Belfast to Pegasus Motorway & Woodend Bypass Pre-implementation and MSQA Professional Services

Transport Effects of the New Pegasus Interchange on the Surrounding Network

NZ Transport Agency (NZTA)

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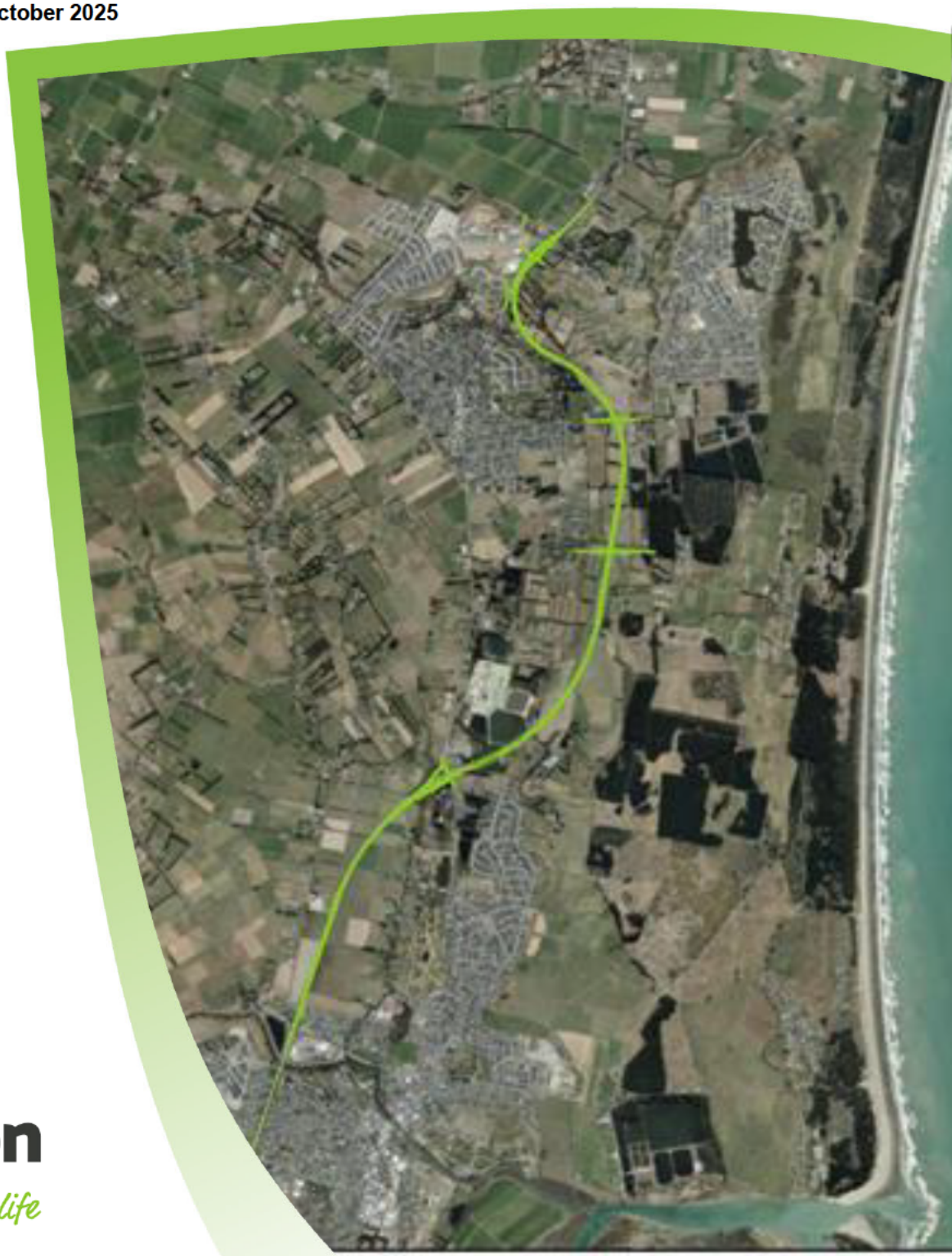

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Executive Summary

This report confirms the primary changes in the transport effects of State Highway 1 North Canterbury—Woodend Bypass Project (Belfast to Pegasus) between the 2015 scheme design[1] and the current 30% design stage of the Pegasus Interchange, where the proposed upgraded roundabout has been changed to a signalised grade separated diamond interchange. Changes after the 30% design will be limited to adding additional design detail within the alignment and structures.

The change was identified at the Investment Case stage where traffic modelling showed a roundabout would not provide sufficient capacity for forecast volumes and did not address pedestrian safety concerns.

Model validation and optioneering has improved the Investment Case interchange design to better balance safety and operations. The current preferred design is a signalised diamond interchange with two-stage pedestrian crossings and seven-phase signal phasing, which will be further optimised as the design progresses to the 50% stage through additional geometric design development and operational refinement.

Aside from the significant benefits to state highway traffic in grade separating North/South (SH1) movements from East/West movements, SIDRA modelling has established the proposed signalised interchange performs better than the existing roundabout layout at the horizon year of 2048. Notably, the Bob Robertson Drive approach shows marked improvements in average delay, queue lengths and level of service. Other approaches maintain acceptable delays and queue lengths generally within available storage capacity.

The modelling undertaken has been based on volumes from the Christchurch Assignment and Simulation Traffic (CAST) Model and reporting from QTP. The future forecast traffic demand only allows for certain levels of employment and population growth at Ravenswood and it is understood that these are almost certainly under-estimated in light of recent and ongoing commercial development. The models developed represent scenarios based on current best estimates and assumptions, but actual future conditions may vary due to changes in land use, travel behaviour, infrastructure developments, and other external factors. Further investigation is underway to better quantify and understand the potential effects of this anticipated additional development demand on operational performance.

Tolling of Belfast to Pegasus has been out for consultation, but a decision on this is still to be made.. Sensitivity analysis is currently being conducted to assess the potential impacts of tolling and additional growth in the wider area (e.g., Ravenswood, Stokes) on traffic flow, distribution, and the resulting performance of the Pegasus interchange and surrounding local network. This analysis may indicate some additional delays or queuing compared to the outcomes presented in this report. Nevertheless, the full grade-separated interchange design remains the optimal solution, offering the best balanced performance by minimizing impacts on both the State Highway and adjoining local roads, and ultimately delivering a superior outcome compared to the previously proposed roundabout design.

In summary, it is considered that the proposed design does not materially change transport effects from the original designation scheme design, with the updated signalised interchange providing a net positive transport outcome by accommodating growth and improving operational performance and safety particularly for state highway traffic.

Further detailed design will refine interchange geometry and operations, with ongoing work underway to evaluate local network performance to support further development of the recommended option.

Traffic effects during construction were authorised by the original designation and these effects have not changed as a result of the updated design, including the changes to Pegasus interchange. The designation requires a Traffic Management Plan (TMP) to be prepared and certified by WDC prior to construction works commencing.

[1] As authorised by the existing current designation.

Next Steps

Local network modelling is currently underway to evaluate the performance of the SH1/Pegasus Boulevard and Bob Robertson Drive/Garlick Street intersections in conjunction with each other. This will include establishing the existing performance of the two roundabouts, using new turning movement counts undertaken in 2025, and comparing this with the performance of the future SH1 interchange with options for the Bob Robertson Drive / Garlick Street intersection as a roundabout and a signalised intersection.

Further work is also underway to better understand predicted traffic demand associated with development and the resultant employment and population growth in the area.

This work will help further refine the understanding of the localised network performance, including the future SH1 Pegasus interchange, and inform further development of the recommended option.

1 Introduction

The purpose of this report is to assess whether there has been any change in the transport effects of the State Highway 1 North Canterbury—Woodend Bypass Project (Belfast to Pegasus) (the **Project**) 30% design when compared to the original scheme design, which supported the Project designation in 2015.

The design changes since scheme design have not fundamentally changed the transport effects of the Project except at the Pegasus intersection. Section 3 of this report outlines the changes in project scope between the scheme design and the proposed 30% design stage.

The Pegasus intersection was assessed by Jacobs as part of the Investment Case in 2024, which found the roundabout designed during scheme design was inadequate for forecast traffic demands, including to and from the Ravenswood key activity centre. The intersection was re-assessed with an alternative layout, with the Investment Case recommending a two-lane overbridge, with a signalised diamond interchange, due to its superior performance. There is a future proofed design that allows for an additional state highway two lanes to the east of the proposed two-lane overbridge.

Aurecon and its key sub-consultant Tonkin+Taylor were awarded the commission to undertake Pre-Implementation in early 2025. In Pre-Implementation, the proposed detailed design of the Pegasus Interchange layout is a modification on the preferred grade separated design identified at the Investment Case.

Work has subsequently been undertaken to validate the Pegasus Interchange modelling undertaken for the Investment Case, which is outlined in the Pegasus Interchange Traffic Modelling Assessment Report (11320-AUR-0350-PGI-TR-RPT-0002). The assessment identified that future interchange performance was worse than predicted, which has been addressed through additional optioneering of geometric layouts, phasing and pedestrian crossing design. A design which balances operational performance and safety has been identified which incorporates two-stage pedestrian crossings across Bob Robertson Drive and Pegasus Boulevard with a typical seven-phase signal phasing arrangement, supplemented by strategic lane length extensions. Further work is underway to evaluate the performance of the SH1/Pegasus Boulevard and Bob Robertson Drive/Garlick Street intersections in conjunction with each other to assist with further design refinement.

Detailed design will consider further optimisation of the new Pegasus Interchange from an operational and geometrics perspective; however, the general interchange form and function identified in the Investment Case remains.

1.1 Expert witness statement

While this is not a matter before the Environment Court, the authors of this report have each read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023 (‘Code’). The authors have each complied with the Code in the preparation of this report.

The data, information, facts and assumptions the authors have each considered as part of this report are set out in this report. The reasons for the conclusions of the report are also set out in this report. Unless stated otherwise, this report is within each of the authors’ expertise and the authors have not omitted to consider material facts known to them that might alter or detract from the opinions expressed.

1.2 Applicability statement

We understand and agree that NZTA will submit this report as part of an application under the Fast-Track Approvals Act 2024 and the appointed panel will use this report for the purpose of assessing that application.

2 Background

SH1 is a national strategic freight route, connecting Picton to Bluff along the east coast of the South Island. It provides critical access to Christchurch City, the primary service centre for the South Island. The neighbouring communities of Woodend, Pegasus, and Ravenswood shown in Figure 2-1, are experiencing rapid residential and commercial development, since the Christchurch earthquakes, with Ravenswood recently declared a 'key activity centre' in the Greater Christchurch area. These areas currently house a combined population of 8,720 residents, reflecting a 53% increase over the past five years. Continued growth is anticipated, with Pegasus expected to reach a population of 6,000, Ravenswood 4,000, and the wider Woodend area 3,960, bringing the total projected population to 13,960 by 2048[2].

The Project is an extension of the Christchurch Northern Motorway and will provide four lanes of grade-separated motorway over an approximately 11 kilometre (km) length. The physical work commences approximately 200 metres (m) south of the Ohoka Road Overpass and extends to approximately 700 m north of the Pegasus/Ravenwood intersection, including a bypass of Woodend township.

Figure 2-1: Canterbury operative district plan zones of the surrounding area

The Project has been prioritised for delivery as part of the Roads of National Significance (RoNS) in the Government Policy Statement (GPS) on Land Transport 2024. The upgrade of the Pegasus intersection, shown in Figure 2-2, will support increased traffic from the bypass and significant growth in the surrounding areas.

[2] Enterprise North Canterbury - Woodend, Pegasus and Ravenswood, https://enterprisenorthcanterbury.co.nz/invest/woodend-and-pegasus/

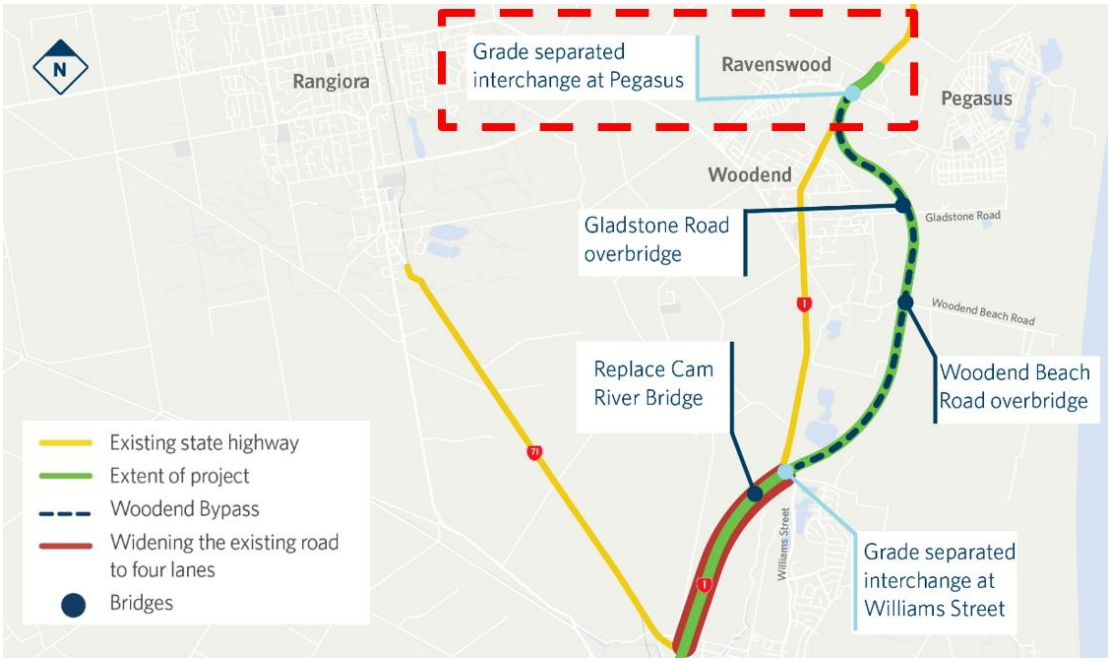

Figure 2-2: Location of the Pegasus Interchange (Source: NZTA)

In 2013, as part of the original scheme design that informed the Project's designation, an upgraded double-lane roundabout (Figure 2-3) was proposed for the intersection[3]. However, traffic modelling[4] carried out in 2024 as part of the Investment Case found the roundabout would not perform adequately with updated traffic forecasts. It also raised safety concerns for pedestrians and cyclists crossing the state highway. Ongoing growth in housing and commercial development, especially in the Ravenwood area, is expected to increase traffic demand on Bob Robertson Drive beyond the roundabout's design capacity. The existing roundabout at the intersection of Pegasus Boulevard, Bob Roberston Drive and SH1 was constructed separately to this project.

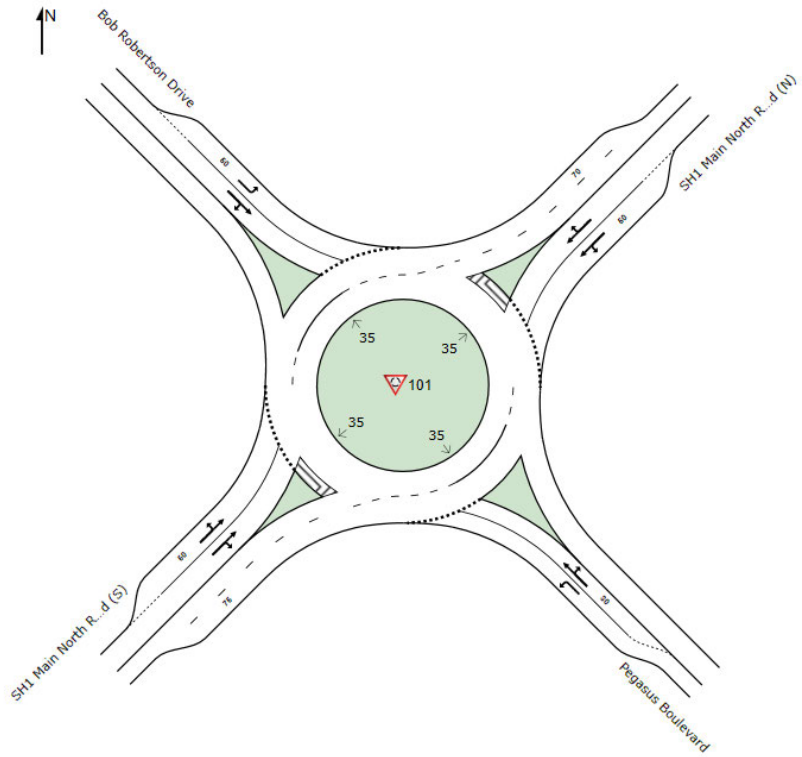

Figure 2-3: Previously Proposed Pegasus Roundabout Layout (Designation Scheme Design)

[3] Integrated Transport Assessment State Highway 1: Woodend Corridor, MWH, October 2013
[4] B2P Summary Note - Pegasus Interchange Future Proofing Rev B, Jacobs, 12 September 2024

As a result, a new grade separated interchange layout, shown in Figure 2-4, was proposed in the Investment Case due to the high volume of traffic and improved provision for pedestrians and cyclists. The interchange connects the four-lane motorway to a two lane over bridge with lane drop and lane gain via on and off ramps. The intersection is controlled with a signalised diamond interchange.

A key feature of the interchange design is the introduction of shared user paths and crossings, which link Pegasus town with Ravenswood. The shared user connection establishes a primary route along the southern side of Pegasus Boulevard/Bob Robertson Drive, with road crossings to the northern side at the Pegasus signalised interchange, connecting to adjacent land use and bus stops.

The proposed interchange design accommodates over-dimensional vehicle access at Pegasus and William Street, which would encourage heavy vehicles to utilise State Highway 1 and the Woodend Bypass. This would enable a reduction in traffic congestion within the Woodend township.

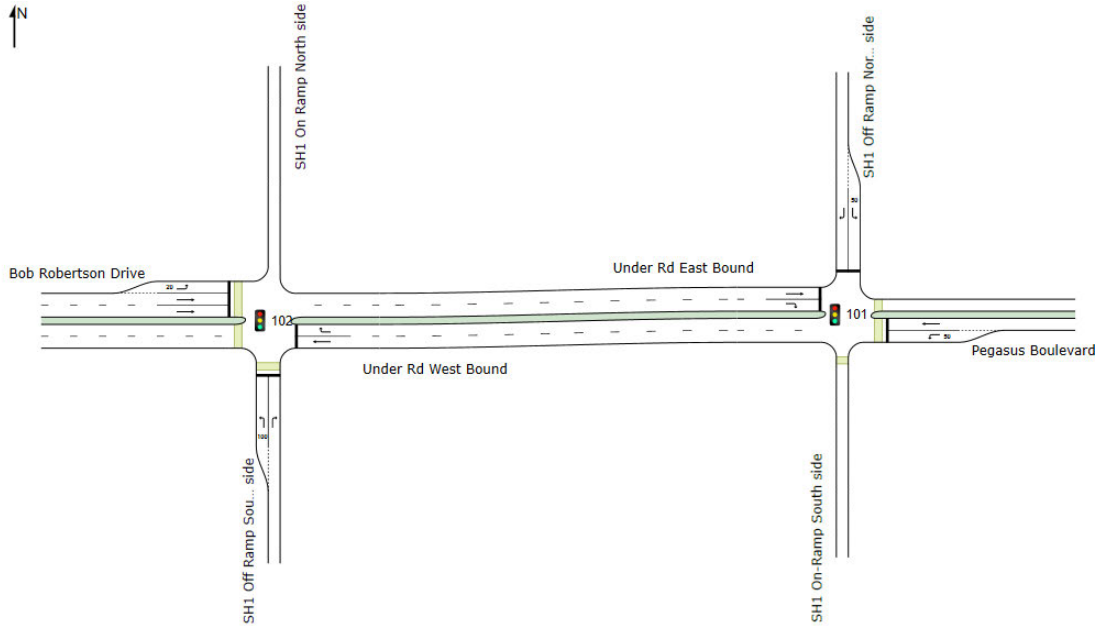

Figure 2-4: Proposed Pegasus Interchange Layout (Investment Case Design)

2.1 Wider Project Benefits

The proposed interchange design supports the wider project benefits, identified in the Investment Case and outlined in the draft Belfast Pegasus Motorway Economic Impact Assessment report.

The Project can be seen as a catalyst for broader regional and national economic performance across Christchurch and Canterbury, by improving connectivity, labour mobility, and freight efficiency, and reinforcing Canterbury's role as the economic engine of the South Island, to align with national infrastructure goals to support regional growth, resilience, and productivity[5].

The Investment Case sets out the case for change, along with a range of benefits, measuring the success of the project. These benefits are summarised in the sections below.

2.1.1 Improved Transport Efficiency and Reliability

With Christchurch serving as the South Island's primary economic hub, the efficient movement of people and goods within and beyond the region is critical. The project will divert through-traffic away from the increasingly congested township of Woodend, thereby improving travel times and reducing freight delays.

The existing layout has at grade intersections along the length of the project, a variable safety speed limit (70 km/hr) at Pineacres, a mid-block signalised pedestrian crossing in Woodend and the Pegasus roundabout

[5] Extracted from the draft Belfast Pegasus Motorway Stage 2 Fast Track Economic Impact Assessment, August 2025.

intersection. Traffic delays occur at the two-to-one lane bottleneck north of Lineside Road, at the intersection speed zone at Pineacres and the 50 km/hr speed limit change entering Woodend. The corridor often experiences a 1.5 minute to 4 minute delay during peak periods.

The side road intersections provide access to residential, commercial, industrial and social destinations and often experience high delays, up to 15 minutes during peak periods, due to the steady platoon of traffic along SH1. There are often very few appropriate gaps for side road users to enter the corridor, often leading to driver frustration, increasing the safety concerns of this corridor.

The project provides travel time and reliability benefits for journeys to Pegasus and the Ravenswood activity centre and beyond. Travel time and reliability benefits are specifically related to four lani../ng SH1 north of Lineside Road, providing a free flowing and reliable travel time through to Pegasus with a travel time saving of at least 2.3 minutes from baseline. Off peak times, the project provides reliable 3 minute travel time saving along SH1, with up to 10 minutes saving during peak commuter times.

2.1.2 Reduced Severance and Improved Accessibility

SH1 runs through the centre of the Woodend township with schools, shops and people living along the corridor. High traffic volumes, including freight, causes high delays on sideroads resulting in poor access along the state highway corridor.

There is one signalised pedestrian crossing across SH1, which is adjacent to Woodend School. There are no other designated crossing locations nor signalised intersections within Woodend. The lack of crossing opportunities increases severance along the state highway corridor, particularly through Woodend.

Connectivity between Pegasus and the Ravenswood activity centre is impeded by the existing state highway roundabout where pedestrians and cyclists are unable to safely or efficiently cross SH1.

The bypass is expected to reduce traffic demand on the existing SH1 from 21,000 vehicles per day (3,000 trucks) today to around 8,000 vpd (300 trucks) through Woodend on opening of the project.

The revocation of SH1 is expected to include changes to the form and function of the existing SH1, particularly through Woodend town centre, encouraging traffic to use the bypass, improving access and reducing severance along the existing SH1 between housing growth areas, the Woodend town centre and Ravenswood key activity centre .

Grade separating the Williams Street and Pegasus interchanges enable improved connectivity for the local community, especially for pedestrians and cyclists. With a decrease in traffic demand within Woodend there is the opportunity to develop a more vibrant town centre with increased local activity.

The project is expected to encourage up to 100 new pedestrian/cyclist to travel between Pegasus and Ravenswood.

2.1.3 Improved Safety

There has been a total of 280 crashes over a 10-year period between 2014 and 2023. These crashes resulted in 3 fatalities and 25 serious injuries. The increasing traffic volumes along the SH1 corridor results in increased conflict and frustration leading to crash consequences. Crashes within the Woodend township account for 28% of crashes including a pedestrian fatality.

The project will divert through-traffic away from the increasingly congested township of Woodend, thereby enhancing road safety and reducing the crash risks at local side road intersections along the existing SH1 corridor.

The state highway improvements will deliver a 4* KiwiRap corridor and reduce state highway deaths and serious injuries from 5.6 pa to 1.25 pa at opening of the project.

3 Project Scope Comparison

The key transport features of the original designation scheme design and the proposed 30% design for consenting, which is a modification of the Investment Case interchange design, are outlined below to identify where changes have been made – these are highlighted in green. The only change noted which will have an effect on the surrounding transport network is the change in layout of the Pegasus Boulevard intersection of the Interchange.

Table 3-1: Original Designation Scheme versus Proposed 30% Design Scope Comparison

	Scheme Design[6]	30% Design
Focus	The focus is on enhancing capacity, safety, multimodal connectivity, and community outcomes within a comprehensive delivery framework.	
Corridor Length	Eleven kilometres, of which 6km is the Pineacres to Pegasus bypass	
Speed Limit	100 km/h generally 80km/h from Gladstone Road to Pegasus Roundabout and north to the SH1 tie in	100 km/h generally 80km/h from south of Pegasus Interchange northwards to the SH1 tie in
Mainline	4 lanes through the SH1/SH71 Lineside Road interchange to north of Pegasus Roundabout Widening of existing SH1 between Lineside Road interchange and Williams Street Woodend Bypass to the east of SH1 between Williams Street and Pegasus Boulevard	
Pegasus Interchange	Upgraded two-lane circulating roundabout	2 lane flyover of SH1 with signalised ramp intersections – full diamond interchange Two stage pedestrian crossings across Bob Robertson Drive and Pegasus Boulevard Seven phase signalling design Lane Extensions
Gladstone Road	Overbridge	
Woodend Beach Road	Overbridge	
Williams Street	Grade Separated Interchange (South facing ramps)	
Cam River Bridge	To be replaced	Cam River Bridge to remain and utilised as NB off ramp New bridge over Cam River for mainline and SB on ramp
Kaiapoi River Bridge	To be strengthened	

[6] https://nzta.govt.nz/assets/About-us/docs/oia-2025/oia-17133-attachment.pdf

4 Model Specifications

SIDRA modelling of the Pegasus Interchange has been undertaken utilising forecast demands from the Christchurch Assignment and Simulation Traffic (CAST) model. The model, utilising future forecast traffic demands, only allows for certain levels of employment and population growth at Ravenswood. It is understood that these are almost certainly under-estimated in light of recent and ongoing commercial development.

The 2048 volumes were conservatively rounded up to the nearest 50 vehicles per peak hour in response to uncertainties related to development within the Ravenswood area. The figures below show the 2048 AM and PM peak volumes modelled.

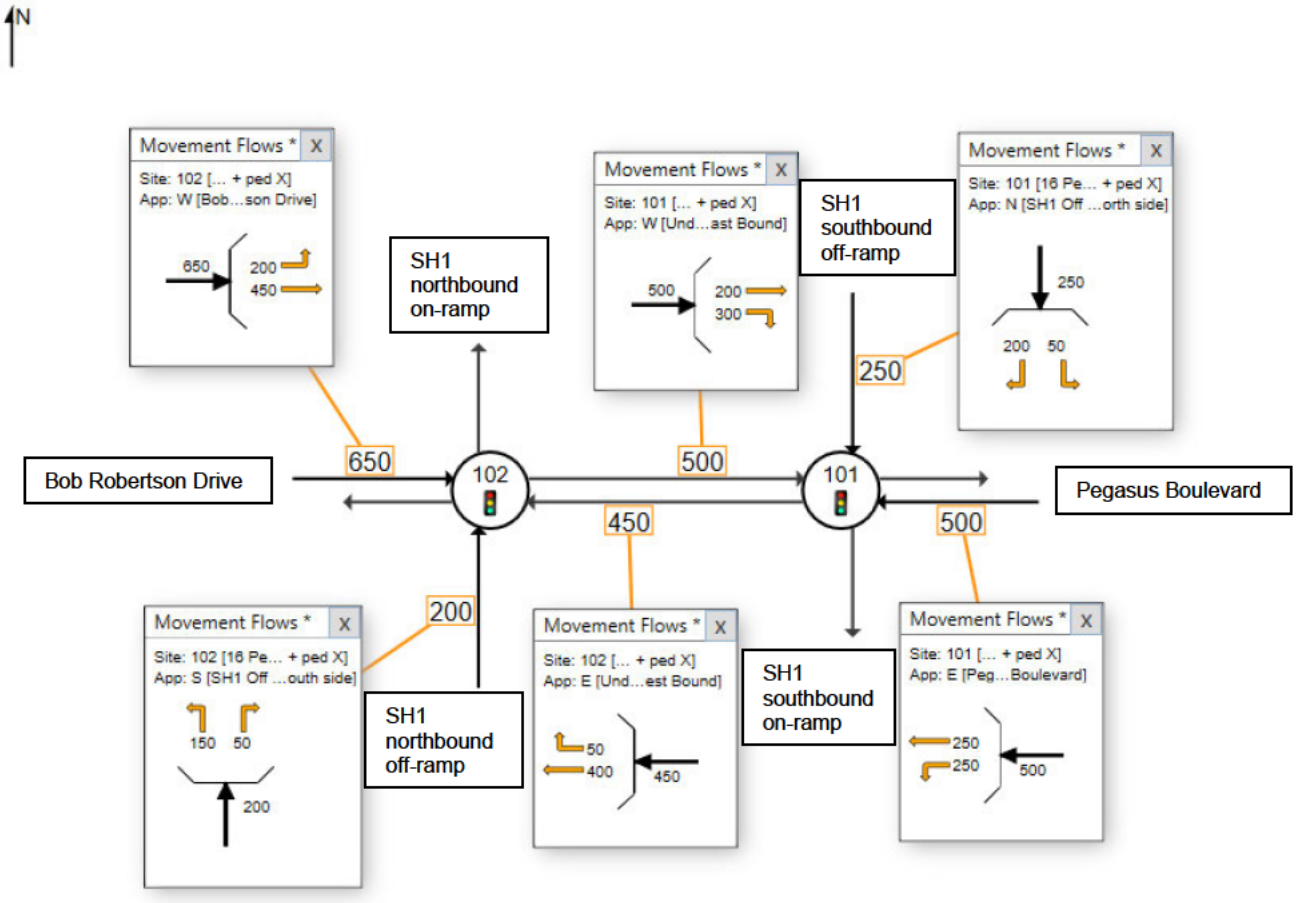

Figure 4-1: 2048 traffic volumes for AM peak hour

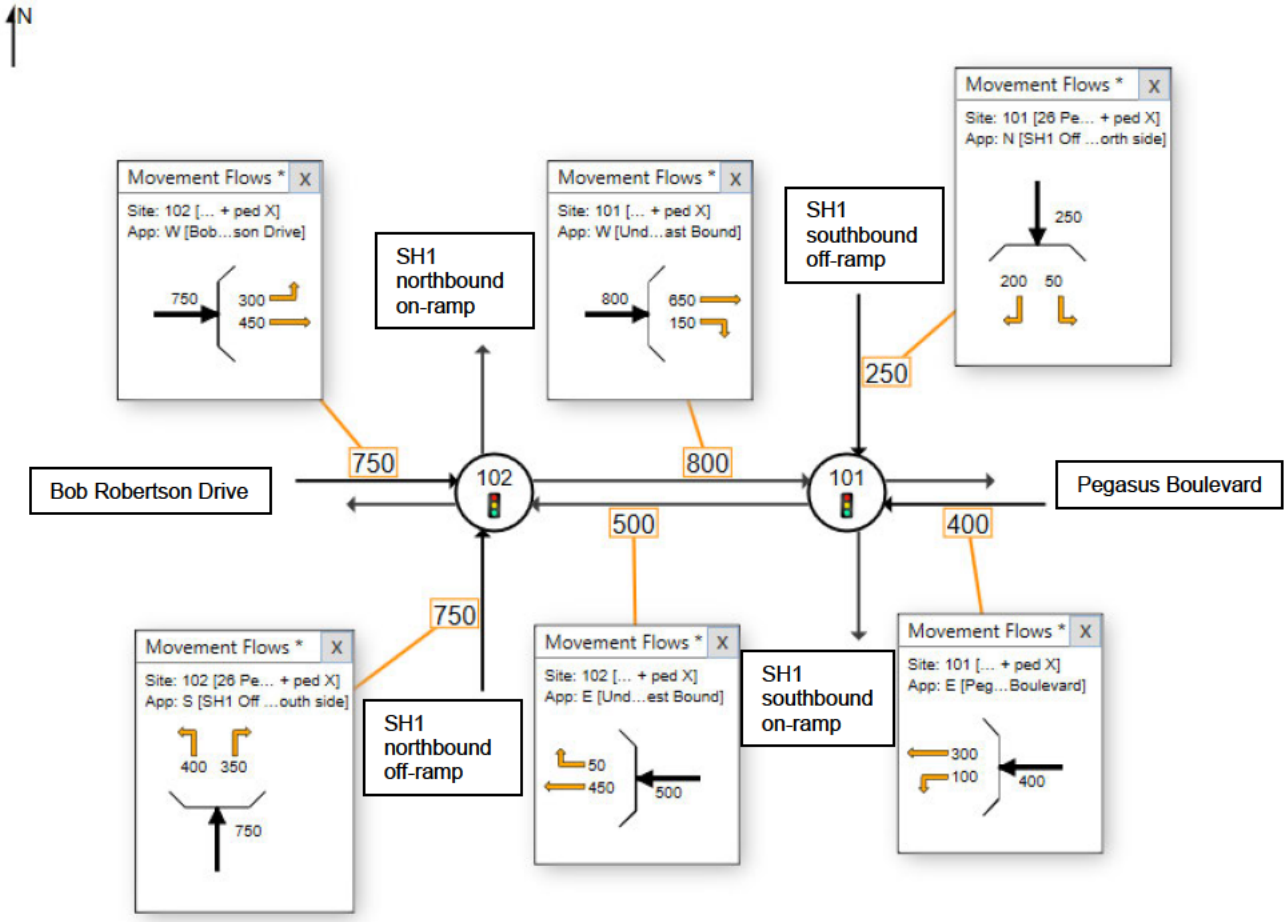

Figure 4-2: 2048 traffic volumes for PM peak hour

The traffic flow pattern identified is:

- The predominant AM peak traffic flow is southbound on SH1
- The predominant PM peak traffic flow is northbound on SH1
- The PM peak hour traffic flow is the governing peak period with high traffic volume conditions observed on the off-ramps and in the eastbound direction.

5 Performance of Proposed Signalised Grade Separated Interchange

A range of alternative options were tested to develop, what is considered to be, the most balanced interchange design to take forward to the 50% design stage. A signalised grade separated interchange will allow free flow traffic on SH1 with no delays related to the interchange expected.

The option recommended, shown in Figure 5-1 below, combines optimal traffic performance (predicted DoS and queue lengths) with enhanced safety and limited additional physical infrastructure. The option utilises shared lanes and accommodates the projected 2038 proxy opening year volumes. It can be further refined and optimised to achieve acceptable traffic performance for the projected 2048 future year volumes.

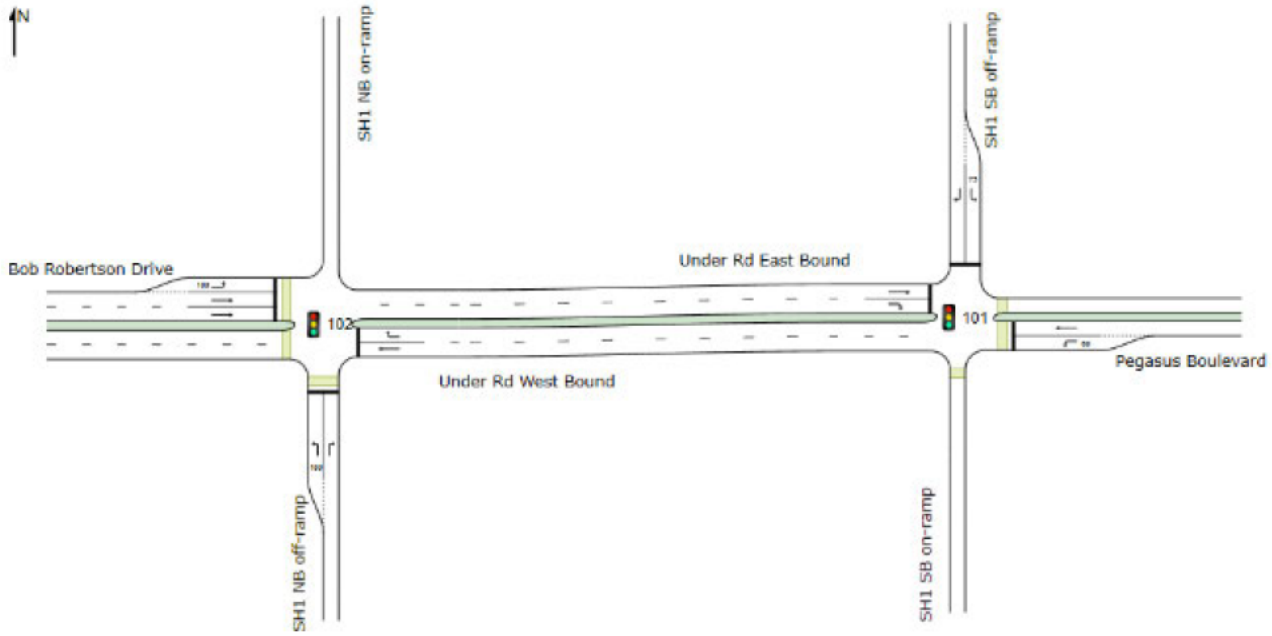

Figure 5-1: Recommended Option interchange design

The option incorporates two stage pedestrian crossings at Bob Robertson Drive and Pegasus Boulevard, extends the left turn lanes on both the eastern and western interchange approaches and includes a shared through and left lane on the eastern Pegasus Boulevard approach and a shared right and left lane on the SH1 southbound off ramp.

The model results show that the signalised intersections maintain acceptable performance levels across all approaches during both peaks. The Bob Robertson Drive approach shows significant improvement when compared with the roundabout design. In this scenario, average delays on Bob Robertson Drive were 29 seconds in the AM peak and 38 seconds in the PM peak for left-turning traffic, while through traffic experienced delays of 29 to 33 seconds. Delays on other key approaches, such as Pegasus Boulevard and the SH1 off-ramps varied with the highest 195 seconds for the left turn from the SH1 off ramp on the south side.

Table 5-1: Summary of modelled intersection performance

Location	Direction (lane length))	AM				PM			
		Average Delay (s)	95% Queue Length (m)	DoS	LOS	Average Delay (s)	95% Queue Length (m)	Dos	LOS
Pegasus Boulevard	L (60m)	51	98	0.697	D	46	73	0.4	D
	T (500m)	45	94	0.635	D	41	78	0.407	D
SH1 Southbound Off Ramp	L (75m)	45	45	0.329	D	50	51	0.328	D
	R (500m)	46	46	0.329	D	51	52	0.328	D

Location	Direction (lane length))	AM				PM			
		Average Delay (s)	95% Queue Length (m)	DoS	LOS	Average Delay (s)	95% Queue Length (m)	Dos	LOS
Under Road East Bound	T (45m)	2	8	0.201	A	2	38	0.627	A
	R (45m)	22	74	0.504	C	28	41	0.287	C
SH1 Northbound Off Ramp	L (100m)	43	54	0.387	D	56	195	0.827	E
	R (500m)	41	17	0.13	D	50	156	0.722	D
Under Road West Bound	T (45m)	5	26	0.292	A	8	38	0.352	A
	R (45m)	23	26	66.167	C	28	37	0.352	C
Bob Roberston Dr	L (100m)	29	57	0.498	C	38	113	0.751	D
	T (122m)	29	70	0.682	C	33	81	0.666	C

6 Performance of Original Roundabout Scheme Design

Due to changes in land use assumptions since the original modelling for the roundabout was completed, the only comparable scenarios are the 2048 PM peak case for the signalised intersection and the 2044 PM peak case for the roundabout. Table 6-1 below outlines the differences in traffic forecasts used in the two models. When the through traffic on SH1 is excluded, both scenarios experience a similar volume of traffic at the intersection.

Table 6-1: Traffic volumes used

Location	Direction	Signalised Intersection (2048 PM)	Roundabout (2044 PM)	Percentage Difference
SH1 Interchange East	T	650	851	23.6%
	R	150	283	47.0%
SH1 Off Ramp East	R	200	101	-98.0%
	L	50	41	-22.0%
Pegasus Boulevard	T	300	199	-50.8%
	L	100	145	31.0%
SH1 Interchange West	T	450	300	-50.0%
	R	50	29	-72.4%
SH1 Off Ramp West	R	350	486	28.0%
	L	400	414	3.4%
Bob Robertson Dr	T	450	365	-23.3%
	L	300	235	-27.7%
SH1 Northbound	T	-	844	-
SH1 Southbound	T	-	749	-

The modelled output for the roundabout, as shown in Table 6-1 and Figure 6-1, indicates a high level of congestion on the Bob Robertson Drive approach which operates at LOS F, while the remaining approaches generally achieve LOS B to D.

The most notable difference is the queue length and average delay on the Bob Robertson Drive approach. In the roundabout scenario, this approach experiences an average queue length of 1,213 metres and a delay of 413 seconds, compared to only 127m and 42 seconds in the signalised intersection scenario.

Additionally, the SH1 approach in the roundabout scenario shows a substantially longer queue of 112m (North) and 179m (South), even when compared to the combined queue lengths from the equivalent movements in the signalised intersection scenario, including those through the underpass.

Table 6-2: Summary of modelled roundabout performance, 2044 PM peak

Location	Direction	Average Delay	Queue Length	LOS
Pegasus Boulevard	L	11.2	13.3	B
	T	8.7	16.6	A
	R	15.4	16.6	B
SH1 (North)	L	12.8	29.9	B
	T	20.9	111.9	C
	R	29.8	111.9	C
Bob Robertson Dr	L	35.6	55.6	D
	T	548	1213.2	F
	R	553.7	1213.2	F

Location	Direction	Average Delay	Queue Length	LOS
SH1 (South)	L	6.7	28.3	A
	T	13.8	178.8	B
	R	20.7	178.8	C

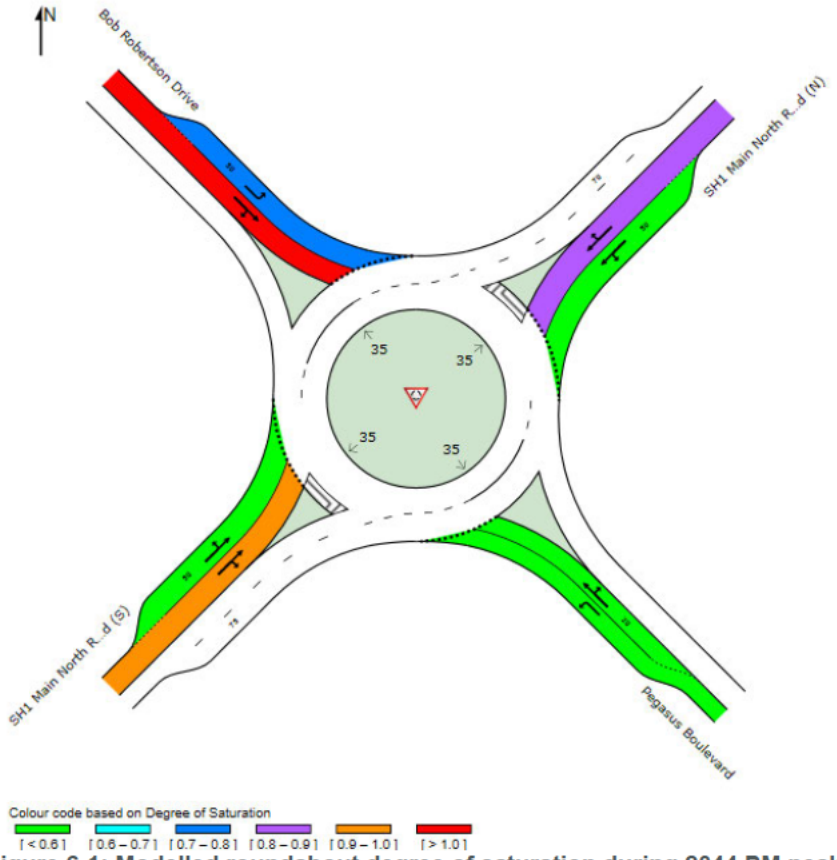

Figure 6-1: Modelled roundabout degree of saturation during 2044 PM peak

7 Comparison between Proposed Interchange Design and Original Roundabout Scheme Design

The performance of the modelled roundabout in the 2044 PM peak has been compared with the interchange performance in the 2048 PM peak to illustrate the differences in operational performance and safety.

The roundabout incorporates the SH1 mainline flow, delaying all state highway traffic at all times (either geometrically or due to interactions with other traffic). In contrast, the operation of the grade separated interchange ensures all through state highway traffic is separated from turning traffic, and therefore does not experience delays from the interchange.

Delays and congestion at a roundabout are typically shared when flows are balanced, so level of service of specific approaches or movements can be higher as shown in Table 6-2, with the Pegasus Boulevard and SH1 southern approaches operating at LOS A-B in the 2044 PM peak. However, when roundabout flows are unbalanced, such as when there is a commuter peak in one direction, the level of service can quickly deteriorate as gaps are not created in circulating traffic to allow side road queues to clear. This is forecast to occur on SH1 north and Bob Robertson Drive in the PM peak period, with SH1 north experiencing LOS C-D and 100m+ long queues and Bob Robertson Drive experiencing LOS D-F and 1.2km long queues.

Delays and congestion at a signalised grade separated interchange are shared based on the priority assigned to each movement, so level of service is typically lower across all approaches to ensure no specific movement experiences significant delays. Priority can be changed through signals software to accommodate commuter peaks and manage changes in traffic patterns across the day, reducing the delays and queues which would be experienced by the minor flows at a roundabout in the peak traffic periods.

At 2048 the interchange performance forecast in the PM peak is generally LOS D across all approaches, with some movements operating at LOS A or C. The worst movement is the left turn from the SH1 south side off ramp which operates at LOS E. The interchange redistributes delays across all movements to lower overall LOS but addresses the significant queuing experienced at the roundabout on the Bob Roberston Drive approach reducing queue lengths from 1.2km to a <120m.

The benefits of the signalised grade separated interchange over an at-grade roundabout positively contribute to the wider project benefits (section 2.1), and are summarised:

- SH1 through traffic is not delayed by the operation of the interchange
- Grade separation removes conflicts between turning and crossing traffic at the interchange and SH1 through traffic
- Priority, movement and conflicts are manged by the traffic signals operation which reduce the opportunity for conflicts by separating opposing vehicle movements in time
- Access onto the SH1 corridor is managed through the interchange traffic signals
- Pedestrians crossing the interchange have priority over other traffic when crossing through operation of the signalised crossings, improving the safety of pedestrians

8 Design Speed

As part of the Investment Case, Jacobs assessed different design speeds to support a decision around whether the corridor should have a posted speed limit of 110km/h. Jacobs prepared a summary note, Design Speed Northern Section Summary Note, which summarised their assessment and recommended an 80km/h design speed for the northern curve just south of the Pegasus Interchange. This decision was based on the following reasons:

- Provides consistency with the posted speed to the north of the proposed interchange and slows motorists over the interchange, which provides a strong visual cue for speed reduction.
- It remains within the current designation reducing programme and cost risks.
- It provides the best value for money solution at the northern curves due to providing a shorter bridge due to the reduced speed and vertical curve requirements.

The project team agrees with this decision, with this section remaining at an 80km/h design speed for Pre-Implementation and detailed design.

9 Traffic Management

Traffic effects during construction were authorised by the original designation and these effects have not changed as a result of the updated design, including the changes to Pegasus interchange.

The designation requires a Traffic Management Plan (TMP) to be prepared and certified by WDC prior to construction works commencing. Once a contractor is appointed a TMP will be finalised to confirm traffic effects and management mitigation during construction inline with the conditions under the designation.

10 Tolling

Following the approval of the Belfast to Pegasus Motorway and Woodend Bypass investment case, NZTA have been undertaking tolling assessments on all RoNS projects. Consultation on the proposal to toll the motorway commenced on 12 August 2025 based on a scheme that proposes two toll points:

- North of Pineacres (the Woodend Bypass section)
- South of Pineacres (between Pineacres and SH71 Lineside Road).

The prices being consulted on are $1.25 at each toll point for light vehicles and $2.50 for heavy vehicles.

NZTA has advised that 'the existing SH1 route through the Woodend township (Main North Road) will be the signposted alternative untolled route, however there is an expectation that drivers will 'tend to spread out across the wider road network based on their preferences, destination and local knowledge', which 'may result in some drivers choosing to stay on existing roads instead of using the Belfast to Pegasus Motorway and Woodend Bypass route. Traffic modelling shows that when the road opens, tolling could result in around half of the expected motorway users continuing to use the current route or seeking other options.'

Further modelling has been undertaken by QTP in July 2025 and updated traffic volumes have been reported as a result of this work. Based on the updated modelling, under a tolled scenario, there are some changes to movements and traffic demand at the Pegasus Interchange, however, the modelling has used a conservative approach to traffic volumes which sufficiently allows for an increase in demand from tolling. The modelling shows that the Pegasus Interchange performs appropriately based on the expected demands from this tolling scenario.

11 Summary of Findings

The assessment of the traffic effects of the proposed Pegasus Interchange confirms that the signalised diamond layout, as tested and proposed by Jacobs in 2024, performs better than the previously proposed roundabout configuration, particularly under the projected 2048 traffic volumes. The interchange layout also addresses pedestrian safety concerns through the provision of controlled crossings and therefore, overall, provides a better balance of safety and operations compared to the roundabout.

The modelling undertaken has been based on volumes from the Christchurch Assignment and Simulation Traffic (CAST) Model and reporting from QTP. The future forecast traffic demand only allows for certain levels of employment and population growth at Ravenswood and it is understood that these are almost certainly under-estimated in light of recent and ongoing commercial development. The models developed represent scenarios based on current best estimates and assumptions, but actual future conditions may vary due to changes in land use, travel behaviour, infrastructure developments, and other external factors.

Further optioneering has identified a recommended interchange design to take forward for further design optimisation at the 50% design stage. The new design accommodates the projected 2038 proxy opening year volumes and can be further refined and optimised, for example by adding shared lanes, to achieve acceptable traffic performance for the projected 2048 future year volumes.

Notable interchange performance indicators include:

- A signalised grade separated interchange will allow free flow traffic on SH1 with no expected delays related to the interchange.
- The Bob Robertson Drive approach, which experienced critical performance issues in the base roundabout layout, showed significant improvement, achieving LOS C with average delays of 27 seconds (AM) and 42 seconds (PM) for left-turning traffic. Through traffic delays on the same approach were also substantially reduced to 32-40 seconds.
- Queue lengths were generally within acceptable limits. The most critical queueing was observed on SH1 northbound off ramp which reached 203 metres in the PM peak exceeding the lane length. However, the queue lengths on Bob Robertson Drive reduced significantly, to <130m, which is a marked improvement compared to the roundabout scenario tested, where the same approach experienced a 1,213 metre queue and 413 second delay, corresponding to LOS F.
- Other approaches, such as those from Pegasus Boulevard and the SH1 southbound off-ramp, also performed satisfactorily with the signalised layout, with delays remaining under 90 seconds and queue lengths within their available storage.

Comparatively, the roundabout layout tested under the 2044 forecast traffic volumes showed a much higher degree of congestion on the Bob Robertson Drive and SH1 approaches, despite similar total local traffic volumes. The roundabout scenario resulted in LOS F for several critical movements, excessive queue lengths, and substantially higher delays, confirming its inadequacy for long-term traffic demands.

Overall, it is considered that the 30% design does not materially change the transport effects of the Project relative to the scheme design supporting the original Project designation process. If anything, the updated interchange design at Pegasus will result in a net positive outcome for transport effects.

Sensitivity analysis is currently being conducted to assess the potential impacts of tolling and additional growth in the wider area (e.g., Ravenswood, Stokes) on traffic flow, distribution, and the resulting performance of the Pegasus interchange and surrounding local network. This analysis may indicate some additional delays or queuing compared to the outcomes presented in this report. Nevertheless, the full grade-separated interchange design remains the optimal solution, offering the best balanced performance by minimizing impacts on both the State Highway and adjoining local roads, and ultimately delivering a superior outcome compared to the previously proposed roundabout design.

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