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Comment under the Fast-track Approvals Act 2024

Applicant: New Zealand Transport Agency

Project: State Highway 1 North Canterbury – Woodend Bypass (Belfast to Pegasus)

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Draft conditions of consent can be sent to the email address above for comment.

Introduction

- 1 This comment is made by Ravenswood Developments Ltd (**RDL**) in respect of the fast-track approval application lodged by the New Zealand Transport Agency Waka Kotahi (**NZTA**) for the Woodend Bypass Project.
- 2 RDL supports strategic transport infrastructure that enables safe, efficient movement of people and goods and that aligns with planned urban growth. This comment is made to outline Ravenswood's interest in the proposed Woodend Bypass Project and to address matters of relevance to the planning, delivery, and integration of the project with existing and planned development at Ravenswood and in the wider Woodend–Rangiora area.

Ravenswood

- 3 RDL is the master developer of Ravenswood, a large-scale, comprehensive development comprising residential neighbourhoods, a substantial business and industrial precinct, open space and community facilities, located at North Woodend adjacent to State Highway 1 (**SH1**). The commercial precinct is located at the eastern side of the development, adjacent to SH1. It is intersected by Bob Roberston Drive, which runs in an east-west alignment. Garlick Street and Kesteven Place provide north-south connections, roughly parallel to SH1.
- 4 Bob Robertson Drive and Garlick Street are classified by the Waimakariri District Plan Road Hierarchy as Collector Roads. Collector Roads have a dual role of providing a significant property access function, and being roads that collect and distribute traffic between neighborhoods and arterial roads. SH1 has a Strategic Road classification with an expected function to cater especially for longer trips between districts and regions.

- 5 A recent plan change and subsequent Waimakariri District Plan (**WDP**) review confirmed Ravenswood as the North Woodend Key Activity Centre (**KAC**), and provided for development of the 20.74ha hectare commercial precinct, which is subject to Town Centre and General Industrial zoning.
- 6 KACs are defined through the regional and district planning framework as commercial centres identified as focal points for employment, community activities and the transport network, and which are suitable for more intensive mixed use development.¹ They are also directed to be high quality centres that incorporate good urban design principles.² The identification of KACs are a critical component within the Greater Christchurch land use and infrastructure framework, which has been developed to, amongst other things, provide for the integration of strategic infrastructure with land use development.³
- 7 The purpose of the Town Centre Zone is to provide for the Waimakariri District's principal employment and commercially focused areas. They are the primary focal points for community and other activities at the highest density of development.⁴
- 8 This combined direction for KACs and the Town Centre Zone was given extensive consideration through the Ravenswood plan change and WDP review processes. As a result, specific direction for the Ravenswood KAC is provided in Policy DEV-NWD-P2, as follows (our **emphasis**):

Provide for development within the emerging Key Activity Centre at North Woodend that:

1. provides a focal point for a wide range of retail, commercial, service and community activities, as well as employment opportunities;
2. ensures an attractive, compact and cohesive town centre with a unique sense of identity and a high quality of design, that is integrated with surrounding land uses and adjoining residential areas and public open space;
3. enables larger floorplates and **accessible car parking** that is integrated with surrounding land use, including off-street parking areas for sites with frontage to the principal shopping street, to achieve efficient utilisation of town centre land, recognising the role and function of North Woodend as an emerging Key Activity Centre, whilst creating and maintaining a high level of amenity in the centre;
4. is planned, integrated and co-ordinated in accordance with the Outline Development Plan in DEV-NWD-APP2 and its associated text to provide:
 - a. a principal shopping street and town square/reserve as key elements of the character and amenity, a focal point for activity within a pedestrian focussed environment, and for the provision of reserve space for the wider development;

¹ Canterbury Regional Policy Statement, Definition – Key Activity Centres; Partially Operative Waimakariri District Plan, Definition – Key Activity Centre

² Canterbury Regional Policy Statement, Objective 6.2.1(2), Policy 6.2.5

³ Canterbury Regional Policy Statement, Objective 6.2.1(9)

⁴ Partially Operative Waimakariri District Plan, Town Centre Zone Introduction

- b. **high quality, attractive and engaging streetscapes that reinforce the function of streets, enhance amenity and accessibility of the town centre, and maximise integration with building frontages;**
- c. public open spaces which enhance connectivity;
- d. **a legible and highly connected network of well-designed roads, internal vehicular and pedestrian linkages and the principal shopping street, public open spaces, and crossing points that provide high levels of access, are responsive to surrounding activities, and include at least one north-south connection between Bob Robertson Drive and the Taranaki Stream corridor;**
- e. **supports safe connection between the site and Bob Robertson Drive, Garlick Street and Aitkin Street the future function of those roads;**
- f. **provision of a connected network of walkways and cycleways that promotes walking and cycling as a means of travel:**
 - i. **within the Town Centre zone;**
 - ii. **between developments along Bob Robertson Drive;**
 - iii. linking the Town Centre zone land to the Taranaki Stream;
 - iv. linking the residential neighbourhoods of Ravenswood and Woodend to the town centre;
 - v. **linking with pedestrian desire lines through car parking areas;**
- g. **identifies opportunities for Environment Canterbury/Metro to provide public transport services and infrastructure in the locations identified on the Outline Development Plan as passenger demand grows.**

- 9 A copy of the Outline Development Plan (**ODP**) contained in the Waimakariri District Plan to provide direction for development of Ravenswood is provided in **Appendix 1**. We note that the ODP identifies the location of intended public transport infrastructure (yellow stars) on Bob Robertson Drive and Garlick Street, and pedestrian linkages (green arrows) across Bob Robertson Drive, Garlick Street and Kesteven Place.
- 10 As is evident from Policy DEV-NWD-P2 and the ODP, the transport, access and connectivity arrangements within Ravenswood have been identified as being of primary importance to the future development of the centre and delivery on the expectations for a KAC.
- 11 Existing development within the KAC includes a New World supermarket, McDonalds restaurant, BP and Gull service stations, Harvey Norman, and Ravenswood Central, which is under development but currently provides a range of hospitality, health services and commercial services, including five restaurants, a café, pharmacy, dentist, medical practice, pilates studio, gym, and two real estate agencies. A further 7.8ha is currently undeveloped but has been zoned for a town centre development, comprising of retail, commercial services, food and beverage,

and a town square. At full development, it is anticipated that Ravenswood will provide 25,000m² GFA of retail floor space, in addition to other commercial and community activities.

- 12 Significant additional land in proximity to Ravenswood has been zoned for urban development through the recent Waimakariri District Plan review. This includes the Gressons Road development, which will provide for approximately 1,500 houses to the immediate north of and connected by a number of roads to Ravenswood, and additional development areas between Rangiora and Ravenswood. Bob Robertson Drive provides a direct road connection from SH1 to Rangiora Woodend Road, to access Rangiora to the west.
- 13 The location of Ravenswood means that its development and future function is directly impacted by its connection to SH1 and associated local arterial connections. RDL therefore has a strong interest in how the Woodend Bypass is designed and integrated with existing and planned land use in Ravenswood and adjoining areas.

Key matters of interest in the Woodend Bypass project

- 14 The Woodend Bypass Project has the potential to play a significant role in:
 - (a) The provision of safe, efficient and legible access from SH1 to Ravenswood, including for visitors to the commercial precinct;
 - (b) Traffic patterns and access arrangements within Ravenswood, impacted by traffic generated in relation to both Ravenswood and adjoining areas;
 - (c) The viability and success of the Ravenswood commercial centre, and its ability to deliver on the expectations of a KAC; and
 - (d) More broadly, supporting or constraining the orderly, integrated development of urban growth areas identified through statutory planning processes.
- 15 RDL is particularly concerned that the Woodend Bypass Project has given little consideration to, and provides only limited assessment of, the implications of the Project for the development and operation of the Ravenswood KAC, despite the strategic importance of KACs to urban form, land use and infrastructure planning, and the significant investment anticipated at Ravenswood.
- 16 Specific points of interest are addressed in further detail below.

Potential impacts of tolling

- 17 NZTA have undertaken consultation, under the Land Transport Management Act 2003, on the potential for tolling of the Bypass. RDL understand that a decision on tolling is still to be made by the NZTA Board.
- 18 There is a risk that tolling of the Bypass could result in some drivers selecting alternative, untolled routes through local roads, including routes through Ravenswood, resulting in increased traffic volumes.
- 19 Traffic model forecasts provided to RDL by NZTA indicate that Garlick Street, adjacent to the undeveloped commercial area, could be used by approximately 5,000 additional vehicles per day (vpd) compared to an untolled model forecast. This traffic that would otherwise use SH1 as a strategic trip under an untolled scenario, will be using a lower order collector road network intended to provide a key property access role to the KAC. At the total volumes projected for Garlick Street, which could increase from approximately 9,000 vpd without tolls to more than

14,000 vpd with tolls, there will likely be effects on the ability to deliver safe and efficient multi-modal transport access and connections for the KAC.

- 20 RDL also understand this increase in traffic volumes past the KAC combined with changes to traffic routes could have significant adverse effects on the operation of the existing Bob Robertson Drive / Garlick Street / Kesteven Place roundabout (**Ravenswood intersection**) in particular. For this reason, RDL is opposed to tolling. However, while the potential for tolling remains, an assessment of the potential effects of the Bypass must include the effects arising under a tolled scenario.

Pegasus Interchange and integration with the Ravenswood intersection

- 21 The Project includes a signalised grade separated diamond interchange (**Pegasus Interchange**), in place of previous proposals for an upgraded roundabout at the SH1 / Bob Robertson Drive / Pegasus Boulevard intersection.
- 22 The proposed Pegasus Interchange signalised intersection with Bob Robertson Drive is in close proximity to the Ravenswood intersection. RDL has been advised by NZTA that they consider an upgrade to the Ravenswood intersection will be required, with a change from the roundabout control to a signalised intersection proposed by NZTA.
- 23 While the upgrade to the Ravenswood intersection sits outside of the current Project as applied for, given its close proximity to the Pegasus Interchange signals and potential to impact the operation of that intersection, RDL considers that both intersections must be planned, designed and assessed in an integrated manner.
- 24 We note that the Aurecon Transport Assessment for the Project records that "*Further detailed design will refine the interchange geometry and operations, with ongoing works underway to evaluate local network performance to support further development of the recommended option*". RDL is concerned to ensure that this work considers and provides for (or at least, does not preclude) the best option for future upgrade of the Ravenswood intersection. RDL also consider, that the effects of the interchange modifications and potential for tolling on the functioning of multi-modal transport connections to and from the KAC, including maintaining existing and planned access connections, are a key consideration in design for a future upgrade of the Ravenswood intersection.
- 25 RDL has been provided by NZTA a subsequent traffic modelling assessment addendum for the Pegasus Interchange by Aurecon dated 5 December 2025. The report recommends the Ravenswood intersection is redesigned as a major signalised intersection form, with final layout refinements requiring WDC approvals and further stakeholder engagement. It is apparent that the design and reporting gives minimal consideration to addressing adverse effects of the bypass tolling on existing and planned KAC access connections.
- 26 RDL, together with Foodstuffs South Island Properties Limited, has engaged Stantec to assess the operation of proposed signalisation of the Ravenswood intersection as reported in the Aurecon addendum report. Stantec advises in respect of the Ravenswood intersection –

Analysis of the NZTA/Aurecon traffic models, supplemented by additional SIDRA testing and sensitivity analysis, indicates that the proposed signalised intersection does not achieve its stated objectives. Under all tested future scenarios, including NZTA's 2038 and 2048 forecasts:

- The signalised intersection operates at or over practical capacity, with several approaches experiencing severe delay and extensive queuing.

- The longest and most critical queues occur on the eastern approach, with high risk of queue spillback into the SH1 interchange, adversely affecting the strategic road network.
- The signal phasing and lane configuration required to manage conflicting movements, pedestrian crossings, and access constraints further erode intersection capacity, particularly for Kesteven Place and local access movements.
- While traffic signals provide a greater degree of operational control, the analysis demonstrates that this control does not translate into improved network performance or resilience. Instead, congestion is redistributed in a manner that creates operational risk at the interchange and undermines access within the Ravenswood town centre.

27 Specifically with regard to access to established businesses within the Ravenswood KAC, RDL has been advised that the design of a signalised intersection will result in:

- (a) New World and Ravenswood Central restricted to left in / left out on Bob Robertson Drive (currently full movement);
- (b) BP and McDonalds access on Bob Roberston Drive will be left in / left out (currently full movement);
- (c) Gull fuel station access on Bob Roberston Drive will be left in / left out (currently full movement);
- (d) Removal of U-turn opportunity at Bob Roberston Drive / Garlick Street forcing some redistribution of traffic movement in the wider transport network.

28 Stantec's assessment of the operation of the signalised Ravenswood intersection and potential impact on access also identifies that:

The modelling for NZTA indicates the Kesteven Place leg being particularly penalised through signal timing arrangements. The impact of this is as follows:

- Access restrictions on New World car park will place pressure on Kesteven Place access for egress to enable movement in various directions at the signalised intersection.
- As the Kesteven Place queue is forecast to extend well beyond the access, then movements exiting New World onto Kesteven Place will be challenging. Likewise, movements into the BP service station access will not be readily achievable.
- Access to BP and McDonalds to and from Kesteven Place being affected, noting restrictions are also proposed with the signal layout for Bob Robertson Drive.

The west and south approaches show similar issues.

29 RDL is concerned that congestion and access restrictions resulting from the Woodend Bypass Project together with signalisation of the Ravenswood intersection will result in access restrictions that are unworkable for existing businesses and a level of congestion that will significantly impede the movement of people and goods within the centre.

- 30 The west and south approaches referred to by Stantec are the sections of Bob Robertson Drive and Garlick Street adjacent to the currently undeveloped commercial area. This area is to be the subject of extensive investment in the coming years, not only in terms of the retail/commercial development, but also the provision of a public amenities including the town square/reserve and pedestrian focussed principal shopping street. Potential tenants understand that easy access to and from businesses and carparking areas is critical to the success of retail areas. Any impediment to that access has the potential to deter tenants, putting at risk the investment required in this development.
- 31 RDL also considers that the form and function of the proposed signalised Ravenswood intersection is entirely inconsistent with the transportation and urban design principles for the KAC, as set out in Policy DEV-NWD-P2 above, and will fail to deliver the level of connectivity and provision of pedestrian linkages anticipated.
- 32 Stantec have considered alternative configurations for upgraded roundabout at the Ravenswood intersection, and conclude –

In contrast, modified roundabout options, including safe-system, multilane configurations, demonstrate substantially better performance and resilience across the same future traffic scenarios:

- Roundabout options accommodate forecast traffic volumes with lower and more stable delays, even when operating near capacity.
- Queuing is generally contained within the local road network, with reduced risk of spillback into the SH1 interchange.
- The roundabout form better supports pedestrian and cyclist movements through low-speed geometry and simpler crossing arrangements.
- Access flexibility is retained, supporting existing and planned commercial activity consistent with the District Plan objectives.

Sensitivity testing indicates that roundabout performance is less sensitive to uncertainty in toll-road uptake, traffic distribution from the Gressons Road development, and longer-term behavioural change. While congestion may still occur under high-growth scenarios, the roundabout is better able to absorb and manage that congestion without significant effects on the strategic road network.

- 33 A copy of Stantec's draft report is attached as **Appendix 2**. The report is currently in a draft format as it has been subject to initial engagement with WDC technical staff and their consultant peer reviewers on the matters raised.
- 34 The performance, safety, and efficiency of these intersections are interdependent and should be considered holistically to ensure appropriate detailed design of the Pegasus Interchange's signalised intersection with Bob Robertson Drive, and to minimise queuing and spill-back effects, and maintain safe and efficient movement for all road users.

Importance of SH1 access at Bob Robertson Drive and request for signage

- 35 RDL strongly supports the proposed provision of off/on ramps to connect SH1 to Bob Robertson Drive as part of the Woodend Bypass Project.
- 36 As detailed above, Bob Robertson Drive is a key access route serving the Ravenswood residential and commercial development and provides an important connection between SH1 and

local roads. Off/on ramps at this location are critical to ensuring direct, legible, and efficient access to Ravenswood, minimising indirect travel, and reducing the risk of traffic diverting onto less suitable local roads.

- 37 Ravenswood additionally seeks the provision of clear and legible signage ahead of off-ramps, including signage that clearly directs traffic to Ravenswood. In comparison to the previously proposed upgraded roundabout at the Pegasus Interchange, which would slow traffic and provide a clearly legible access at Ravenswood, the grade separated proposal will require that visitors to Ravenswood identify the exit in advance of the development, at full highway speed. Advance signage will assist drivers in making informed route choices and improve safety and network efficiency.

Connection between Garlick Street and the former section of SH1 through Woodend

- 38 RDL supports and emphasises the importance of the proposed connection between Garlick Street and the former section of SH1 / Main Street through Woodend. This connection performs an important local function, providing access between Woodend, Ravenswood, and surrounding residential and business areas, and supporting the efficient distribution of traffic onto the wider local road network.
- 39 Maintaining a well-functioning connection at this location will assist in avoiding less efficient alternative routes and will support resilience within the local transport network, particularly as development in Ravenswood and the wider area continues.
- 40 As described earlier, RDL is concerned that the tolling scenario will create a major uplift in traffic volumes on the connection compared with its defined Collector Road function, reducing the effectiveness of KAC multi-modal transport access.

Conclusion

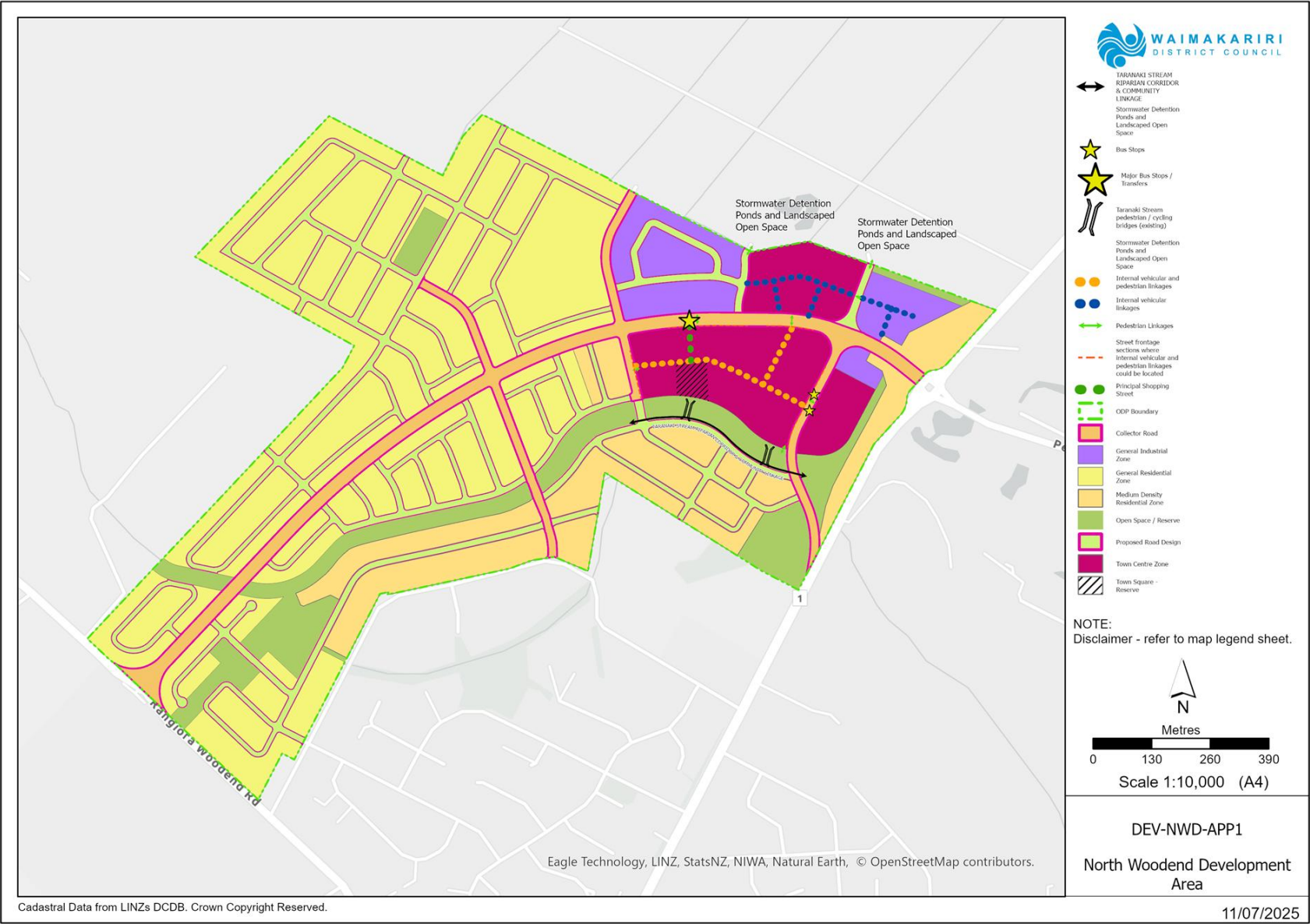
- 41 RDL recognises the strategic importance of efficient nationally and regionally significant transport infrastructure. Critical to the delivery of efficient transport infrastructure is ensuring appropriate integration with surrounding communities and planned growth areas.
- 42 RDL is concerned that planning and assessment of the Woodend Bypass Project to date has not appropriately or adequately considered impacts on the Ravenswood centre. As a result, the Project has the potential to undermine the viability and success of the Ravenswood centre, and delivery on the expectations of it as a KAC.
- 43 RDL is available to provide further information or evidence addressing the matters above, at the Panel's request.

Paul Croft

For Ravenswood Developments Limited

4 May 2026

Appendix 1 - Ravenswood Outline Development Plan



Appendix 2 – Stantec Draft Report

Ravenswood Traffic Layout

Bob Robertson Drive / Garlick Street Intersection Review

Prepared for:
Ravenswood Town Centre Limited

Date:
13 March 2026

Prepared by:
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Revision Record

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Executive Summary

This report reviews long-term intersection control options for the Bob Robertson Drive / Garlick Street intersection at Ravenswood, in the context of future growth, the SH1 Belfast Pegasus Motorway project, and potential toll-road scenarios. The assessment responds to proposals by NZTA to replace the existing roundabout with a signalised intersection, based on forecast increases in traffic volumes associated with motorway tolling and nearby residential and commercial development.

The scope of this report does not assess the suitability of Garlick Street or the Ravenswood network as an alternative toll-avoidance route for SH1. Instead, it adopts NZTA's toll-road forecasts and traffic modelling assumptions as the basis for testing whether the proposed signalised intersection represents a robust and effective long-term solution under those scenarios.

Key Findings

Analysis of the NZTA/Aurecon traffic models, supplemented by additional SIDRA testing and sensitivity analysis, indicates that the proposed signalised intersection does not achieve its stated objectives. Under all tested future scenarios, including NZTA's 2038 and 2048 forecasts:

- The signalised intersection operates at or over practical capacity, with several approaches experiencing severe delay and extensive queuing.
- The longest and most critical queues occur on the eastern approach, with high risk of queue spillback into the SH1 interchange, adversely affecting the strategic road network.
- The signal phasing and lane configuration required to manage conflicting movements, pedestrian crossings, and access constraints further erode intersection capacity, particularly for Kesteven Place and local access movements.
- While traffic signals provide a greater degree of operational control, the analysis demonstrates that this control does not translate into improved network performance or resilience. Instead, congestion is redistributed in a manner that creates operational risk at the interchange and undermines access within the Ravenswood town centre.

Limitations of the Signalised Approach

The signalised layout assessed by NZTA has been developed primarily to identify future land requirements rather than to demonstrate a deliverable, high-performing long-term solution. The analysis highlights several limitations with the proposed signalised intersection:

- Pedestrian movements on Bob Robertson Drive require staged crossings across multiple lanes, increasing green time requirements and reducing available capacity for vehicles.
- Large corner radii and shared lane arrangements introduce safety concerns that are likely to necessitate additional late-start movements, further degrading performance.
- Significant right-turn volumes, particularly between Bob Robertson Drive and Kesteven Place, are not adequately accommodated with exclusive turn phases, which materially reduce intersection throughput.
- Access restrictions associated with the signalised form conflict with the North Woodend ODP and will adversely affect the operation of existing commercial activities.



Investigations indicate further refinement of the signalised layout is unlikely to resolve these issues without additional traffic lanes, increased land take, or more restrictive access management, all of which are inconsistent with the established town-centre environment.

Roundabout Options and Network Resilience

In contrast, modified roundabout options, including safe-system, multilane configurations, demonstrate substantially better performance and resilience across the same future traffic scenarios:

- Roundabout options accommodate forecast traffic volumes with lower and more stable delays, even when operating near capacity.
- Queuing is generally contained within the local road network, with reduced risk of spillback into the SH1 interchange.
- The roundabout form better supports pedestrian and cyclist movements through low-speed geometry and simpler crossing arrangements.
- Access flexibility is retained, supporting existing and planned commercial activity consistent with the District Plan objectives.

Sensitivity testing indicates that roundabout performance is less sensitive to uncertainty in toll-road uptake, traffic distribution from the Gressons Road development, and longer-term behavioural change. While congestion may still occur under high-growth scenarios, the roundabout is better able to absorb and manage that congestion without significant effects on the strategic road network.

Conclusion

The analysis demonstrates that replacing the existing roundabout with a signalised intersection does not provide a demonstrably durable or effective response to the forecast traffic conditions used by NZTA to justify the change. The signalised option prioritises operational control but results in poorer network outcomes, higher risk to the SH1 interchange, and adverse impacts on local access and town-centre amenity.

Modified roundabout solutions are expected to offer a more resilient and context-appropriate long-term approach. They better align with the function of Ravenswood as a key activity centre, support multimodal movement, and provide greater flexibility to respond to uncertainty in future traffic patterns.

Recommendation

It is recommended that NZTA and Waimakariri District Council reconsider the proposed signalisation of the Bob Robertson Drive / Garlick Street intersection and undertake further development of a safe-system, multilane roundabout solution as the preferred long-term form. On the basis of the analysis presented, further refinement of the signalised option is unlikely to achieve acceptable performance without significant additional impacts, whereas a modified roundabout provides a more resilient, and context-sensitive outcome.

1 Introduction

NZTA is developing plans for the SH1 Belfast to Pegasus Motorway and Woodend Bypass. In response to potential increased traffic volumes through Ravenswood as a result of a toll road proposal, the existing roundabout controlled intersection at Bob Roberston Drive / Garlick Street has been investigated to determine how a signal intersection may better accommodate traffic volumes in the long term.

The signalised intersection concept has been developed to identify land requirements and provide operational control under forecast future traffic conditions. This report tests whether that form of control translates into improved intersection and network performance, and whether alternative intersection forms better manage congestion, uncertainty, and place-based outcomes.

This assessment evaluates both signalised and roundabout intersection options using NZTA/Aurecon modelling and additional sensitivity testing. The concluding recommendations that a modified roundabout control will be preferred to a signalised intersection reflect professional judgement based on network performance, safety, access, and town-centre outcomes, with uncertainties in future traffic patterns acknowledged.

2 Background

2.1 Woodend Bypass Pegasus Interchange

Detailed design has been carried out by NZTA's design team for a new interchange to replace the current SH1 / Bob Robertson Drive / Pegasus Boulevard intersection. The interchange will be in the form of a signalised diamond interchange, with the motorway passing over the local connections. Garlick Street in Ravenswood will be connected to Main North Road in Woodend, as the SH1 motorway will bypass Woodend.



Figure 2-1: Indicative Arrangement of Motorway Interchange

The interchange is a change to the layout previously proposed as part of the Woodend Bypass Notice of Requirement application, which designated land for the bypass. As part of that process, a large multilane roundabout was proposed at the SH1 intersection with Bob Robertson Drive and Pegasus Boulevard.

NZTA have lodged a Fast Track Approvals Act application¹ and it is understood NZTA will seek approval for the modified interchange (and other project related changes) through that process.

2.2 Highway Revocation Plans

As part of the motorway, the NZTA Investment Case identifies a “low traffic” highway revocation plan through Woodend is likely to involve introduction of a 30km/h speed limit at Woodend town centre, and shared use path.

¹ <https://www.fasttrack.govt.nz/projects/state-highway-1-north-canterbury-woodend-bypass-project-belfast-to-pegasus>

In addition to the changes in layout, the motorway is being considered to be operated as a toll road. It is understood that no final decision has been made on the tolling of the motorway. A consequence of the tolling is that a large change in traffic patterns through Ravenswood and Woodend is forecast to eventuate.

The NZTA Investment Case has identified that tolling has the potential to divert traffic back onto the local road network. The road network through Ravenswood and Woodend will accommodate traffic from SH1 that chooses not to pay the toll to use SH1. It is likely further changes to the highway revocation plan through Woodend will be required under a “high traffic” scenario, to support improved community outcomes. Objectives include:

- Support Woodend Town Centre
- Enable active modes and crossability
- Discourage through traffic along Main North Road
- Promote use of Rangiora Woodend Road
- Discourage rat runs along Revels and Pa/Greens/Tuahivi

In addition to the “low traffic” revocation provisions, the NZTA reporting anticipates replacing the Bob Robertson Drive / Garlick Street roundabout intersection at Ravenswood with traffic signals, as well as realigning Rangiora Woodend Road to have priority over Main North Road, possibly with traffic signals. It is not clear to what extent the sensitivity of the Ravenswood town centre to changes in traffic volumes has been considered in the revocation plan.

These uncertainties mean that intersection forms which are highly sensitive to traffic distribution and network assumptions carry greater long-term operational risk.

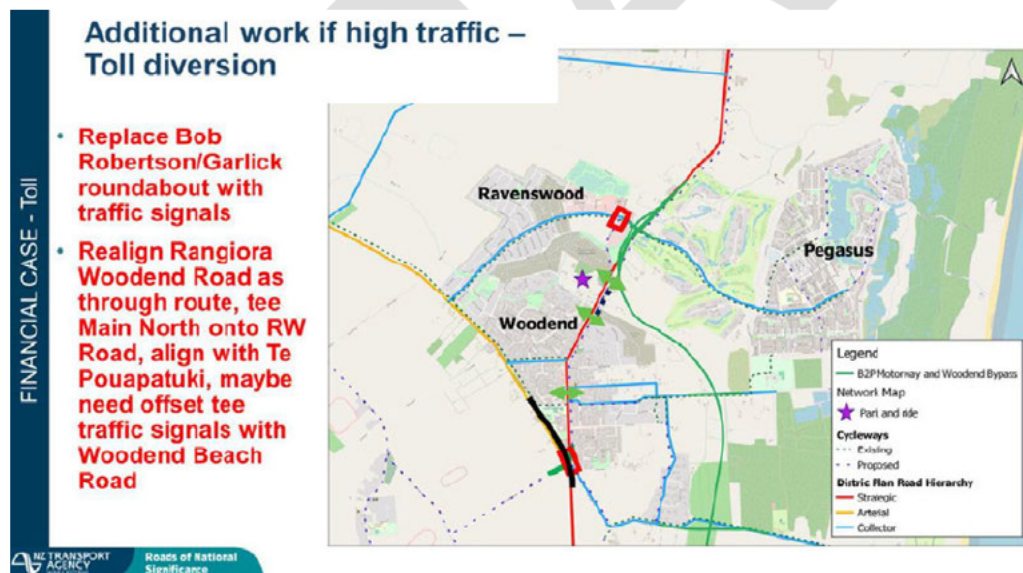


Figure 2-2: Revocation Plan – High Traffic Scenario (NZTA Investment Case)

2.3 Ravenswood Town Centre Development

Ravenswood near the Bob Robertson Drive / Garlick Street intersection has been defined as a North Woodend Town Centre Zone in the Waimakariri District Plan, enabling substantial commercial

Ravenswood Traffic Layout

2 Background

development. The commercial development straddles both Garlick Street and Bob Robertsons Drive, defined as Collector Roads, and objectives for the zone include facilitating multi-modal travel, with travel across the roads anticipated. The ODP sets out a layout that provides for frequent active modes cross-movement, local access, and a low-speed environment, rather than one optimised primarily for through traffic.

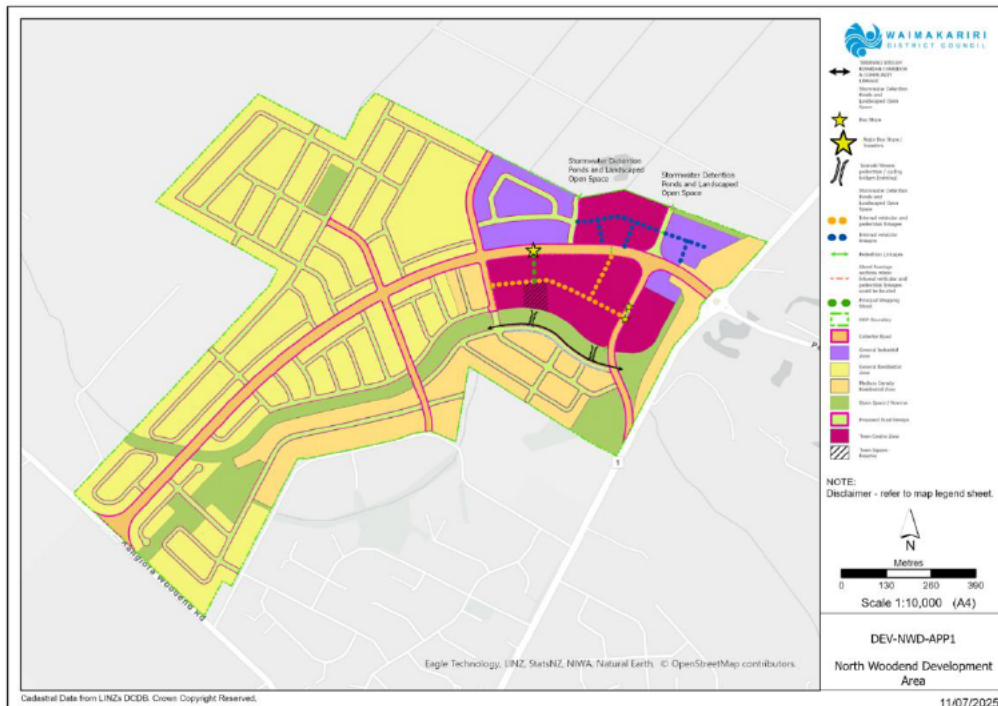


Figure 2-3: North Woodend Development Area

Existing development has been planned based on expected traffic forecasts and traffic management associated with the Woodend Bypass as promoted through the NOR process. The local intersections and access strategies are consistent with the Collector Road classification, and long term capacity in the road network was anticipated. The extent of development in the vicinity of Garlick Street and Bob Roberston Drive is shown in Figure 2-4.

Further master planning for the large block southwest of the Bob Roberston Drive / Garlick Street intersection is well underway, with major tenant enquiries although no consents have yet been sought.



Figure 2-4: Ravenswood Town Centre (Google Nov '25)

2.4 Gressons Road Development

As part of providing for housing capacity, land immediately north of Ravenswood has been rezoned as part of the District Plan review, and is expected to accommodate approximately 1,500 households. Access to the development will be via Collector Roads connecting to existing roads in Ravenswood, a local connection, as well as via Gressons Road to Rangiora Woodend Road and SH1.

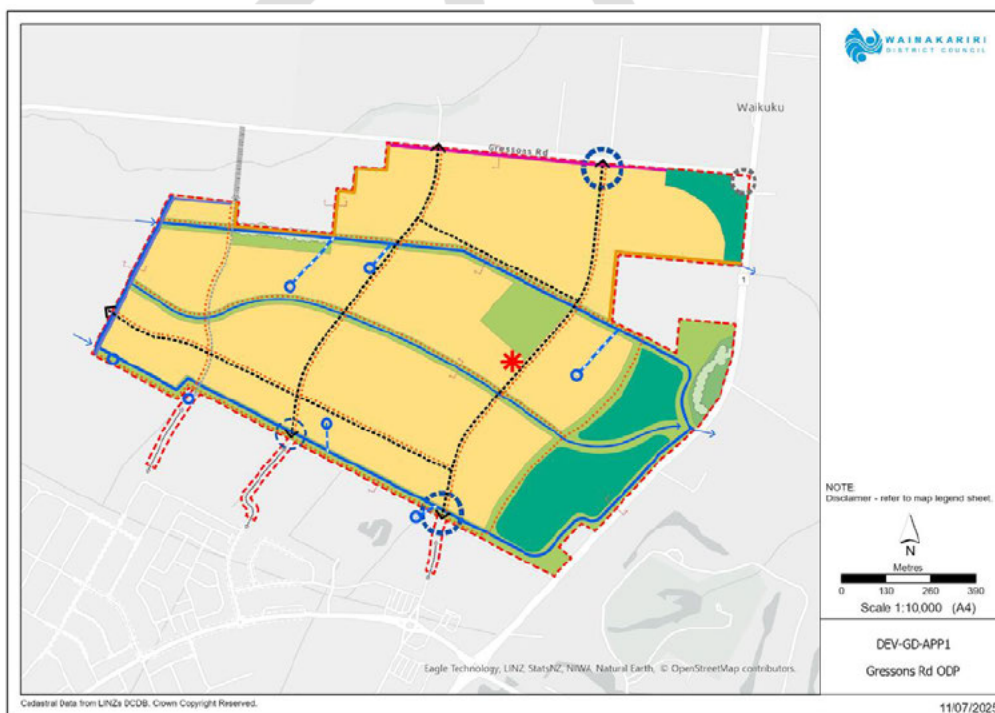


Figure 2-5: Gressons Road ODP



2.5 Traffic Modelling and Signal Layout

The NZTA project team has carried out a high level traffic modelling exercise using the CAST traffic model, and allowing for un-tolled and tolled road options, and with development of the Gressons Road residential subdivision and the Ravenswood commercial centre.

Analysis of the interchange and Bob Robertson Drive / Garlick Street intersection by Aurecon for NZTA has informed a signalised intersection design, to identify potential land take. The signalised intersection is shown in Figure 2-6.

It is understood the layout has sought to achieve the following objectives:

- Accommodate forecast future 2038 traffic volumes with acceptable levels of performance (delay and queue).
- Enable signal progression coordinated with the interchange signals.
- Identify land take for the signalised intersection option to be delivered either in the short or long term.

The traffic signal layout adopted results in the following impacts on existing access:

- New World restricted to left in / left out on Bob Robertson Drive (currently full movement);
- BP and McDonalds access on Bob Roberston Drive will be left in / left out (currently full movement);
- Gull fuel station access on Bob Roberston Drive will be left in / left out (currently full movement)
- Removal of U-turn opportunity at Bob Roberston Drive / Garlick Street forcing some redistribution of traffic movement in the wider transport network.

Ravenswood Traffic Layout

2 Background

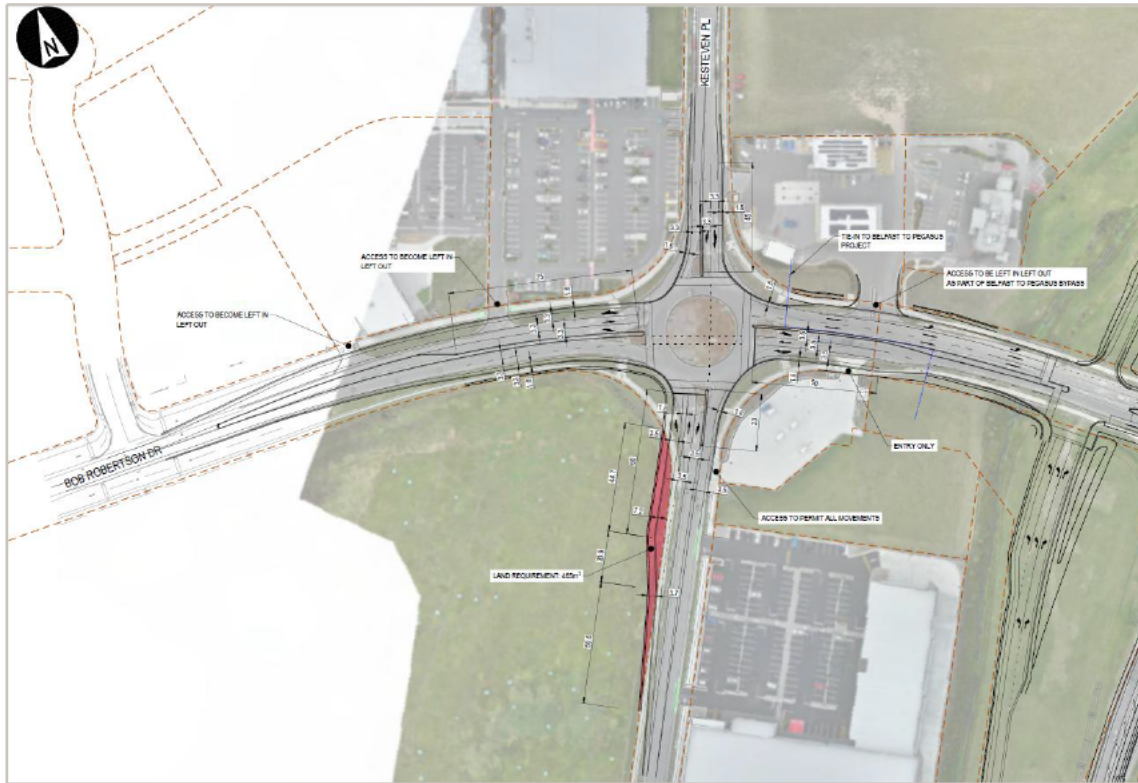


Figure 2-6: Signal Plan (November 2025 - extract from Aurecon plan)

3 Traffic Environment

3.1 Existing Traffic Volumes

Stantec has previously carried out traffic surveys at the Bob Robertson Drive / Garlick Street intersection in 2025. These are summarised in Table 3-1.

Table 3-1: Bob Robertson Drive / Garlick Street – Existing Traffic Volumes

		AM Peak	PM Peak
Garlick St Northbound	Left	11	19
	Thru	3	7
	Right	15	34
	U-Turn	0	0
Bob Robertson Dr Westbound	Left	19	8
	Thru	283	220
	Right	38	115
	U-Turn	1	1
Kesteven Pl Southbound	Left	33	134
	Thru	5	2
	Right	19	17
	U-Turn	0	0
Bob Robertson Dr Eastbound	Left	23	11
	Thru	187	362
	Right	9	13
	U-Turn	2	1
Total		648	944

Existing traffic demands can be seen to be low, at less than 1,000 vph total using the intersection. Predominant movements are:

- Bob Robertson Drive through with slight westbound bias in the morning, and eastbound bias in the evening.
- Movement between Bob Robertson Drive east and Kesteven Place, in both directions, indicating access to and from the commercial premises.

3.2 PC30 Forecast Traffic Volumes

The Ravenswood site has been developed with expectation of major changes in traffic volumes. At the time of infrastructure construction and then the subsequent Plan Change 30, forecast² traffic volumes in the evening peak period were forecast to increase to approximately 2,500 vph. Intersection performance with the existing roundabout and lane arrangements was forecast to be LOS A.

² Approximately 2031 base traffic patterns, plus full development of PC30, Ravenswood, and Pegasus, as well as a Woodend Bypass, forecasts from a previous landuse model

Table 3-2: Bob Robertson Drive / Garlick Street (PC30 traffic volumes)

		2025 PM Peak	Future PM peak (PC30)
Garlick St Northbound	Left	19	210
	Thru	7	70
	Right	34	190
	U-Turn	0	-
Bob Robertson Dr Westbound	Left	8	210
	Thru	220	630
	Right	115	110
	U-Turn	1	-
Kesteven Pl Southbound	Left	134	100
	Thru	2	50
	Right	17	20
	U-Turn	0	-
Bob Robertson Dr Eastbound	Left	11	20
	Thru	362	630
	Right	13	260
	U-Turn	1	-
Total		944	2,500

3.3 NZTA Forecasts with Gressons Road Development and Bypass

The traffic forecasts adopted by NZTA have been compared with previous PC30 traffic forecasts, and are shown in Table 3-3.

Table 3-3: Traffic Forecasts for NZTA Assessment

		Future PM Peak (PC30)	2038 PM Un-tolled Gressons	2038 PM Tolled Gressons	2048 PM Un-tolled Gressons	2048 PM Tolled Gressons
Garlick St Northbound	Left	210	116	135	126	125
	Thru	70	177	234	170	214
	Right	190	167	324	180	322
	Approach Total	470	460	693	476	661
Bob Robertson Dr Westbound	Left	210	342	495	395	558
	Thru	630	465	425	475	467
	Right	110	441	444	397	374
	Approach Total	950	1,248	1,364	1,267	1,399
Kesteven Pl Southbound	Left	100	109	32	122	63
	Thru	50	148	227	147	217
	Right	20	32	31	123	32
	Approach Total	170	289	290	392	312
Bob Robertson Dr Eastbound	Left	20	54	53	49	49
	Thru	630	508	469	515	468
	Right	260	130	185	115	162
	Approach Total	910	692	707	679	679
Total		2,500	2,689	3,054	2,814	3,051



Major change in the traffic forecasts between scenarios are:

- The very large right turn from Bob Robertson east into Kesteven Place (shown in table by **highlight**) as a result of the Gressons Road development.
- The increased volumes between Garlick Street and Bob Robertson Drive east to accommodate the toll road scenario (shown in table by **highlight**).

Comparable changes in opposing directions are also evident in the morning peak traffic volumes provided by NZTA.

While absolute traffic volumes differ between forecasting exercises, all scenarios indicate substantial growth and a high proportion of turning movements. This reinforces the need for an intersection form that is resilient to uncertainty in traffic distribution, rather than one optimised for a single forecast scenario.

3.4 Comment on QTP Traffic Forecasts

Stantec has had some early involvement with the Gressons Road development, and understands that it is more likely to involve a total number of households of approximately 1,500 across the entire site due to the need to make land available for stormwater. This is lower than the 1,900 households modelled by QTP.

The QTP modelling loads a high proportion of Gressons Road traffic through the Kesteven Road connection. The ODP provides additional connections, and preliminary micro simulation modelling by Stantec indicated there will be a spread of traffic across connections. This will likely reduce some movements and increase others at Bob Robertson Drive / Garlick Street (for example, fewer right turn movements from east to north, more movements to and from the west).

Gressons Road analysis indicated that a roundabout is likely justified at SH1 / Gressons Road for later stages of development, after about 1,000 households to manage safety risk, and that will divert some traffic away from the Ravenswood intersection (un-tolled scenario). A roundabout would be at NZTA approval discretion. This likely makes the QTP traffic distribution through the Bob Robertson Drive / Garlick Street intersection conservative. As noted by QTP, this will primarily affect the outbound movements to SH1, and will be a bigger change in the AM peak distribution, which is less critical.

The QTP modelling represents minimal change to the Woodend traffic network, and the intersection at Bob Robertson Drive / Garlick Street may provide a location to and from the north to moderate the use of the alternative route to the toll road noting the revocation plans described earlier.

If for example traffic calming features were introduced through Woodend, a comparable treatment at the Ravenswood intersection would be to provide an intersection that supports the local place environment rather than being designed for unconstrained demand for the toll road alternative. In that respect, traffic demands adopted for analysis may be worst case, although ultimately it will depend on willingness to pay the toll.

3.5 Sensitivity Test Traffic Volumes

To provide an alternative traffic forecast scenario for sensitivity testing purpose, the following changes were made to the PC30 traffic movement forecast:

- Add difference with / without development preliminary micro-simulation modelled for Gressons Road with 1,500 households, which has a more refined traffic distribution
- Add difference of tolled to un-tolled scenarios from NZTA forecasts.

This will be a “worst case” as traffic volumes under various scenarios are additive to the originally assessed Ravenswood traffic volumes, and no allowance for reductions in through movements or route redistribution have been made.

		<i>Future PM Peak (PC30)</i>	<i>Future Peak + Gressons</i>	<i>Future Gressons Toll</i>
Garlick St Northbound	Left	210	223	242
	Thru	70	275	332
	Right	190	217	374
	Approach Total	470	715	948
Bob Robertson Dr Westbound	Left	210	225	378
	Thru	630	645	605
	Right	110	196	199
	Approach Total	950	1,066	1,182
Kesteven Pl Southbound	Left	100	181	104
	Thru	50	142	221
	Right	20	52	51
	Approach Total	170	375	376
Bob Robertson Dr Eastbound	Left	20	69	68
	Thru	630	649	610
	Right	260	263	318
	Approach Total	910	981	996
Total		2,500	3,136	3,501

The total traffic volume is higher than modelled by NZTA for 2038, but includes less turning traffic volumes. The intention of the traffic volumes is to consider sensitivity to differences in turn proportions, for both design and performance considerations.

4 Intersection Performance

4.1 Aurecon Models

4.1.1 Overview

Aurecon supplied various intersection analysis for the interchange network at 2038 and 2048 without and with the tolls.

The existing Bob Robertson Drive / Garlick Street intersection is modelled as a roundabout with existing lane arrangements in each of the SIDRA Intersection models. No other roundabout layouts appear to have been modelled with a roundabout control as part of assessing future intersection performance.

The traffic signalised option for Bob Robertson Drive / Garlick Street has been modelled with two layouts.

- The B2P Pegasus Intersections Preferred Option.sip9 model represents an earlier traffic signal arrangement, but includes McDonalds access. The modelling included 2048 traffic demands. Aurecon advised the lane arrangements are no longer proposed, so for the signal intersection analysis this model setup has been ignored.
- The *Garlick St Roundabout vs Signalised WTOC (1).sip9* model represents the most recent traffic modelling, and includes the signal layout adopted in the traffic signal layout plan (Figure 2-6). Aurecon advised that the specific traffic signal phasing setup for assessment has been determined by Wellington Transport Operations Centre (WTOC) which manages the NZTA signal network in this area. This model only covers 2038 and does not include 2048 traffic volumes.

4.1.2 Roundabout Layout Model Modifications

On review of the modelled layouts, some minor modifications to the representation of the roundabout intersection lane arrangements (for example lane lengths) have been made to reflect the plans.

- Kesteven Place – change left lane to short lane 45m
- Bob Robertson Drive (West) – short lane length reduce to 50m
- Adjust roundabout geometry angles

4.1.3 Traffic Signal Layout Modifications

The traffic signal layout has also had minor modifications.

- Aurecon advise the left turn from the west into the western interchange signal has been shortened to 45m (from 100m) so it starts east of the BP access.
- Shorten Bob Robertson Drive west through lane from 175m to 130m.

4.1.4 Intersection Performance Summary

The Aurecon analysis shows that the PM peak carries 30% more traffic than the AM peak. Intersection average delay in the AM peak is better than the PM peak.



A summary of PM peak performance measures presented by Aurecon modelling is included in the table below:

Table 4-1: 2038 PM Peak intersection performance

Approach	Demand Flow	Roundabout (Existing Lanes)			Signals (NZTA Layout)		
		Deg Sat	Av Delay (LOS ³)	95% Queue (m)	Deg Sat	Av Delay (LOS)	95% Queue (m)
Garlick St Northbound	729	0.89	42 (D)	180	0.52	20 (B)	75
Bob Robertson Dr Westbound	1436	0.79	10 (B)	86	1.02	61 (E)	269
Kesteven Pl Southbound	305	0.42	10 (B)	28	1.22	248 (F)	241
Bob Robertson Dr Eastbound	744	1.08	128 (F)	474	0.55	35 (D)	86
Total	3,214	1.08	45 (E)	474	1.22	63 (E)	269

It is understood that NZTA determined that the performance with the roundabout generates queues that are unsuitable for the surrounding road network so traffic signals are preferred. While both intersection forms operate over capacity, the key distinction is where and how congestion manifests: the roundabout contains queuing within the local network, whereas the signalised option results in queues propagating to the SH1 interchange.

Our review of the analysis highlights:

- Both intersection arrangements operate over capacity.
- The existing roundabout generates longest queues on the west and south approaches, affecting District Council roads with minimal effect on the SH1 interchange intersections.
- The proposed signalised intersection layout is unable to accommodate traffic demands forecast, and has some approaches significantly over practical capacity. The signal timings appear to penalise the Kesteven Place approach. The signals generate longest queues on the east approach, resulting in queue back to the interchange traffic signals, affecting strategic network movements. Whilst some capacity adjustment at the interchange will occur in the Network SIDRA model, the full effects of queue back are likely to be underestimated.

4.1.5 Network Performance Statistics

The SIDRA network statistics (for the peak hour) have been investigated, and show slight benefits to the roundabout scenario, with the exception of stop rate, where all vehicles are likely to stop due to the give way control nature of the intersection.

³ LOS is a "level of service" measure of performance based on delay for intersections. LOS A represents very low delay through to LOS F represented high delay and/or congested conditions.

Table 4-2: 2038 Network Performance Summary (including interchange)

Performance Measure	Roundabout (Existing)	Traffic Signals (NZTA)
Network LOS	D	E
Average Speed (km/h)	28	26
Travel Time (veh-h/h)	155	165
Effective Stop Rate	1.06	0.76

5 Options to Improve Performance

5.1 Roundabout

Alternative roundabout configurations capable of accommodating forecast traffic volumes do not appear to have been tested as part of the NZTA assessment.

Stantec has investigated staged improvement options.

5.1.1 Modified Lanes at Existing Roundabout

This option alters lane arrangements to support two through circulating lanes east-west to better reflect turn movements forecast, whilst retaining a single exit lane on each leg except the eastern leg (widened to two lanes for the interchange).

- East approach: change from L / TR to LT / R
- West approach: change from L / TR to LT / TR

This will involve some works within the roundabout, expected to be reducing the central island diameter to accommodate the additional lane, although widening the inscribed diameter of the roundabout could also be considered. In particular the large right turn from east to north is provided a dedicated right turn lane.

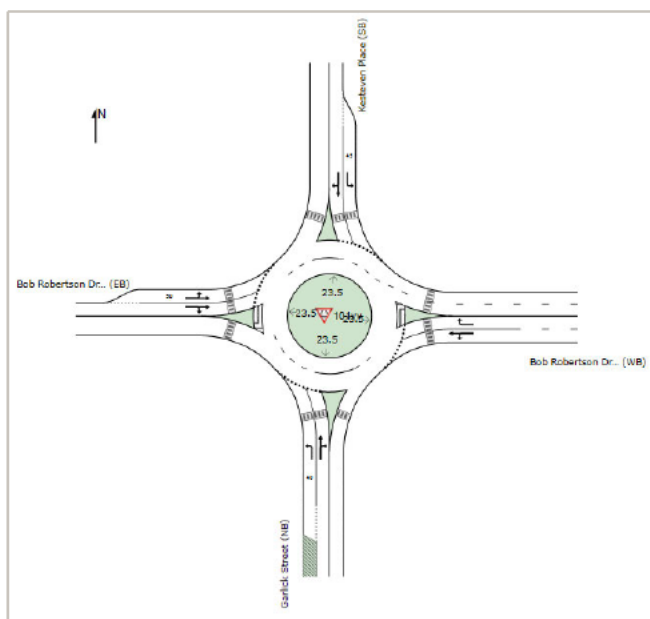


Figure 5-1: Modified Lanes Option: Indicative Lane Arrangements

This layout will support single lanes in each direction past existing accesses, enabling access management flexibility.

It is noted that the intersection will accommodate some active modes movements, and the multilane approaches (as existing) warrant consideration of how active modes can be provided for.

One option, which is used at high volume roundabouts, would be approach speed management ahead of or at the active modes crossings, such as through the use of raised crossings. That could also help with signalling the change in environment from the motorway into the key activity centre.

5.1.2 Safe System Roundabout (Modified Lanes)

To provide further improved active modes provision with active modes crossing a single traffic stream, a safe system roundabout layout has been investigated similar to that adopted at the Salisbury Road / Champion Road intersection in Richmond (Tasman District)⁴, as shown in Figure 5-2. The eastern approach is not provided with a single lane in each direction to cross, and as such would either require speed management or removal of the existing crossing. This is considered feasible given the activities on the northeast corner of the intersection and proposed staged pedestrian crossing at the interchange intersections.

⁴ <https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/case-studies/nelson-the-application-of-dual-crossings-at-an-existing-roundabout#successes-and-learnings>

Ravenswood Traffic Layout

5 Options to Improve Performance



Figure 5-2: Richmond Roundabout (Salisbury Road / Champion Road)

Two intersection forms have been modelled as indicated in Figure 5-3. The first is a safe system layout comparable to the Richmond intersection. Other multilane roundabout options may be available, but would likely require multilane departure legs, which in the first instance has been avoided to reduce impacts on commercial area access. Nevertheless, a standard multilane roundabout configuration has also been modelled.

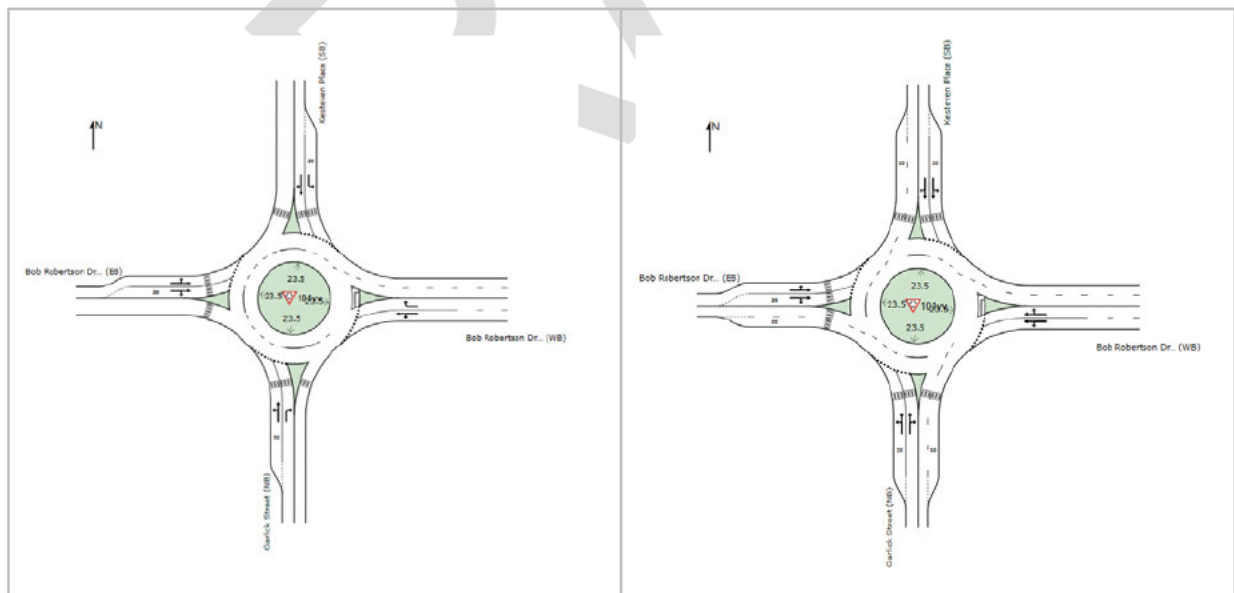


Figure 5-3: Safe System roundabout layout and standard multilane roundabout



5.1.3 Roundabout Performance Summaries

The summary of key vehicle movement statistics is included in the following tables.

Table 5-1: 2038 PM Peak Roundabout Options (1) Performance

Approach	Demand Flow	Roundabout (Modified Lanes)			Roundabout (Safe System Multilane)		
		Deg Sat	Av Delay (LOS)	95% Queue (m)	Deg Sat	Av Delay (LOS)	95% Queue (m)
Garlick St Northbound	729	0.74	12 (B)	50	0.52	9 (A)	24
Bob Robertson Dr Westbound	1436	0.87	13 (B)	120	0.85	13 (B)	112
Kesteven Pl Southbound	305	0.38	7 (A)	16	0.37	7 (A)	15
Bob Robertson Dr Eastbound	744	0.73	34 (C)	91	0.56	11 (B)	31
Total	3,214	0.87	17 (B)	120	0.85	11 (B)	112

Table 5-2: 2038 PM Peak Roundabout Options (2) Performance

Approach	Demand Flow	Roundabout (Safe System Multilane Standard Lanes)		
		Deg Sat	Av Delay (LOS)	95% Queue (m)
Garlick St Northbound	729	1.18	168 (F)	535
Bob Robertson Dr Westbound	1436	0.82	12 (B)	95
Kesteven Pl Southbound	305	0.36	7 (A)	15
Bob Robertson Dr Eastbound	744	0.72	25 (C)	69
Total	3,214	1.18	50 (D)	535

Table 5-3: 2038 Network Performance Summary (including interchange)

Performance Measure	Roundabout (Modified Lanes)	Roundabout (Safe System Multilane)	Roundabout (Safe System Multilane Standard Lanes)
Network LOS	D	D	D
Average Speed (km/h)	35	36	28
Travel Time (veh-h/h)	127	122	155
Effective Stop Rate	0.85	0.79	1.05

These results indicate that lane arrangements are important for providing capacity, and some staging of the lane arrangement changes could be contemplated. Options exist with the forecast demand to significantly improve capacity and performance with a roundabout form, without implementing a large, signalised intersection which is unlikely to achieve capacity improvements.



Some flexibility in any design should be considered to support evolving changes in movement patterns, which will be heavily impacted by the level of toll road induced traffic (toll avoidance) and movement patterns from the Gressons Road development.

The testing of a standard multilane circulating lane arrangement indicates that the movement patterns forecast by NZTA are less able to be accommodated, and the dedicated turn lanes will be necessary. This is likely due to different lane utilisation and gap acceptance considerations.

Active modes crossing movements are included in models and primarily reflected in adjusted capacity. However, as pedestrians are not modelled well in SIDRA within a roundabout model, a simple single direction unsignalised pedestrian priority crossing has been modelled.

The outputs at various traffic volumes are shown in Table 5-4.

Table 5-4: Pedestrian Crossing (single stage) queue and delay statistics

Demand Flow (veh/hr)	Delay (s/veh)	Average back of queue (m)	95% back of queue (m)	Stop Rate
500	0.4	7	17	0.02
550	0.4	8	20	0.02
600	0.5	9	23	0.03
650	0.5	11	27	0.03
700	0.6	13	32	0.04
750	0.6	15	37	0.04
800	0.6	18	44	0.05
850	0.7	21	53	0.06
900	0.7	26	63	0.07
950	0.8	31	77	0.08

Delay for vehicles overall is very low, and 95 percentile back of queue has potential to queue into the roundabout when directional volumes reach about 550 vph. Average back of queue is substantially shorter, indicating most occurrences the back of queue would be contained up to volumes of approximately 850 vph. Volumes over approximately 1,000 vph could be operating at capacity to support pedestrian crossing movement, increasing the likelihood of congestion.

Traffic forecasts indicate that under a tolled scenario, approach volumes on Bob Robertson Drive east could be in excess of 1,300 vph, indicating that approach is not suitable for a pedestrian priority crossing. The departure volume on Garlick Street is forecast at 900vph, indicating it may be desirable to have additional crossing facilities further south to reduce the level of demand at the intersection. Overall, the effect is likely to be intermittent and the slow speed roundabout will support safe movement.

5.2 Modified Signalised Intersection Options

The currently modelled and designed signal layout has some features that would need to be modified through future design and modelling stages. Each of these safety-driven modifications introduces additional signal phases or green time requirements, compounding the capacity shortfall already observed in the base signalised layout:



- Staged pedestrian crossing movement: currently the crossings on Bob Robertson Drive require pedestrians to cross 5 lanes of traffic in a single stage. Most intersection designs of this scale now require staged crossing for such movements. Initial testing indicates this will increase intersection delays when pedestrians are present. Staged pedestrian movements require wider refuge areas than currently shown in the design plan, which will influence the land areas necessary. There, will be a need to control some turn movements, such as filter left and right turns with a late start where there is coincident pedestrian crossing movements.
- The signalised intersection design includes large radius corners, which will create pedestrian safety concerns, and further warrant late start left turn phases and / or safe system speed treatments. As shared through and left lanes are adopted in the design, that may impact through efficiency.
- Provision for non-filter right turns: the SIDRA output modelled signal sequence calculates the right turns on Bob Robertson Drive (approximately 400 vph) to only operate with a filter right turn. As Bob Robertson Drive is shown on a curve, the large right turn from Bob Robertson Drive (east) into Kesteven Place will likely require the exclusive right turn phase for safety reasons due to poor visibility of opposing traffic. The introduction of exclusive turn phases will affect intersection capacity.
- Provision for dedicated phases to support U-turns that will be generated by access restrictions that will eventuate from the signalised intersection form.

Various signal layouts have been tested to determine if alternative layouts could better accommodate the expected traffic demands, and improve the layout for the surrounding environment. In the first instance, some minor modifications such as adjusting lane discipline and phasing (for example, dedicated left turn lanes on east and west approaches) were tested, to incorporate more user friendly signal phasing and reflect the forecast low utilisation of some lane movements. The testing indicates that at peak times there is insufficient capacity to accommodate changes and / or improve capacity.

It appears that the only way that additional capacity can be achieved will be adding additional traffic lanes, which is unlikely to be practicable in the commercial centre traffic environment.

It is considered the network modelling in SIDRA should be further developed in a micro-simulation environment to more fully test sensitivity to phasing arrangements, and potentially the reassignment that may occur from high levels of delay on some movements.

6 Concept Designs

6.1 Signalised Intersection

The signalised intersection design has been developed by NZTA, as presented earlier. Further refinements have not been carried out, although as noted in the performance analysis, as a minimum it is considered there will need to be additional median width provided to support staged pedestrian crossing treatments on the Bob Robertson Drive pedestrian crossings.

Access management has been discussed previously between Ravenswood Town Centre and WDC. WDC advisors have suggested the possibility of adding a right turn facility from Bob Robertson Drive into the New World car park access. Such an arrangement will require right turning traffic to cross two lanes of queued traffic, as well as a shared path. Such an arrangement may not pass a safety audit process. It is understood there are also unresolved access issues for McDonalds, which will only be able to service left in and left out traffic.

Once implemented, the signalised form would be difficult to retrofit without further land take or access loss, effectively locking in a sub-optimal outcome.

The consequential impact of queue back from the signalised intersection to the interchange may result in a need for additional queue storage (and hence longer ramps) on the SH1 northbound off ramp which presumably have not been designed for.

6.2 Roundabout Modified Layouts

The roundabout concept developed has sought to achieve a safe system treatment where roundabout circulating speeds are restricted, and active modes are supported by having single crossing points. Staged options are considered possible, and for this reporting a single concept has been developed for the purpose of testing potential pedestrian crossing positions, and adjusted roundabout geometry. The layout concept is shown in Figure 6-1.

Key features of the layout include:

- Raised platform safe system active modes crossings on south, west, and north approaches, with retention of two-lane carriageway with additional flush median. These could be shifted further from the intersection, or duplicated adjacent to the commercial centre and will be a matter of balancing intersection movement and place functions.
- Adjusted entry geometry from the east, assuming no other speed treatments are incorporated.
- Potential removal of the existing multilane pedestrian crossing on the east approach, which for some movements duplicates the signalised crossing to the east at the interchange, and will be less appropriate at this highest volume part of the road network.
- Spiral roundabout markings to be incorporated where necessary (to be refined in design development)
- Tie in with NZTA design at BP access.

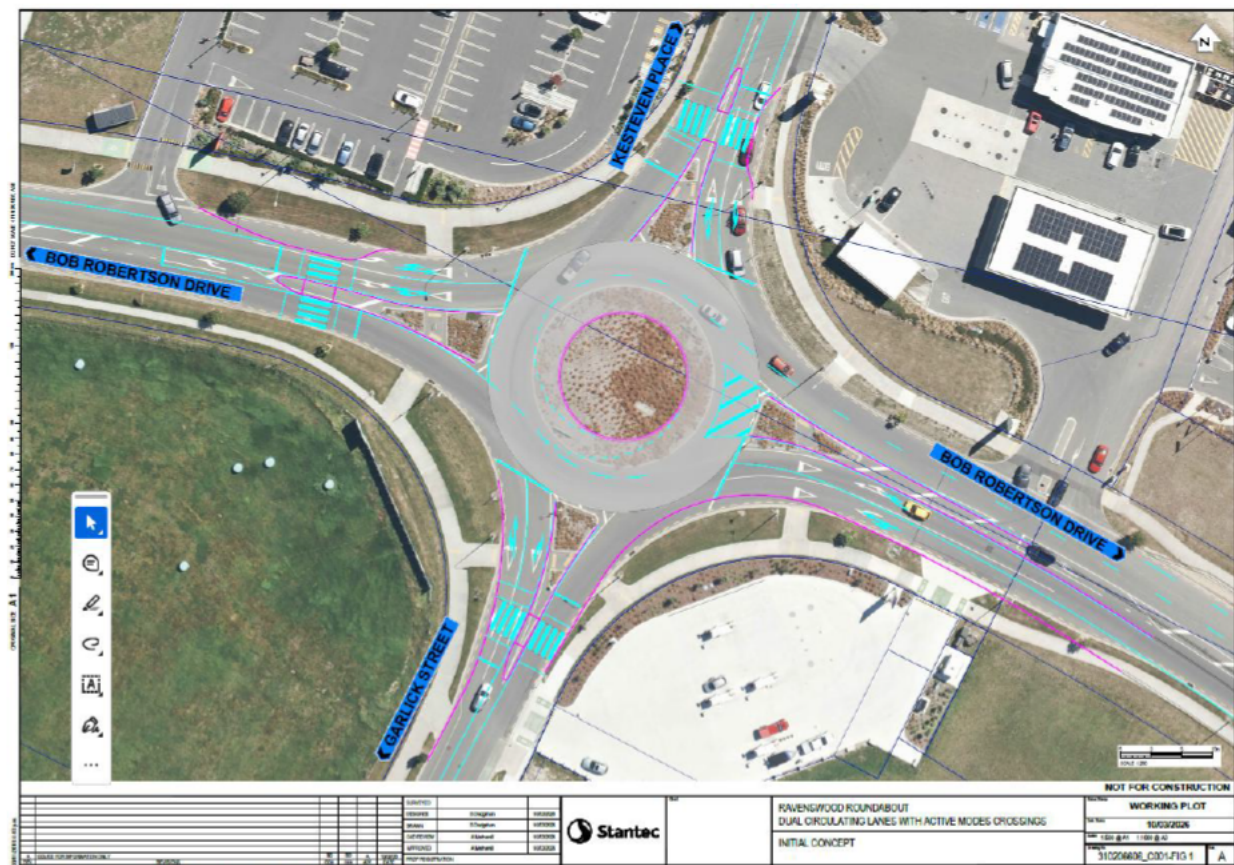


Figure 6-1: Multilane Safe System Roundabout Concept

The central island is shown with a diameter of 21m, reduced from the existing diameter of almost 30m. Central islands of approximately 20m diameter have been commonly used in areas where long heavy vehicles use the roundabout, although current geometry requirements typically warrant slightly larger islands where approach speeds are managed by the island size. This will be managed through adjustments to approach geometry from the east, and safe system speed management on other approaches.

Vehicle tracking is indicated in the following diagrams within Figure 6-2.

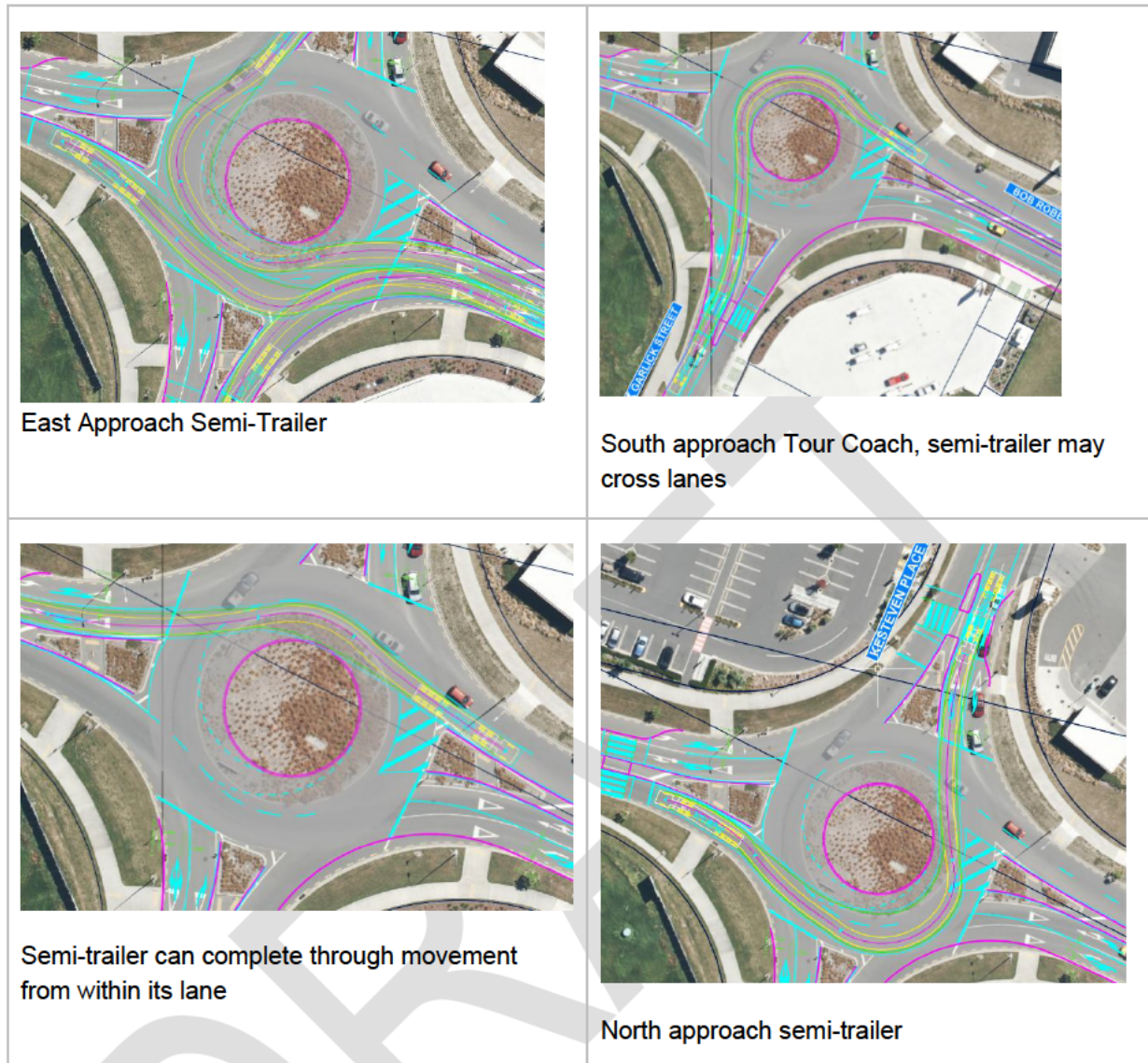


Figure 6-2: Indicative Vehicle Tracking

The primary matter identified is the right turn semi-trailer from the south not fully staying in lane. In practice, the truck will be able to straddle lanes as it will have circulating priority, and the double right turn from the south is unlikely to be required.

Based on comment from WDC, it is understood there is the potential for the route from SH1 to Garlick Street being an over-dimension route. The proposed amendments are not expected to constrain such movement. The east to south movement could be designed with a wider apron on the inside of the corner if determined as necessary through detailed design (eg potentially retain the existing kerb), and the south to east movement will be accommodated more readily than existing layout with the additional central island widening. Adjustments to roundabout infrastructure such as splitter islands can be considered through design refinement.

7 Land and Development Considerations

7.1 Signalised Intersection

Land Take

The NZTA design sets out land requirements to support development of additional traffic lanes. It is considered likely that safety considerations will warrant wider median islands for staged pedestrian movements, which may increase the land requirement.

Place Characteristics

The signalised design provides a layout with an apparent sole objective of providing flexibility to manage traffic movements and control which legs / movements will experience high level of delay. As it is forecast to operate over capacity, there will always be at least one leg or more with high delays and extensive queuing.

The scale of the signalised intersection is typical of a major arterial intersection, and access considerations are much lower priority considerations in the design. Speed of traffic through the intersection will be high at times that the intersection is not congested. Access management in the vicinity is likely to have to be revisited through future planning processes.

The District Plan ODP (originally through PC30 to the Operative District Plan) has been developed with expectation of good performance being retained with the existing roundabout, and potential enhancements primarily to support speed management and pedestrian connectivity. This has enabled access management consistent with a collector road environment.

To understand potential future issues, an overlay of the Woodend North ODP and the extent of the intersection form and queuing is shown in Figure 7-1. It shows that several ODP access connections will be directly affected by the physical elements of the intersection, and / or the peak period queuing. Effects are particularly noticeable on accesses to established commercial activities.

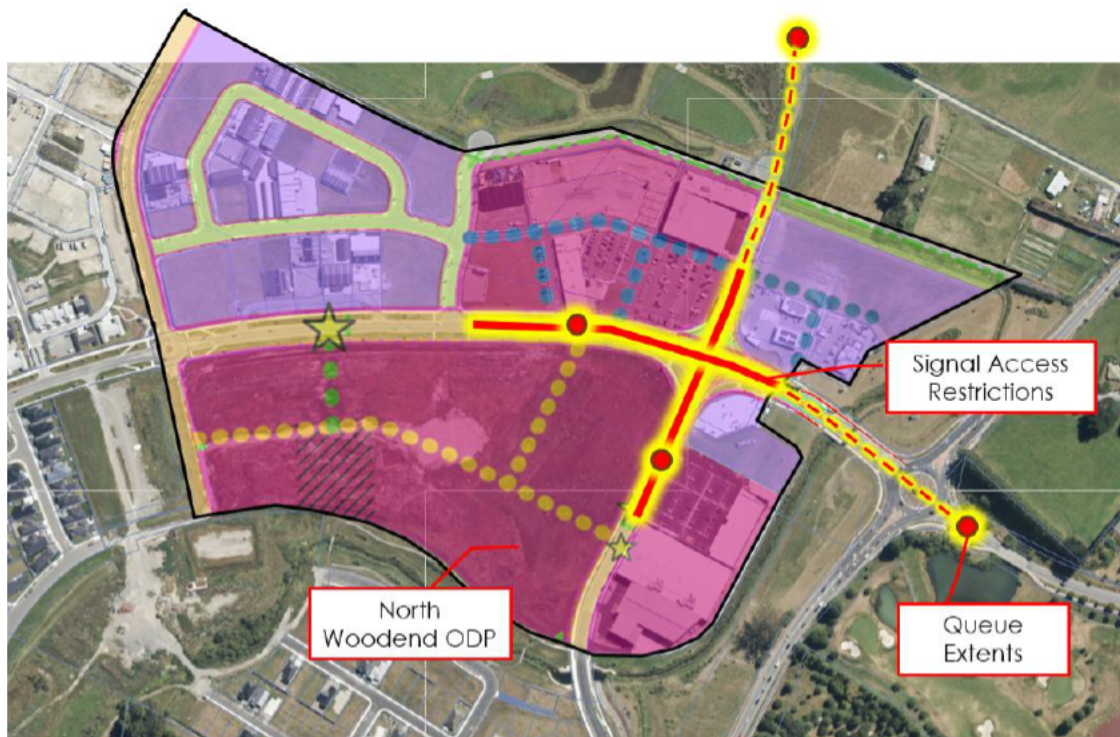


Figure 7-1: Extent of Signalised Intersection Form (solid red) and PM Peak Intersection Queuing from Bob Robertson Drive / Garlick Street (dashed / dot)

The modelling for NZTA indicates the Kesteven Place leg being particularly penalised through signal timing arrangements. The impact of this is as follows:

- Access restrictions on New World car park will place pressure on Kesteven Place access for egress to enable movement in various directions at the signalised intersection.
- As the Kesteven Place queue is forecast to extend well beyond the access, then movements exiting New World onto Kesteven Place will be challenging. Likewise, movements into the BP service station access will not be readily achievable.
- Access to BP and McDonalds to and from Kesteven Place being affected, noting restrictions are also proposed with the signal layout for Bob Robertson Drive.

The west and south approaches show similar issues.

In practice, the signal settings could be managed further at Bob Robertson Drive / Garlick Street as the queuing is shown to extend into the interchange which is unlikely to be acceptable to the road controlling authorities. It could be expected that signal timing adjustments are made by improving capacity and time available for traffic westbound on Bob Robertson Drive at the expense of side roads within Ravenswood (including the eastbound movements). That will likely see queues propagate further within the development.

The signalised intersection may support protected pedestrian and cyclist movements at the intersection. However, as noted in this report, safety is likely to be compromised unless staged crossings are provided, which in turn will also impact the efficiency of the intersection. Staged crossings can also be

seen as inconvenient for pedestrians in the town centre environment, due to the long overall time to cross.

7.2 Roundabout Intersection

Land Take

The concept design utilises much of the existing roundabout geometry, and is largely completed within the footprint of the existing road. Land take is not anticipated based on the concept design.

Place Characteristics

The roundabout control supports a slow speed environment at Ravenswood commercial area. The concept design indicates that all existing accesses on the north, south, and west approaches can retain a two lane carriageway, affording flexibility for access management.

As traffic volumes increase, some additional access movement resilience is provided with a roundabout, as U-turns can be achieved if it is deemed that some access turn restrictions are necessary. This will also support the likes of access to BP and McDonalds, retaining some movements (although McDonalds is still constrained for right turn movements out).

The pedestrian movements at the intersection are proposed to be managed with safe system crossings, supporting movement.

Importantly, the queuing as analysed shows significantly less interaction between accesses and queues.

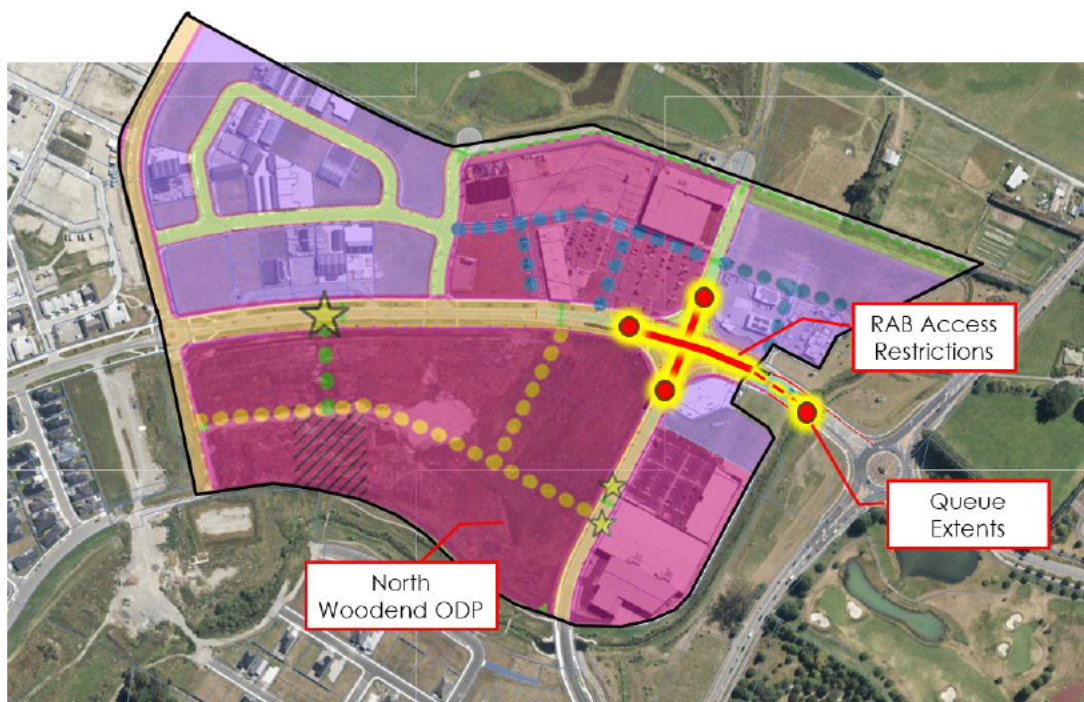


Figure 7-2: Extent of Roundabout Intersection Form (solid red) and PM Peak Intersection Queuing (dashed / dot)

8 Sensitivity Tests

This report has focused on the 2038 PM peak period, being the focus period of the Aurecon assessment.

Three sensitivity tests have also been carried out:

- 2038 AM peak
- 2048 PM peak
- PC30 PM Peak with changes due to Gressons Road and Tolls.

Across all sensitivity tests, the signalised intersection exhibits high sensitivity to traffic distribution and phasing assumptions, while the roundabout exhibits stable performance characteristics under uncertainty.

8.1 2038 AM Peak

Table 8-1: 2038 AM Peak intersection performance

Approach	Demand Flow	Roundabout (Safe System Concept)			Signals (NZTA Layout)		
		Deg Sat	Av Delay (LOS)	95% Queue	Deg Sat	Av Delay (LOS)	95% Queue
Garlick St Northbound	628	0.40	7 (A)	7	0.88	35 (C)	107
Bob Robertson Dr Westbound	748	0.46	7 (A)	10	0.39	37 (D)	96
Kesteven Pl Southbound	567	0.38	6 (A)	6	0.97	102 (F)	303
Bob Robertson Dr Eastbound	533	0.33	7 (A)	5	0.28	29 (C)	59
Total	2476	0.46	7 (A)	10	0.97	50 (D)	303

The roundabout intersection concept performs well in the AM peak period.

The signalised intersection will operate at or over capacity in the AM peak. Demand from Kesteven Place is not accommodated, and extensive queues form. As such, this reflects a similar outcome to the PM peak period.

8.2 2048 PM Peak

A full signal timing coordination has not been attempted for 2048. Instead, the traffic signal has been modelled as an isolated intersection in the network, which results in the Bob Robertson Drive / Garlick Street adopting signal timings that reflect demand at that intersection, as well as platooning from the interchange. Traffic demand is taken from Aurecon reporting.



Table 8-2: 2048 PM Peak intersection performance

Approach	Demand Flow	Roundabout (Safe System Concept)			Signals (NZTA Layout)		
		Deg Sat	Av Delay (LOS)	95% Queue	Deg Sat	Av Delay (LOS)	95% Queue
Garlick St Northbound	732	0.52	10 (A)	26	1.13	110 (F)	254
Bob Robertson Dr Westbound	1552	0.97	23 (C)	247	1.14	91(F)	269
Kesteven Pl Southbound	324	0.36	7 (A)	14	1.13	139 (F)	206
Bob Robertson Dr Eastbound	753	0.54	10 (A)	28	1.10	89 (F)	125
Total	3360	0.97	16 (B)	247	1.14	99 (F)	269

The 2048 modelling indicates that the signalised intersection will be even worse performing, being over capacity on all approaches. The roundabout will be reaching practical capacity on the approach from the east, and a queue will start to form. Importantly, delays are modest, indicating a moving queue (the cycle average queue is 100m which would be contained clear of the signals, with a 19% probability of the queue reaching the signals).

8.3 PC30 + Gressons + Tolls PM Peak

The alternative traffic volume set is expected to be conservatively high, as additive changes have been made. Traffic volumes are higher than the Aurecon 2048 assessment.

The signalised intersection is modelled as an isolated intersection the network, rather than phase times matching the interchange phase times perfectly. This allows delay across movements to be balanced.

Table 8-3: Sensitivity Scenario 2048 PM Peak intersection performance

Approach	Demand Flow	Roundabout (Safe System Concept)			Signals (NZTA Layout)		
		Deg Sat	Av Delay (LOS)	95% Queue	Deg Sat	Av Delay (LOS)	95% Queue
Garlick St Northbound	998	0.81	15 (B)	69	1.36	229 (F)	423
Bob Robertson Dr Westbound	1244	1.06	68 (E)	468	1.41	240 (F)	745
Kesteven Pl Southbound	396	0.50	10 (B)	24	1.39	375 (F)	390
Bob Robertson Dr Eastbound	1048	0.79	15 (B)	59	1.34	137 (F)	353
Total	3686	1.06	32 (C)	468	1.41	222 (F)	745

It is clear that with the alternative traffic volume forecast, the signals continue to show performance that indicates the layout cannot support traffic volumes.



Conversely the roundabout intersection is able to perform slightly over capacity, but with queuing contained to one approach. Cycle average queuing is 295m, and queue back to the signals at the interchange is likely to occur approximately 76% of the period.

If traffic volumes reached these levels, some additional intervention may need to be considered. Testing as summarised in Table 8-4 indicates that a separate left turn lane from the west would address the capacity constraint.

Table 8-4: Sensitivity Scenario 2048 PM Peak intersection performance – Extra Left Lane East Approach

Approach	Demand Flow	Roundabout (Safe System Concept additional Left Turn East Approach)		
		Deg Sat	Av Delay (LOS)	95% Queue
Garlick St Northbound	998	0.79	15 (B)	67
Bob Robertson Dr Westbound	1244	0.65	10 (A)	52
Kesteven Pl Southbound	396	0.50	10 (B)	24
Bob Robertson Dr Eastbound	1048	0.79	15 (B)	58
Total	3686	0.79	13 (B)	67

This additional lane could be considered for inclusion either through initial design, or at a later stage if required (to avoid overdesign initially). It is anticipated that sufficient land is already available.

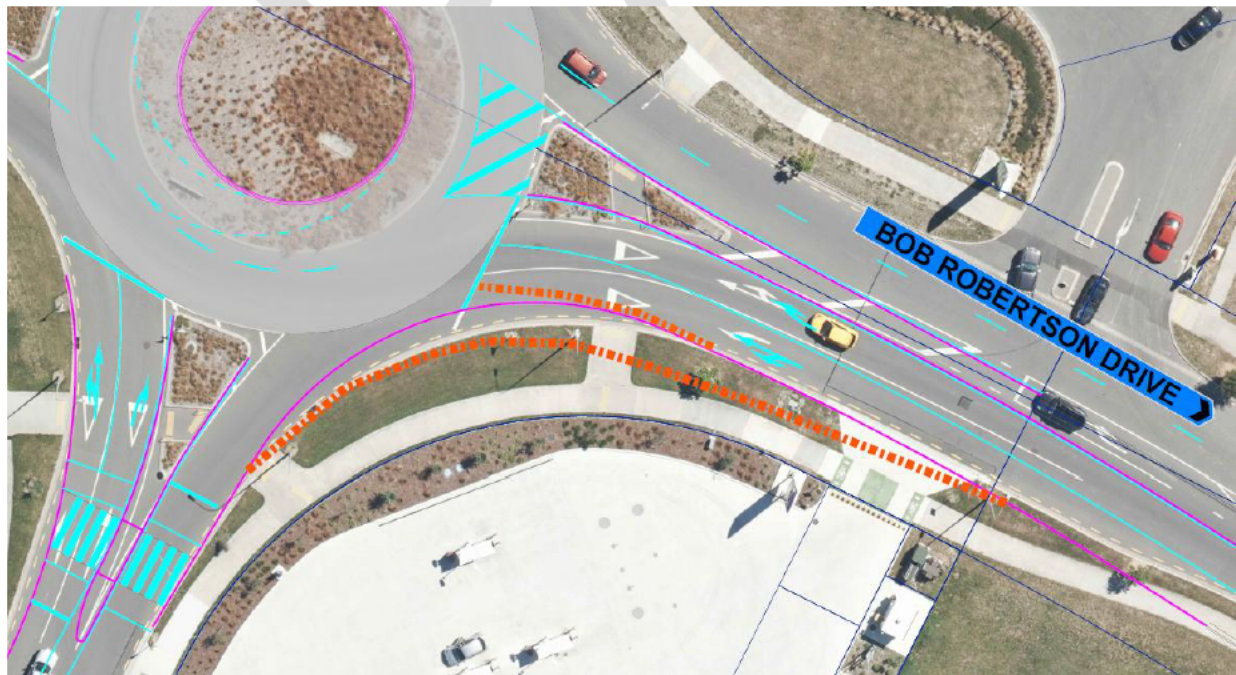


Figure 8-1: Indicative Additional Left Turn Lane



8.4 Summary

The sensitivity testing shows that the likely queueing that could occur in the long term with the roundabout will be on the eastern approach, which is important for the functioning of the interchange. In practice, it is highly likely that one of two scenarios could eventuate if performance was worse than forecast:

1. More SH1 traffic will utilise the toll motorway route, improving performance at the Ravenswood intersections.
2. More Gressons Road traffic will utilise Gressons Road for access to the development, bypassing the Ravenswood intersection.

It is also considered that with the forecast years being long term, a range of other changes may eventuate, such as increased public transport and removal or reduction of tolling. Nevertheless, options are available to manage that queue through an additional short left turn lane from the east.

Overall, the roundabout is considered to be less sensitive to future changes in traffic patterns.

9 Recommendation

On the basis of the analysis presented, proceeding with signalisation at Bob Robertson Drive / Garlick Street cannot be justified as a robust long-term solution. It is recommended that NZTA and WDC further investigate intersection scenarios that can support longer term traffic volumes, as well as provide an intersection form consistent with the current and future 'place' function associated with the entry point to the Ravenswood commercial centre, with a safe-system-focused, long-term roundabout solution.

The review of the signalised intersection layout shows that it is a large intersection form for the commercial centre setting, and will reach capacity or be over capacity at the forecast traffic volumes for 2038. A particular issue appears to be the significant right turn movements that will be generated at the intersection. The signals are forecast to generate long queues and combined with the requirements for the physical layout (for example, medians), will result in a need to restrict many accesses that have been provisioned for in the North Woodend ODP. As many of those accesses already exist, this will have adverse effects on the functioning of established businesses.

A roundabout solution has been investigated as an alternative. It would involve moderate changes to the existing intersection, and minimal changes beyond the immediate vicinity of the existing roundabout. The multilane approaches and circulation will enable turning movements to be accommodated at acceptable levels of performance, and particularly the large right turn movements forecast. Minimal effects on established or planned accesses are expected.

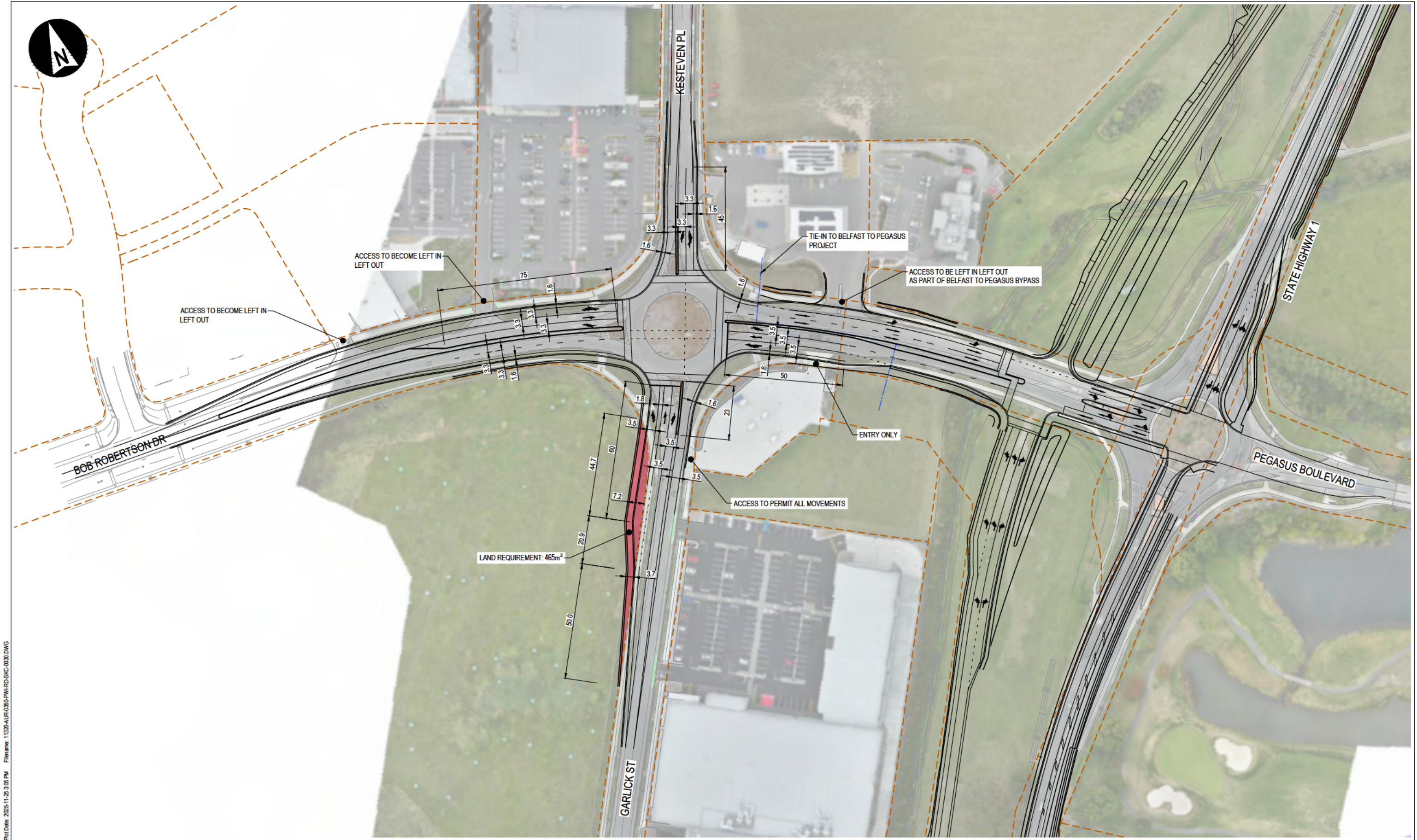
The roundabout is assessed as particularly resilient to congestion up to traffic volumes of approximately 3,500 vph. Existing traffic volumes at the intersection are less than 1,000 vph, and lane arrangement changes are warranted to reflect the major changes in traffic patterns forecast in the long term (being approximately 3,200 vph). Longer term interventions are also possible, such as a short left turn lane from the east to support additional intersection capacity.

It is acknowledged there are limitations to the traffic forecasting, and particularly forecasts of modelling with a toll road scenario. The form of modelling (SIDRA Intersection) can have some limitations also in a closed space network of intersections. However, from a network performance perspective planning for future conditions with a signalised intersection appears to be of little benefit compared to planning for future conditions with a modified roundabout.

Appendices

Appendix A Signalised Intersection Concept

DRAFT



Plot Date: 2025-11-25 3:05 PM Filename: 11320-AUR-0350-PWI-RD-SKC-0030.DWG

REVISIONS						
REV	DATE	REVISION DETAILS	REV	DRAWN	DESIGNED	VERIFIED
A	2025-11-12	ISSUED FOR INFORMATION	A	C.LACAMBRA	A.BARSOMO	B.HOMEWOOD
B	2025-11-25	ISSUED FOR INFORMATION	B	A.BARSOMO	A.BARSOMO	B.HOMEWOOD

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DESIGNED BY
A.BARSOMO

STATUS
WORK IN PROGRESS

CODE
WIP

DOCUMENT STATE
WORK IN PROGRESS

PROJECT
BELFAST TO PEGASUS MOTORWAY & WOODEND BYPASS

TITLE
ROADS
BOB ROBERTSON DRIVE - GARLICK ST INTERSECTION CONCEPT

DOCUMENT CODE
11320-AUR-0350-PWI-RD-SKC-0030

SCALE	SIZE	REFERENCE No.	REV
1:750	A1	RD-SKC-0030	A

Appendix B Roundabout Modification Concept

DRAFT





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