	B	45	70
		T	680	13	B			685	23	C		
		R	120	21	C			95	19	B		
	S	L	45	85	F	50	90	75	4	A	25	30
		T	40	191	F			65	6	A		
		R	35	194	F			45	6	A		
	W	L	10	3	A	35	100	55	8	A	35	45
		T	870	10	B			620	12	B		
		R	170	22	C			380	13	B		
SH1 / Rolleston Drive North (Signals)	E	L	850	43	D	-	-	-	-	-	-	-
		T	1,140	27	C			-	-	-		
	S	L	100	23	C	155	470	-	-	-	-	-
		R	570	88	F			-	-	-		
	W	T	920	38	D	60	100	-	-	-	-	-
		R	70	74	E			-	-	-		
SH1 / Hoskyns Rd (Signals)	N	L	365	43	D	245	435	-	-	-	-	-
		R	625	93	F			-	-	-		
	E	T	1,415	236	F	340	550	-	-	-	-	-
		R	230	466	F			-	-	-		
	W	L	430	24	C	-	-	-	-	-	-	-
		T	1,065	79	E			-	-	-		
Levi Rd / Weedons Rd (Priority)	N	L	245	2	A	Less than 5m	Less than 5m	235	2	A	Less than 5m	Less than 5m
		T	920	3	A			885	2	A		
	S	L	30	14	B	30	35	30	13	B	35	40
		R	160	26	D			130	30	D		
	W	T	540	4	A	20	30	585	4	A	20	25
		R	50	6	A			50	6	A		

Table A6: 2038 PM flow, delay, LOS and queue statistics

			Do Minimum					Rolleston Access Improvements Project				
Intersection	**Approach**	**Turn**	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*	**Volume** *vph, rounded to nearest 25*	**Delay** *seconds*	**LOS**	**50th% queue** *meters, rounded to the nearest 5m*	**95th% queue** *meters, rounded to the nearest 5m*
Lowes Rd / Masefield Rd (Roundabout)	NW	L	170	25	C	55	55	135	25	C	55	60
		T	220	25	C			215	26	C		
		R	30	32	C			40	34	C		
	E	L	215	15	B	85	220	230	12	B	75	100
		T	550	33	C			525	29	C		
		R	150	44	D			115	39	D		
	SE	L	60	19	B	45	70	50	19	B	45	50
		T	185	21	C			170	21	C		
		R	80	26	C			80	28	C		
	W	L	15	18	B	50	60	10	14	B	60	65
		T	260	23	C			335	24	C		
		R	55	11	B			85	12	B		
Masefield Rd / Rolleston Dr (Signals)	N	L	275	18	B	-	-	280	32	C	-	-
		R	570	13	B			790	30	C		
	E	T	165	21	C	-	-	95	19	B	-	-
		R	145	53	D			175	64	E		
	W	L	305	13	B	-	-	335	8	A	-	-
		T	135	18	B			125	20	B		
Lowes Rd / Tennyson St (Signals)	N	L	50	9	A	-	-	40	10	B	-	-
		T	685	13	B			720	13	B		
		R	190	23	C			225	22	C		
	E	L	265	27	C	-	-	285	29	C	-	-
		T	295	20	C			265	21	C		
		R	30	23	C			15	14	B		
	S	L	60	16	B	-	-	65	18	B	-	-
		T	440	17	B			395	19	B		
		R	115	63	E			130	99	F		
	W	L	120	18	B	-	-	135	18	B	-	-
		T	185	17	B			270	18	B		
		R	60	24	C			100	27	C		
Rolleston Dr / Tennyson St (Signals)	N	L	10	17	B	-	-	20	35	C	-	-
		T	215	38	D			135	39	D		
		R	20	29	C			10	24	C		
	E	L	505	10	A	-	-	635	13	B	-	-
		T	230	13	B			225	16	B		
		R	105	15	B			115	17	B		
	S	L	80	15	B	-	-	50	16	B	-	-
		T	205	17	B			165	19	B		
		R	260	36	D			285	41	D		
	W	L	25	9	A	-	-	25	10	B	-	-
		T	100	14	B			95	13	B		
		R	55	43	D			30	44	D		
Norman Kirk Dr / Rolleston Dr (Signals)	N	L	65	13	B	50	55	85	18	B	75	120
		T	705	14	B			975	23	C		
		R	90	19	B			215	27	C		
	E	L	5	17	B	40	45	10	16	B	35	45
		T	20	23	C			15	19	B		
		R	10	117	F			20	15	B		
	S	L	55	62	E	45	225	35	8	A	40	40
		T	355	219	F			440	20	C		
		R	25	113	F			30	29	C		
	W	L	0	907	F	40	75	5	26	C	35	40
		T	5	160	F			5	11	B		
		R	25	17	B			15	12	B		
Jones Rd / Iport Dr (Roundabout)	N	L	220	3	A	20	30	65	2	A	20	25
		R	15	1	A			5	2	A		
	E	T	160	3	A	20	30	105	5	A	20	30
		R	115	3	A			130	4	A		
	W	L	105	2	A	25	40	105	3	A	25	35
		T	80	2	A			90	3	A		

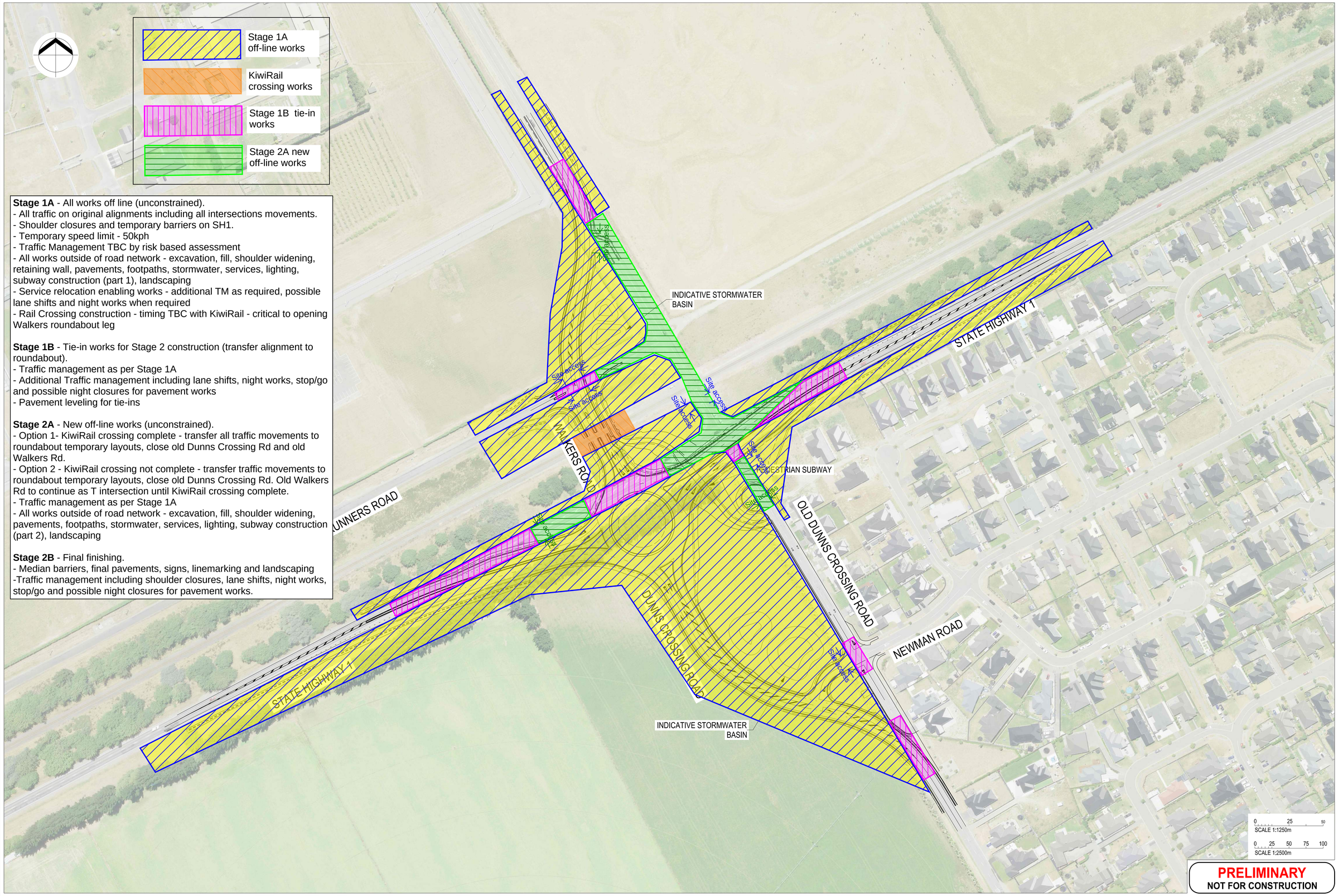
Table B2: 2038 intersection delay and LOS statistics

	AM				IP				PM			
	Do Minimum		Project		Do Minimum		Project		Do Minimum		Project	
Intersection	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**	**Delay** *seconds*	**LOS**
Rolleston Drive Extension / Jones Road (Signals)	0	A	19	B	0	A	13	B	0	A	16	B
Jones Road / Hoskyns Road (Signals)	59	E	19	B	101	F	15	B	169	F	26	C
Jones Road / Weedons Ross Road (Roundabout)	20	C	14	B	11	B	9	A	57	E	17	B
Weedons Road / SH1 off/on ramp (north) (Roundabout)	6	A	8	A	4	A	4	A	7	A	7	A
Weedons Road / SH1 off/on ramp (south) (Roundabout)	114	F	58	E	7	A	8	A	83	F	56	E
Kidman Street / Rolleston Drive (Signals)	221	F	25	C	103	F	22	C	292	F	18	B
Kidman Street / Tennyson Street (Roundabout)	69	E	3	A	4	A	2	A	7	A	3	A
SH1 / Dunns Crossing (Roundabout)	58	E	12	B	14	B	11	B	44	D	15	B
SH1 / Rolleston Drive North (Signals)	22	C			23	C			44	D		
SH1 / Hoskyns Rd (Signals)	120	F	13	B	52	D	15	B	147	F	16	B
Levi Rd / Weedons Rd (Priority)	60	F	669	F	20	C	23	C	26	D	30	D
Lowes Rd / Masefield Rd (Roundabout)	28	C	27	C	19	B	19	B	27	C	24	C
Masefield Rd / Rolleston Dr (Signals)	170	F	21	C	15	B	16	B	19	B	28	C
Lowes Rd / Tennyson St (Signals)	19	B	35	D	15	B	16	B	20	C	23	C
Rolleston Dr / Tennyson St (Signals)	34	C	18	B	16	B	15	B	20	B	22	C
Norman Kirk Dr / Rolleston Dr (Signals)	191	F	20	B	16	B	16	B	75	E	22	C
Jones Rd / Iport Dr (Roundabout)	3	A	4	A	2	A	4	A	3	A	4	A

E

Appendix E – Construction Staging Diagrams

Drawing Ploted: $DATE$ $TIME$



Stage 1A - All works off line (unconstrained).
- All traffic on original alignments including all intersections movements.
- Shoulder closures and temporary barriers on SH1.
- Temporary speed limit - 50kph
- Traffic Management TBC by risk based assessment
- All works outside of road network - excavation, fill, shoulder widening, retaining wall, pavements, footpaths, stormwater, services, lighting, subway construction (part 1), landscaping
- Service relocation enabling works - additional TM as required, possible lane shifts and night works when required
- Rail Crossing construction - timing TBC with KiwiRail - critical to opening Walkers roundabout leg

Stage 1B - Tie-in works for Stage 2 construction (transfer alignment to roundabout).
- Traffic management as per Stage 1A
- Additional Traffic management including lane shifts, night works, stop/go and possible night closures for pavement works
- Pavement leveling for tie-ins

Stage 2A - New off-line works (unconstrained).
- Option 1- KiwiRail crossing complete - transfer all traffic movements to roundabout temporary layouts, close old Dunns Crossing Rd and old Walkers Rd.
- Option 2 - KiwiRail crossing not complete - transfer traffic movements to roundabout temporary layouts, close old Dunns Crossing Rd. Old Walkers Rd to continue as T intersection until KiwiRail crossing complete.
- Traffic management as per Stage 1A
- All works outside of road network - excavation, fill, shoulder widening, pavements, footpaths, stormwater, services, lighting, subway construction (part 2), landscaping

Stage 2B - Final finishing.
- Median barriers, final pavements, signs, linemarking and landscaping
-Traffic management including shoulder closures, lane shifts, night works, stop/go and possible night closures for pavement works.

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR INFORMATION	---	---	---	---

Original Scale (A1) 1:1250
Reduced Scale (A3) 1:2500

Design			Approved For Construction*
Drawn	M.HARRIS	25.03.24	
Dsg Verifier			
Drg Check			Date

* Refer to Revision 1 for Original Signature

Beca

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 1

Title: PACKAGE 1 SITE OVERVIEW PLAN CONSTRUCTION PHASING

Discipline: CIVIL - GENERAL

Drawing No.: 3338703-10-SK-CP-0001

Rev.: A

Document No. $FILE&$

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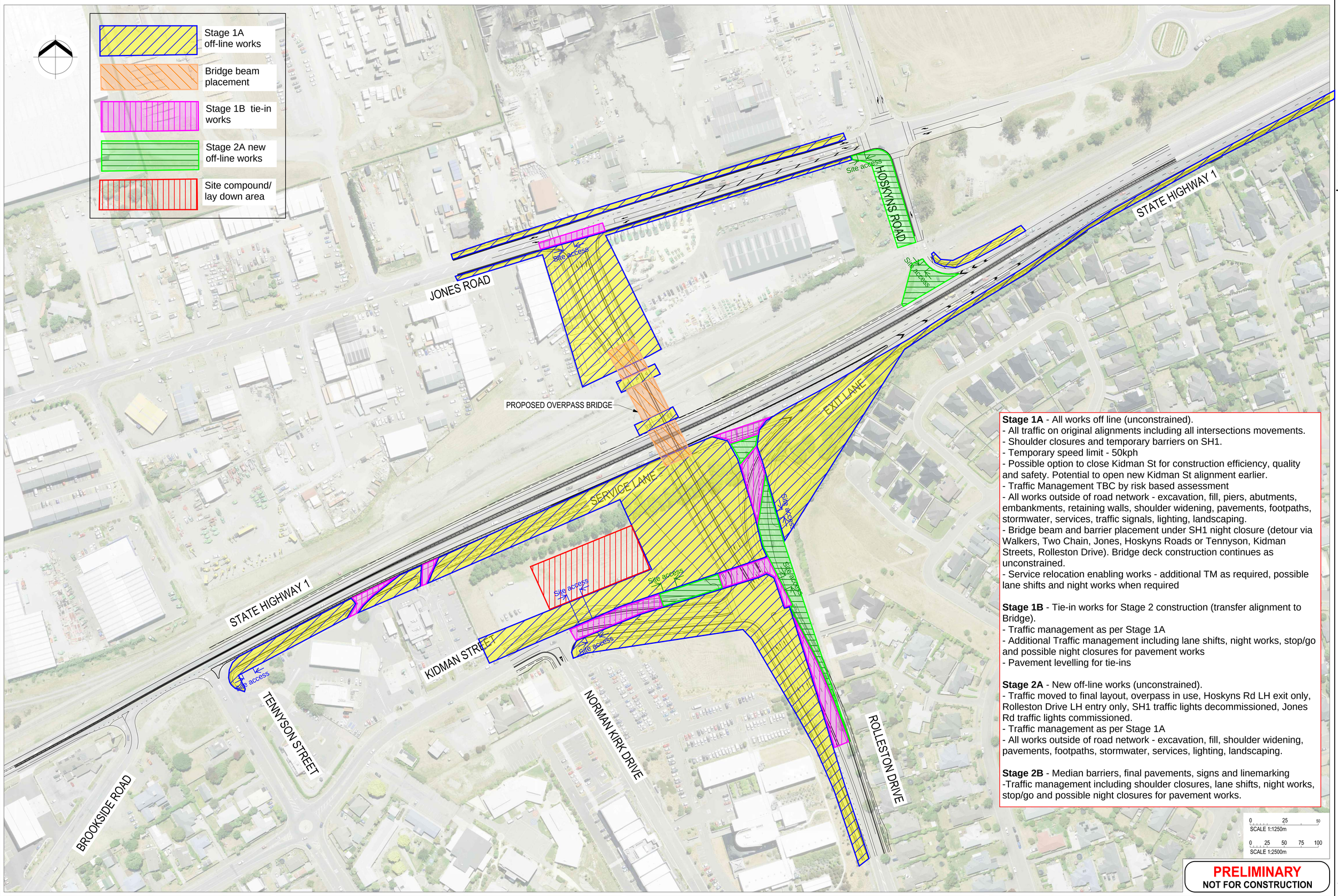

Stage 1A - All works off line (unconstrained).
- All traffic on original alignments including all intersections movements.
- Shoulder closures and temporary barriers on SH1.
- Temporary speed limit - 50kph
- Possible option to close Kidman St for construction efficiency, quality and safety. Potential to open new Kidman St alignment earlier.
- Traffic Management TBC by risk based assessment
- All works outside of road network - excavation, fill, piers, abutments, embankments, retaining walls, shoulder widening, pavements, footpaths, stormwater, services, traffic signals, lighting, landscaping.
- Bridge beam and barrier placement under SH1 night closure (detour via Walkers, Two Chain, Jones, Hoskyns Roads or Tennyson, Kidman Streets, Rolleston Drive). Bridge deck construction continues as unconstrained.
- Service relocation enabling works - additional TM as required, possible lane shifts and night works when required

Stage 1B - Tie-in works for Stage 2 construction (transfer alignment to Bridge).
- Traffic management as per Stage 1A
- Additional Traffic management including lane shifts, night works, stop/go and possible night closures for pavement works
- Pavement levelling for tie-ins

Stage 2A - New off-line works (unconstrained).
- Traffic moved to final layout, overpass in use, Hoskyns Rd LH exit only, Rolleston Drive LH entry only, SH1 traffic lights decommissioned, Jones Rd traffic lights commissioned.
- Traffic management as per Stage 1A
- All works outside of road network - excavation, fill, shoulder widening, pavements, footpaths, stormwater, services, lighting, landscaping.

Stage 2B - Median barriers, final pavements, signs and linemarking
-Traffic management including shoulder closures, lane shifts, night works, stop/go and possible night closures for pavement works.

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR INFORMATION	---	---	---	---

Original Scale (A1) 1:1250
Reduced Scale (A3) 1:2500

Design			Approved For Construction*
Drawn	M.HARRIS	25.03.24	
Dsg Verifier			
Drg Check			Date

* Refer to Revision 1 for Original Signature

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

Project: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

Title: PACKAGE 2 SITE OVERVIEW PLAN CONSTRUCTION PHASING

Discipline: CIVIL - GENERAL

Drawing No.: 3338703-20-SK-CP-0001

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