

Titanium Park Limited and Rukuhia Properties Limited

Northern Precinct

Integrated Transport Assessment

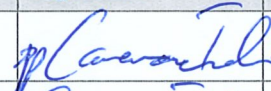
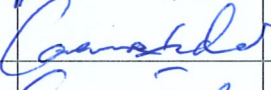

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1. Executive Summary

Bloxam Burnett & Olliver (BBO) has been commissioned by Titanium Park Limited (TPL) and Rukuhia Properties Limited (RPL) (the Applicants) to prepare an Integrated Transport Assessment to support a plan change application to Waipa District Council to rezone approximately 133 hectares (ha) of rural zoned land to Airport Business Zone (ABZ).

This includes updates to the current ABZ Structure Plan for the 40ha of existing zoned land known as Titanium Park Northern Precinct, together with amendments to the provisions within Section 10 (“Airport Business Zone”) of the Operative Waipa District Plan.

The combined 133 ha land area is referred herein as the Northern Precinct.

The concept development master plan for Northern Precinct envisages:

- Approximately 120.5 ha of gross land area of industrial hub (i.e. airside logistics, light industrial, warehouses and manufacturing businesses).
- Approximately 12.5 ha of gross land area for commercial development, potentially including activities such as hospitality, accommodation and conference facilities, and convenience retail.

When complete, the proposed development is expected to generate approximately 2,500 trips per peak hour spread across three access points. Heavy commercial vehicles will account for about 12% and 15% of traffic.

Two new intersections are proposed for access to the plan change area, one to State Highway 3 (SH3) and one to Raynes Road. Access to SH3 is proposed via the RPL property together with a “spine” road connecting through the TPL property to Raynes Road.

The Raynes Road access is to have restricted movements preventing right turns in and left turns out of the plan change area. This is to prevent traffic associated with the development from using the northern section of Raynes Road where many rural lifestyle properties and accessways are concentrated.

Overall, this assessment finds that the transportation effects on the adjoining road network enabled by the proposed rezoning of Northern Precinct can be managed and mitigated to acceptable levels, subject to the recommended infrastructure upgrades and associated timing of each (outlined below) being adopted within the District Plan Airport Business Zone rule framework and revised Structure Plan.

Recommended Infrastructure Provision

SH3 Access to Northern Precinct

- A new 3 -arm roundabout on SH3 connecting to a new public road through RPL land, ultimately connecting through TPL land to Raynes Road, in general accordance with the location and form illustrated in Appendix B of this ITA. This roundabout enables Waka Kotahi and WDC to significantly improve safety at SH3 / Ingram Road intersection by modifying it to Left In / Left out movements only.

Raynes Road Access

- Construction of a new intersection with banned Left Out and Right In movements, in general accordance with the intent illustrated in Appendix B of this ITA. The final intersection form and method of control, that addresses Safe System Design principles is to be determined through consultation and agreement with Waipa District Council.



Southern Links Access

- A direct access connection to the future Southern Links Central interchange for accessing future PT, walking, and cycling and freight, should be further investigated and planned in consultation with Waka Kotahi, Waipa District Council and Hamilton City Council. The access opportunity can be geometrically accommodated at the western roundabout of the interchange with a design amendment to include a clover-leaf style westbound off-ramp such that the roundabout remains consistent with the designated 4-leg roundabout layout.
- No access be provided from the plan change areas to Middle Road (north of Northern Precinct) or Narrows Road for general traffic. (Refer to **Appendix A** for the proposed Airport Business Zone Structure Plan). However, walking and cycling access should be provided through the closure point of Middle Road and to Narrows Road from Northern Precinct for connectivity to the proposed shared active modes path on Middle Road.

SH21 / Raynes Road Intersection

- The existing SH21 / Raynes Road priority-controlled intersection should be upgraded to at least a single lane roundabout before any land use activity in Northern Precinct generates operational traffic.
- The capacity of the roundabout should be upgraded to dual circulating lanes and approaches when the proposed Raynes Road access to Northern Precinct is constructed, or once 80 ha (combined gross area) of rezoned land has been developed and is generating 1520 trips per peak hour accessing SH3. It may be appropriate and most economic to construct the dual lane roundabout from the outset, and this should be confirmed in consultation with Waka Kotahi and Waipa District Council.

SH3 / Raynes Road Intersection

- No land use activity in Northern Precinct shall generate operational traffic until the upgrade of SH3 / Raynes Road intersection to a roundabout by Waka Kotahi, is under construction.

Walking and Cycling

Walking and cycling paths/infrastructure are recommended to connect Northern Precinct with the rest of Titanium Park as follows:

- On all internal transport roads through the Northern Precinct
- On the west side of Raynes Road connecting from Northern Precinct to the shared walking and cycling path adjacent to Raynes Precinct. This then connects Northern Precinct to the eastern and southern employment precincts of Titanium Park.
- Along the east side of SH3 to Ingram Road to connect Northern Precinct with the western employment precinct of Titanium Park.

For connectivity to the wider network a strategic walking and cycling path connection is proposed as part of the Northern Precinct rezoning, between Peacocke Road and Northern Precinct via Middle Road and the presently unformed section of Faiping Road. This will provide an attractive and convenient walking and cycling connection between the extensive cycling network in the Peacocke residential growth cell to the employment precincts surrounding the Airport. Delivery of the shared path to Peacocke Road requires a safe and appropriate road crossing facility across Raynes Road for continuity of the proposed path along Middle Road.

The path length for the route between Northern Precinct and Peacockes Road via Middle Road and Faiping Road is approximately 1.9 km, while the distance to central Peacocke growth cell and the Cobham Drive /



Wairere Drive interchange via the new Waikato River bridge (presently under construction) would be a cycling distance of approximately 4 km and 6km respectively.

It is intended that the Faiping Road sections of the path be developed in partnership with Waipa District Council, Waka Kotahi and Hamilton City Council to ensure it meets the needs of the wider community by integrating well with the planned walking and cycling network in Peacocke. A Private Developer Agreement between TPL, RPL and the road controlling authorities is likely to be an appropriate mechanism in this case.

Public Transport

A new “on-demand” public transport service called “Flex” commenced operation between Hamilton City Transport Centre and the Airport in February 2022. The service is operated by Waikato Regional Council as a 12-month trial. The Airport service operates weekdays from 10am to 4pm, with fares costing \$3 per person each way. Passengers book the ride share service using an app downloaded on their smart phone.

For Northern Precinct, the proposed spine road connecting between SH3, and Raynes Road will be designed for use by public transport. When complete, this development would enable an efficient public transport service loop around the Airport precincts and could be incorporated into the Hamilton to Te Awamutu services. This together with the proposed walking and cycling paths ensures multi-modal transport options are provided to help reduce reliance on private vehicles for travel to Hamilton and between the surrounding precincts of Titanium Park and the Airport.

The unformed section of Faiping Road also presents an opportunity for a potential future local public transport link between the Airport and Hamilton CBD via Peacocke residential growth cell, particularly in the period before Southern Links major arterial is constructed and potentially fills this purpose. Given the timing and funding for Southern Links is uncertain, it is recommended that Hamilton City Council, Waipa District Council and Waikato Regional Council investigate the use of Faiping Road corridor for public transport connection alongside the proposed walking and cycling path, in context with the wider network public transport planning. For clarity, use of this corridor by public transport is not required mitigation for transport effects of the rezoning proposal, as the Spine Road through Northern Precinct will enable a loop around the airport by the Te Awamutu / Hamilton bus service. It is also recognised that provision of public transport services by others is not something the rules in the District Plan can require.

Table 1 summarises the recommended transportation infrastructure upgrades and related timing and responsibilities for delivery, in relation to this rezoning submission.

Table No: 1

Staging of Transportation Infrastructure Improvements				
No.	Proposed Upgrade	Development Stage Trigger	Upgrade Triggered by Rezoning?	Delivered By
1	Upgrading of SH21 / Raynes Road intersection to a 3-arm roundabout (Refer Figure 20)	Before any commercial/industrial activity in Northern Precinct generates traffic	No*	Waka Kotahi
2	Capacity Increase at SH21 / Raynes Road roundabout to double circulating lanes and dual approach lanes (Refer to Figure 19: Proposed Intersection)	Before any commercial/industrial activity in Northern Precinct generates traffic accessing Raynes Road OR When the cumulative total consented land area in Northern	Yes	The Applicants



	Upgrades – SH21 / Raynes Road Intersection	Precinct with sole access to SH3 roundabout, exceeds 70 ha (gross)		
3	3-arm roundabout at SH3 / Raynes Road intersection	Before any commercial/industrial activity in Northern Precinct generates traffic	No*	Waka Kotahi
4	3-arm roundabout on SH3 for access to Northern Precinct	Before any commercial/industrial activity in Northern Precinct generates traffic accessing SH3 OR When the cumulative total consented land area in Northern Precinct with sole access to Raynes Road, exceeds 40 ha (gross)	Yes	The Applicants
5	Restricted movement intersection access from Northern Precinct to Raynes Road	Before any commercial/industrial activity in Northern Precinct generates traffic and requires access to Raynes Road OR When the cumulative total consented land area in Northern Precinct with sole access through SH3 roundabout, exceeds 70 ha (gross)	Yes	The Applicants
6	Construction of new walking and cycling shared path connecting Peacocke Road to the Northern Precinct via Middle Road and Faiping Road	Before any commercial/industrial activity in Northern Precinct generates traffic	Yes	Waipa District Council, Hamilton City Council, The Applicants
7	Conversion of SH3 / Ingram Road Intersection to permit only Left In and Left Out movements	After construction of the proposed SH3 roundabout access into Northern Precinct	No. Safety improvement made possible by rezoning	Waka Kotahi, Waipa District Council

* Upgrade required regardless of proposed rezoning to address current safety/capacity deficiencies.



2. Introduction

Titanium Park Limited (TPL) and Rukuhia Properties Limited (RPL), the Applicants, have jointly lodged an application with Waipa District Council (Council) for a private plan change to enable the development of the Northern Precinct of the Airport Business Zone.

The Northern Precinct comprises approximately 40 hectares (ha) of land already zoned Airport Business on the northern side of Hamilton Airport, and the applicants seek to rezone a further 64 ha of farmland to the north that is presently zoned Rural under the Operative Waipa District Plan (District Plan) together with 29ha of Rural zoned land owned by RPL.

The Rural zone part of the Northern Precinct site is identified in the District Plan as a 'Possible Future Growth Area' beyond the existing 40 ha zone, as shown in Figure 1. The District Plan anticipates that this future extension will provide for industrial land beyond 2035, but the Applicants have identified that current and projected demand for industrial land sees this timeframe needing to be brought forward.

A team of experts were commissioned in 2019 to develop a master plan for the Northern Precinct; the purpose of which was to explore options consistent with the overall vision to create an industrial park with a business park hub that includes commercial / retail activities to service and complement the industrial activities. The RPL property has been included in this application and provides the preferred access and transport network arrangement for the Northern Precinct site by way of a new road connection to State Highway 3 through the RPL property.

This Integrated Transport Assessment (ITA) supports the plan change application by the Applicants which is in general accordance with Assessment Criteria 21.2.16.3 in Section 21 of the District Plan, and Appendix 5C of the Waka Kotahi NZ Transport Agency Planning Policy Manual. The ITA provides an assessment of the traffic and transportation aspects of the proposed Plan Change, which includes:

- The local transport environment surrounding Northern Precinct.
- An estimation of the predicted trip generation when rezoned and developed.
- The proposed access arrangement.
- Anticipated effects on the road corridors and intersections, including the
 - State Highway 3 / Raynes Road intersection
 - State Highway 21 / Raynes Road intersection
 - State Highway 3 / Collins Road intersection
 - State Highway 3 / State Highway 21 intersection
 - State Highway 3 / Normandy Avenue intersection
 - State Highway 21 / Tamahere Interchange intersections
- Proposals to mitigate effects on the network having regard to the long-term function and configuration of the road network and consideration for existing zoned and consented development.
- The provision for alternate modes of transport including public transport, micro-mobility and pedestrian and cycle linkages within Northern Precinct; and
- The proposal's alignment with local and national transport strategies and policies.



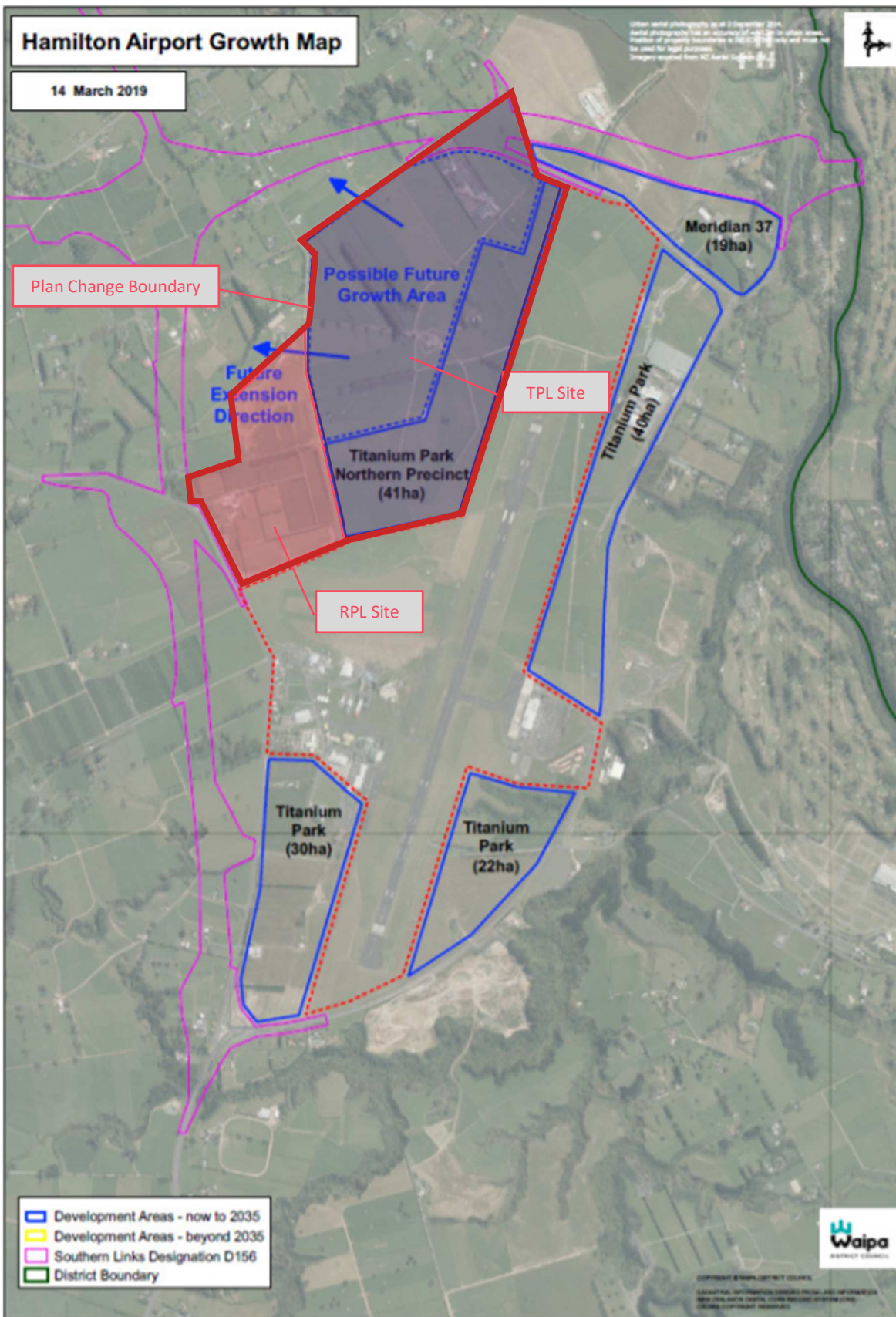


Figure 1: Hamilton Airport Growth Map with Proposed Plan Change Site



3. Existing Transportation Environment

3.1 Site Location

The locality of the subject site is shown in Figure 2. The site is within the Waipa District close to the boundary of Hamilton City to the north-west and Waikato District to the north-east.

The TPL property is bordered by Hamilton Airport's main runway to the east, the secondary grass runway to the south, Middle Road and Narrows Road to the west and Raynes Road to the north. The RPL property is bordered by Middle Road to the east and State Highway 3 to the west.

The combined total land area of the rezoning proposal is 133 ha, which includes changes to the existing 40 ha Northern Precinct Airport Business Zone and Structure Plan.

Development in the Peacocke Structure Plan area for residential purposes to the north, together with the Southern Links Arterial transport corridors will create strong transport demands for employment at Titanium Park, the transport hub of the Airport and Hamilton Central Business District (CBD).

The site is identified as a potential development node and enhance employment area in the Hamilton Waikato Metropolitan spatial plan.

The proposed Southern Links Arterial transport corridors will be located to the north of the subject site with a new grade separated interchange near the Northern Precinct, as shown in Figure 2.



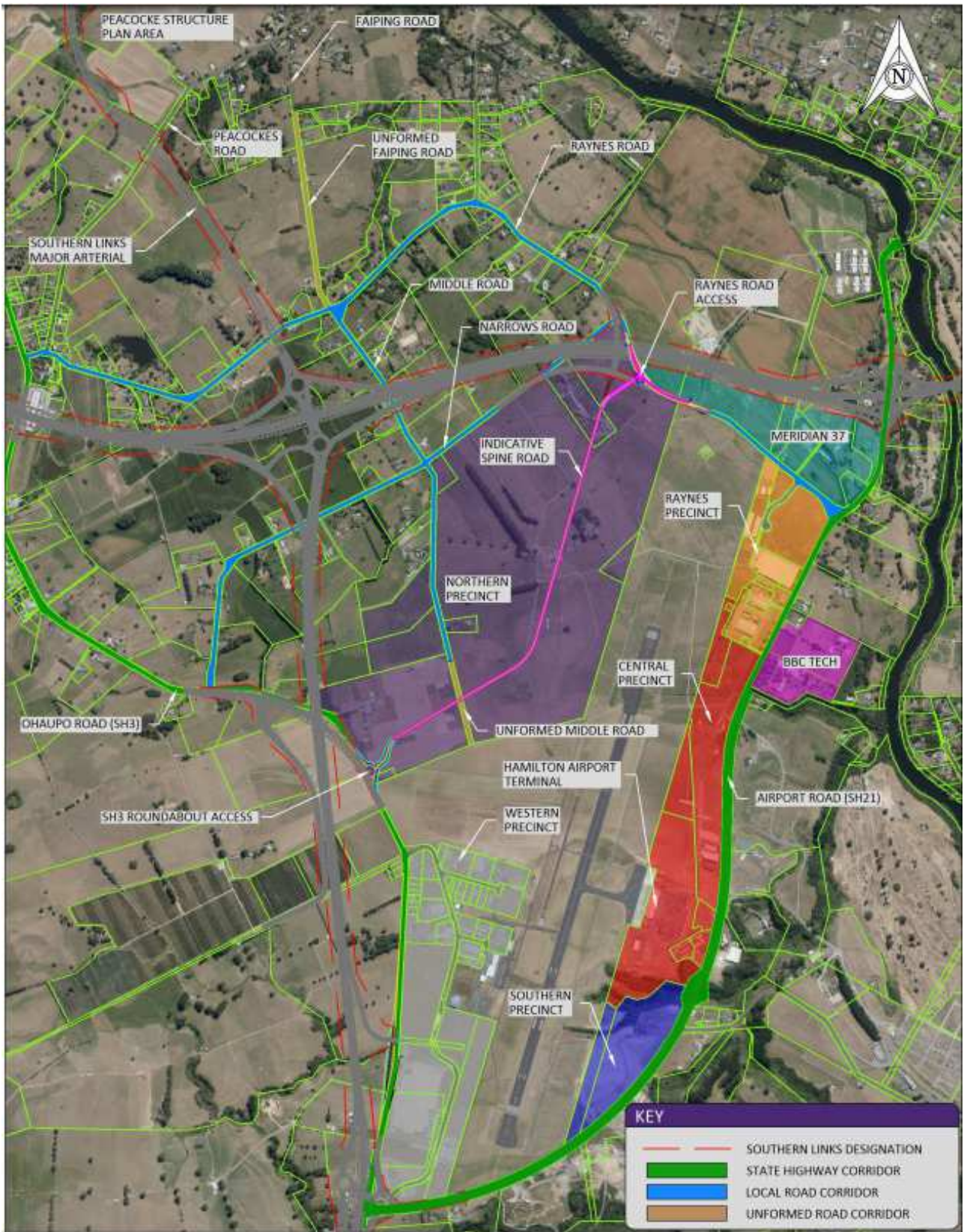


Figure 2: Site Locality



3.2 Land Use

The current Airport Business Zone Structure Plan shown in Figure 3 illustrates the 40 ha of Northern Precinct already zoned Airport Business, and the associated indicative internal road network with proposed access via Ingram Road in the Western Precinct of Titanium Park.

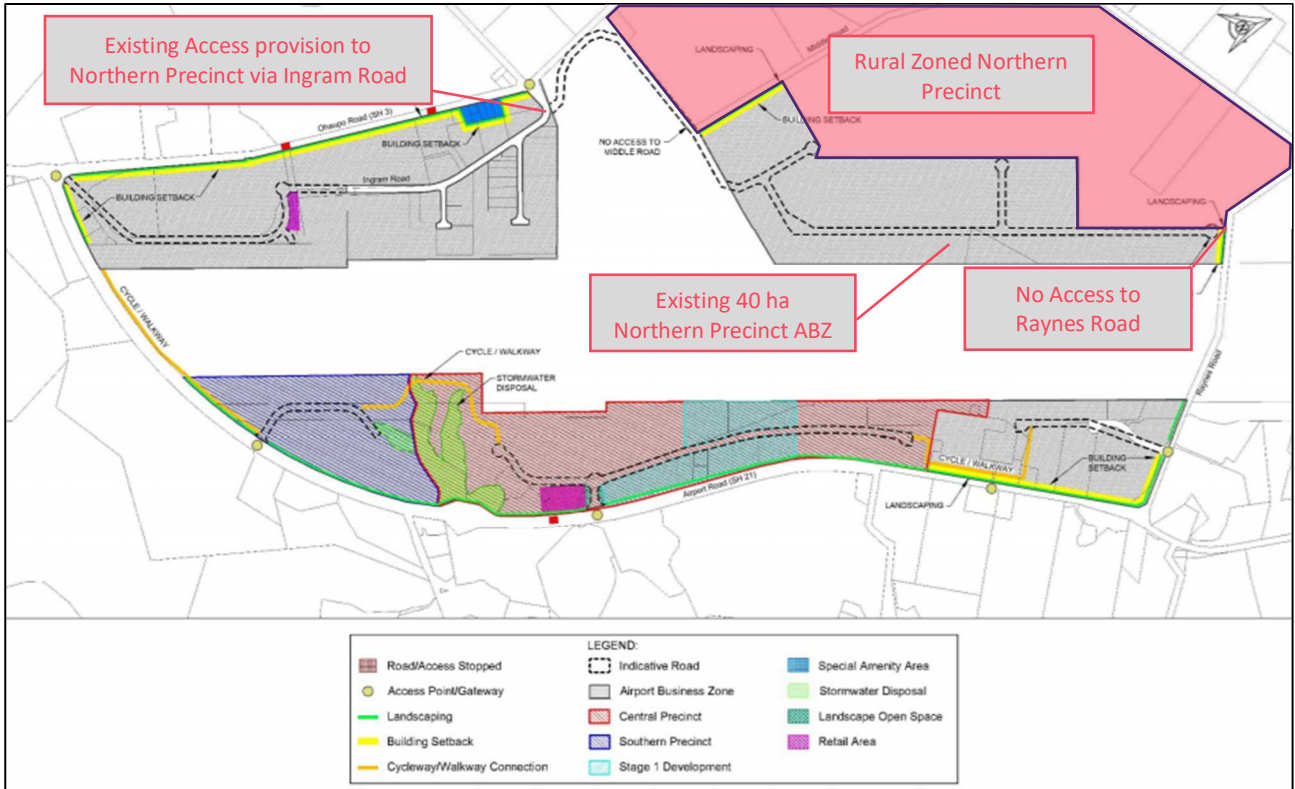


Figure 3: Current Airport Business Zone Structure Plan

3.3 Existing Road Network

The existing network of roads surrounding the subject site that could potentially be affected by the proposed rezoning are described in this section.

3.3.1 State Highway 3

State Highway 3 (SH3) connects Hamilton City to Te Awamutu and townships further south, down to New Plymouth. It also provides the main transport link between Hamilton Airport and the southern and central parts of Hamilton. It is identified as a Major Arterial Road and a Significant Road Corridor in the District Plan road hierarchy and is classified as a Regional Road in the One Network Road Classification (ONRC) system. The estimated Annual Average Daily Traffic (AADT) volume along the section of SH3 to the west of the subject site is approximately 14,900 vehicles per day (vpd) with 10% heavy commercial vehicle (HCV) according to information on the Mobile Road website. This section of SH3 has a two-lane two-way carriageway with a posted speed limit of 100 km/h.

3.3.2 State Highway 21

State Highway 21 (SH21) is also a two-lane, two-way undivided road with a posted speed limit of 100 km/h on the section closest to the site. It is classified as a Major Arterial Road and a Significant Road Corridor in the District Plan road hierarchy, and as an Arterial Road in the ONRC. The estimated AADT for SH21 is 7,150 vpd with 10% HCV according to information on the Mobile Road website.



3.3.3 Raynes Road

Raynes Road intersects with SH21 approximately 780 m south-east of the site, and to SH3 approximately 2,900 m north-west of the site. The intersection of SH21 / Raynes Road is a priority-controlled T-intersection with a right turn lane on SH21. The intersection of SH3 / Raynes Road is also a priority T-intersection with a right turn lane on SH3.

Raynes Road is a two-way two-lane rural road with a posted speed limit of 80 km/h and is identified as a Local Road in the District Plan road hierarchy, and a Primary Collector Road in the ONRC. It has an estimated AADT of 3,400 vpd with 10% HCV based on information on the Mobile Road website.

3.4 Existing Transport Modes

3.4.1 Public Transport

Public transport options at Hamilton Airport presently consist of taxis and Airport to CBD mini vans. There are no scheduled public bus services operating between Hamilton or other Waikato centres and the Airport or Titanium Park. However, a new “on-demand” PT service trial called “Flex” commenced operation between Hamilton City Transport Centre and the Airport in February 2022. The service is operated by Waikato Regional Council as a 12-month trial. The Airport service is planned to operate on weekdays from 10am to 4pm, with fares costing \$3 per person each way. Passengers book the ride share service using an app downloaded on their smart phone.

Public transport services have been allowed for at the Airport terminal and are not precluded in the development of Titanium Park to date or the master planning for Northern Precinct.

3.4.2 Walking and Cycling

There is no existing pedestrian or cycling facilities on SH 3, SH 21 or Raynes Road due to the existing rural environment. However, the current Airport Business Zone Structure Plan shows walking and cycling connectivity between Titanium Park Southern Precinct, to Western Precinct and Central Precinct and on to the Raynes Precinct. The connection between Southern and Central Precincts has just been completed and a walking and cycling path will soon be constructed from Ozzie James Drive (Central Precinct) to Raynes Road adjacent to the runway reserve and Raynes Precinct as part of the Stage 5 development of Titanium Park Central Precinct. This will include a viewing platform of the runway.

3.5 Crash History

Crash data was sourced from the Waka Kotahi NZ Transport Agency’s (Waka Kotahi) Crash Analysis System (CAS) over a ten-year period from 2011 – 2020, including available data for 2021. The study area includes all crashes within a 200 m radius of the proposed accesses to the subject site and key intersections in the vicinity of the subject site (as identified in Appendix O12 of the District Plan).

The crash data indicates that the current right turn bay intersection forms of the SH3 / Raynes Road intersection and SH21 / Raynes Road intersection are likely to be contributing to the crash types observed at these intersections. Both intersections are likely to be upgraded to roundabouts with the SH3 / Raynes roundabout currently being designed by NZTA. These upgrades will significantly reduce the risk of death or serious injury crashes at the intersections and bring both into alignment with Safe System design principles.



Table No: 2

Crash History 2011 - 2021						
Location	Total Crashes	Crash Severity				Comments
		Death	Serious Injury	Minor Injury	Non-injury	
SH 3 near proposed Northern Precinct Access	3	1	0	1	1	The fatal incident involved a vehicle crossing the centre line to overtake and collided with the on-coming vehicle. Two vehicles were racing.
Raynes Road near proposed Access Intersection	1	0	0	0	1	-
SH3 / Normandy Ave intersection	51	0	1	8	42	Trends noted were failing to give way when entering the roundabout and rear-end collisions.
SH3 / Collins Rd intersection	23	0	1	4	18	Rear-end collisions were the most common crash type, which is common at signalised intersections. Right turn against crashes were also found to be a pattern, which is more likely when filter turns are allowed.
SH3 / Raynes Rd intersection	30	1	5	6	18	Trend of drivers turning right from Raynes Road failing to give way to southbound SH3 traffic.
SH3 / SH21 intersection	29	0	3	7	19	This intersection was upgraded to a roundabout in 2016. Only 12 crashes have been recorded since. The 3 serious crashes occurred prior to the upgrade.
SH21 / Raynes Rd intersection	14	0	1	6	7	Crash factors included failure to give way, and failure to observe another vehicle slowing ahead. The crash record suggests that the form of intersection may be contributing such that some drivers are not understanding or obeying priorities.
Tamahere Interchange	13	0	1	3	9	Trend of rear-end collisions due to driver inattention on various approaches, which is common at major intersections.



4. Future Planned Transport Infrastructure

This section provides a brief description on key roading projects that are currently in planning stages within the vicinity of the subject site.

4.1 Southern Links

The Southern Links Arterial roading project involves the realignment of SH3 and construction of a grade separated interchange at the SH3 / SH21 intersection as shown in Figure 2 above. It will provide efficient and safer connections from SH3 near SH21 and Hamilton Airport to central and east Hamilton (including Waikato University and the Ruakura industrial growth cell) via the Major Arterial Road through the Peacocke growth cell. A safe and efficient southern corridor is also planned, linking from Stat Highway 1 (SH1) to the Hamilton west industrial and residential areas.

At the time of writing this report, while the future Southern Links corridors and interchanges are designated, the project remains a concept with no detailed design having been completed, or construction timeframe or funding confirmed.

4.2 SH3 / Raynes Road Intersection Upgrade

During pre-application consultation with Waka Kotahi and the Council, Waka Kotahi identified that the SH3 / Raynes Road intersection was soon to be upgraded to a roundabout as a Speed and Infrastructure Programme (previously Safer Network Programme) safety upgrade. Funding for the pre-implementation phase is now confirmed in the NLTP and design is expected to be completed within the next six months. Funding for construction and land purchases is also available for this upgrade. At present Waka Kotahi expects the roundabout will be a single circulating lane with single lane approaches and exits, although that may change as design and investigations proceed.

4.3 SH21 / Raynes Road Intersection Upgrade

Stantec prepared a *CDP Modelling Summary* report in 2018 on the behalf of Meridian 37 Limited, to provide details of the modelling undertaken to support the development of the Hamilton Airport Growth Node. This Growth Node consists of two key land blocks, namely Meridian 37 (M37) and Titanium Park. However, together with the rest of the precincts, only the zoned 40 ha of Northern Precinct was included in the land use for Titanium Park.

The modelling exercise undertaken by Stantec concluded that the existing SH21 / Raynes Road priority-controlled intersection will require capacity improvements with or without Southern Links by 2031, with the right turn out from Raynes Road becoming the problematic movement from a capacity and safety perspective.

Stantec identified that a single lane roundabout with a dual lane approach from Raynes Road as shown in Figure 4, would be required as a minimum to accommodate the modelled future traffic demands from the anticipated development of the Hamilton Airport Growth Node with or without Southern Links.



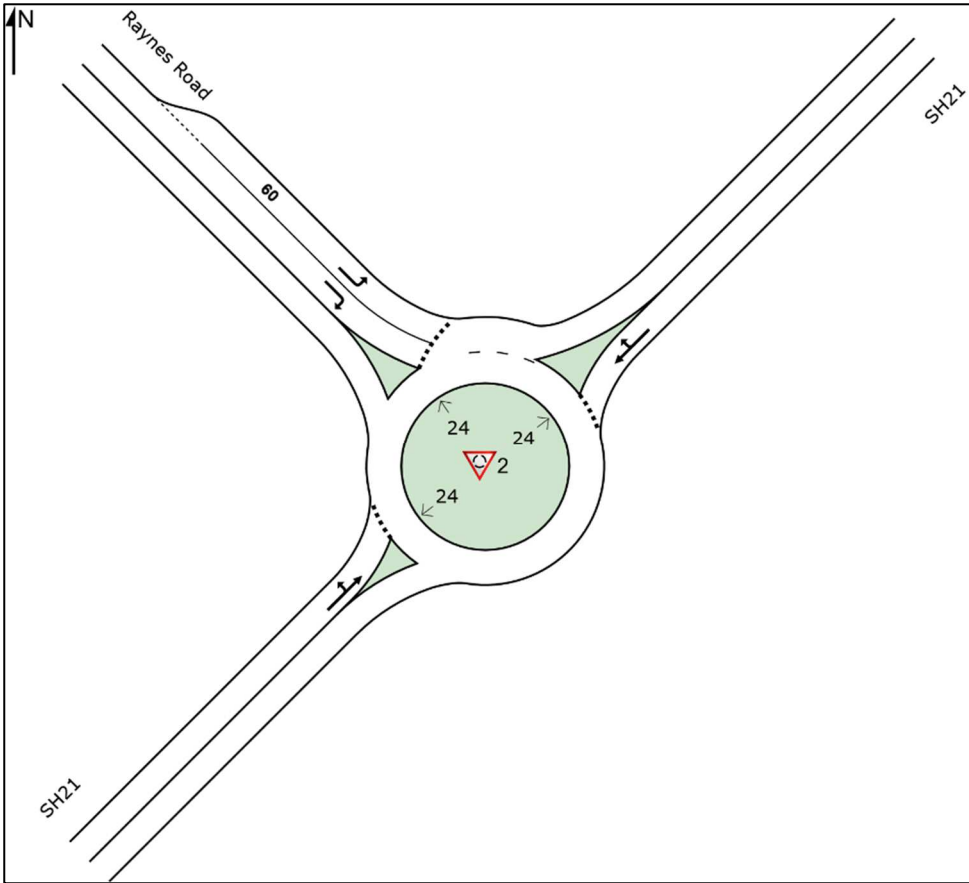


Figure 4: SH21 / Raynes Road Future Roundabout Layout Recommended by M37 Modelling Assessment



5. Proposed Plan Change

5.1 Proposal Overview

The Applicants illustrative masterplan provides the basis for the rezoning request across the site. The Masterplan, which is shown in Figure 5 will continue to evolve to allow response to opportunities and constraints as they are identified through the re-zoning and subdivision design processes.

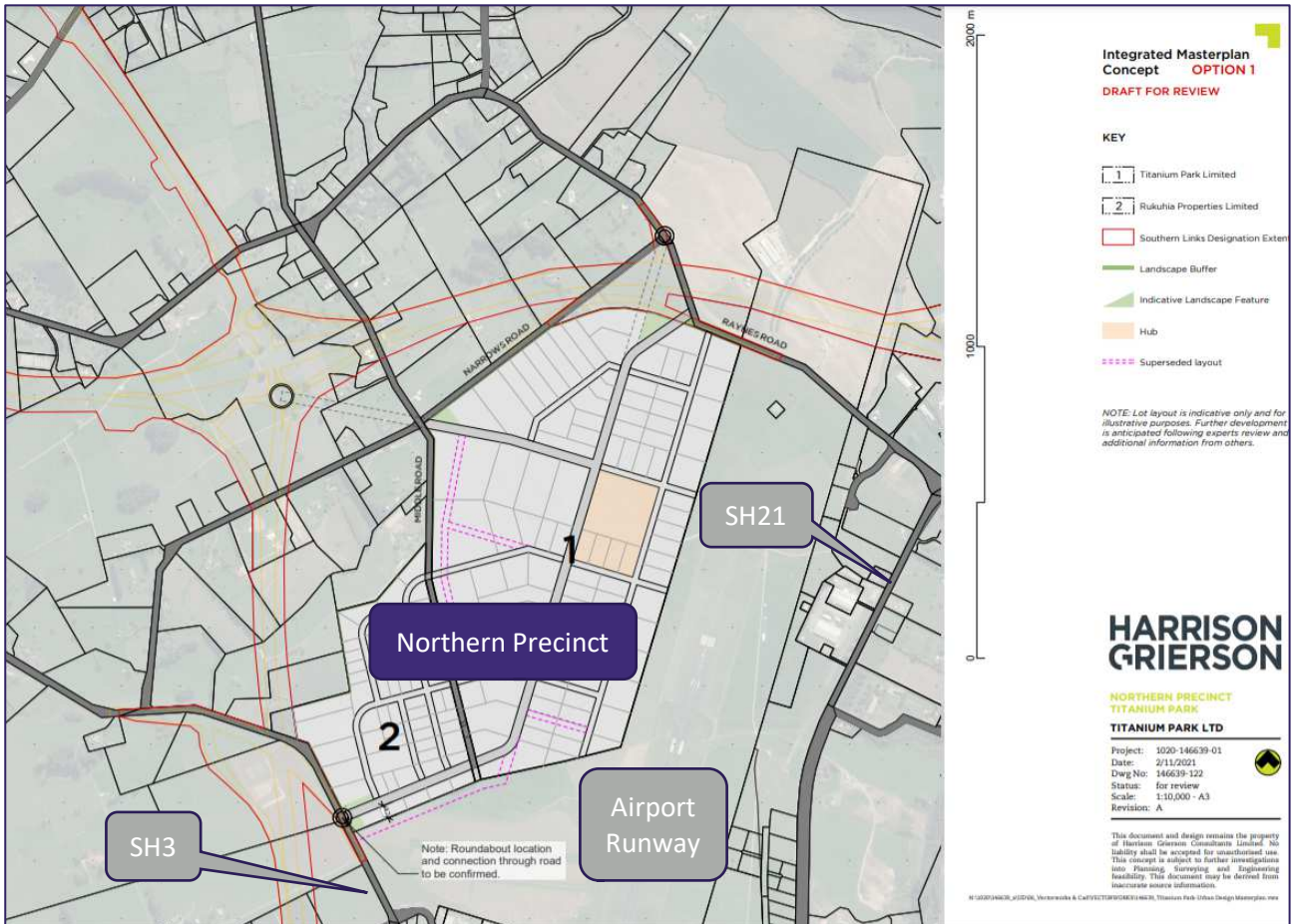


Figure 5: Draft Integrated Masterplan

The following land uses are proposed within the Airport Business Zone:

- A 120.5 ha of industrial hub (i.e. airside logistics, light industrial, warehouses and manufacturing businesses).
- Approximately 12.5 ha of commercial development, potentially including activities such as hospitality, accommodation and conference facilities, and convenience retail.

The following transport infrastructure is proposed to support the rezoning and subsequent development:

- A new roundabout access on SH3.
- A new priority-controlled access on Raynes Road.
- Provision for safe and convenient walking and cycling connectivity within Northern Precinct and to the other business zone precincts of Titanium Park (Raynes, Central, Southern and Western).

The transport effects of this proposal are considered and discussed in the following sections of this report.



5.2 Access Strategy

The Operative District Plan rules around access to the Northern Precinct are as follows:

- Rule 10.4.2.10 states that there shall be no direct access to a State Highway or to Raynes Road, except as shown on the current Airport Business Zone Structure Plan in Appendix S10 of the District Plan.
- Rule S10.2.2 of the current Airport Business Zone Structure Plan states that there will be no vehicle access from the Northern Precinct land to Narrows Road or Middle Road and vehicle access will be by way of an internal road connection to the Western Precinct.

The Masterplan (refer Figure 5) that informed the rezoning proposal illustrates an access strategy for Northern Precinct that contrasts with these two rules in the District Plan. Specifically, it shows two primary access points, one through RPL land to SH3, and one directly to Raynes Road. In addition, and applicable as a long-term solution only, there are two access roads connecting to Middle Road, one of which enables a future connection directly to the Southern Links central interchange roundabout.

In the period before Southern Links is constructed, all transport access into the subject site will be through two connections only: SH3 to the west and Raynes Road to the northeast. These access points will be internally connected via a central spine road as illustrated in the Masterplan and proposed revised ABZ Structure Plan. Where local road connections between RPL and TPL land cross the formed sections of Middle Road south of Narrows Road, it is proposed that these new roads do not permit connection of ABZ traffic to Middle Road north of the site. However, it is proposed that active modes are provided for through the closure point to the formed section of Middle Road to improve connectivity and convenience for walking and cycling.

To minimise traffic volume increases on Raynes Road and Middle Road north of Narrows Road it is proposed that the Northern Precinct access to Raynes Road be formed so that left turn out and right turn in movements are banned and physically prevented as much as practicable. Northern Precinct traffic with origins and destinations in the western parts of Hamilton will use the access to SH3 via RPL land.

The following are the key benefits of the proposed access strategy with and without the Southern Links arterials:

- Improved access legibility over the current Airport Business Zone Structure Plan road network, which presently shows vehicle access between Northern Precinct and SH3 via the Western Precinct road network.
- Improved transport connections to SH21 and SH1 Waikato Expressway than the current Structure Plan network.
- Greater accessibility and options for efficient future Public Transport servicing of the Airport and surrounding employment zones, both to Hamilton CBD and potentially also Peacocke growth cell.
- Releases more land within Northern Precinct to be developed for economic growth. At present, the amount of land that can be developed in Northern Precinct is constrained by access capacity and safety. The current 40ha zone was to be accessed via the SH3 / Ingram Road / Penniket Road intersection, which is shared with Western Precinct. This and the form of the intersection limits the developable area. The proposed access strategy would enable Ingram Road / SH3 to become Left In / Left out only.
- Avoids impacting / relocation of the Hamilton Airport east / west runway.
- Future Proofing network connection to Southern Links Central Interchange, that will provide fast and efficient public transport and freight connections between Hamilton and the Airport and Airport Business Zone.



Table 4 provides a summary of the concept design configurations for each access intersection (refer also to Drawings 144380-06-0021 and 144380-06-0031 in Appendix B).

These concept layouts have been discussed with, and initial feedback received from Waka Kotahi and Council to ensure there are no significant objections at a fundamental level to a new intersection at the locations identified. It is recognised that these are high-level concepts, and the final design configuration is subject to preliminary and detailed design processes, safety audits and the RCA’s standard approval processes, so they will be amended and confirmed as part of resource consent or subdivision consent applications to develop the land once rezoned.

For the purposes of assessing effects and demonstrating that access to the rezoned land is feasible, each concept design has been produced in accordance with the existing District Plan provisions, the Waikato Regional Infrastructure Technical Specifications (RITS) and the Waka Kotahi NZ Transport Agency Planning Policy Manual. The concept layouts have been modelled to demonstrate that the expected performance and capacity of the intersection is sufficient for the transport demands of the rezoned land once developed.

Table No: 4

Preliminary Access Configurations			
Proposed Access	Access Type	Proposed Configuration	Appendix Reference
Access 1 (SH 3)	Intersection	Dual circulating lane, 3 Leg Roundabout with double right turn lanes from Northern Precinct	Appendix B Drawing 144380-06-0021
Access 2 (Raynes Road)	Intersection	Limited movement Tee intersection, with banned Left turn out and Right turn in movements from/to the site. (Priority control or potentially signal control)	Appendix B Drawing 144380-06-0031

5.2.1 Proposed SH3 Roundabout Access

The SH3 roundabout access has been designed at a concept level in accordance with the best practice guidance in the *Austrroads Guide to Road Design Part 4B: Roundabout*.

In the form illustrated, the roundabout enables approximately 80 ha (gross) of rezoned land to be developed and built out with access to SH3 (Refer to Section 7.5). The roundabout is required when subdivision of the ABZ requires access to SH3, or after 45 ha (gross) is developed and accessed via Raynes Road.

The key design considerations in developing the concept roundabout layout and location were:

- The location of the intersection in relation to the future Southern Links Arterial corridor and how it can integrate without adversely impacting on the Southern Links design or construction. Design plans show there is sufficient suitable land for the roundabout while avoiding any clash with the Southern Links alignment and designation. Consultation with NZTA to date identified that the roundabout position could potentially be further west into the land opposite RPL, which is Crown owned. It was acknowledged that this may assist with better integration with the Southern Links transport corridor but can be addressed during the detailed design phase of the roundabout.
- The SH3 / Narrows Road intersection is situated approximately 790 m northwest of the proposed roundabout location on SH3. It is a low volume intersection that does not have any bearing on the roundabout design or performance. It is possible this intersection could become Left In / Left Out



only once the roundabout is built, as a safety improvement. The intersection will be deleted from the network in the long term with construction of Southern Links.

- SH3 / Ingram Road intersection was to be modified to left in / left out (LILO) movements only when the current zoned Northern Precinct was given access to SH3 via Western Precinct road network. This rezoning request no longer seeks that shared access arrangement with Western precinct, but the Ingram Road intersection could still be amended to LILO as a safety improvement by Waka Kotahi when the northern and southern sections of Ingram Road are connected. This safety improvement is no longer related to effects mitigation for Northern Precinct.
- The proposed internal Spine Road from the SH3 / GTL roundabout will pass through or near an unformed section of Middle Road to connect through Northern Precinct to Raynes Road. It is proposed that no access be provided from the Northern Precinct to Middle Road (north of Northern Precinct) or Narrows Road for general traffic. (Refer to **Appendix A** for the proposed Airport Business Zone Structure Plan). However, access for walking and cycling is recommended through the closure point of Middle Road and also to Narrows Road from Northern Precinct to enhance active mode connectivity to the proposed shared walking and cycling path on Middle Road.

5.2.2 Proposed Raynes Road Access

The future Northern Precinct commercial/industrial activities have the potential to significantly increase heavy vehicle volumes on Raynes Road north of Narrows Road if unrestricted access is enabled to Raynes Road from the site prior to the Southern Links transport corridor being operational. This potentially would create adverse amenity and safety effects for residents of the numerous rural residential properties along Raynes Road (north of Narrows Road) and Lowe Road, and the need to mitigate this with significant road upgrade requiring more land are likely to be needed on Raynes Road to mitigate these effects.

Therefore, BBO has investigated at a high level, a concept design of a partial seagull treatment (channelised 'T' intersection) for the Raynes Road access. Left turn movements out of the site and right turn movements into the site would be legally banned and made physically impractical through kerb and infrastructure design. The partial seagull treatment provides improved safety for right turning traffic exiting the site and less delay than at a conventional Tee intersection as the right turn out movement gives way to one opposing traffic movement only (northbound on Raynes Road). The removal of the right turn in movement reduces high angle conflict points and reduces conflicting traffic volumes. It therefore aligns more closely with Safe System principles than a conventional priority-controlled Tee intersection.

Some of the design considerations for this access were:

- This intersection is suitable until the Southern Links Transport Project is under construction. It would be a 'sacrificial' investment for the applicants, but the lack of any certainty around the timing of Southern Links means it could be good for at least 10 years and possibly 15 years or more. Ultimately, if Southern Links is constructed, the intersection would become obsolete and the spine road within Northern Precinct would be connected by a short extension to the new intersection of the realigned Raynes Road and Narrows Road that is planned as part of Southern Links.
- The location of the intersection is at the apex of a curve. This is not ideal but restricting movements to left in and right out will help mitigate safety risks, along with some further Safe System design elements.
- The location of the intersection is a balance of achieving separation from M37 access on the opposite side of Raynes Road and trying to set up for a usable lot depth from the runway boundary. If the intersection is located closer to M37 access, then the right-turn out acceleration lane will overlap with M37's access which presently allows right turn in movements.



- Shifting the location of the intersection to Narrows Road adjacent to the existing Nursery would not prevent vehicles at the Raynes Road / Narrows Road intersection turning left onto Raynes Road or right in from Raynes Road, via SH3 / Raynes Road intersection which is what the proposal is trying to avoid.
- Other potentially viable options exist to achieve the same intent of preventing Left Out and Right In movements between Raynes Road and Northern Precinct. These include connecting the Spine Road to Raynes Road (south) in a continuous curve or severing Raynes Road to general traffic north of the Spine Road connection, or provision of a traffic signal intersection (with Raised Safety Platform) that includes banned Left Out and Right In movements. The intent of the concept access design is the critical element. Alternative options that achieve the same should be considered at detailed design.

Traffic modelling by BBO has confirmed that the Raynes Road access with the critical movements banned together with the SH3 roundabout accommodating all movements will be sufficient for approximately 95% build out of the combined Northern Precinct land area, before Southern Links is operable. Without the SH3 roundabout access and Southern Links arterials, the Raynes Road access with banned left turn out and right turn in movements described above is sufficient to develop and build out approximately 45 ha (gross) of Northern Precinct (assuming the SH21 / Raynes Road roundabout is built).

As mentioned above, a signalised form of Tee intersection together with strategic kerb and island design offers an alternative solution to prevent the left turn out and right turn in movements at Raynes Road. Although not a Safe System form of intersection where crash impacts are > 50 km/h at high angles, alignment with Safe System principles can be improved through treatments such as raised safety platforms to reduce vehicle speeds and accordingly, the potential for injury severity in crashes. Such treatments include:

- Localised reduction in the speed limit on Raynes Road from 80 km/h to 60 km/h (reduces severity)
- Installation of Raised Safety Platforms (RSPs) to reduce entry and impact speeds below 50 km/h (reduces severity)
- Incorporating channelised islands that prevent or avoid high angle crash movements (reduces exposure)
- Removing solid road-side furniture or adding crash barriers (reduces likelihood and severity)
- Banning of certain critical turning movements to heavy vehicles (reduces exposure and severity)
- Installing red light speed cameras (reduces likelihood).

5.3 Sight Distance

Safe intersection sight distance (SISD) does not apply to the proposed SH3 / RPL roundabout. Instead, the approaches to a roundabout must meet the requirements for the operating speed in relation to Criterion 1 and 2 of *Austroads Guide to Road Design Part 4B – Roundabouts*. Criterion 3 sightline is also desirable but not mandatory. Criterion 1 is Approach Sight Distance (ASD).

For the proposed location of the SH3 / RPL roundabout, the minimum ASD required, for a design speed of 110 km/h is 193 m. The concept roundabout design complies with both Criterion 1 and Criterion 2 sight distance requirements based on the design speed.

Austroads Guide to Road Design Part 4A – Unsignalised and Signalised Intersections requires the minimum SISD to be approximately 181 m for a design speed of 80 km/h. The proposed Raynes Road access will comply with the minimum SISD in all directions.



5.4 Separation Distance

The position of the SH3 / RPL roundabout achieves a separation distance of approximately 340 m to SH3 / Ingram Road / Penniket Road crossroad intersection from the centre of the roundabout. Typically, Waka Kotahi prefers the separation distance of intersections on State Highways to be at least 500 m according to the Planning Policy Manual, which is not achieved in this case. However, the shortfall in separation distance is not considered critical at this location as Ingram Road is likely to be converted to left in and left out intersection following completion of an internal road connection through the Western Precinct to allow Ingram Road traffic to access the SH3 / SH21 roundabout.

For the access to Raynes Road, an assessment against the District Plan access spacing requirements (i.e., Rule 16.4.2.5) shows that the proposed access meets the minimum access separation distance of 100 m to the Raynes Road / Narrows Road intersection as well as the existing access to M37 property.

5.5 Proposed Internal Transport Network

An indicative integrated network of internal roads to service the proposed development areas has been designed as shown in Figure 6. The road corridor typologies and layout proposed within the revised Structure Plan are designed to industrial road standards of the District Plan to appropriately cater for heavy vehicle traffic that is typically anticipated, along with safe provision for walking and cycling and public transport.

Figure 6 illustrates the proposed road hierarchy while the proposed revised ABZ Structure Plan is included in Appendix A.



Figure 6: Northern Precinct Road Hierarchy



The primary access into and through the site is proposed via the central spine road connecting between the proposed roundabout on SH3 (Access 1) and the proposed Raynes Road (Access 2). This will function as a collector road, with its hierarchy and purpose reinforced by the overall width (26 m) as well as the integration of a shared cycle and pedestrian paths along both sides of the road.

Secondary internal roads connect from the spine road and will be suitable for heavy traffic whilst also accommodating pedestrians on both roadside berms. These roads require swale drains for stormwater management and the low speeds and volumes on such roads means cyclists are intended to share the road with vehicles. This design is consistent with the existing road cross-sections formed and under construction in Titanium Park Central Precinct.

Figure 7 provides indicative cross-section illustrations that reflect the described road typologies above.

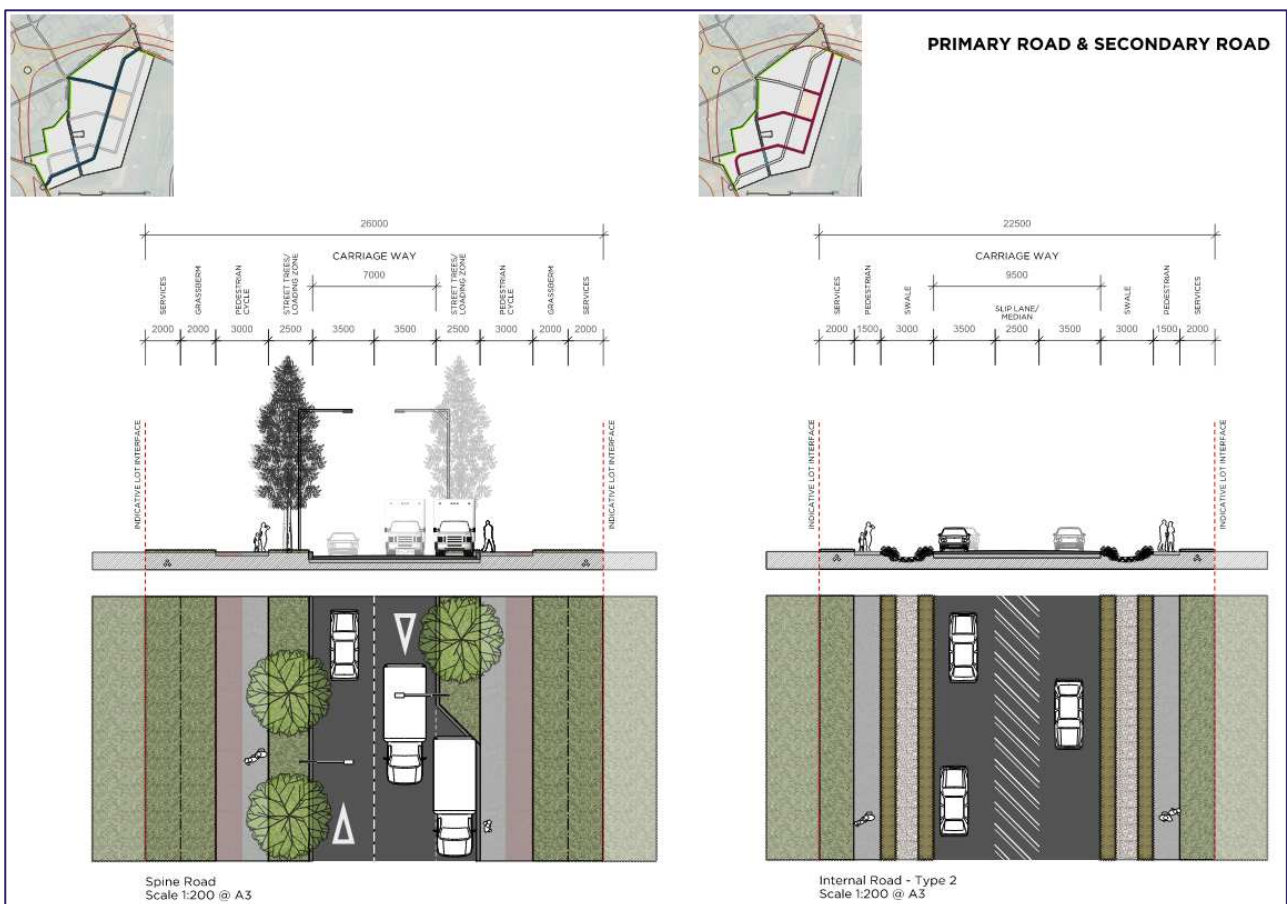


Figure 7: Indicative Road Typology Cross-Sections

5.6 Walking and Cycling Networks

The proposed rezoning to Airport Business Zone and resulting future employment opportunities will create demand for walking, cycling and recreational exercise within Northern Precinct and potentially to/from the other Titanium Park precincts surrounding the Airport. Therefore, all internal roads within Northern Precinct will provide either dedicated footpaths and on-road cycling on secondary roads, or shared walking and cycling paths (on primary roads). The spine road shared walking and cycling paths will connect to a new path of similar width and purpose on Raynes Road between Northern Precinct and Raynes Precinct, and a new shared walking and cycling path adjacent to SH3, connecting Northern Precinct to Western Precinct.



Externally from the site, there is unlikely to be significant demand for walking to and from work other than for potentially the closest area of the Peacocke residential growth cell. Peacocke development has commenced and will continue over the next 10 to 15 years. When complete it is expected to contain 6,000 – 7,000 dwellings. These will be located approximately 2 to 5 km travel distance from the Northern Precinct.

While walking further than 3 km to work is unlikely to be viable for most people, it is likely that future residents of Peacocke will work in Northern Precinct or other Titanium Park precincts and will consider cycling for their commuter trips is a viable option if high quality, safe, and efficient off-road cycling paths, and road crossing facilities exist. Cycling 3 - 5 km as a commuter has generally been a choice that only fit active people might consider. Now, it is more feasible and achievable for able-bodied people with the increasing popularity and affordability of e-bikes and scooters coupled with ongoing improvements by road controlling authorities and developers in developing and extending network connectivity, safety, and accessibility for cycling.

Therefore, to support and encourage active transport as viable travel choices for commuting to the wider Titanium Park and Airport precincts, an opportunity is identified to create a shared walking and cycling path connecting the Peacocke residential growth area to the Northern Precinct via Peacocke Road, Faiping Road and Middle Road.

The distance between Northern Precinct and Peacockes Road is approximately 1.9 km long, as shown in Figure 8. The distance to central Peacocke growth cell it is approximately 4 km, and it is 6 km to Cobham Drive from Northern Precinct via the proposed Faiping Road link.



Figure 8: Potential Walking and Cycling Route from Peacockes Road to Narrows Road via Faiping Road



The majority of Faiping Road is presently unformed public road. Farms adjacent to the corridor use it for access and grazing. Initial discussions with Waipa DC reveal this strategic alternative transport mode corridor is a practical and achievable solution, subject to design and consultation with stakeholders, including neighbouring landowners.

Delivery of the shared walking and cycling path would likely involve a partnership by Waipa District Council, Hamilton City Council, and the Applicants by way of a private developer agreement.

The shared path width should be 3.0m over the full length to cater for e-bike speeds. The path should be on the road berm of Middle Road separated from the sealed traffic lanes and include a tight bound all weather surface suitable for commuter cycling.

The walking and cycling path will also require a safe road crossing facility across Raynes Road for continuity of the path between Middle Road and Faiping Road. This will be required at the same time as the path itself.

The walking and cycling path from Northern Precinct to Peacocke Road, including the crossing facility on Raynes Road is considered necessary transport infrastructure for rezoning and developing Northern Precinct as ABZ. It aligns with the government’s transport objectives for providing greater travel choice, reducing car dependency, and reducing transport emissions.

An opportunity also presents for the three stakeholder Councils to consider Faiping Road for use as a strategic public transport link between Peacocke and the Airport in the short to medium timeframe before Southern Links is constructed. This public transport opportunity is discussed further in Section 5.7.2, however to future-proof for this, the walking and cycling path should be located to one side of the Faiping Road corridor.

It is noted that the section of proposed walking and cycling path on Middle Road will be severed in future when Southern Links is constructed. This is unlikely to be in the next 15 years, but continuity of the path could be achieved with an underpass beneath Southern Links, or by Waka Kotahi providing a new path along the northern section of Southern Links transport corridor that then connects to Raynes Road and passes over Southern Links via the designated Raynes Road overbridge, as demonstrated in Figure 9.

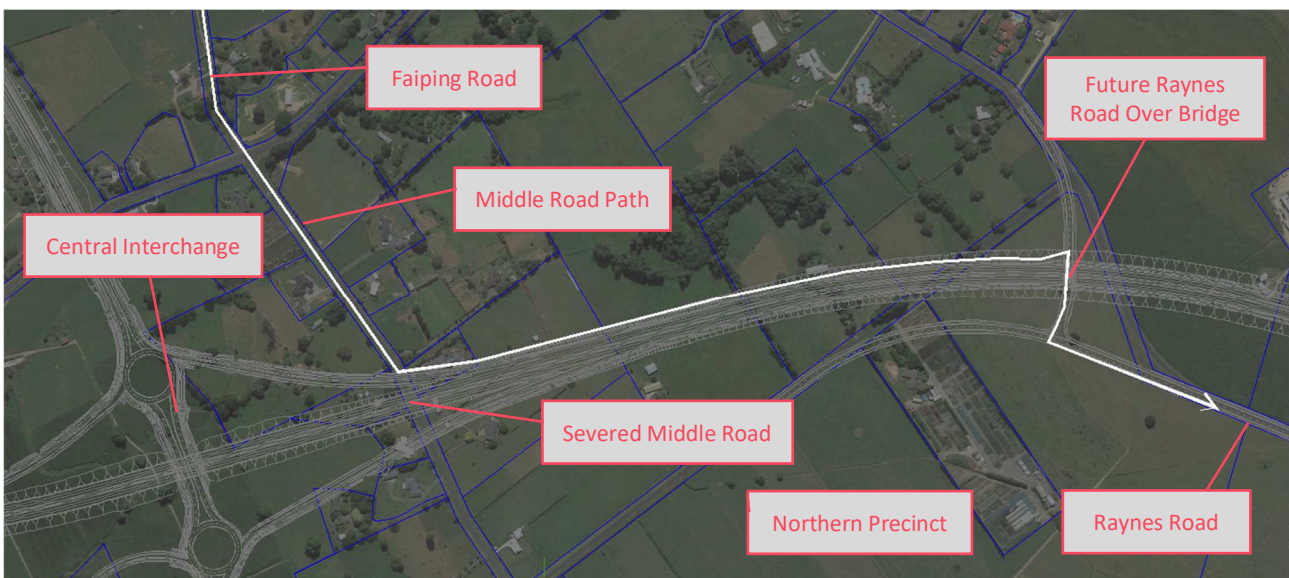


Figure 9: Walking and Cycling Route Diversion with Southern Links

This diversion adds approximately 1 km to the cycling journey where the destination is the Northern Precinct, however, there is negligible increase in travel distance if the cyclist’s destination is M37 or Central Precinct or the Airport.



Details of the proposed routes should be explored and confirmed through collaboration with Waipa District Council, Hamilton City Council, and Waka Kotahi during planning and design stages. Given the wider community benefits of such a connection, the walking and cycling path via Faiping Road should be developed as a partnership project by the Applicants and HCC and WDC.

Safe cycling within the Northern Precinct will be enabled by inclusion of shared use paths on the main roads, and off-road paths have also been provided adjacent to the stormwater swale as shown in Figure 10.

Cycling will be an accessible local transport option for short trips within the Plan Change area given the flat topography of the subject site. Consideration is to be given to providing local linkages between Northern Precinct and other precincts within the Airport Business Zone.

In addition, connections have been indicated to proposed future cycle connections to SH3, Mystery Creek and Narrows Road with potential to join riverside paths north to the Hamilton CBD and beyond.

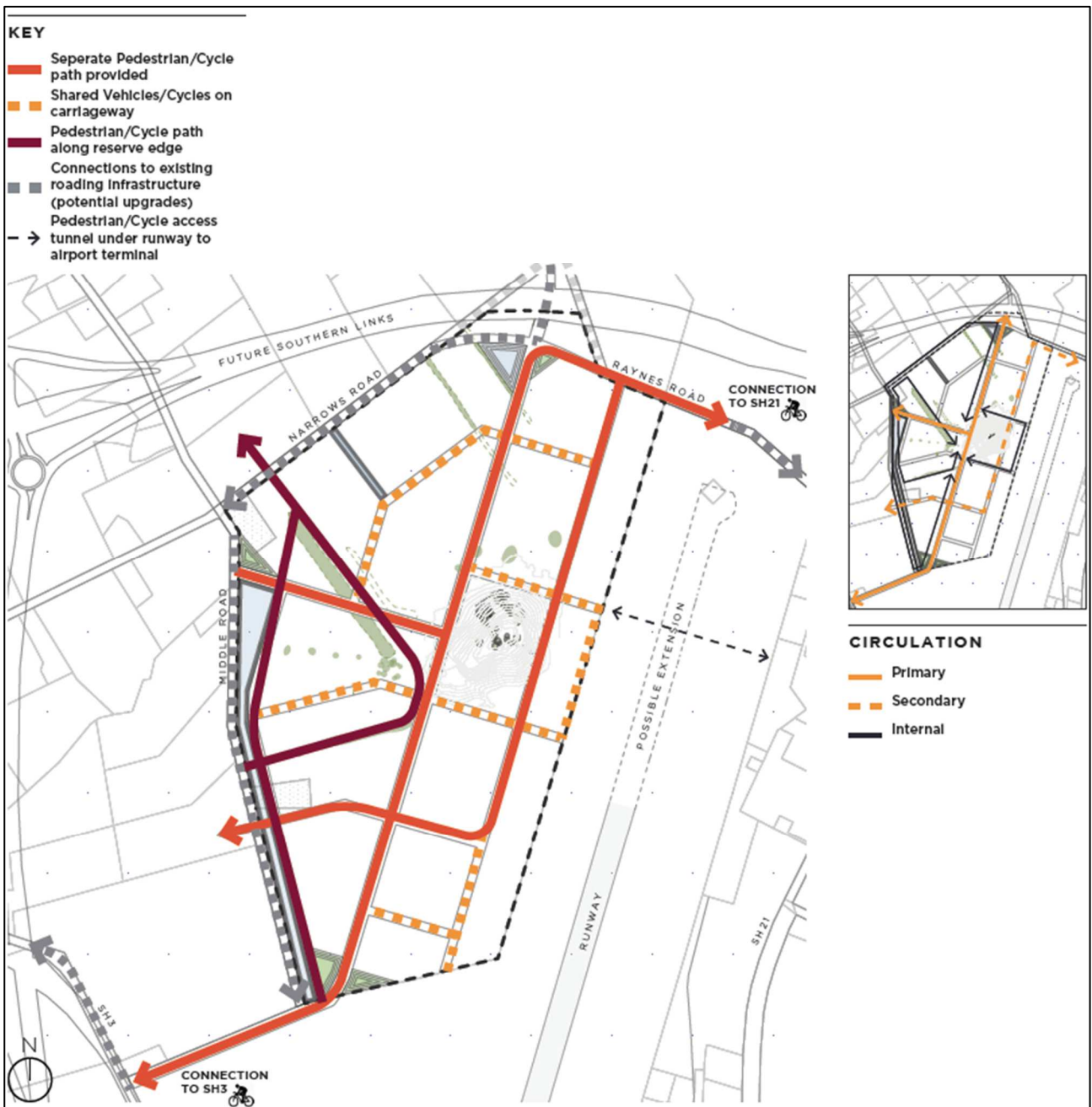


Figure 10: Proposed Pedestrian and Cycle Linkages

5.7 Public Transport Network

Historically, there has been insufficient demand for scheduled public transport servicing the airport without employment opportunities enabled by Titanium Park increasing. This has meant the only options for airport users were private vehicle, taxi or mini-bus shuttle.

High-level discussions between TPL, Waka Kotahi, Hamilton City Council, Waikato Regional Council (WRC) and Waipa District Council concerning future public transport provision between Hamilton and the Airport have been held and generally point to the Southern Links transport project providing the logical long-term opportunity for direct and efficient public transport services between Hamilton city and the airport. However, there is no certainty around the timeframe for construction of Southern Links or what form the arterial transport corridor might take in future if it is constructed.

The Applicants understand that Waka Kotahi plans to undertake a “form and function” review of the Southern Links designation to identify how the project fits or needs to potentially be revised to meet the current government GPS 2021 priorities of *Safety, Better Travel Options, Improving Freight Connections, and Climate Change*.

In the meantime, as mentioned, the new “on-demand” public transport service trial called “Flex” commenced operation in February 2022 travelling on weekdays between Hamilton City Transport Centre and the Airport. Assuming the trial is successful and continues as a permanent service, the proposed Northern Precinct development is likely to further increase demand for the Flex service and scheduled bus services through the creation of more employment opportunities. The resulting significant employment hub of Titanium Park is also likely to improve the feasibility for additional fixed time public transport services on new routes between Hamilton and the Airport.

To that end, opportunities for short- and long-term public transport servicing of Titanium Park and the Airport were explored with WRC at a meeting on the 18th of August 2021. Options identified through the meeting as having potential for further consideration by Waikato Regional Council and Hamilton and Waipa Councils are illustrated in Figure 11 and described briefly below.

5.7.1 Short Term (2-7years), Pre-Southern Links, Northern Precinct Spine Road not connected between SH3 and Raynes Road

- Bus stops provided on both sides of SH3 in the vicinity of the access roundabout, with appropriate paths and safe road crossing facilities connecting to the bus stops. This initial service potentially utilises the existing Route 24 Te Awamutu bus service.
- Extending a future bus route serving the Peacocke Structure Plan Area into Raynes Road then via SH21 to the Airport and Titanium Park employment precincts, returning to Hamilton via SH3 to Raynes Road and back through Peacocke Road.

5.7.2 Medium Term (7-15 years), Pre-Southern Links, Northern Precinct Spine Road connected between SH3 and Raynes Road

- Public Transport service connecting from Hamilton via SH3 and Ohaupo Road to the Airport and the surrounding Airport Business Zone land. The service travels through Northern Precinct down the spine road then via Raynes Road and SH21 to loop around to the Airport terminal and other Titanium Park precincts, returning to Hamilton via SH3.



- A potential future bus route serving the Peacocke Structure Plan Area and Airport/Titanium Park precincts via Peacocke Road, Faiping Road and Middle Road. As discussed, Faiping Road is mostly unformed road owned by Waipa District Council and connects between Peacockes Road and Raynes Road. It is proposed that this link be developed to provide a walking and cycling connection but there is also an opportunity for the councils to use it as a more convenient and purpose-built public transport connection alongside the walking and cycling path. Ideally, the corridor would not be open to general traffic except residents' vehicles for property access which exists now. The bus service could connect from Faiping Road, across Raynes Road into Middle Road, across Narrows road and enter the Northern Precinct spine road to then loop around to the Airport Terminal and surrounding employment precincts via Raynes Road, SH21 and SH3. The return service would potentially travel the same route in reverse from Middle Road.
- The above two scenarios are possible alternatives that should be investigated by HCC, Waipa DC and WRC for actioning in the medium term before Southern Links Major Arterial is constructed. It would be most efficient when the Northern Precinct spine road connects between SH3 and Raynes Road, although in the interim development period the service could utilise existing Raynes Road to and from Faiping Road and stop adjacent to the Northern Precinct access point/s without entering the site. Part of this longer-term route planning requires an understanding of Waka Kotahi's objectives and timing for Southern Links, specifically the Major Arterial corridor in relation to its future form and function. Waka Kotahi advises that work on this is planned to commence in 2022.
- Since the timing for construction of Southern Links is unknown but unlikely within the next 10 years, it is recommended that HCC, WDC and WRC investigate the use of the Faiping Road corridor for public transport alongside the proposed walking and cycling path, in context with the short to medium term public transport network planning.
- For clarity, use of the Faiping Road / Middle Road corridor by public transport is not required for mitigation of transport effects of the rezoning proposal. The existing highway road network can and does accommodate public transport services. It is also recognised that provision of public transport services by the Councils, and route planning is not something the rules in the District Plan can require.

5.7.3 Long Term (15-30 years), Southern Links Arterials, Northern Precinct Spine Road connected between SH3 and Raynes Road

- Current expectations of HCC and Waka Kotahi is that a future public transport connection to the Airport is likely to utilise the Southern Links Major Arterial corridor that is orientated north / south through the Peacocke Structure Plan area, connecting to Hamilton CBD. A public transport service using this corridor could be an express service that has a few stops along the route at or near major intersections (for connectivity with other bus routes) but is foremost, a direct and efficient service.
- Given the alignment and connectivity of the Southern Links designation, any future public transport services that use the corridors will pass through the future Central Interchange located immediately north and adjacent to Northern Precinct. At this time in future (15+ years) the developed ABZ will be a very significant employment and freight hub in the Waikato region. The Applicants and the Airport accordingly identified a new strategic road connection direct to the Central Interchange from Northern Precinct spine road. It is envisaged that the future transport connection would primarily serve public transport between Hamilton and the Airport and employment precincts (perhaps the express service described above) and provide an efficient freight and cycling access to the employment precincts from the Southern Links corridors. This long-term strategic transport link is explained further in Section 5.8.
- Further to the strategic connection with Southern Links, there would likely remain demand for slower but more accessible public transport routes through the population catchments between the CBD



and Airport. These could continue to be the non-express services connecting via Ohaupo Road (SH3) and SH 21, or Peacocke Road (Southern Links Minor Arterial) via Faiping Road and Middle Road, as described above and subject to these route opportunities being supported by the three Councils.

The above public transport route opportunities are illustrated in Figure 11.

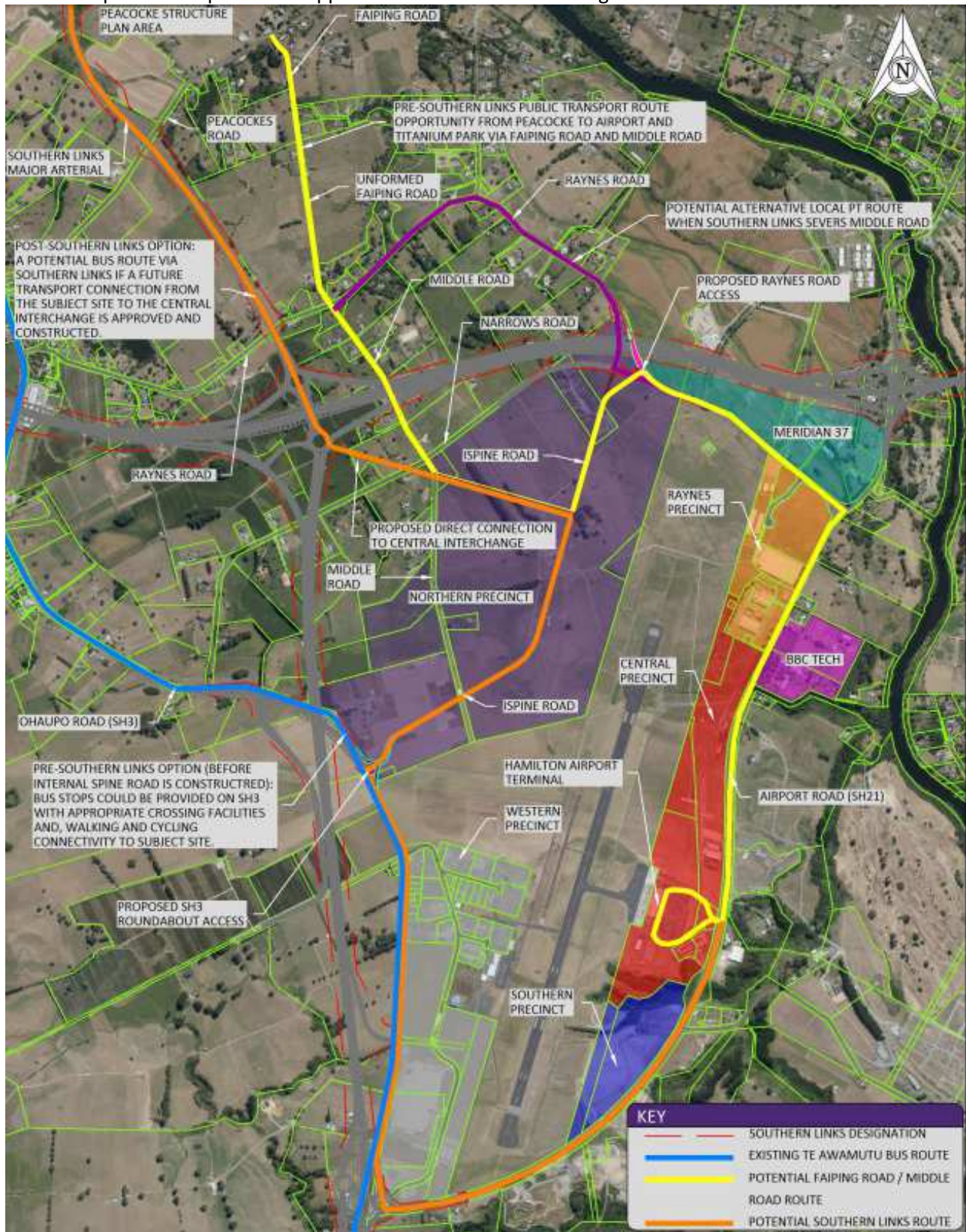


Figure 11: Potential Future Public Transport Route Options



5.8 Future Transport Connection to Southern Links Arterials

As discussed in 5.7.3, the Applicants propose a new strategic transport link connecting the Southern Links Central Interchange directly to the Airport hub via Northern Precinct spine road when Southern Links is constructed. At this time in future (estimated 15-30 years) the employment precinct surrounding the Airport will have exceeded 250 ha of Industrial and Airport Business activity (assuming Northern Precinct is rezoned), reinforcing the Airport as a significant employment, freight, and transport hub in the Waikato region.

The Applicants and the Airport have long recognised this significance, and accordingly propose the new strategic road connection direct to the Central Interchange from Northern Precinct spine road. The link is envisaged to connect directly to the future western roundabout of the Central Interchange. The purpose of the corridor is to provide a highly efficient connection to the Airport and employment hub for public transport, freight movements and cycling between Hamilton and the strategic highway corridors. Having recognised the strategic importance of this link, TPL have future proofed the ability to provide it by acquiring land on its path between Northern Precinct and the Southern Links designation.

In 2018, BBO prepared concept plans for the strategic corridor connection to the Southern Links Central Interchange roundabout. It is important to clarify that this proposed link is promoted by the Applicants in association with the Plan Change to strengthen the long-term connectivity and function of the transport network supporting Hamilton city. While the concept has been discussed numerous times at a high-level with Waka Kotahi, it has not yet been subject to rigorous review or approval processes.

Two concept options demonstrating the connection to the Central Interchange are illustrated below.

Option 1: Introduce a fifth leg on the Central Interchange southern roundabout (Figure 12)

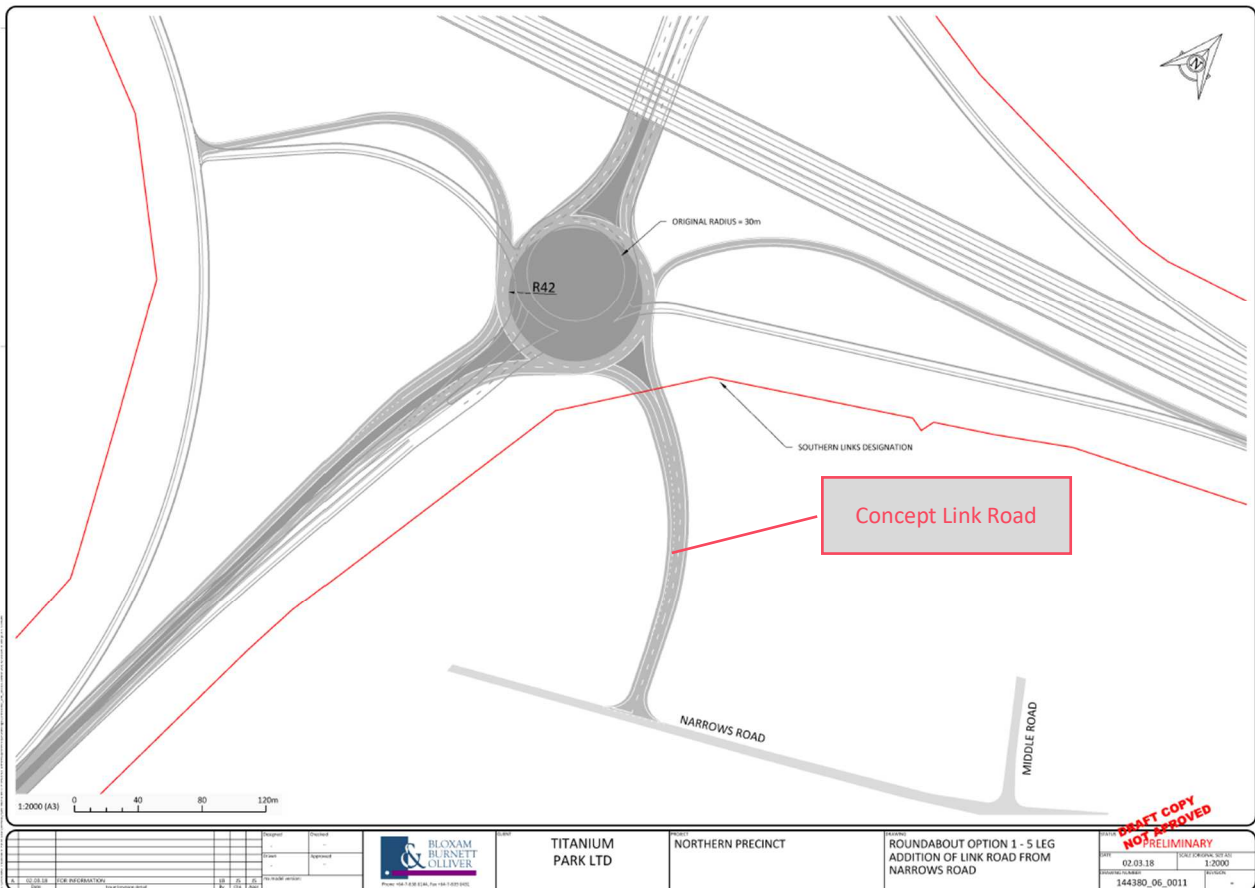


Figure 12: Southern Links Connection – Option 1: 5-leg Roundabout

Option 2: Amend the westbound off-ramp design to a clover-leaf style off-ramp and connect the strategic corridor link to the roundabout where the westbound off-ramp was, thereby keeping the roundabout as a four-leg layout (refer to Figure 13).

The high-level transport effects of this future connection are assessed further in Section 7.5.2.

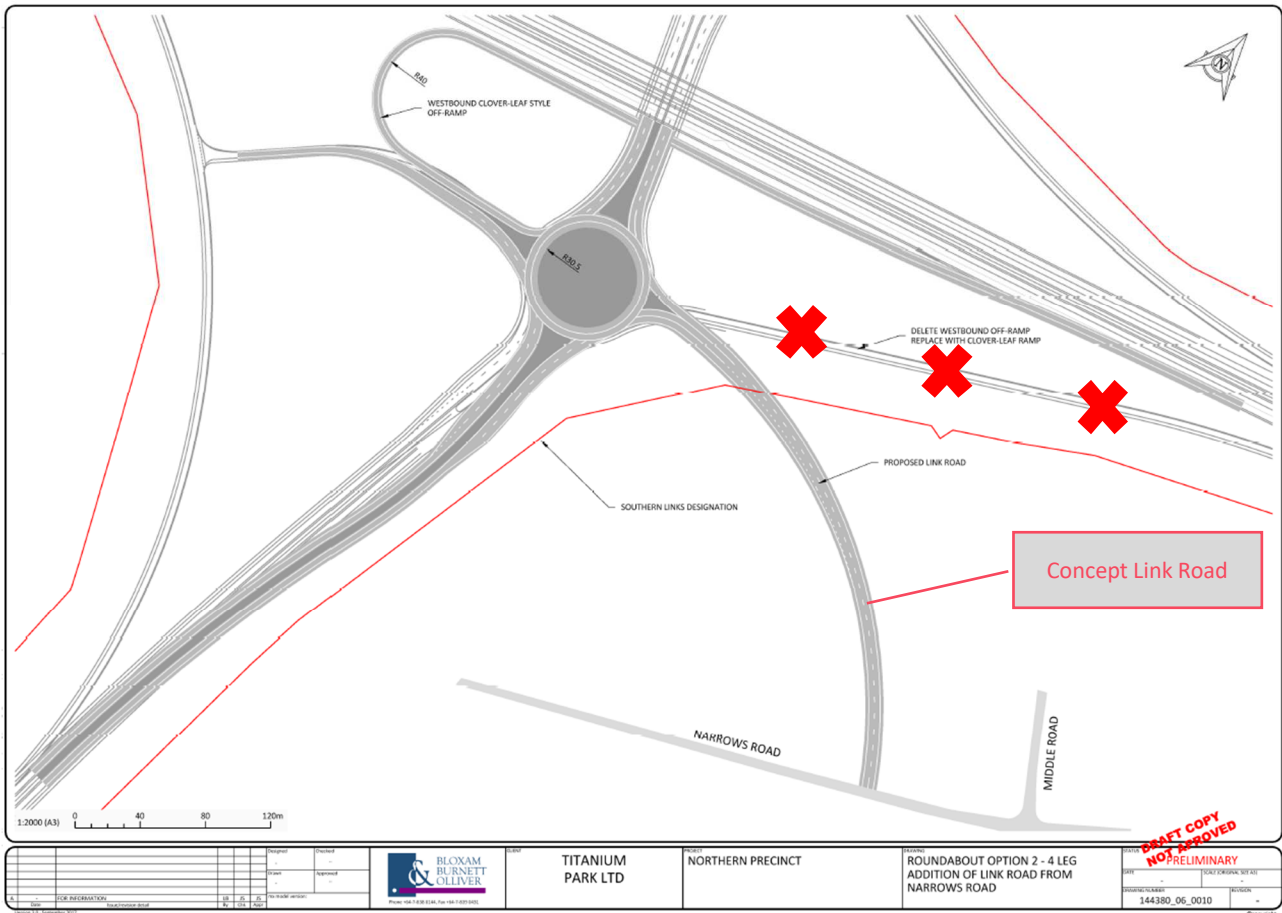


Figure 13: Southern Links Connection – Option 2: 4-leg Roundabout



6. Trip Generation

The expected trip generation for the Plan Change proposal was determined using the following trip generation manual and related research material (i.e. previous ITAs):

- NZTA Research Report 453 (RR453)
- Plan Change 57 Transportation Assessment and Access Strategy prepared by BBO and dated July 2007¹;
- Hamilton Airport Central and Southern Development Precincts ITA prepared by BBO and dated April 2018; and
- Ohinewai Rezoning and Structure Plan ITA prepared by BBO and dated May 2020.

Table 5 below provides a summary of the expected trip generation for the proposed development. The total Northern Precinct area when developed can be expected to generate around 2,560 trips per peak hour.

Table No: 5

Northern Precinct Total Estimate Trip Generation							
Precinct	Activity	Gross Area (ha)	Developable Area (ha)	Unit	Adopted Trip Rate	Source	Peak Hour Trip Generation (trips / peak hour)
1	Airside Logistics / Industrial	11	9.9	3.96 ha GFA (assuming 40% site coverage)	59.1 trips / ha (GFA) / hr	PC57 TIA July 2007	234
2	Industrial	24	19.5	-	20.9 trips / ha (dev) / hr	Ohinewai ITA	408
3	Industrial	19	12.9	-	20.9 trips / ha (dev) / hr	Ohinewai ITA	270
4	Industrial	17.8	15.1	-	20.9 trips / ha (dev) / hr	Ohinewai ITA	316
5	Eco-Tech Business (i.e. Industrial with tech focus)	19.5	13.4	-	20.9 trips / ha (dev) / hr	Ohinewai ITA	408
The Hub	Visitor Accommodation	12.5	10.1	100 rooms	0.63 trips / room/hr	PC57 TIA July 2007	63

¹ In 2007, the Titanium Park Joint Venture (between Waikato Regional Airport Limited and McConnell Property) lodged a plan change to rezone land from Rural to Airport Business (Plan Change 57). As part of this plan change application a transportation assessment was completed that addressed the transportation effects and access options to the airport and Titanium Park.



	Non-Ancillary Retail			Up to 5000 m ² GFA	4.0 trips/ 100 m ² GFA / hr	Central and Southern Precinct ITA	200
	Childcare			100 children	1.4 trips / child / hr	RR453	140
RPL Land	Industrial	29	25	-	20.9 trips / ha (dev) / hr	Ohinewai ITA	523
Total		132.8	105.9				2,560

The following conservative assumptions were adopted in the trip generation calculations in Table 5:

- The industrial area is likely to comprise a mix of warehousing, hi-tech manufacturing and general industrial, for which warehousing, and manufacturing typically generate much lower trips per hour than industrial activities. However, with little certainty over the percentage split at this early stage, rather than assuming Gross Floor Area (GFA) for each type, this assessment adopts the more intensive developable site area rate for general industrial business estates.
- The trip rate adopted for general industrial activities is 20.9 trips per developable hectare per peak hour. This is higher than the Hamilton City Council typical rate of 15.4 trips per gross hectare per peak hour and trip rates adopted for other developments such as the Rotokauri industrial and Ruakura Superhub. However, this higher rate provides a more robust assessment for the Plan Change area.
- The retail and childcare components of the development were incorporated into the Masterplan to firstly support the industrial and other employment components of the future development, and secondly to serve the local community (i.e. Rukuhia, Ohaupo, Raynes Road, Tamahere). In calculating the effects of Northern Precinct on the wider network it would be technically accurate to deduct the internal trip component from the total trip generation (i.e. ignore trips that originate and terminate within the development). However, no such deduction has been made in this assessment to ensure the calculations and resulting conclusions are conservative.
- Given the present limited options for alternative transport mode connections to Northern Precinct, it is conservatively assumed that all staff travelling to the subject site will be private car dependent although this is clearly an unlikely worst case with the proposed walking and cycling connectivity to Peacocke growth area and the expected increase in public transport feasibility as the critical mass of the employment precincts and airport passenger growth increases.

6.1 Sensitivity Testing

A sensitivity test has been carried out by applying the typical trip generation rate for industrial business estates to the combined area of the Northern Precinct. The trip rate used commonly in the Waikato region for trip generation calculations for large new industrial developments (such as Ohinewai Plan Change, Northgate Business Park, and Titanium Park Central, Southern and Western Precincts) is 20.9 trips / ha (net) per peak hour. Roads, reserves, landscape bunds and stormwater management devices combined, typically use between 10% and 20% of the total land area.

This sensitivity assessment adopts 90% net developable area for TPL land and 85% for RPL land (given the smaller land holding and less efficient land shape), resulting in a conservative total trip generation calculation of approximately 2,500 trips per peak hour as illustrated in Table 6.



Table No: 6

Total Estimate Trip Generation						
Development	Activity	Gross Area (ha)	Developable Area (ha)	Peak Hour Trip Rate	Source	Peak Hour Trip Generation (trips / peak hour)
Northern Precinct	Industrial	103.8	94 (applying 90% developable)	20.9 trips / ha (dev)	Ohinewai ITA	1,965
RPL	Industrial	29	25 (applying 85% developable)	20.9 trips / ha (dev)	Ohinewai ITA	525
Total		133	119			2,490

This trip calculation based on the industry standard rate compares well with the total combined trips by indicative activity type, in Table 5. The difference in total derived trips by each methodology is less than 5%.

Accordingly, 2,500 trips is the adopted peak hour total for network performance assessment purposes, recognising that several conservative assumptions are reflected in that, as described on the previous page.

6.2 Public Transport and Active Mode Share

The trip generation estimated in Tables 5 and 6 reflects peak hour trips. As highlighted in the previous sections, the existing public transport provision between Hamilton and the Airport is very limited and there are almost no walking and cycling trips within the vicinity of the Airport at present. With Northern Precinct developed and the recommended walking and cycling infrastructure upgrades (Section 5.6) completed, the active mode home to work/work to home trips are expected to significantly increase compared with existing active mode-share, but is still likely to be a low overall percentage (less than 5%) relative to the potential for trips by private vehicles as the viability for cycling is likely to reach only the catchment areas of Peacocke and possibly southern parts of Melville.

For comparison, a suburb like Pukete in Hamilton which is approximately 2.5 km southeast of Te Rapa North industrial zone has an active-mode uptake of between 2% and 3% according to Census 2018 data. Walking and cycling connectivity is plentiful between these two areas, in the form of on-road cycle lanes as well as off-road shared paths. Road crossing opportunities and facilities are generally lacking for cycling convenience, and there are no dedicated off-road cycle paths for high-speed cycling with little interruption. Therefore, it is considered a baseline proxy for the active-mode share that is likely to be achieved by Northern Precinct. An active mode share of 2% to 3% (i.e. 50 – 75 trips per peak hour) is considered negligible overall.

Hence, for the purposes of this assessment we find that it is not beneficial to assess the reduction of estimated trips by private vehicle due to active mode share at this stage.

Long term it is conceivable that commuter cycling trips to and from the Airport employment precinct could increase to 5% or more if the rapid increase in the popularity of e-bikes continues and provided the Southern Links transport corridors include high-speed off-road cycling paths connecting to Hamilton CBD and the walking and cycling network in Melville. However, neither of these aspects are certainties. For one, the form and function review for Southern Links by Waka Kotahi is only due to commence and the findings should not be pre-empted.

Similarly for public transport, while this report identifies several opportunities for short-, medium- and long-term public transport servicing of the Airport and employment precincts, the Applicant's do not control how,



when, or even if these services will be provided, nor how they may integrate with the wider public transport network. This is the responsibility of the three Councils, HCC, WDC and WRC, to plan and adapt public transport as growth occurs. Therefore, the future uptake of trips by public transport cannot be predicted with certainty, other than to say that if it is not enabled by Northern Precinct then the uptake will remain less than 1% of all trips. Accordingly, while public transport is enabled and supported by the proposed Northern Precinct infrastructure provisions, it is considered appropriate for the purpose of assessing network and intersection capacity to conservatively assume public transport trips and walking and cycling trips will be negligible relative to private vehicle trips. This is the basis adopted for the network assessment in Section 7.

7. Transport Modelling

BBO had undertaken a transport modelling exercise as an initial task for the proposed rezoning. This task included undertaking trip generation calculations associated with the proposed Northern Precinct industrial business park and the RPL property, and transport modelling of those future trips on the network using the Waikato Regional Transportation Model (WRTM) to assess the trip distribution and any resulting capacity or safety effects on affected intersections and the proposed accesses to the site.

The outcomes of the modelling were then discussed with the relevant road controlling authorities (i.e. Waka Kotahi and Council) and following any comments and input from the RCAs, was fed into the assessment of safety and operational effects in this ITA.

7.1 Waikato Regional Transport Model (WRTM) Validity

The WRTM is presently the most appropriate strategic transport planning tool for predicting transport demands of proposed and consented land-use activity zones in the Waikato.

The current 2,500 zone WRTM (2017 version) is based on 2013 census data, with future forecast models for years 2021, 2031, 2041 and 2051, based on the National Institute of Demographic and Economic Analysis (NIDEA) “low” growth projections.

The consensus amongst traffic engineering practitioners using the WRTM (2017 version) is that it tends to under-estimate the future forecast projections in the network around Hamilton for year 2021, as several key corridors in the model show much lower traffic volumes in the peak periods than was recorded from traffic counts in 2019. While this is a known constraint, the WRTM remains a highly valuable tool for assessing the potential transport effects of land development.

Land use forecasts within the WRTM (2017 version) are as provided by the Local Authority Shared Services (LASS) based on Future Proof allocations, and no further refinement or project-related adjustments are captured in the model. BBO conducted a review of the WRTM network and zone structure around the airport and identified that various zones (that represent land use development) did not connect to the road network in the most representative locations, and that the land use and employment inputs within the Airport Business Zone (Titanium Park) did not fully reflect future activities that have been consented in the zone thus far.

Figure 14 and Figure 15 illustrate the road network and two-way two-hour link volumes within the Airport Business Zone in the current WRTM (2017 version) for the year 2031. Both figures demonstrate that only three of the precincts (namely Northern, Central and Western precincts) have been incorporated into the current WRTM (2017 version).

However, Figure 1 illustrates that there are five discrete growth cells surrounding the Airport. The low two-way two-hour link volumes presented in Figure 14 and Figure 15 also indicate that the consented land use



within the Airport Business Zone is not reflected accurately in the WRTM (2017 version). These differences have therefore necessitated further refinement to the WRTM outputs to better reflect the project's study area.

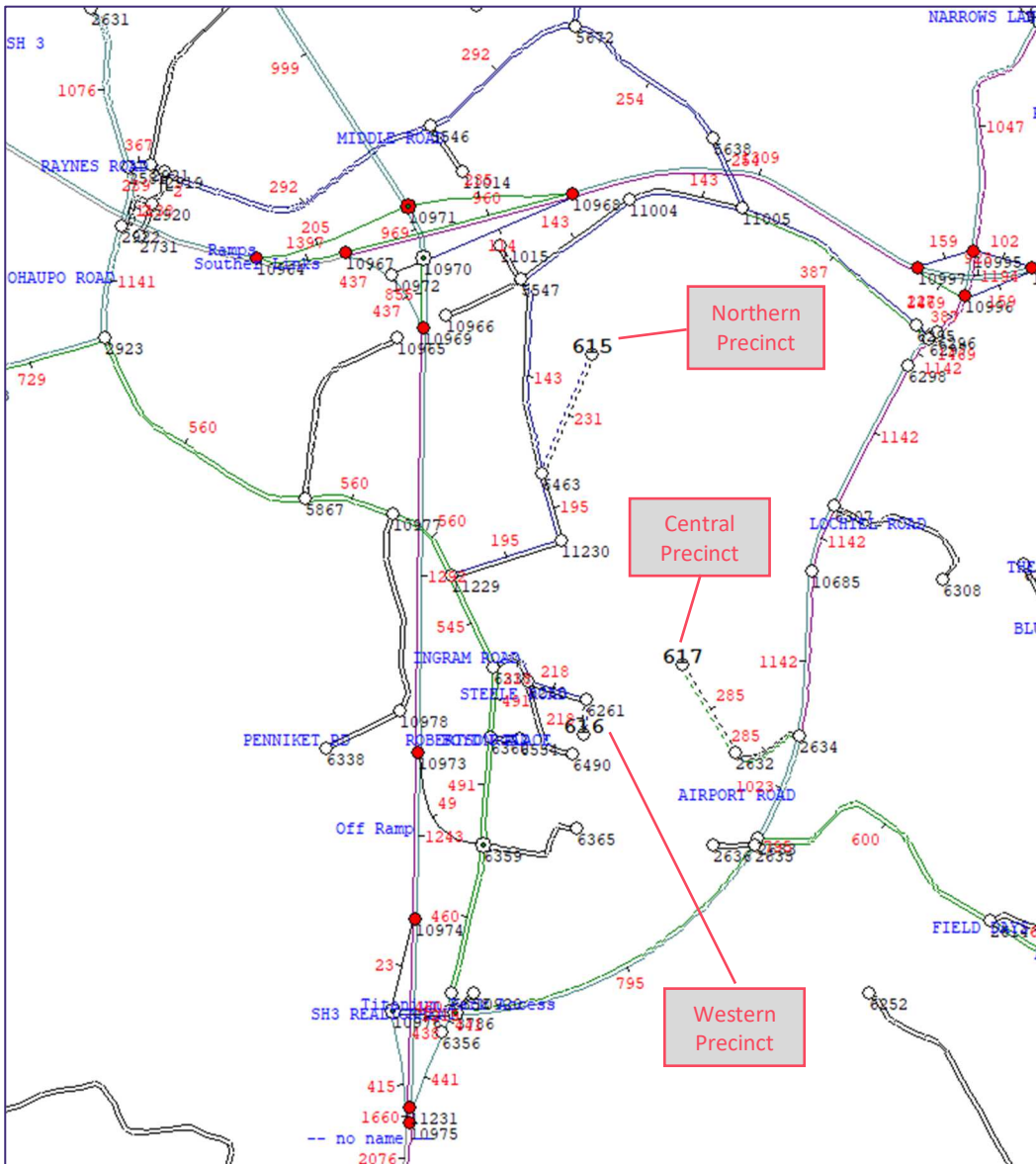


Figure 14: WRTM (2017 version) 2031 AM Peak – 2-hour Volumes



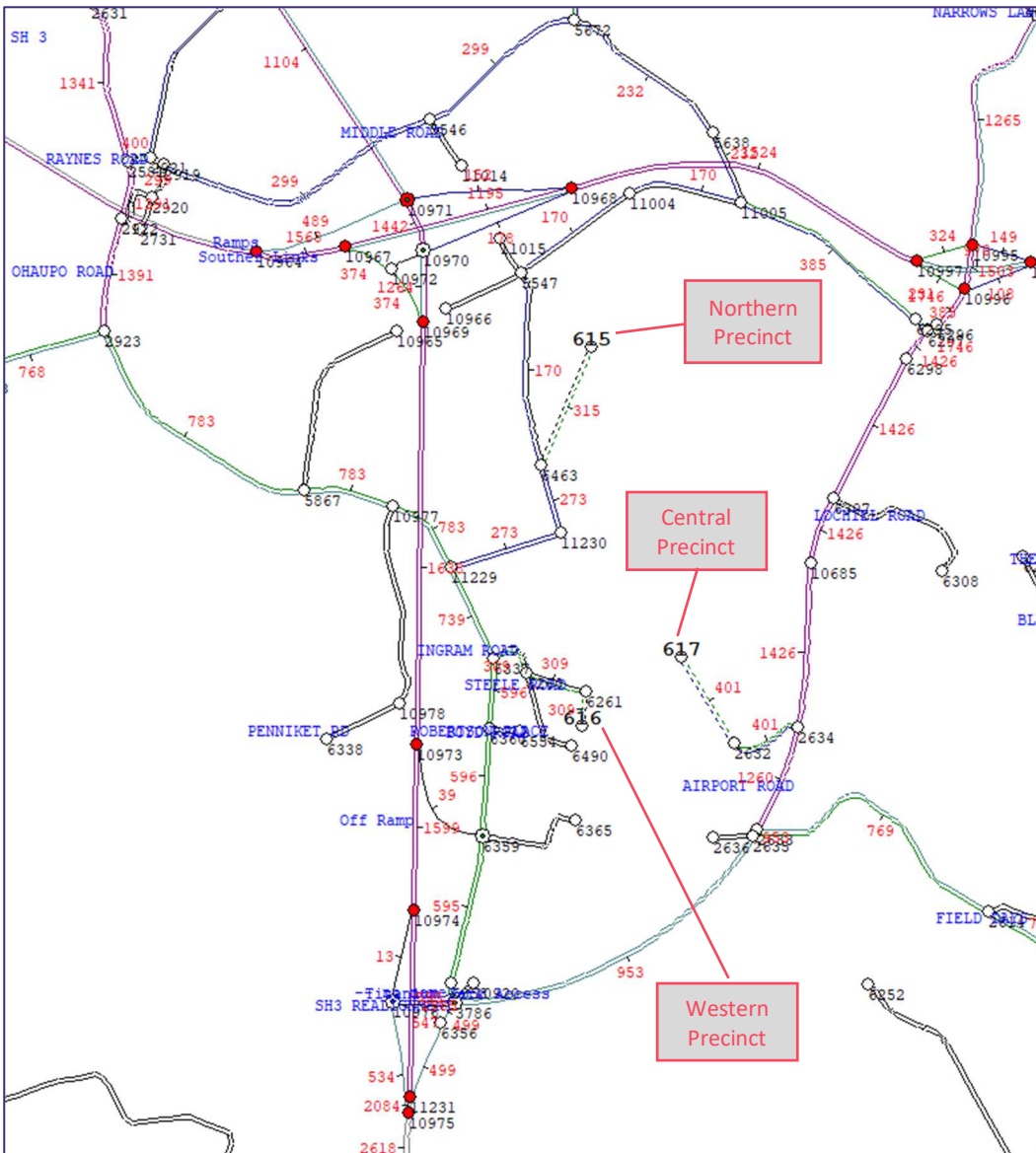


Figure 15: WRTM (2017 version) 2031 PM Peak – 2-hour Volumes

In 2018, BBO collaborated with Stantec and Waka Kotahi to refine the WRTM as a project model to aid the assessment of effects of the M37 Comprehensive Development Plan (CDP). This included refinements to the wider Titanium Park, Northern Precinct and Airport trip generation and zone connector locations. BBO then later used this project model as the basis for the Waikato River Bridge and Strategic Services project model for Hamilton City Council, which incorporated further refinement to zones, network and trip generation within the Peacocke Structure Plan area.

Therefore, for modelling the proposed rezoning of and the enlarged Northern Precinct BBO recommended that the Waikato River Bridge and Strategic Services project model be used as a base to build on for consistency and greater confidence in the predicted traffic volumes for the future road network around the Airport Business Zone. Figure 16 illustrates the road network and land use that was incorporated into the Waikato River Bridge and Strategic Services project model. This now includes seven zones representing consented or zoned land relating to industrial or airport business activities.

- Northern Precinct (40ha)
- Meridian 37
- Raynes Precinct



- Central Precinct
- Southern Precinct
- Western Precinct (north)
- Western Precinct (south)

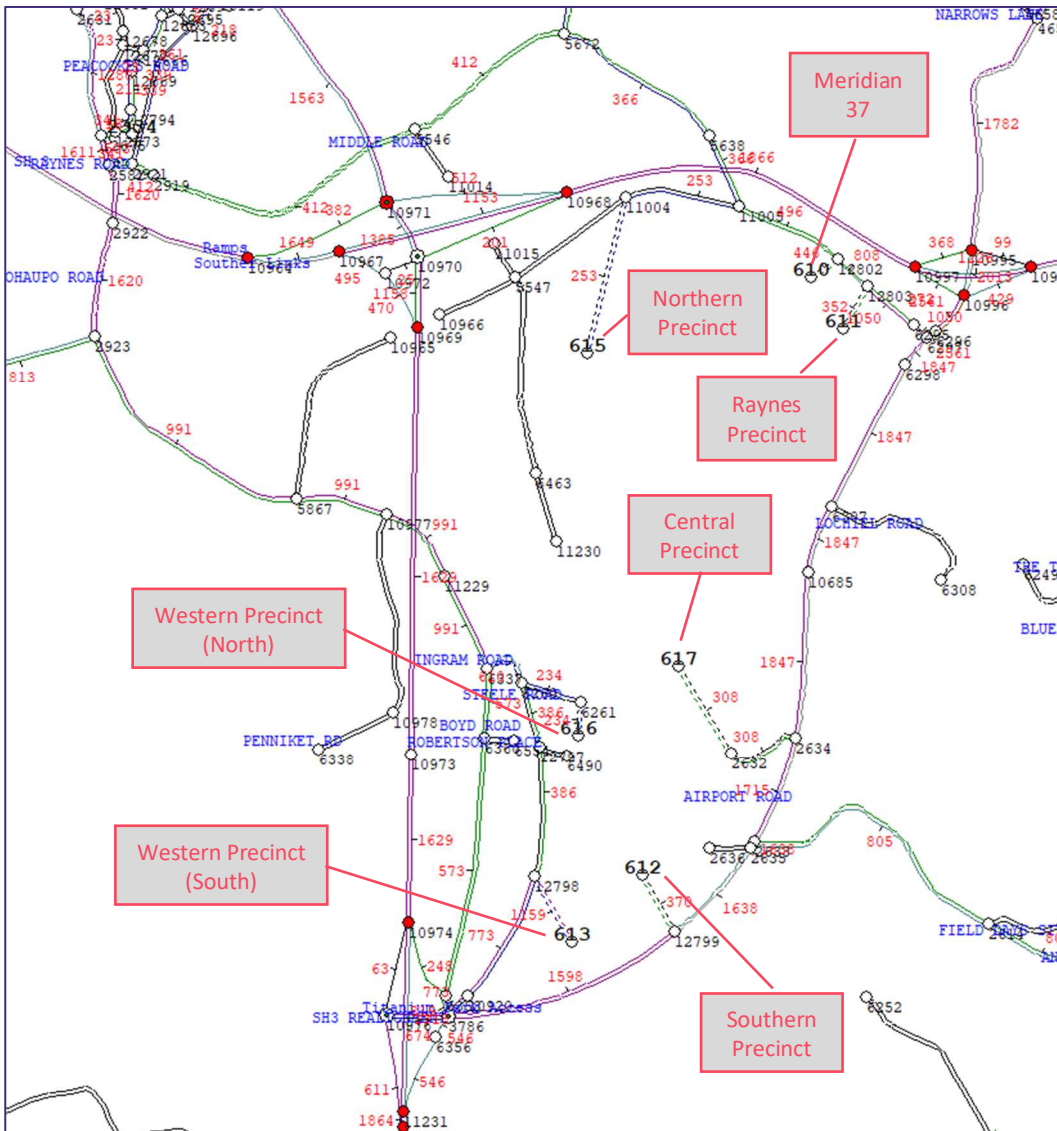


Figure 16: Waikato River Bridge and Strategic Services Project Model 2041 AM Peak – 2-hour Volumes

7.2 WRTM Network Amendments

This section discusses the WRTM zone and road network amendments, as well as land use and employment modifications that have been added into the Waikato River Bridge and Strategic Services project model to create the TPL Northern Precinct project model for the future year 2031. The modifications include:

- Adopting all changes incorporated in the WRTM (2017 version) for Peacocke Area future year 2031.
- Update Zone 616 (Western Precinct) to represent similar land use and employment as that modelled for M37 CDP (file ref: WL31BSAALL3F).
- Update Zone 617 (Central Precinct) to represent similar land use and employment as that modelled for M37 (file ref: WL31BSAALL3F).



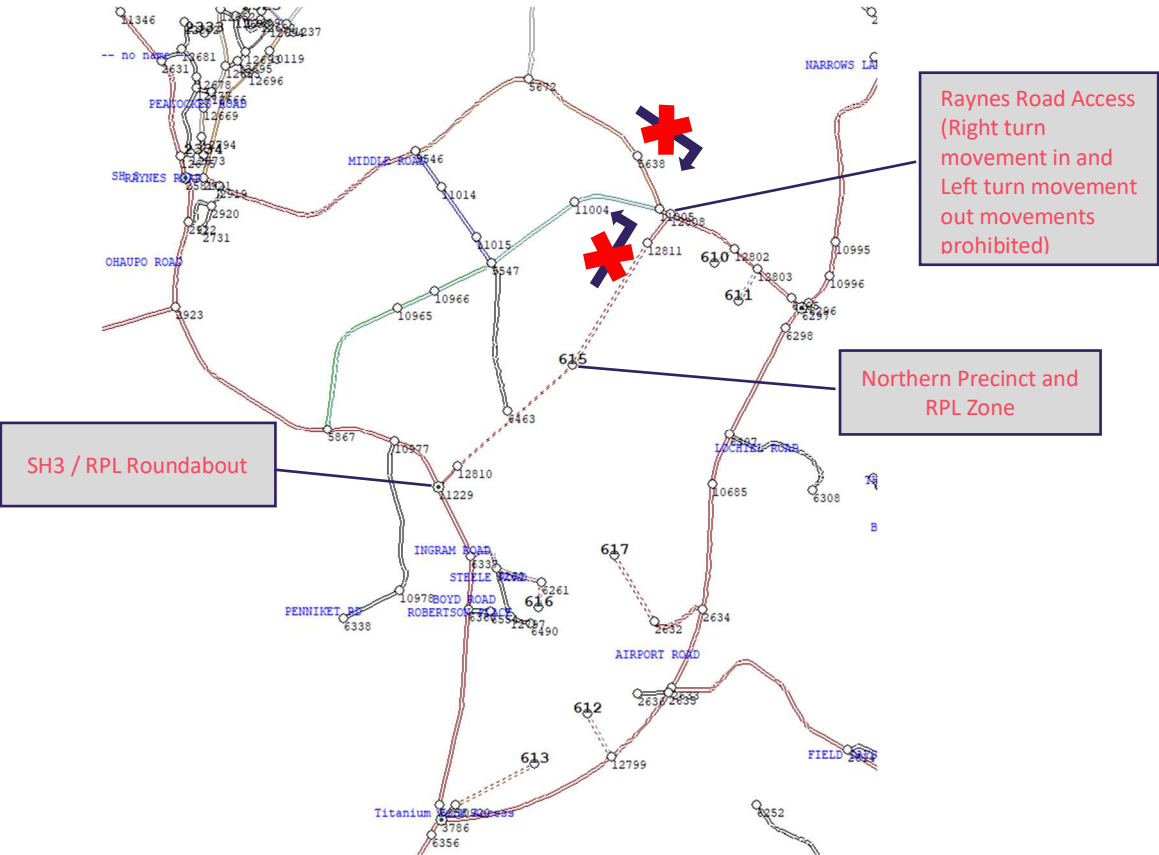
- SH3 / Raynes Road intersection to be modelled as a roundabout.
- SH21 / Raynes Road intersection to be modelled as a roundabout.

7.3 Modelled Scenarios

Table 7 below summarises the access scenarios that have been assessed with the WRTM by incorporating the amendments mentioned in the preceding section. As clearly shown in Table 7, these options have been numbered from 4 to 6.

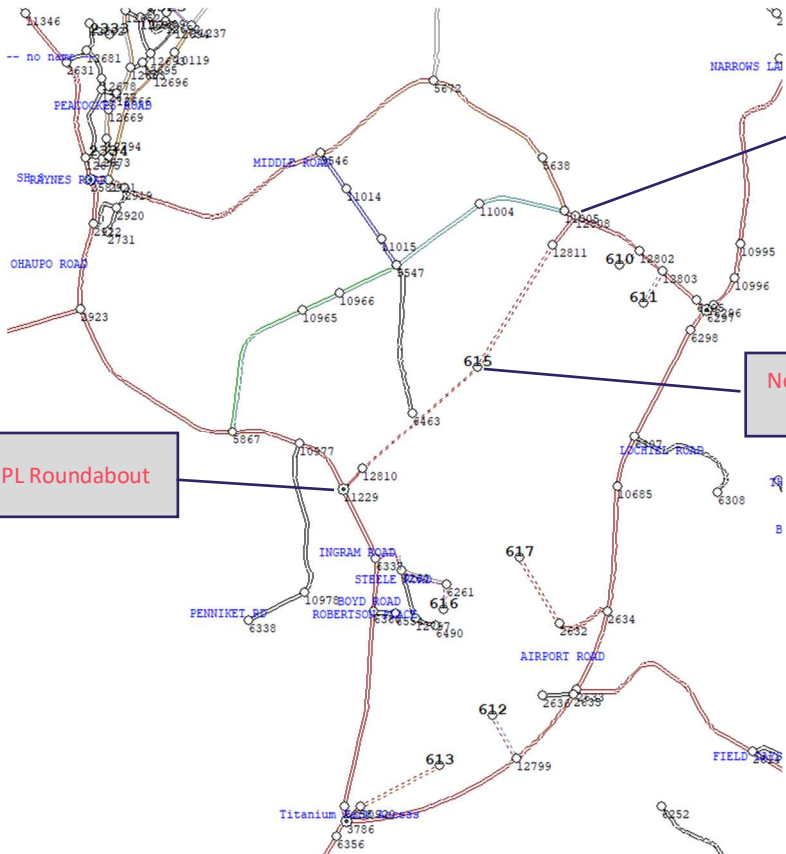
It should be noted that Options 1 to 3 were initial model scenarios that involved only the Northern Precinct development, excluding RPL land, being accessed solely by Raynes Road with trips distributing north through SH3 / Raynes Road intersection and south through SH21 / Raynes Road intersection. These options have since been superseded, as the proposed access scenario (refer to Section 5.2) involving the connection to SH3 through the RPL property was the preferred solution to minimise effects on Raynes Road residents north of Narrows Road, and at the SH3 / Raynes Road intersection.

Table No: 7

Modelling Scenarios	
Option	Description
4	<ul style="list-style-type: none"> • Year 2031 with no Southern Links • Access to Northern Precinct and RPL property to be provided via: <ul style="list-style-type: none"> ○ New roundabout at SH3 ○ New priority-controlled intersection at Raynes Road. Right turn movement in and left turn movement out movements prohibited. 
5	<ul style="list-style-type: none"> • Same as Option 4 but with Southern Links



Modelling Scenarios

Option	Description
	<ul style="list-style-type: none"> Raynes Road access modelled as staggered intersection to realigned Raynes Road / Narrows Road intersection.
6	<ul style="list-style-type: none"> Year 2031 with no Southern Links Access to Northern Precinct and RPL property to be provided via: <ul style="list-style-type: none"> SH3 / RPL roundabout Raynes Road access; all movements permitted. HCVs from the proposed site to be banned along Raynes Road (north of Raynes Road access) and Narrows Road. 

It should be noted that the land use within Zone 615 (i.e. Northern Precinct) was adjusted to replicate the specified peak hour trip generation identified in Table 5. However, for consistency, only one adjusted land use scenario was produced, which meant that either the AM or PM peak hour trips provided by the WRTM outputs was slightly different to the specified target. However, the difference was no greater than 5%.

The resulting distribution of trips from the WRTM with full development of Northern Precinct and RPL is approximately 50% of the daily trip generation to each access point (SH3 and Raynes Road). This adjusts slightly in the peak periods with 55% via Raynes Road and 45% via SH3 accesses in the AM Peak, and 40% to Raynes Road and 60% to SH3 in the PM peak.

With these trip distribution outputs BBO carried out further detailed intersection modelling using SIDRA Intersection 9 to assess the performance and refine the layouts of the proposed intersections at SH3 and Raynes Road. The results and conclusions derived for each option from this modelling exercise have been documented and discussed in the Traffic Modelling memorandum prepared by BBO (dated 16 June 2021) which is attached as Appendix C.



Although there is uncertainty in terms of timing of the Southern Links Major Arterial project, it should be noted that the project has been designated and is likely to be concentrated. Therefore, this assessment considers that assessing a 2041 no Southern Links scenario to be not beneficial.

7.4 Preferred Model Scenario

Based on the transport modelling assessments outlined in the memorandum attached as Appendix C for the SH3 / RPL roundabout and Raynes Road access options, BBO considers that Option 4 is the preferred scenario over Option 6 because it proves to service almost all of the proposed Northern Precinct ABZ in the pre-southern links period (i.e. approximately **129 ha of plan change area (gross area)**), while minimising effects on Raynes Road residents and at the SH3 / Raynes Road intersection.

Therefore, the assessment of the traffic and transportation effects of the proposed rezoning in Section 8 is based on Option 4 access scenario.

7.5 Additional Modelling

7.5.1 Access by SH3 Roundabout Only

BBO had also undertaken modelling to understand the land area that could be developed if the site were to be serviced by only the proposed SH3 / RPL roundabout. The modelling and further manual refinement of the traffic flows indicated that approximately **80 ha of the plan change area (gross area)** can be serviced by the single access. This equates to approximately **1,520 trips per peak hour** (i.e. 71 ha developable land x 20.9 trips per hectare per peak hour).

7.5.2 Southern Links Future Connection

Transport modelling was undertaken early in the master planning process for Northern Precinct to determine the effects of the proposed direct connection to the Southern Links central interchange roundabout (explained in Section 5.9). The assessment considered this direct connection to Southern Links in tandem with a secondary access at Raynes Road for the Year 2041.

The resulting trip distribution from the WRTM involves 60% of the trips accessing via the Southern Links direct link while the remaining 40% of trips distributes between SH3 (16%) and SH21 (24%).

Further SIDRA modelling undertaken by BBO demonstrates that the right-turn out movement from Northern Precinct at the SH3 roundabout performs at level of service (LOS) B during both peak periods, and all other movements are either LOS A or B. That is for a single circulating lane roundabout with single lane approaches.

The reduction in the number of trips distributed to the SH21 / Raynes Road intersection due to the direct connection to Southern Links central interchange allows the SH21 / Raynes Road roundabout to perform better at LOS A and LOS B during the AM and PM peak periods respectively. During the AM peak period, the eastbound traffic performs at LOS B (16 s/veh) and during the PM peak period, the left turn movement from Raynes Road performs at LOS C (27 s/veh) with a 95th percentile queue distance of 119 m.

With Southern Links constructed, traffic volumes on SH3 are expected to reduce by approximately 25% from current day flows, and therefore 100% of the Northern Precinct and RPL development trips can be accommodated with efficient performance through the proposed SH3 / RPL roundabout and Raynes Road access.



8. Appraisal of Transportation Effects

The following sections outline an assessment of the traffic and transportation effects of the proposed rezoning on the adjoining road network.

8.1 Intersection Effects Assessment

8.1.1 Affected Intersections

Rule 15.4.2.92 of the District Plan states that an ITA prepared for the Northern Precinct development shall assess the traffic effects on Raynes Road and the State Highway network between the SH1 / SH21 intersection and the SH3 / Normandy Avenue intersection as shown in Appendix O12 of the District Plan. Figure 17 below illustrates the affected six intersections.

The future year (2031) intersection performances of these six intersections and the two proposed access intersections were assessed using SIDRA Intersection 9 for the preferred access scenario (Option 4). It should be noted that SH3 / Raynes Road intersection and SH21 / Raynes Road intersection were modelled as roundabouts for this capacity assessment as the respective existing priority-controlled intersections are currently operating at or near capacity (further discussed in Section 0).

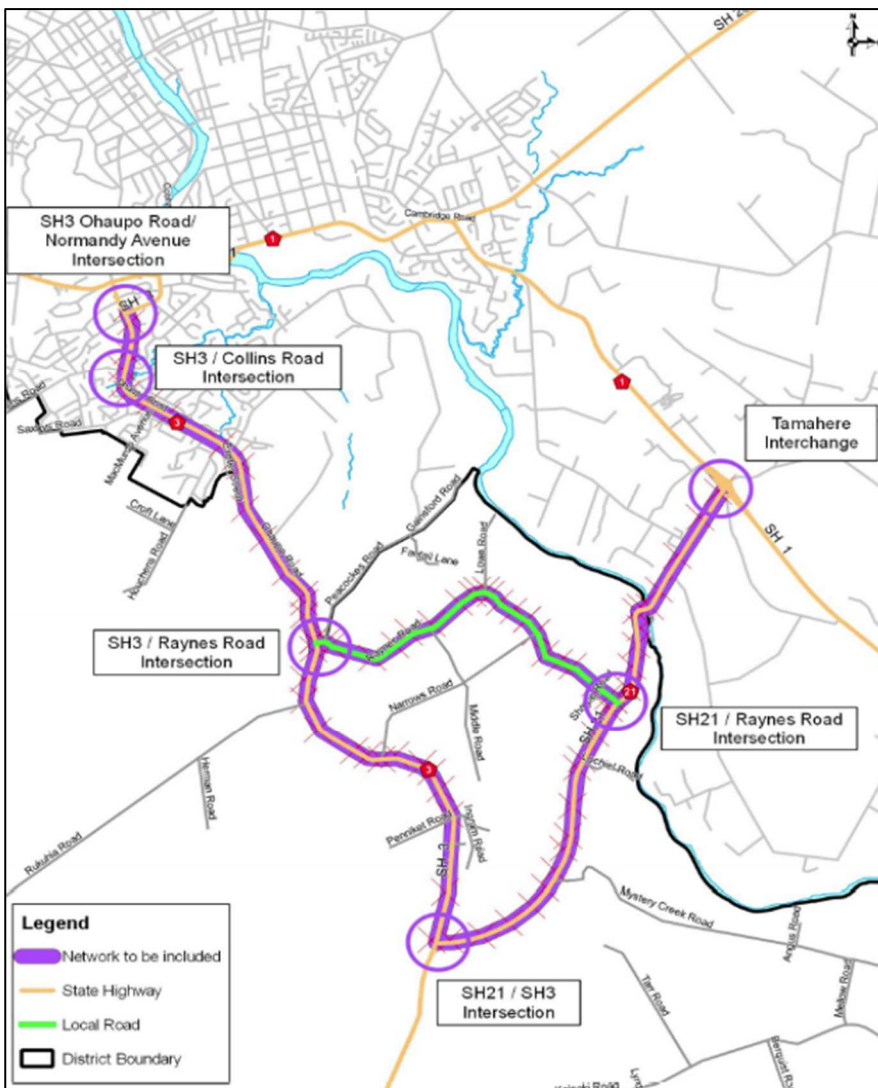


Figure 17: Affected Intersections as per District Plan



8.1.2 Capacity Analysis – 2031 with Proposed Development (Option 4)

The capacity analysis results from Option 4 are summarised in Table 8 below. The SIDRA Intersection movement summaries are provided in Appendix D. Yellow highlights show the worst performing movements.

Table No: 8

Intersection Performance Results (Year 2031)							
Intersection	Approach	AM Peak			PM Peak		
		Delay (sec)	95 th %ile Queue (m)	LOS	Delay (sec)	95 th %ile Queue (m)	LOS
Access 1: SH3 / RPL Roundabout	South: SH3	6.2	14.7	A	18.1	71.9	B
	East: Access Rd	8.4	6.0	A	12.9	57.5	B
	North: SH3	6.6	32.4	A	4.0	20.6	A
	Intersection	6.6	32.4	A	11.3	71.9	B
Access 2: Raynes Road Access	South: Access Rd	10.9	15.2	B	30.4	164.1	D
	East: Raynes Rd	5.0	0	N/A	2.5	0	N/A
	West: Raynes Rd	0	0	N/A	0	0	N/A
	Intersection	4.4	15.2	N/A	15.6	164.1	N/A
Intersection 3: SH3 / Normandy Avenue	SE: SH3	7.0	88.3	A	9.1	114.3	A
	NE: Normandy	10.4	14.8	B	15.4	34.0	B
	NW: SH3	7.3	23.4	A	7.1	31.7	A
	Intersection	7.7	88.3	A	9.9	114.3	A
Intersection 4: SH3 / Collins Road	South: SH3	32.7	181.2	C	34.6	184.3	C
	North: SH3	11.9	64.5	B	9.9	125.4	A
	West: Collins Rd	28.0	55.3	C	25.6	49.5	C
	Intersection	23.1	181.2	C	20.5	184.3	C
Intersection 5: SH3 / Raynes Road	South: SH3	4.4	20.5	A	6.3	71.5	A
	East: Raynes Rd	19.5	25.0	B	13.6	25.7	B
	North: SH3	6.8	307.1	A	19.1	153.8	B
	Intersection	6.9	307.1	A	11.4	153.8	B
Intersection 6: SH3 / SH21	East: SH21	12.8	33.5	B	12.8	25.7	B
	NE: Ingram Rd	6.4	3.8	A	11.8	39.1	B
	NW: SH3	10.5	12.4	B	10.9	18.9	B
	SW: SH3	9.5	24.3	A	9.5	10.0	A
	Intersection	10.6	33.5	B	11.1	39.1	B
Intersection 7: SH21 / Raynes Road	NE: SH21	8.0	63.8	A	5.8	12.8	A
	NW: Raynes Rd	5.9	15.9	A	17.9	112.3	B
	SW: SH21	13.2	26.4	B	5.9	30.0	A
	Intersection	8.4	63.8	A	10.0	112.3	A
Intersection 8: Tamahere Interchange (NE Roundabout)	NE: Tauwhare Rd	282.0	275.7	F	11.0	7.1	B
	NW: SH1	21.4	41.1	C	19.0	21.7	B
	SW: Tauwhare Rd	5.9	0	A	5.7	0	A
	Intersection	102.0	275.7	F	12.4	21.7	B
Intersection 8: Tamahere Interchange (SW Roundabout)	SE: Tamahere Dr	71.4	53.6	E	10.6	4.5	B
	NE: Tauwhare Rd	4.7	27.2	A	4.7	9.1	A
	SW: SH21	9.8	13.1	A	13.8	56.0	B
	Intersection	17.8	53.6	B	10.4	56.0	B



Proposed SH3 / RPL Roundabout Access

- The worst performing movement at the SH3 roundabout access will be the northbound SH3 through movement during the PM peak hour, as this traffic gives way to traffic exiting Northern Precinct. However, to ensure the state highway flow is not unacceptably affected the LOS target for SH3 movements was set at no worse than LOS C.

Proposed Raynes Road Access

- The worst performing movement at the Raynes Road intersection will be the right turning movement out from the site during the PM peak hour. The movement is projected to perform at LOS D with an average delay of approximately 30 seconds and a 95th percentile back of queue of 164 m. With this level of performance being marginal the alternative intersection solutions discussed in Section 5.2.2 could be preferable for the long-term and should be considered in further detail at consenting phase.

SH3 / Normandy Avenue Roundabout

- The worst performing movement at this roundabout will be the right turning movement from Normandy Avenue to SH3 during the PM peak hour. The movement is expected to perform at LOS B with an average delay of approximately 19 seconds and a 95th percentile back of queue of approximately 34 m.

SH3 / Collins Road Signalised Intersection

- The modelling of this intersection was based on the existing phase sequence and the average cycle time of 90 seconds during peak hours provided by Hamilton City Council.
- The worst performing movement at this signalised intersection will be the right turning movement out from Collins Road during both peak periods. The movement is anticipated to perform at LOS D with an average delay of approximately 45 seconds and a 95th percentile back of queue of approximately 55 m. The left turning movement from SH3 (northbound) to Collins Road also performs at LOS D with an average delay of approximately 40 seconds and a 95th percentile back of queue of approximately 185 m during both peak periods.
- Optimising the cycle time will provide some benefit with the LOS of both movements reducing to C (i.e. average delay reduces to approximately 30 seconds) and the 95th percentile back of queue for the left turning movement from SH3 (northbound) reduces to approximately 130 m.

SH3 / Raynes Road Roundabout

- As mentioned in Section 8.1.1, this intersection was modelled as a roundabout for the year 2031 and the layout is illustrated in Figure 18.
- The worst performing movement at this roundabout will be the right turning movement out from Raynes Road during the AM peak hour. The movement is projected to perform at LOS C with an average delay of approximately 23 seconds and a 95th percentile back of queue of 25 m.
- One concern would be the 95th back of queue recorded on the southbound SH3 traffic (i.e. approximately 307 m) during the AM peak hour. Although, the approach performs at LOS A, the queue distance is relatively long. Introducing a short left turning bay for the southbound traffic would reduce the back of queue distance on SH3 to approximately 60 m. This mitigating measure could be considered by Waka Kotahi in their detailed design of the upgrade of this intersection.

SH3 / SH21 Roundabout

- The worst performing movement at this roundabout will be the right turning movement from SH21 to Ingram Road during the PM peak hour. The movement is expected to perform at LOS C with an average delay of 20 seconds and a 95th percentile back of queue of 30 m.

SH21 / Raynes Road Roundabout



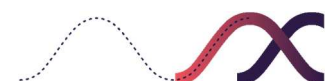
- As mentioned in Section 8.1.1, this intersection was modelled as a roundabout for the year 2031 and the layout is illustrated in Figure 19: Proposed Intersection Upgrades – SH21 / Raynes Road Intersection
- The worst performing movement at this roundabout will be the left turning movement out from Raynes Road during the PM peak hour. The movement is projected to perform at LOS B with an average delay of approximately 18 seconds and a 95th percentile back of queue of 112 m. The back of queue distance is within the separation distance of 180 m to the adjacent Raynes Road / Sharpe Road intersection.

Tamahere Interchange

- The Tamahere Interchange was analysed as a network consisting of the north-eastern and south-western roundabouts, and not individually to account for the potential impact that an intersection would have on the adjacent intersection.
- A critical consideration for the interchange performance and safety is ensuring the queues on the off-ramps do not extend down the ramp to a point that causes vehicles exiting the expressway at 100 km/h to not be able to brake to a stop safely before the back of queue. In this case, this does not happen at both SH1 off-ramps as the 95th percentile queue distance is within 54 m (worst case). The length of the southbound off-ramp is 350 m while the length of the northbound off-ramp is 230 m from the limit line to the nose of the gore area of the ramp (i.e. 170 m from nose to intersection with Tamahere Drive plus 60 m additional storage area to south-western interchange roundabout). The required deceleration distance (comfortable deceleration) from 100 km/h to a stop is 155 m as per Table 5.2 in *Austrroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersection*. On this basis, the 95th percentile queue length on the off-ramps should not exceed 195 m (southbound) and 75 m (northbound) respectively.
- The Tamahere Interchange is expected to operate at acceptable levels of service during the PM peak period with the additional development traffic. However, during the AM peak period, the approaches from Tauwhare Road (north-eastern roundabout) and Tamahere Drive (south-western roundabout) are expected to fail.
- The increase in delays is unlikely to cause anything more than increased queue lengths and some minor crashes. However, the current interchange form does align with Safe System principles and does its part to keep the DSI count as low as one in the past ten years as shown in Table 2.
- Intersection capacity improvements such as providing exclusive slip lanes on Tauwhare Road and Tamahere Drive approaches, and providing a second lane for through movement on Tauwhare Road are considered not feasible due to existing physical constraints (i.e. east side gully and proximity of bridge columns),
- On this basis, this assessment considers no mitigating measures are necessary for this interchange.

For Option 4, the following road network upgrades are proposed based on the capacity assessment and safety results:

- Waka Kotahi plans to upgrade the SH3 / Raynes Road intersection to a roundabout as a Safer Network Programme improvement in 2022/23. Option 4 does not add additional turning movement volumes at this intersection, but additional trips are added to the through movements on SH3. The roundabout design will most likely need the layout shown in **Figure 18** to accommodate the future projected traffic flows through this intersection unless the existing volume on Raynes Road reduces.



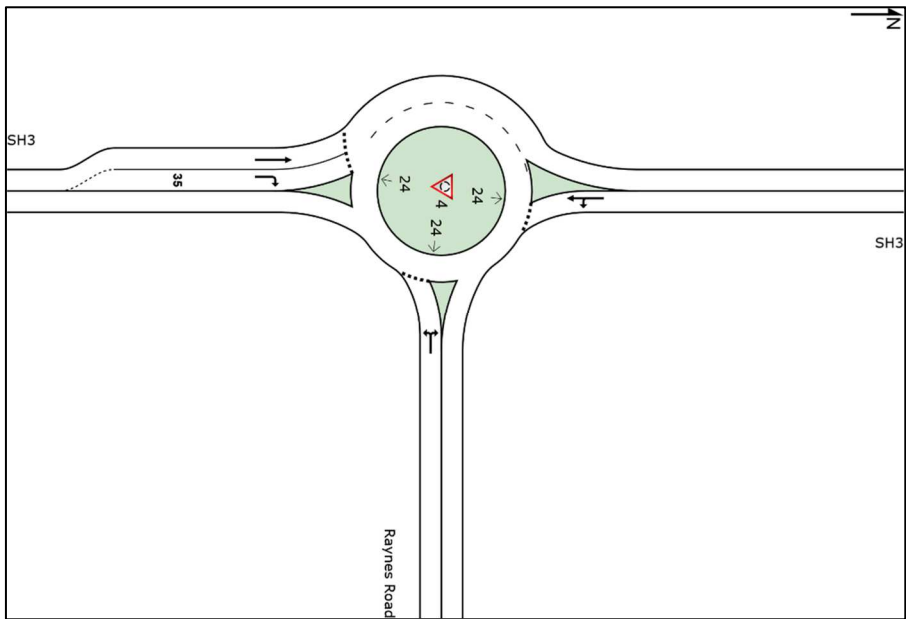


Figure 18: Proposed Intersection Upgrades – SH3 / Raynes Road Intersection

The existing SH21 / Raynes Road priority-controlled intersection is assumed to have been upgraded to a roundabout before Northern Precinct is developed (further discussed in Section 0). However, to accommodate the full development of Northern Precinct and the RPL development, the roundabout will need to incorporate turning bays on each approach and a dual circulating carriageway as shown in Figure 19: Proposed Intersection Upgrades – SH21 / Raynes Road Intersection

Figure 19: Proposed Intersection Upgrades – SH21 / Raynes Road Intersection

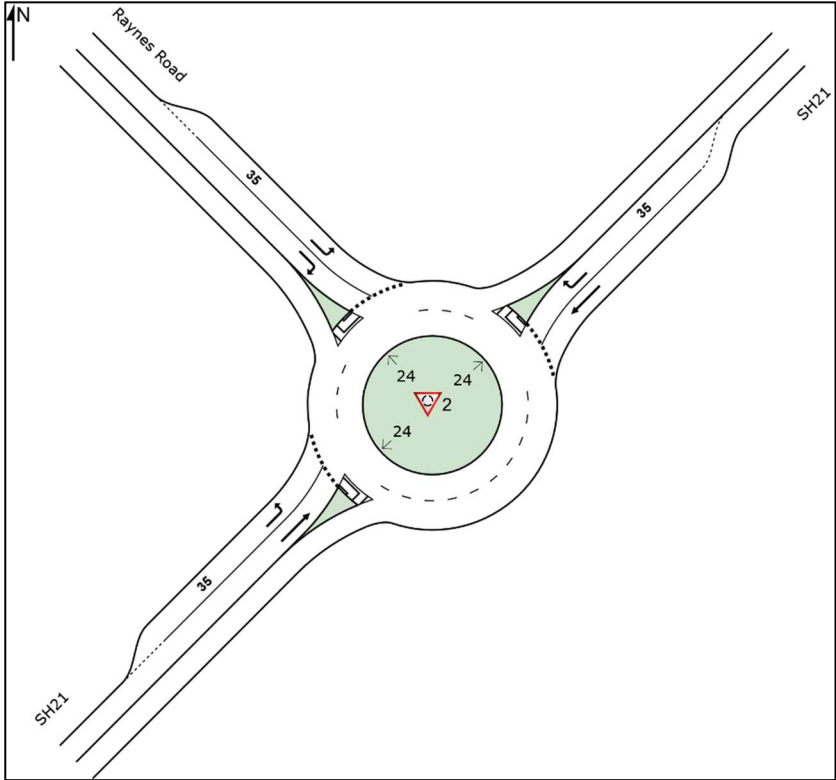


Figure 19: Proposed Intersection Upgrades – SH21 / Raynes Road Intersection



8.2 Staging of Transportation Infrastructure Improvements

This section of the report provides a summary of the staging, and associated triggers for the recommended transportation infrastructure improvements. The recommended improvements are based on the findings from the transportation effects assessments that were undertaken in the preceding section.

The triggers associated with each improvement are related to capacity and safety improvements associated with the advancement of the proposed development stages of the Plan Change. These improvements relate to the associated number of trips that are expected to be generated and distributed on the local road network as the site is successively developed.

8.2.1 SH21 / Raynes Road Intersection

A separate future year 2031 assessment via manual trip assignment was undertaken to assess the effects of this intersection with 100% build out of M37, BBC Tech and Titanium Park (i.e. other consented activities within the Airport catchment), and without any Northern Precinct development or Southern Links network.

The modelling for this scenario demonstrates that the existing SH21 / Raynes Road intersection will not be able to accommodate the trips generated by all existing consented activities in the catchment area. The right turn movement out of Raynes Road fails during the PM peak period and this indicates that the existing intersection will need upgrading for capacity and safety reasons before Northern Precinct is developed. However, subject to traffic growth on SH21 and the timing of Southern Links, a single lane roundabout as shown in Figure 20 may be feasible as an interim roundabout form.

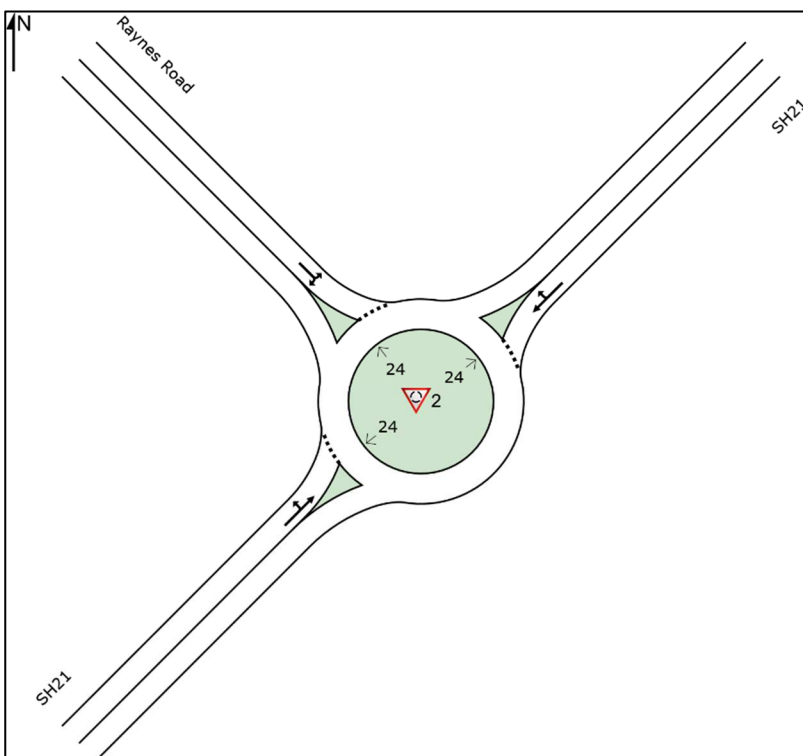


Figure 20: A Single Lane Roundabout Upgrade – SH21 / Raynes Road Intersection

The Memorandum of Agreement (MoA) between Waka Kotahi and TPL (April 2010), recommended this intersection is to be upgraded when the left turn out and right turn out movements from Raynes Road exceeded an average delay of 45 seconds (the construction trigger). However, the upgrade focused on improving sight distances by reconstructing the intersection approximately 35 m to the south-west. Although suitable in 2010, this form of upgrade will not provide the capacity needed for the consented and zoned land



in airport catchment area. As a result, the safety will be compromised even with improved sight lines such that a roundabout is required.

With the 100% build out of M37, BBC Technologies and existing Airport Business Zone the average delay for the right turn out movement from Raynes Road is modelled to be approximately 77 seconds. This exceeds the construction trigger in the MoA. However, as stated above the upgrade recommended in the MoA will not be appropriate to address the capacity issue nor the increased likelihood of Death and Serious Injury crashes at the intersection due to the increased traffic volumes and high speeds and angle of collisions with right turning vehicles.

On this basis, our assessment identifies that the roundabout upgrade two dual lanes would not technically be needed until the Raynes Road access (Access 2) for Northern Precinct and RPL property is formed (i.e. after approximately 80 ha of land has been developed or beyond 1,520 trips per peak hour). However, further assessment is required at a later stage via an ITA report to understand if more development within Northern Precinct could be developed (i.e. after the Raynes Road access becomes operational) before the SH21 / Raynes Road roundabout will have to be upgraded to the layout shown in Figure 19 which would be able to service approximately 129 ha of the plan change area.

8.2.2 SH3 / Raynes Road Intersection

Similar to the SH21 / Raynes Road intersection, a separate future year 2031 assessment via manual trip assignment was undertaken to assess the effects of this intersection with 100% build out of M37 and Titanium Park (i.e. other consented activities within the Airport Business Zone), and without any Northern Precinct / RPL development or Southern Links network.

The modelling for this scenario demonstrates that the existing SH3 / Raynes Road intersection is already performing poorly without any Northern Precinct traffic and has no capacity to accommodate any further trips from development. The right turn out of Raynes Road is the critical movement and this indicates that the existing intersection will have to be upgraded for capacity and safety before Northern Precinct generates traffic.

Waka Kotahi has indicated its intentions to upgrade the SH3 / Raynes Road intersection to a roundabout as a Safer Network Programme improvement.

The proposed access strategy does not add additional turning movements volume on Raynes Road at this intersection, but additional trips are added to the through movements on SH3. Therefore, trips associated with the proposed rezoning still cause some minor impact at this intersection.

8.2.3 Staging Summary

Table 9 below summarises the recommended transportation infrastructure upgrades and related timing and responsibilities for delivery, in relation to this rezoning submission.



Table No: 9

Staging of Transportation Infrastructure Improvements				
No.	Proposed Upgrade	Development Stage Trigger	Upgrade Triggered by Rezoning?	Delivered By
1	Upgrading of SH21 / Raynes Road intersection to a 3-arm roundabout (Refer Figure 20)	Before any commercial/industrial activity in Northern Precinct generates traffic	No*	Waka Kotahi
2	Capacity Increase at SH21 / Raynes Road roundabout to double circulating lanes and dual approach lanes (Refer to Figure 19: Proposed Intersection Upgrades – SH21 / Raynes Road Intersection)	Before any commercial/industrial activity in Northern Precinct generates traffic accessing Raynes Road OR When the cumulative total consented land area in Northern Precinct with sole access to SH3 roundabout, exceeds 70 ha (gross)	Yes	The Applicants
3	3-arm roundabout at SH3 / Raynes Road intersection	Before any commercial/industrial activity in Northern Precinct generates traffic	No*	Waka Kotahi
4	3-arm roundabout on SH3 for access to Northern Precinct	Before any commercial/industrial activity in Northern Precinct generates traffic accessing SH3 OR When the cumulative total consented land area in Northern Precinct with sole access to Raynes Road, exceeds 40 ha (gross)	Yes	The Applicants
5	Restricted movement intersection access from Northern Precinct to Raynes Road	Before any commercial/industrial activity in Northern Precinct generates traffic and requires access to Raynes Road OR When the cumulative total consented land area in Northern Precinct with sole access through SH3 roundabout, exceeds 70 ha (gross)	Yes	The Applicants
6	Construction of new walking and cycling shared path connecting Peacocke Road to the Northern Precinct via Middle Road and Faiping Road	Before any commercial/industrial activity in Northern Precinct generates traffic	Yes	Waipa District Council, Hamilton City Council, The Applicants
7	Conversion of SH3 / Ingram Road Intersection to permit only Left In and Left Out movements	After construction of the proposed SH3 roundabout access into Northern Precinct	No. Safety improvement made possible by rezoning	Waka Kotahi, Waipa District Council

* Upgrade required regardless of proposed rezoning to address current safety/capacity deficiencies.



9. Transport Strategies and Policy

9.1 Government Policy Statement on Land Transport 2021 / 22 – 2030 / 31

The Government Policy Statement (GPS2021) outlines this Government’s priorities for expenditure from the National Land Transport Fund over the next 10 years. It also provides guidance to decision-makers about where the Government will focus resources, consistent with the purpose of the Land Transport Management Act, which is:

“To contribute to an effective, efficient, and safe land transport system in the public interest”.

The key strategic priorities of the GPS2021 are defined as Safety, Better Travel Options, Improving Freight Connections and Climate Change. These are defined further as follows:

- *Safety: Developing a transport system where no-one is killed or seriously injured.*
- *Better Travel Options: Providing people with better transport options to access social and economic opportunities.*
- *Improving Freight Connections: Improving freight connections for economic development; and*
- *Climate Change: Developing a low carbon transport system that supports emissions reductions, while improving safety and inclusive access.*

9.2 The Transport Outlook 2017

The Transport Outlook 2017 provides an overview of what we can expect by way of traffic movements in the future. The population is expected to grow consistently over the next 50 years which will create additional demand on New Zealand’s transport networks. Of relevance to this proposal is the projected increase in freight movements and general traffic movements on Waikato’s Transport network.

9.3 NZTA Statement of Intent 2018 – 2022

This statement of intent presents a new direction for Waka Kotahi. Over the next five years Waka Kotahi aims to deliver three big changes that form the foundation of this new direction:

- *One Connected Transport System: Transform land transport system by integrating digital technology with physical infrastructure to create a safe, connected system that works for everyone.*
- *People Centric Approach: Simplify our customers; lives and or partners’ work with innovative services and experiences that make it easy for them to do what they need to.*
- *Partnership For Prosperity: Unlock social and economic opportunities for customers, businesses, and communities through targeted partnerships.*

9.4 Waikato Regional Land Transport Plan –2021 - 2051

The Waikato Regional Land Transport Plan 2021 – 2051 sets out the strategic direction for land transport in the Waikato region over the next thirty years. The Plan is built around the region’s three key transport problems, namely:

- *Protecting the function of our strategic corridors in the context of growth pressures in and around Hamilton, the North Waikato and in the upper North Island.*



- *Tackling our complex road safety problem and the disproportionate number of death and serious injuries in the region.*
- *Providing better, more equitable transport options to access social, health, economic and cultural opportunities.*

The Plan sets out seven priorities for land transport in the Waikato region. The priorities relevant in these instances are as follows.

- *Strategic Corridors: Improving network resilience, route reliability and safety on key strategic corridors.*
- *Managing Growth: Providing multi-modal transport solutions to support housing and growth in high growth areas.*
- *Access and Mobility: Growing public transport and active mode share in urban and high growth areas.*
- *Maintaining what we have: Maximising efficiencies and optimisation across the transport system.*

9.5 Policy Alignment of the Proposed Rezoning

The report finds that the proposed rezoning is consistent with the new GPS and directions set out in the Waikato Regional Land Transport Plan because:

- The proposed development will support economic growth in the region by providing access to more industrial land that can be developed, which lead to more jobs and increased prosperity.
- The proposed access strategy for the Northern Precinct of the Airport Business Zone is considered to be a safe and efficient access solution. The proposed access strategy will provide the appropriate capacity to enable the Northern Precinct to deliver regional economic growth while providing safe and efficient accessibility to the industrial park and the surrounding transport network at an appropriate cost.
- Although this proposal does not create public transport services to and from the Airport Business Zone, the proposed access arrangement will support more efficient bus movements to the Airport area if services are commenced by WRC in the future.



10. Stakeholder Engagement

10.1 Waka Kotahi

Consultation with Waka Kotahi has been undertaken during the development of this ITA report. Waka Kotahi advised that the following matters would need to be considered and / or addressed as part of the ITA:

- Design and locate the intersection for Access 1 and Access 2 such that both do not adversely impact on the Southern Links designation design.
- Access 1 (SH3 roundabout) is a solution that Waka Kotahi could potentially support as it aligns with safe system principles.
- A strategy for walking and cycling connectivity between the various Titanium Park precincts and the Airport, and for future Public Transport servicing is to be addressed in the ITA
- The direct access link to Southern Links central interchange is not immediately supported. Further consideration of this is needed subject to information presented in the ITA.
- The SH3 / Raynes road intersection will be upgraded to a roundabout as a safety project, likely within the next two years as part of the Speed and Infrastructure Programme. This is currently likely to be a single circulating lane roundabout. Extra capacity may be needed to accommodate Northern Precinct development traffic in the period before Southern Links is constructed.

10.2 Waipa District Council

Consultation has been undertaken with Council during the development of this report. The following preliminary comments were provided by Council staff:

- Can the proposed SH3 / RPL roundabout co-exist with the future Southern Links layout given the grade separation planned nearby?
- Will the SH3 / Raynes Road intersection still require an upgrade to a roundabout even without Northern Precinct development, considering the traffic growth in the Peacocke Structure Plan area and wider area?
- Design and building the Raynes Road access closer to the eventual Southern Links layout to future proof against major disruption.
- Location of Raynes Road access being on a curve.
- SH3 and SH21 may require a review of speed limits and safe system improvements in future to help reduce the risk of DSI crashes that will naturally increase as exposure increases due to additional traffic on the network surrounding the Airport. Only the road controlling authorities can review and set speed limits.
- The SH3 / Narrows Road intersection could potentially be closed or become a left in and left out intersection to help improve safety once the new SH3 roundabout is constructed for accessing Northern Precinct. Waipa Council could extend Middle Road to the new Spine road to enable diverted traffic to access SH3. Volumes are low using Narrows Road to access SH3 so this could easily be accommodated at the new roundabout instead.
- The SH3 / RPL roundabout is close to a large sweeping bend on SH3 and approach speeds could be high, so any queuing toward the north would be a crash risk needing mitigation.
- The Raynes Road access will not be intuitive to unfamiliar drivers and could well be misused with drivers U-turning around islands or driving the wrong side of islands. It is rare to come across such



an intersection in a rural environment which limits two turning movements. There may be better options that should be considered. Maybe traffic signals.

- The Plan Change proposal will require three new roundabouts, two on SH3 and one on SH21. The additional traffic on the network may well trigger the fourth roundabout which is required at the Airport terminal entrance on SH21.
- The additional traffic on SH3 at peak times will affect the Te Awamutu-Hamilton bus service, likely leading to more congestion and delay to services. However, if employees are to use a bus service from Hamilton or Te Awamutu to jobs near the airport then they will need bus stops on SH3 at key points and linking paths and safe SH3 crossings. (Then perhaps some lime scooters or similar for workers to get into the industrial/commercial areas.)

10.3 Waikato Regional Council

Consultation has been undertaken with WRC during the development of this report to discuss the potential for public transport services to operate to Northern Precinct and the Airport in the future. The following preliminary comments were provided by WRC staff:

- There are currently no public transport services that service the Airport Business Zone. The Te Awamutu route is the only current service that travels along SH3.
- The outcomes derived from a business case that was undertaken by WRC a couple of years ago, suggested that the residents from Te Awamutu will be of disadvantage if the existing service diverted to the Hamilton Airport.
- A shuttle service is currently being planned and will be operation by the end of the year from Hamilton to the Hamilton Airport. This service will also help to understand the demand from the airport.
- In the immediate term, there are challenges to serve the Airport Business Zone. WRC is also not keen in diverting the Te Awamutu bus route off SH3 to the subject site. However, there is an option of providing bus stops along SH3 with appropriate crossing facilities and walking and cycling connectivity.
- In the long term (pre–Southern Links), an option would be to extend one of the bus routes servicing the Peacocke Structure Plan Area to the Hamilton Airport and the surrounding industrial land.

These matters have been addressed in this report.



11. Conclusions

The following key conclusions are established from the transportation assessment detailed in this report:

- The proposal consists of rezoning approximately 133 ha of land as Airport Business Zone. The application also proposes to undertake updates to the current Airport Business Zone Structure Plan for Northern Precinct and changes to the Northern Precinct provisions within the District Plan to align it with the Masterplan that has been developed.
- The development master plan envisages 120.5 ha of gross land area developed for industrial/business purposes and approximately 12.5 ha of gross land area for supporting commercial development, potentially including activities such as hospitality, accommodation and conference facilities, and convenience retail.
- When complete the developed land is expected to generate approximately 2,500 vehicle trips per peak hour, with between 12% and 15% of the total by heavy commercial vehicles.
- Access to the subject site is proposed via two new access road intersections, one to SH3 and one to Raynes Road which will be located and designed in accordance with the District Plan requirements, Austroads geometric design guidelines and Waka Kotahi NZTA Planning Policy Manual. These access points will be internally connected via a central spine road through Northern Precinct.
- The SH3 access is proposed as a 3-arm roundabout. The location of the intersection is adjacent to the RPL owned land, with the specific position is to be confirmed through design and consultation with Waka Kotahi, and taking due consideration for the Southern Links corridor designation nearby.
- The Raynes Road access is proposed to be a channelised 'T' intersection with the left turn movement out of the site and right turn movement into the site banned and physically prevented. This is to prevent increased volume of heavy vehicles on Raynes Road north of Narrows Road associated with the Northern Precinct development. This intersection would be a sacrificial investment for TPL, to be rebuilt when Southern Links is constructed. The central spine road within Northern Precinct can be connected by a short extension to the new intersection location accessing the realigned Raynes Road.
- This access configuration is the Applicant's preferred arrangement as it proves to adequately meet the demand of approximately 95% of the total land area without Southern Links having been constructed, while also causing negligible traffic impacts on Raynes Road residents and at the SH3 / Raynes Road intersection.
- Traffic modelling indicates that approximately 80 ha of the plan change area can be serviced by the proposed SH3 roundabout alone before delays on the highway approaches deteriorate to LOS D. This equates to approximately 1,520 trips (two-way) per pm peak hour.
- A future third transport access is proposed to Northern Precinct when Southern Links arterials area constructed. The proposed access is via a direct connection to the Southern Links central interchange. The Applicants propose that this link connects to the future roundabout on the western side of the interchange to provide a highly efficient public transport connection between Hamilton CBD, the Airport and Titanium Park employment hub and a strong freight connection to the wider strategic transport corridors through and around Hamilton.
- Roads within Northern Precinct that meet the presently unformed and formed sections of Middle Road south of Narrows Road will not enable access for ABZ traffic to the formed section of Middle Road north of the site. However, access is proposed through the closure point for active transport modes to support ease of travel and connectivity while reducing car dependency.
- The internal public road network will be designed in accordance with the intended network hierarchy and will adhere to relevant design requirements of the District Plan. This includes, but not limited to, road cross section design, vehicle crossing spacings, sight distance and parking requirements, and a



highly connected network of paths for walking and cycling within Northern Precinct and connecting to the wider Titanium Park walking and cycling paths linking the precincts around the Airport.

- For connectivity to the wider network a strategic walking and cycling path connection is recommended as part of the Northern Precinct development connecting between Peacocke Road and Northern Precinct via Middle Road and the unformed section of Faiping Road.
- The path length for the route between Northern Precinct and Peacockes Road via Middle Road and Faiping Road is approximately 1.9 km, while the distance to central Peacocke growth cell and the Cobham Drive / Wairere Drive interchange via the new Waikato River bridge (presently under construction) would be a cycling distance of approximately 4 km and 6km respectively.
- Southern Links construction will sever the proposed walking and cycling corridor route to Peacockes Road, at Middle Road. An opportunity exists to reconnect the path by extending it along the northern side of Southern Links arterial, then over Southern Links arterial via the designated Raynes Road overbridge. This future route adds approximately 1 km to the cycling journey from Peacocke. Alternatively, an underpass could be provided beneath the Southern Links Arterial to continue the path at Middle Road. This would be approximately 80m long. Alternatively, an underpass could be provided beneath the Southern Links arterial road to continue the active modes path along the existing Middle Road alignment.
- A new “on-demand” PT service trial called “Flex” commenced operation in February 2022 between Hamilton City Transport Centre and the Airport. The service is operated by Waikato Regional Council as a 12-month trial and is planned to operate weekdays from 10am to 4pm, with fares costing \$3 per person each way. Passengers book the ride share service using an app downloaded on their smart phone.
- Over time the demand and feasibility for Public Transport services operating between Hamilton and the Airport is likely to increase as employment within the Northern Precinct increases together with completion of existing Titanium Park and M37 employment precincts, plus passenger growth at the Airport. Public Transport route options that were identified during the meeting with WRC as having merit for future network planning and design consideration were:
 - Pre-Southern Links, Northern Precinct Spine Road not connected to Raynes Road
 - New bus stops provided on both sides of SH3 in the vicinity of the access roundabout
 - Extending a future bus route serving the Peacocke Structure Plan Area into Northern Precinct and the Airport via Middle Road and the presently unformed Faiping Road. Faiping Road offers the potential for an efficient PT connection alongside the proposed walking and cycling shared path.
 - Pre-Southern Links, Northern Precinct Spine Road connected to Raynes Road
 - A bus service connecting between Hamilton and the Airport as well as the surrounding Airport Business Zone land
 - Extending a future bus route serving the Peacocke Structure Plan Area via the unformed section of Faiping Road. There is an opportunity to develop this road as public transport and walking and cycling corridor but closed to private vehicles except residents’ vehicles.
 - Post-Southern Links
 - A direct public transport connection between Hamilton CBD, the Airport and Titanium Park via a new road connection from Northern Precinct to the Southern Links central interchange roundabout.
- The current right turn bay intersection forms of the SH3 / Raynes Road intersection and SH21 / Raynes Road intersection are contributing to the severity of injury crashes recorded at these



intersections. Waka Kotahi anticipates that both intersections will be upgraded to roundabout forms within the next five to seven years, making them more aligned with Safe System design principles for reducing crash injury severity. Capacity modelling carried out in this ITA assumes both intersections are upgraded to roundabouts.

- Capacity assessment undertaken via SIDRA Intersection 9 indicate that all intersections identified in Appendix O12 of the District Plan, except for Tamahere interchange, perform satisfactorily with the addition of the trips generated by the Plan Change proposal.
- The Tamahere interchange is expected to perform unsatisfactorily with the addition of the trips generated by the proposed development. However, the increase in delays is unlikely to cause anything more than increased queue lengths and some minor crashes. The current interchange form does align with Safe System principles and does its part to keep the DSI count as low as one in the past ten years. On this basis, this assessment considers no mitigating measures are necessary for this interchange.

Overall, the transportation effects on the adjoining road network enabled by the proposed rezoning of Northern Precinct can be managed and mitigated to acceptable levels, subject to the recommended infrastructure upgrades and associated timing of each (in the following section) being adopted within the Airport Business Zone rule framework and revised Structure Plan.



12. Recommendations

The following transportation infrastructure provisions are recommended to mitigate the potential effects of transport associated with development in Northern Precinct.

SH3 Access to Northern Precinct

- A new 3 -arm roundabout on SH3 connecting to a new public road through RPL land, ultimately connecting through TPL land to Raynes Road, in general accordance with the location and form illustrated in Appendix B of this ITA. This roundabout enables Waka Kotahi and WDC to significantly improve safety at SH3 / Ingram Road intersection by modifying to Left In / Left out movements only.

Raynes Road Access

- Construction of a new intersection with banned Left Out and Right In movements, in general accordance with the intent illustrated in Appendix B of this ITA. The final intersection form and method of control, that addresses Safe System Design principles is to be determined through consultation and agreement with Waipa District Council.

Southern Links Access

- A direct access connection to the future Southern Links Central interchange for accessing future PT, walking, and cycling and freight, should be further investigated and planned in consultation with Waka Kotahi, Waipa District Council and Hamilton City Council. The access opportunity can be geometrically accommodated at the western roundabout of the interchange with a design amendment to include a clover-leaf style westbound off-ramp such that the roundabout remains consistent with the designated 4-leg roundabout layout.
- No access be provided from the plan change areas to Middle Road (north of Northern Precinct) or Narrows Road for general traffic. However, walking and cycling access should be provided through the closure point of Middle Road and to Narrows Road from Northern Precinct for connectivity to the proposed shared active modes path on Middle Road.

SH21 / Raynes Road Intersection

- The existing SH21 / Raynes Road priority-controlled intersection should be upgraded to at least a single lane roundabout before any land use activity in Northern Precinct generates operational traffic.
- The capacity of the roundabout should be upgraded to dual circulating lanes and approaches when the proposed Raynes Road access to Northern Precinct is constructed, or once 80 ha (combined gross area) of rezoned land has been developed and is generating 1520 trips per peak hour accessing SH3. It may be appropriate and most economic to construct the dual lane roundabout from the outset, and this should be confirmed in consultation with Waka Kotahi and Waipa District Council.

SH3 / Raynes Road Intersection

- No land use activity in Northern Precinct shall generate operational traffic until the upgrade of SH3 / Raynes Road intersection to a roundabout by Waka Kotahi, is under construction.

Walking and Cycling

Walking and cycling paths/infrastructure are recommended to connect Northern Precinct with the rest of Titanium Park as follows:

- On all internal transport roads through the Northern Precinct



- On the west side of Raynes Road connecting from Northern Precinct to the shared walking and cycling path adjacent to Raynes Precinct. This then connects Northern Precinct to the eastern and southern employment precincts of Titanium Park.
- Along the east side of SH3 to Ingram Road to connect Northern Precinct with the western employment precinct of Titanium Park.

For connectivity to the wider network, it is recommended that an active modes path is provided from northern Precinct to Peacocke Road, via Middle Road and Faiping Road, and in partnership with Waipa District Council and Hamilton City Council to ensure it meets the needs of the wider community by integrating well with the planned walking and cycling networks in Peacocke. The shared path requires a safe and appropriate road crossing facility across Raynes Road for continuity between Middle Road and Faiping Road.

Public Transport

For Northern Precinct, the proposed spine road connecting between SH3, and Raynes Road will be designed for use by public transport. When complete, this development would enable a public transport service loop around the Airport precincts, which could be incorporated into the Hamilton to Te Awamutu services and/or a new bus service to and from Hamilton Transport Centre. This together with the proposed walking and cycling paths ensures multi-modal transport options are provided to help reduce reliance on private vehicles for travel to Hamilton and between the surrounding precincts of Titanium Park and the Airport.

The unformed section of Faiping Road also presents an opportunity for a potential future local public transport link between the Airport and Hamilton CBD via Peacocke residential growth cell, particularly in the period before Southern Links major arterial is constructed and potentially fills this purpose.

Given the timing for Southern Links is unknown, it is recommended that Hamilton City Council, Waipa District Council and Waikato Regional Council investigate the use of Faiping Road corridor for public transport alongside the proposed walking and cycling path, in context with the wider network public transport planning. For clarity, use of this corridor by public transport is not required mitigation for transport effects of the rezoning proposal, as the Spine Road through Northern Precinct will enable a loop service around the airport as mentioned above. It is also recognised that provision of public transport services by a third party is not something the rules in the District Plan can require.

The following summarises the recommended transportation infrastructure upgrades and related timing and responsibilities for delivery, in relation to this rezoning submission.

Staging of Transportation Infrastructure Improvements				
No.	Proposed Upgrade	Development Stage Trigger	Upgrade Triggered by Rezoning?	Delivered By
1	Upgrading of SH21 / Raynes Road intersection to a 3-arm roundabout (Refer Figure 20)	Before any commercial/industrial activity in Northern Precinct generates traffic	No*	Waka Kotahi
2	Capacity Increase at SH21 / Raynes Road roundabout to double circulating lanes and dual approach lanes (Refer to Figure 19: Proposed Intersection Upgrades – SH21 / Raynes Road Intersection)	Before any commercial/industrial activity in Northern Precinct generates traffic accessing Raynes Road OR When the cumulative total consented land area in Northern Precinct with sole access to SH3	Yes	The Applicants



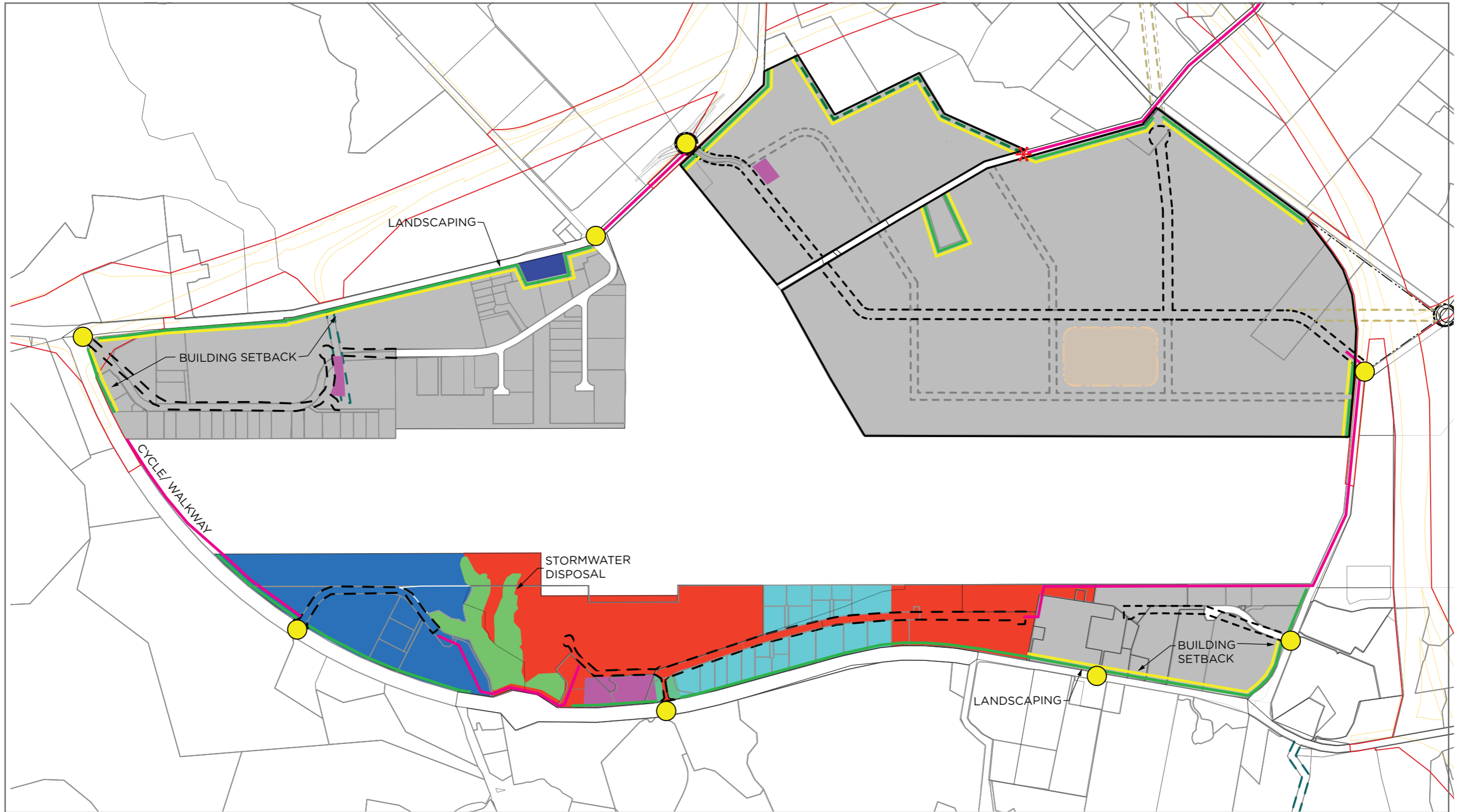
)	roundabout, exceeds 70 ha (gross)		
3	3-arm roundabout at SH3 / Raynes Road intersection	Before any commercial/industrial activity in Northern Precinct generates traffic	No*	Waka Kotahi
4	3-arm roundabout on SH3 for access to Northern Precinct	Before any commercial/industrial activity in Northern Precinct generates traffic accessing SH3 OR When the cumulative total consented land area in Northern Precinct with sole access to Raynes Road, exceeds 40 ha (gross)	Yes	The Applicants
5	Restricted movement intersection access from Northern Precinct to Raynes Road	Before any commercial/industrial activity in Northern Precinct generates traffic and requires access to Raynes Road OR When the cumulative total consented land area in Northern Precinct with sole access through SH3 roundabout, exceeds 70 ha (gross)	Yes	The Applicants
6	Construction of new walking and cycling shared path connecting Peacocke Road to the Northern Precinct via Middle Road and Faiping Road	Before any commercial/industrial activity in Northern Precinct generates traffic	Yes	Waipa District Council, Hamilton City Council, The Applicants
7	Conversion of SH3 / Ingram Road Intersection to permit only Left In and Left Out movements	After construction of the proposed SH3 roundabout access into Northern Precinct	No. Safety improvement made possible by rezoning	Waka Kotahi, Waipa District Council

* Upgrade required regardless of proposed rezoning to address current safety/capacity deficiencies.



Appendix A – Proposed Revised Structure Plan





Legend

- | | | | | |
|-----------------------------|-----------------------|----------------------|----------------------------------|--|
| Road/Access Stopped | Indicative Road | Special Amenity Area | Indicative Secondary Road | Southern Links - Designation Extent |
| Access Point/Gateway | Airport Business Zone | Stormwater Disposal | Potential Future Connection Road | Airport Business Zone - Northern Precinct Extent |
| Landscaping | Central Precinct | Landscape Open Space | Unformed Road | Future Section of Middle Road to be closed |
| Building Setback | Southern Precinct | Retail Area | Northern Precinct Hub | Rural Landscaping |
| Cycleway/Walkway Connection | Stage 1 Development | Site Boundary | Indicative Future Roundabout | Vehicle Access Restriction |

Airport Business Zone Structure Plan
Appendix S10



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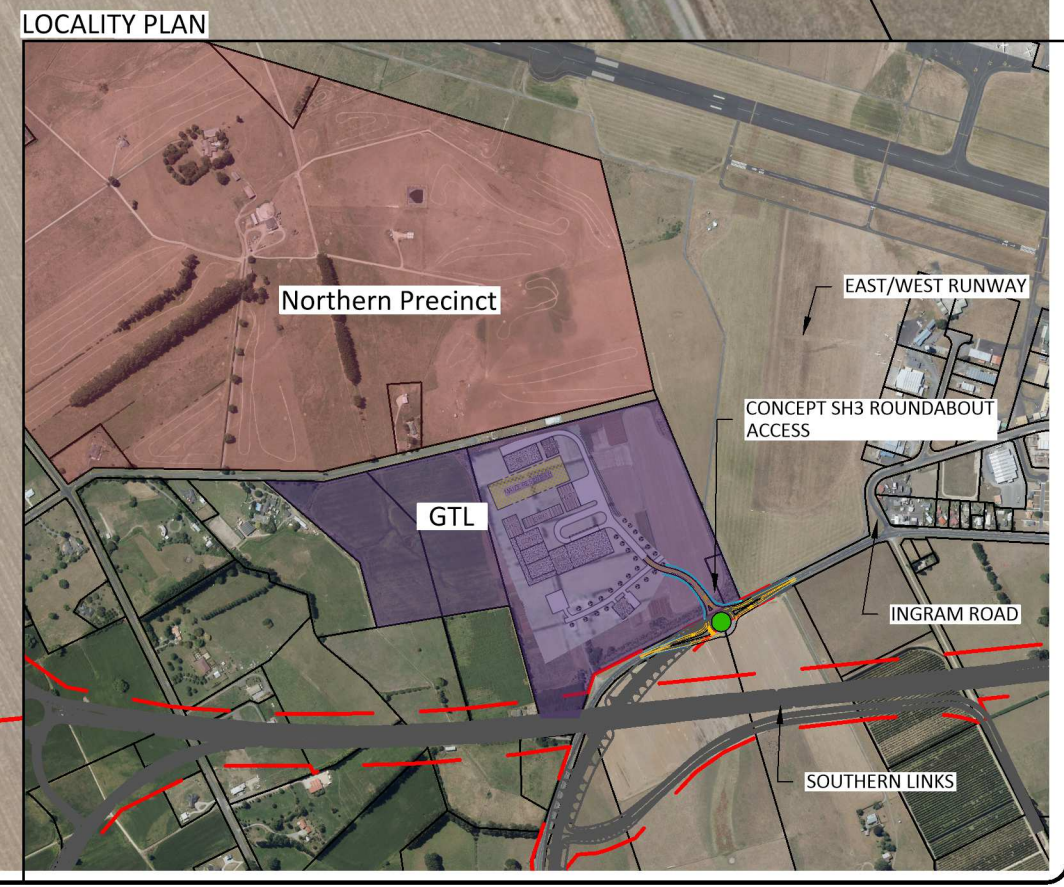
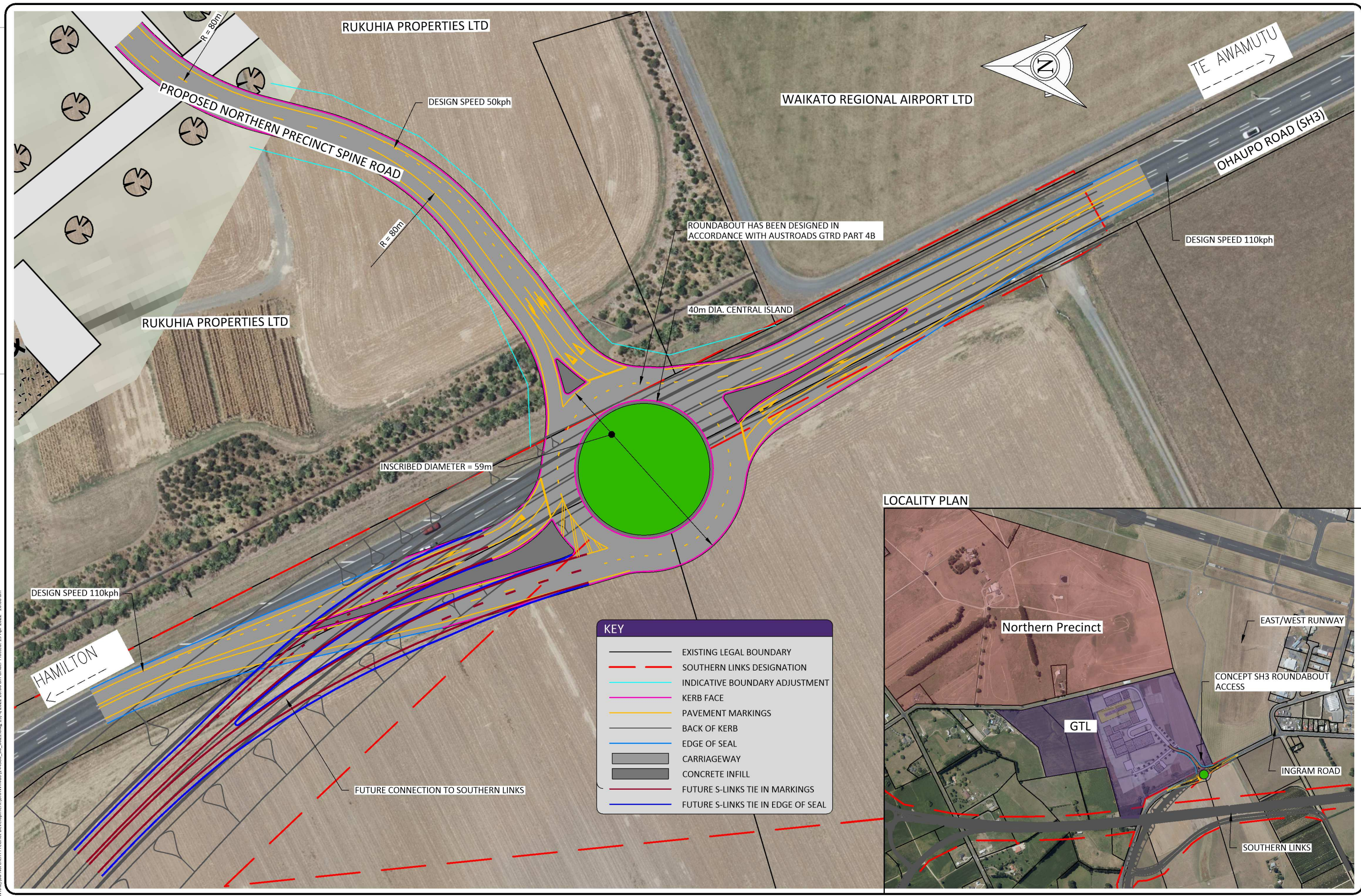
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REFERENCE
Print Date
21 December 2021

Appendix B – Access Concept Designs

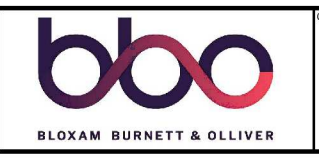


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 Version 4.0 - March 2020



KEY	
	EXISTING LEGAL BOUNDARY
	SOUTHERN LINKS DESIGNATION
	INDICATIVE BOUNDARY ADJUSTMENT
	KERB FACE
	PAVEMENT MARKINGS
	BACK OF KERB
	EDGE OF SEAL
	CARRIAGEWAY
	CONCRETE INFILL
	FUTURE S-LINKS TIE IN MARKINGS
	FUTURE S-LINKS TIE IN EDGE OF SEAL

NO.	DATE	ISSUE/REVISION DETAIL	BY	CHK	APPR
D	23.02.2022	CORRECTION TO RPL APPROACH LANE MARKINGS (2 X RT)	CI	CI	CI
C	09.11.2021	ROUNDABOUT REPOSITIONED	GT	CI	-
B	08.07.2021	ADDITIONAL LANE ON ACCESS LEG - FOR RESOURCE CONSENT	SB	CI	-
A	05.05.2021	ISSUED FOR INFORMATION	GT	CI	-

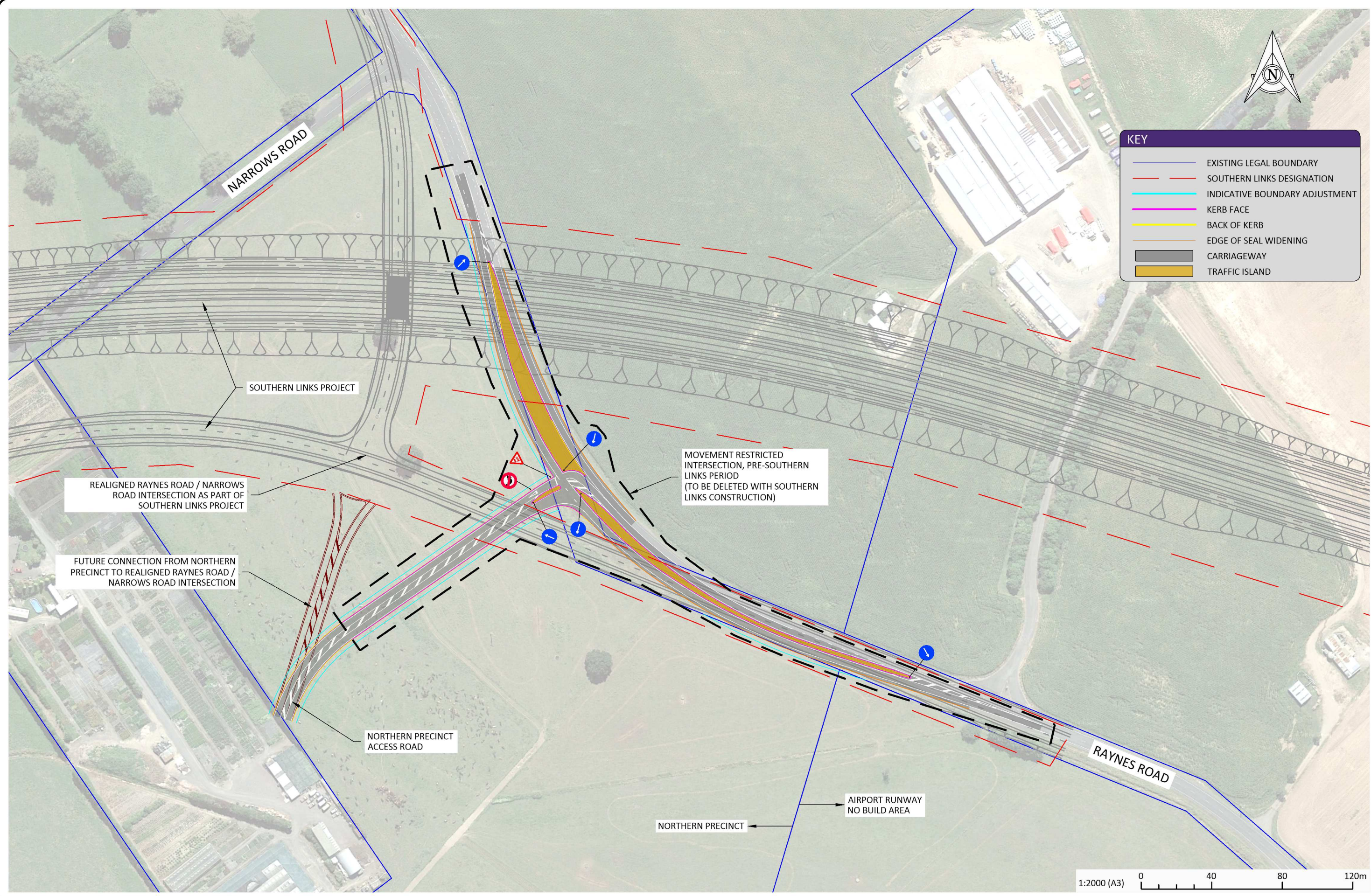


CLIENT: **TITANIUM PARK LIMITED**
 PROJECT: **NORTHERN PRECINCT DEVELOPMENT**

DRAWING: **SH3 ROUNDABOUT ACCESS
 GENERAL ARRANGEMENT
 SHEET 1**

STATUS	
PRELIMINARY	
DATE	05.05.2021
SCALE (ORIGINAL SIZE A3)	1:1000
DRAWING NUMBER	144380_06_0021
REVISION	D

100mm
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 Version 4.0 - March 2020



KEY	
	EXISTING LEGAL BOUNDARY
	SOUTHERN LINKS DESIGNATION
	INDICATIVE BOUNDARY ADJUSTMENT
	KERB FACE
	BACK OF KERB
	EDGE OF SEAL WIDENING
	CARRIAGEWAY
	TRAFFIC ISLAND

NO.	DATE	ISSUE/REVISION DETAIL	BY	CHK	APPR
B	21.05.2021	SOUTHERN LINKS INDICATIVE ALIGNMENT INCLUDED	SB	CI	CI
A	27.04.2021	ISSUED FOR INFORMATION	SB	CI	CI

DESIGNED	CHECKED
SB	CI
DRAWN	APPROVED
SB	



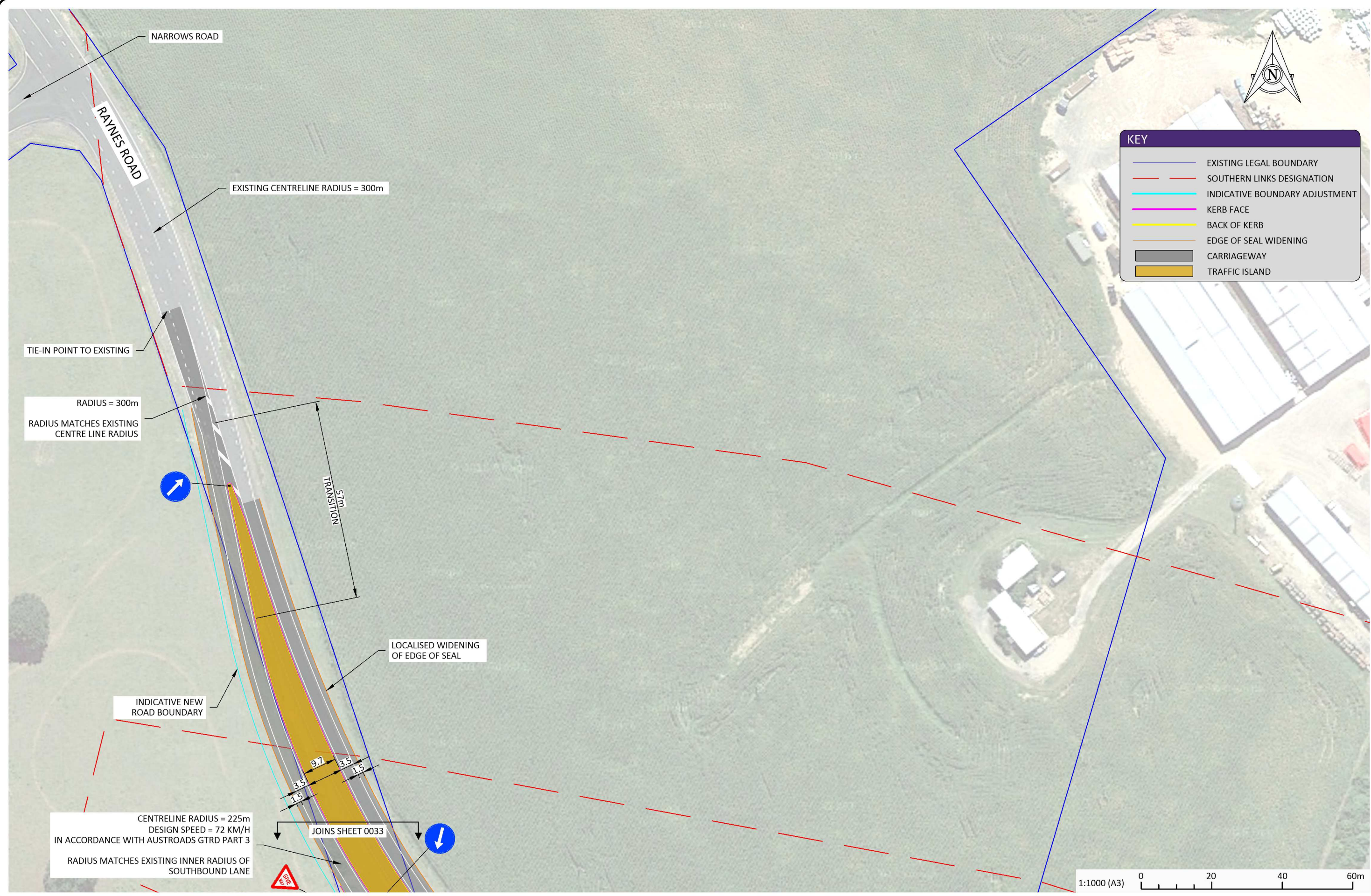
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TITANIUM PARK LIMITED

PROJECT
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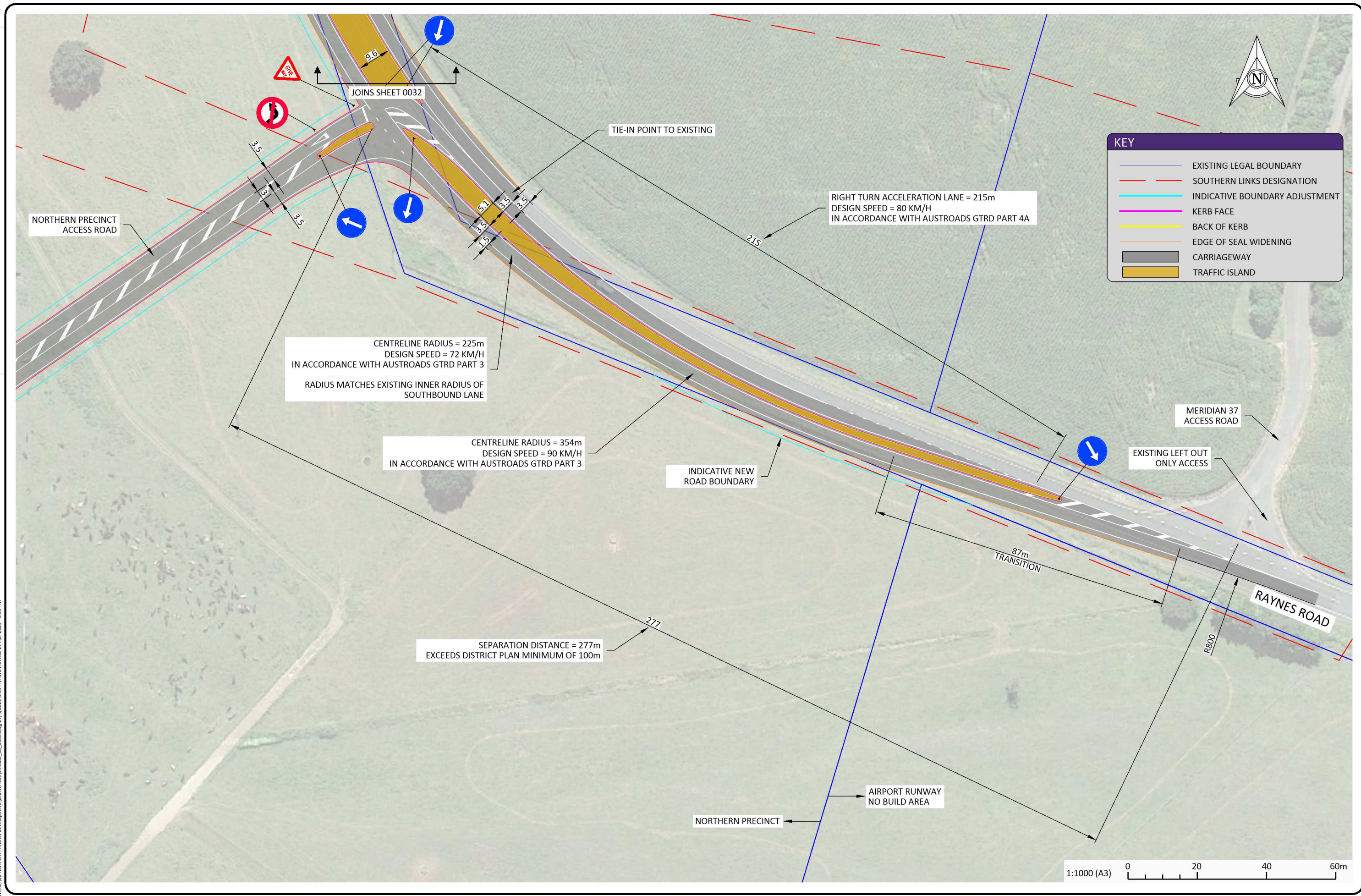
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PROJECT
NORTHERN PRECINCT DEVELOPMENT

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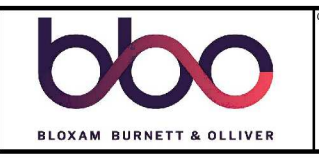
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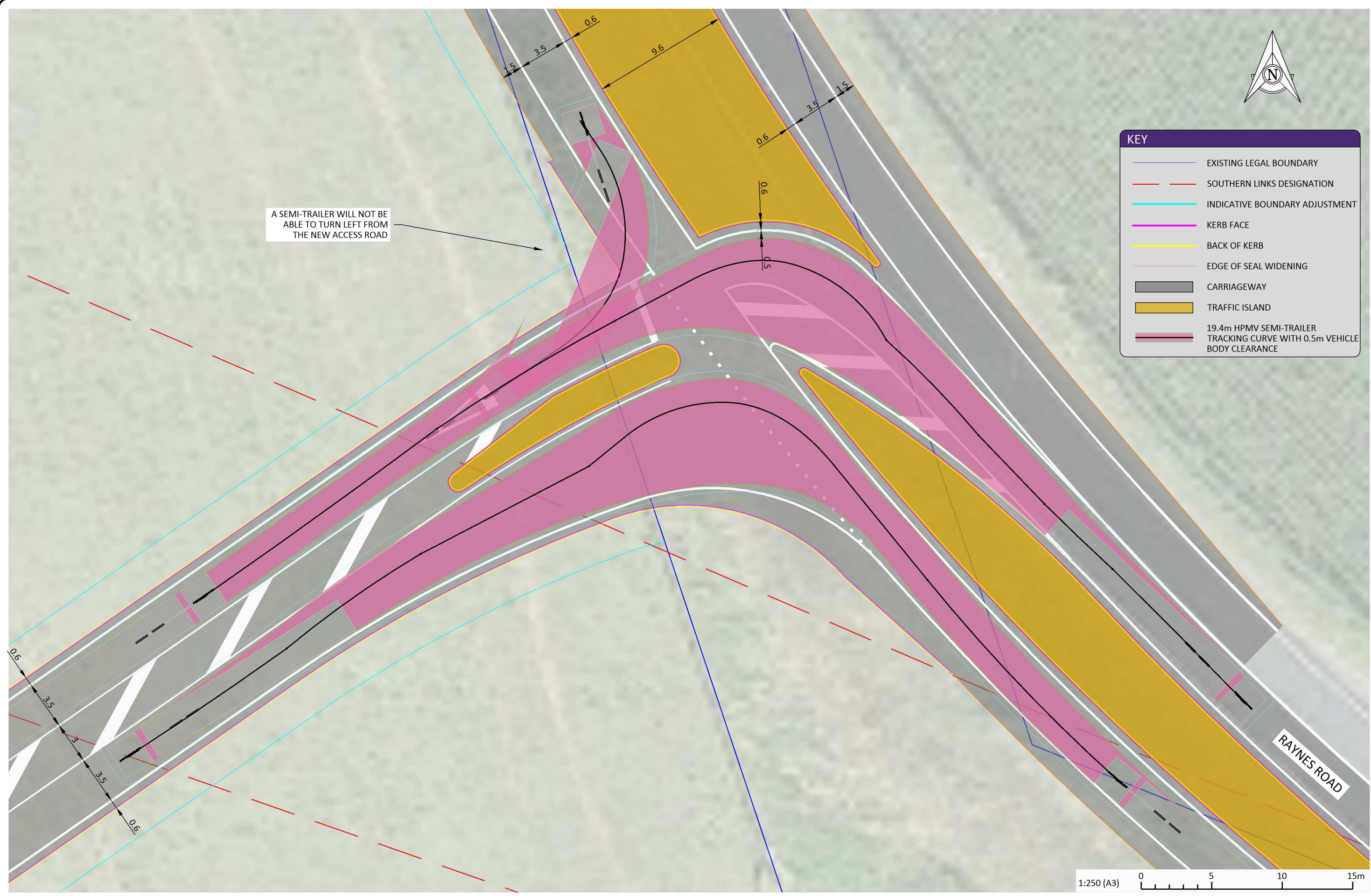
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TITANIUM PARK LIMITED

PROJECT
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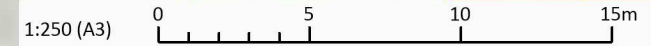
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	INDICATIVE BOUNDARY ADJUSTMENT
	KERB FACE
	BACK OF KERB
	EDGE OF SEAL WIDENING
	CARRIAGEWAY
	TRAFFIC ISLAND
	19.4m HPMV SEMI-TRAILER TRACKING CURVE WITH 0.5m VEHICLE BODY CLEARANCE



DATE	ISSUE/REVISION DETAIL	BY	CHK	APPR
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DRAWN	APPROVED
SB	-



CLIENT
TITANIUM PARK LIMITED

PROJECT
NORTHERN PRECINCT DEVELOPMENT

DRAWING
**RAYNES ROAD ACCESS INTERSECTION
 19.4m HPMV SEMI-TRAILER
 TRACKING CURVES**

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Version 4.0 - March 2020	



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PROJECT
NORTHERN PRECINCT DEVELOPMENT

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 ROUNDABOUT CONCEPT 2
 GENERAL ARRANGEMENT**

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Appendix C – Traffic Modelling Memorandum



Memo

To Titanium Park Limited
From Siva Balachandran
Date 16 June 2021
Job No. 144380.06
Job name Northern Precinct Development
Subject **Northern Precinct Alternative Access Options Assessment**

1. Introduction

Bloxam Burnett & Olliver Limited (BBO) has undertaken additional transport modelling work for Titanium Park Limited (TPL) to assess alternative access options to support rezoning of 104 hectares (ha) of Northern Precinct at Titanium Park.

Transport modelling has been undertaken to date using the Waikato Regional Transportation Model (WRTM) to determine network wide effects of the rezoning, and further SIDRA modelling of specific intersections on the affected network. Initial model scenarios (options) 1 to 3 involved the proposed plan change area accessed solely by Raynes Road with trips distributing north through SH3 / Raynes Road intersection and south through SH21 / Raynes Road intersection.

An alternative access scenario involving connection to SH3 through the neighbouring Genetic Technologies Ltd (GTL) property has been revisited as a potential solution to minimise effects on residents of Raynes Road and on the SH3 / Raynes Road intersection. In contrast to scenarios 1 to 3, the alternative access scenarios include the GTL land (28 ha) with the Northern Precinct land area for rezoning, resulting in 132 ha total. Figure 1 illustrates the locality of the two land areas and the potential shared access (red arrow) to SH3.

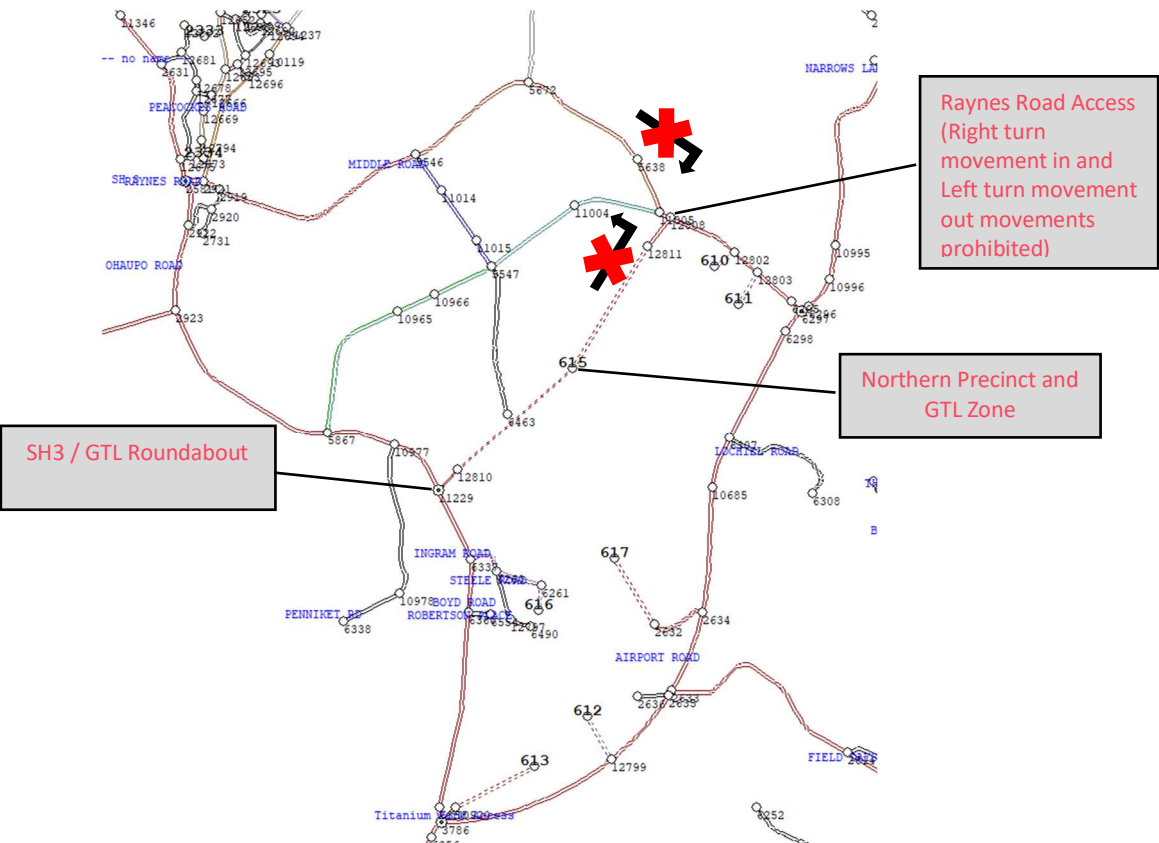


Figure 1: Northern Precinct Potential Alternative Access



The following are the alternative access scenarios assessed with the WRTM by incorporating amendments to the previous models 1 to 3 for Northern Precinct.

Table No. 1

Access Options	Description
4	<ul style="list-style-type: none"> • Year 2031 with no Southern Links • Access to Northern Precinct and GTL property to be provided via: <ul style="list-style-type: none"> ○ New roundabout at SH3 (referred to as SH3 / GTL roundabout hereinafter) ○ New priority-controlled intersection at Raynes Road (referred to as Raynes Road access hereinafter). Right turn movement in and left turn movement out movements prohibited. 
5	<ul style="list-style-type: none"> • Same as Option 4 but with Southern Links • Raynes Road access modelled as staggered intersection to realigned Raynes Road / Narrows Road intersection.
6	<ul style="list-style-type: none"> • Year 2031 with no Southern Links • Access to Northern Precinct and GTL property to be provided via: <ul style="list-style-type: none"> ○ SH3 / GTL roundabout ○ Raynes Road access; all movements permitted. • HCVs from the proposed site to be banned along Raynes Road (north of Raynes Road access) and Narrows Road.



Access Options	
Option	Description
6 cont.	<p>The map displays a complex road network with various roads labeled in blue, including CHAUPU ROAD, MIDDLE ROAD, INGRAM ROAD, STEELE ROAD, BOYD ROAD, ROBERTSON ROAD, AIRPORT ROAD, and FIELD ROAD. A red line traces a path through the network, with callout boxes highlighting key features: 'SH3 / GTL Roundabout' at a central junction, 'Raynes Road Access (All movements permitted)' at the top right, and 'Northern Precinct and GTL Zone' in the middle right. Numerous numerical identifiers (e.g., 11346, 12696, 10965, 12810) are scattered across the map, likely representing specific nodes or data points.</p>

With the trip distribution outputs from the WRTM, BBO carried out more detailed intersection modelling using SIDRA Intersection 9 to assess the performance and refine the layouts of the proposed intersections at SH3 and Raynes Road. The results and conclusions derived for each option from this modelling exercise have been briefly discussed below.

Attachment 1 contains concept design plans for the two new intersections. Attachment 2 contains the detailed SIDRA modelling results for each option assessment.

*Note: Land area mentioned throughout this report refers to **gross site area**. A 90% developable area factor was applied to the gross site area when undertaking trip generation calculations and transport modelling.*

2. Option 4

The modelling undertaken for Option 4 indicates that approximately **100 ha of Northern Precinct plus 28 ha of GTL development** can be accessed through the SH3 / GTL roundabout and the Raynes Road access, with the worst movement (right turn out at Raynes Road) not exceeding LOS D.

Figure 2 and Figure 3 illustrates the intersection layouts required to accommodate the 128 ha of Airport Business Zone development.



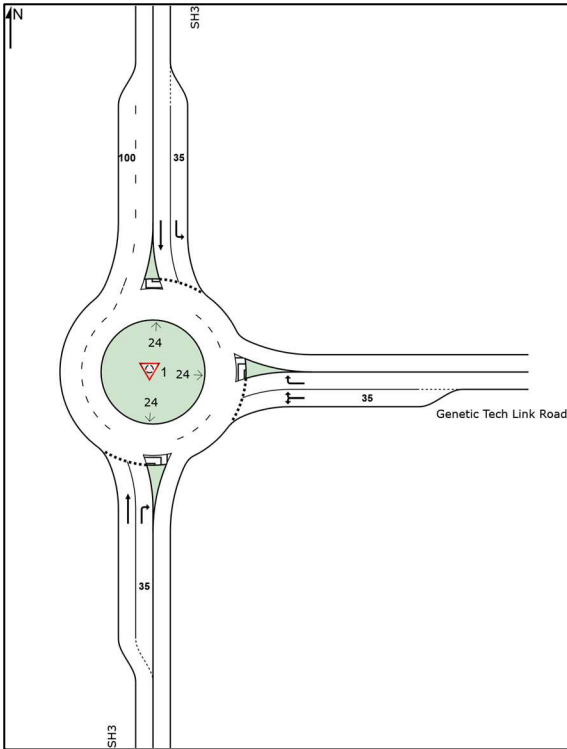


Figure 2: Proposed SH3 / GTL Roundabout Layout

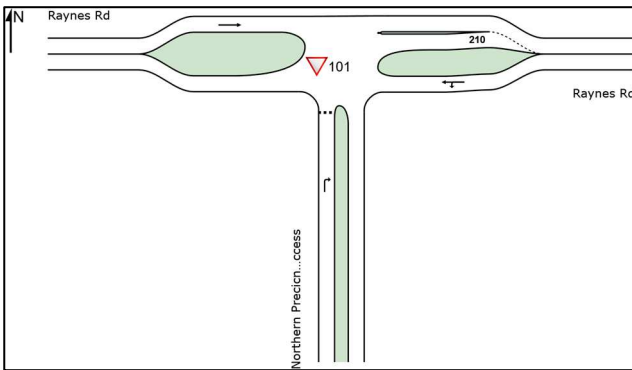


Figure 3: Proposed Raynes Road Access

The following observations are made from the modelling of Option 4 access arrangement:

- During the AM peak period, approximately 45% of the generated trips utilise the SH3 / GTL roundabout, while the remaining 55% utilise the Raynes Road access.
- During the PM peak period, approximately 60% of the generated trips utilise the SH3 / GTL roundabout, while the remaining 40% use the Raynes Road access.
- The worst performing movement at the SH3 / GTL roundabout will be the northbound SH3 through movement during the PM peak hour, as this traffic gives way to traffic exiting Northern Precinct. However, to ensure the state highway flow is not unacceptably affected the level of service (LOS) target for SH3 movements was set at no worse than LOS C.
- The worst performing movement at the Raynes Road intersection will be the right turning movement out from the site during the PM peak hour. The movement is projected to perform at LOS D with an average delay of approximately 30 seconds and a 95th percentile back of queue of 165 m.

Other network issues that will need to be considered:



- The existing SH21 / Raynes Road priority-controlled intersection is assumed to have been upgraded to a roundabout before Northern Precinct is developed. However, to accommodate the full development of Northern Precinct and the GTL development, the roundabout will have to incorporate turning bays in each approach as shown in Figure 4. This configuration is needed for all three options discussed in this memorandum.

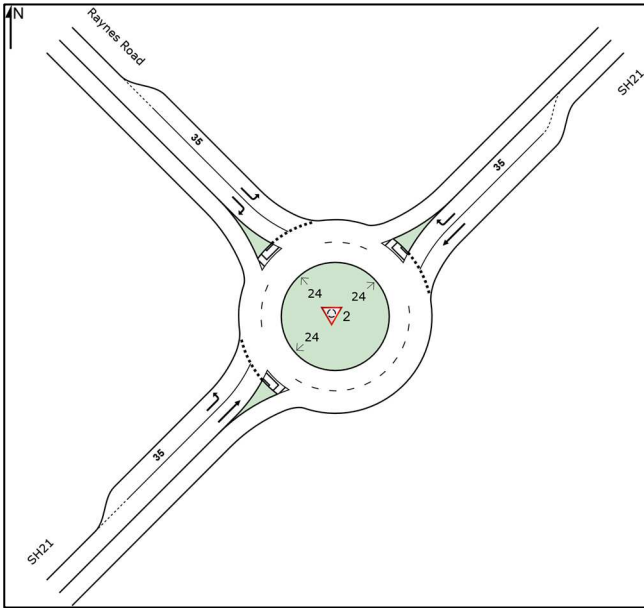


Figure 4: SH21 / Raynes Road Roundabout Layout

- Waka Kotahi has indicated their intentions to upgrade the SH3 / Raynes Road intersection to a roundabout as a Safer Network Programme improvement. Option 4 does not add additional turning movement volumes at this intersection, but additional trips are added to the through movements on SH3. The roundabout design will most likely need to reflect the layout shown in Figure 5 to accommodate the future projected traffic flows as this intersection. This applies to Options 4 and 6 discussed in this memorandum.

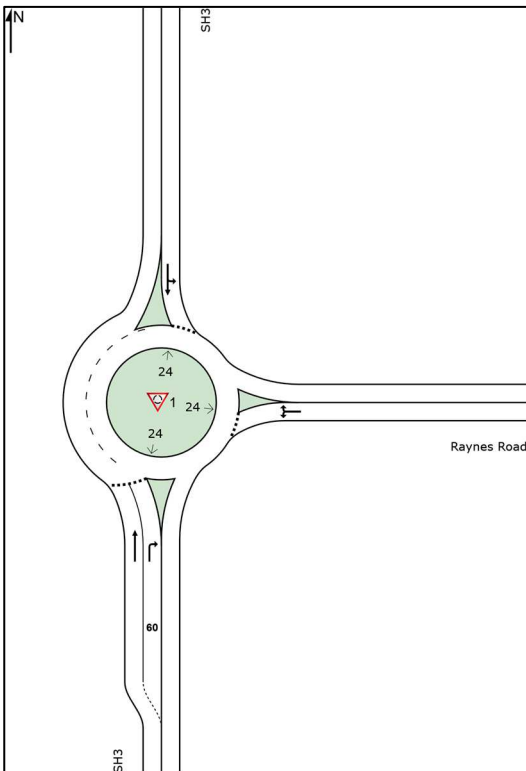


Figure 5: SH3 / Raynes Road Roundabout Layout



3. Option 5

Option 5 is similar to Option 4 with the only exception that Southern Links is included in the road network. With the inclusion of Southern Links, the Raynes Road access has been modelled as a staggered intersection to the realigned Raynes Road / Narrows Road intersection. The modelling undertaken for Option 5 indicates that the **full site area (i.e., 104 ha of Northern Precinct and 28 ha of GTL property)** can be serviced by the SH3 / GTL roundabout and the Raynes Road access.

This is mainly due to the volumes on SH3 reducing by approximately 25% with the introduction of the Southern Links and therefore more trips from the site could be accommodated at the proposed SH3 / GTL roundabout.

The following observations were made from the modelling exercise with regards to the proposed accesses:

- During the AM peak period, approximately 50% of the generated trips utilise the SH3 / GTL roundabout, while the remaining 50% of the generated trips utilise the Raynes Road access.
- During the PM peak period, approximately 60% of the generated trips utilise the SH3 / GTL roundabout, while the remaining 40% utilise the Raynes Road access.
- The worst performing movement at the SH3 / GTL roundabout will be the right turn in from SH3 during the PM peak. However, the performance of the movement is still respectable at LOS B with an average delay of just 10 seconds and a 95th percentile back of queue of 20 m.
- The worst performing movement at the Raynes Road intersection is the right turn out during the PM peak which performs at LOS B with an average delay of approximately 12 seconds and a 95th percentile back of queue of 68 m. This is very respectable and demonstrates the intersection has plenty of capacity to accommodate the development for the long-term.

4. Option 6

The main differences between Option 4 and Option 6 are:

- In Option 6, all movements are allowed at the proposed Raynes Road access. Figure 6 illustrates a possible layout of this intersection; and
- HCVs from Northern Precinct and the GTL development will be banned to turn left out of the access or turn right in from Raynes Road (i.e., HCVs banned on Raynes Road north of Narrows Road).

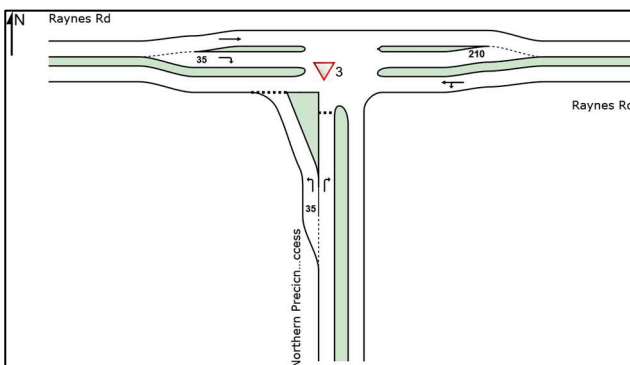


Figure 6: Possible Raynes Road Access Layout for Option 6

The modelling undertaken for Option 6 indicated that **full development (i.e., 104 ha of Northern Precinct and 28 ha of GTL development)** can be serviced by the proposed SH3 / GTL roundabout and the Raynes Road access.



The following conclusions were made from the modelling exercise with regards to the proposed accesses:

- During the AM peak period, approximately 45% of the generated trips utilise the SH3 / GTL roundabout, while the remaining 55% of the generated trips use the Raynes Road access.
- During the PM peak period, approximately 45% of the generated trips utilise the SH3 / GTL roundabout, while the remaining 55% of the generated trips use the Raynes Road access.
- The worst performing movement at the SH3 / GTL roundabout will be the right turn out to SH3 during the PM peak hour. However, the performance of the movement is still respectable at LOS B with an average delay of approximately 12 seconds and a 95th percentile back of queue of 31 m.
- The worst performing movement at the Raynes Road intersection will be the right turn out during the PM peak hour which performs at LOS D with an average delay of approximately 25 seconds and a 95th percentile back of queue of 120 m.

Other issues that will need to be considered:

- This option would require a larger access intersection footprint at Raynes Road compared to Option 4. An ancillary lane for left turn out from the access and a southbound right turn in storage bay are necessary additions to cater for the increased traffic flows. A larger intersection footprint would mean that the cost of constructing the intersection is higher than Option 4 and less developable land as more land within Northern Precinct would be allocated to road reserve.
- The layout shown in Figure 6 represents a seagull treatment. This arrangement is generally safer than a typical T-intersection. However, it is not the preferred arrangement from a Safe System design perspective as all movements are still allowed which means the number of conflict points does not reduce. Banning selected movements, as proposed for Option 4, is likely to provide significantly greater safety benefits.
- Option 6 adds traffic (approximately 1,500 vpd) from Northern Precinct and the GTL development to Raynes Road flows (north of the proposed Raynes Road access). A portion (approximately half) of this traffic will also utilise Peacockes Road. This would mean that the AADT on Raynes Road could increase to approximately 5,000 vpd which is relatively high for this road with narrow lanes, many accesses and almost no sealed shoulders. If this option is preferred the Integrated Transport Assessment for the Plan Change will need to assess if widening of Raynes Road and potentially Peacockes Road to Collector standard is necessary and appropriate to mitigate potential safety effects.

5. Additional Modelling

BBO had also undertaken modelling to understand the land area that could be developed if the site were to be serviced by only the proposed SH3 / GTL roundabout. The modelling and further manual refinement of the traffic flows indicated that approximately **51 ha of Northern Precinct and 28 ha of GTL land** can be serviced by the single access.

The worst performing movement at the SH3 / GTL roundabout will be the northbound SH3 through traffic during the PM peak hour. However, to avoid adverse effects on the state highway network, the LOS target for SH3 through movements was kept to no worse than LOS C.

Therefore, if the GTL property is not developed as industrial, then approximately 79 ha of Northern Precinct could be developed and serviced by a single access (i.e., SH3 / GTL roundabout).



6. Conclusion

Based on the transport modelling assessments outlined in this memorandum for the SH3 / GTL roundabout and Raynes Road alternative access options, BBO considers that Option 4 is the preferred arrangement over Option 6 as it proves to service almost all the GTL and Northern Precinct land in the pre-southern links period, while minimising effects on Raynes Road residents and at the SH3 / Raynes Road intersection.

Yours sincerely

Bloxam Burnett & Olliver



Siva Balachandran

Traffic & Transportation Engineer

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siva@bbo.co.nz

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Attachment 1

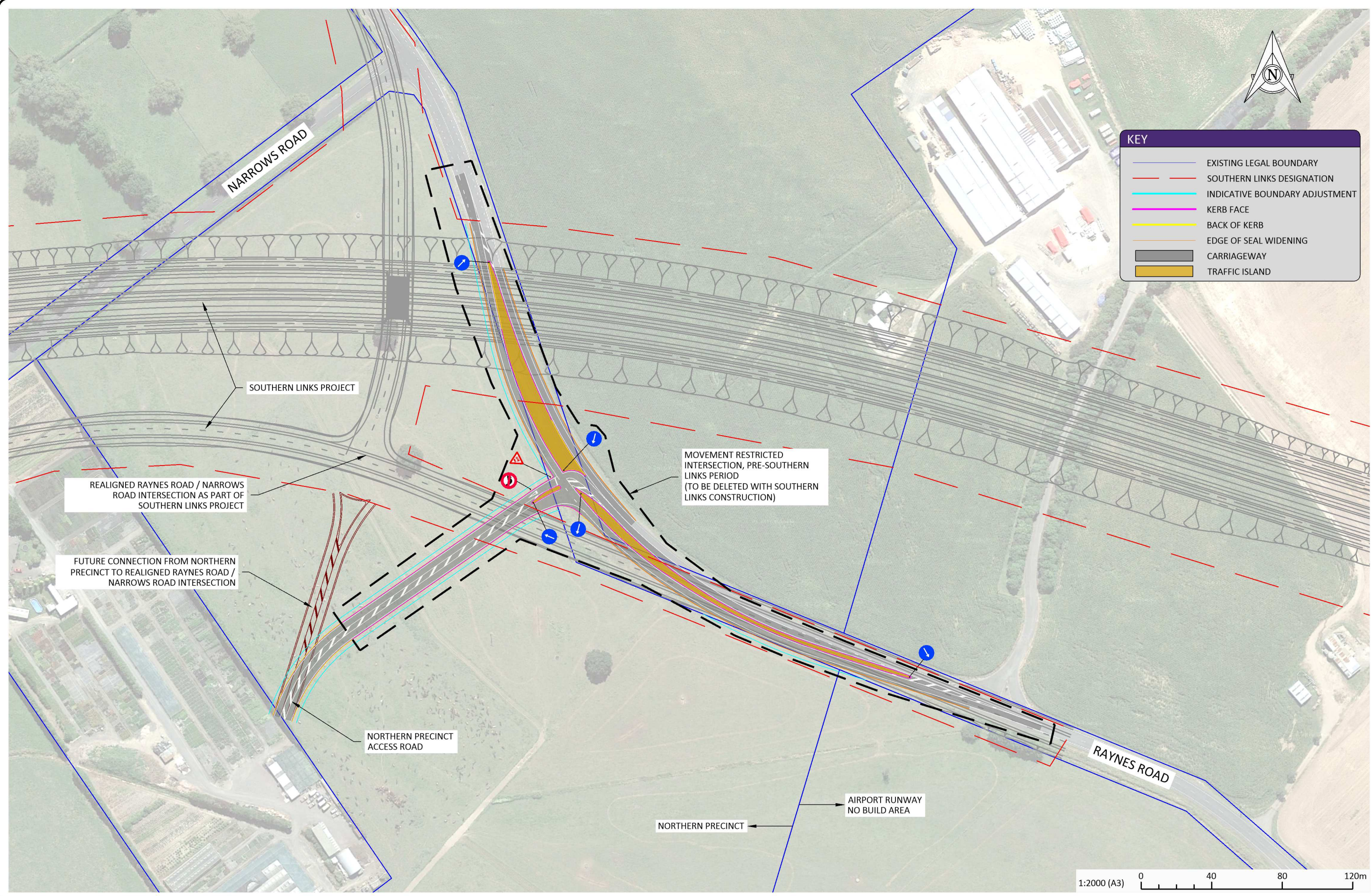


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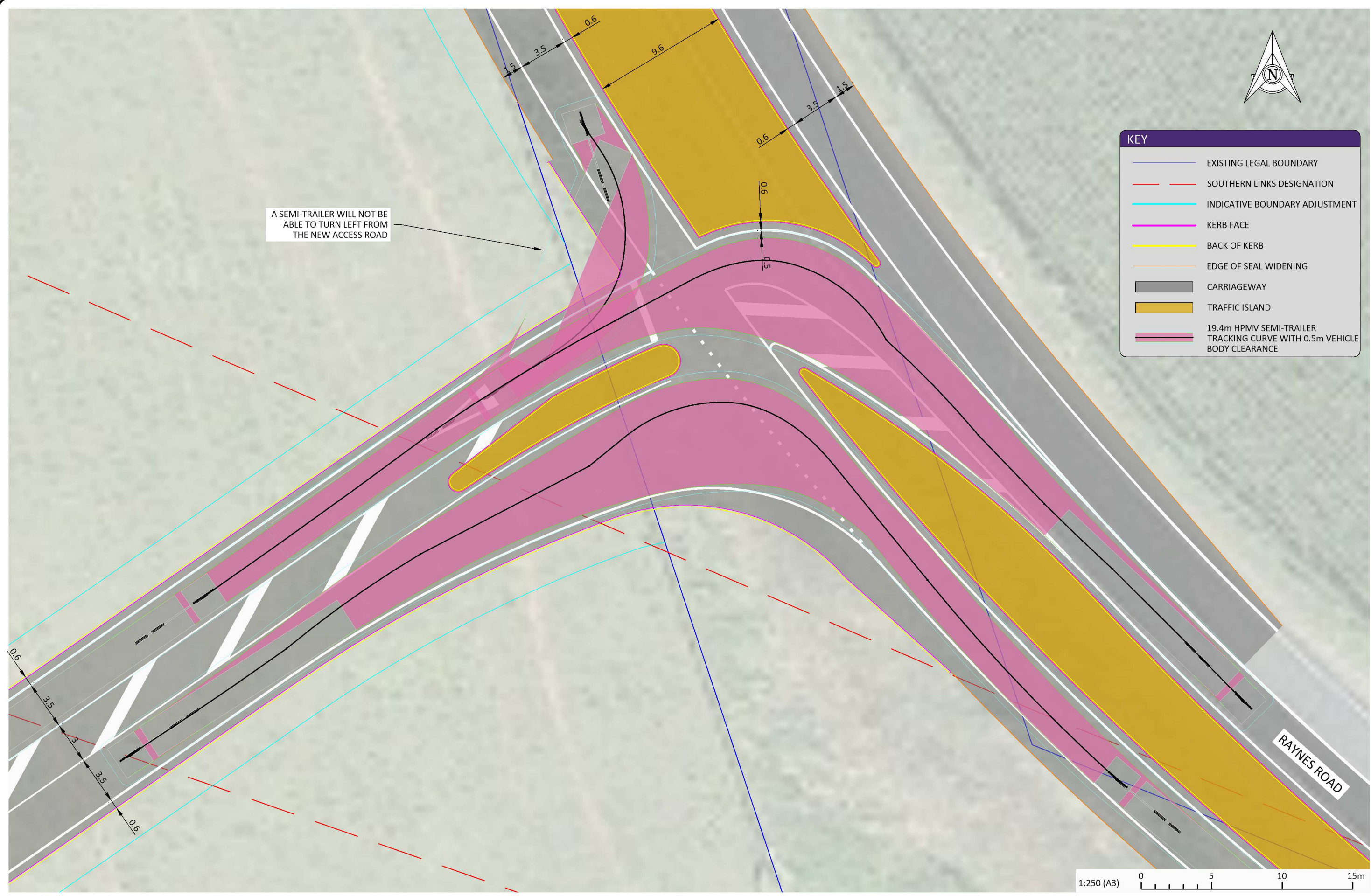
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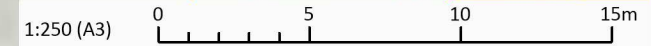
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	EDGE OF SEAL WIDENING
	CARRIAGEWAY
	TRAFFIC ISLAND
	19.4m HPMV SEMI-TRAILER TRACKING CURVE WITH 0.5m VEHICLE BODY CLEARANCE



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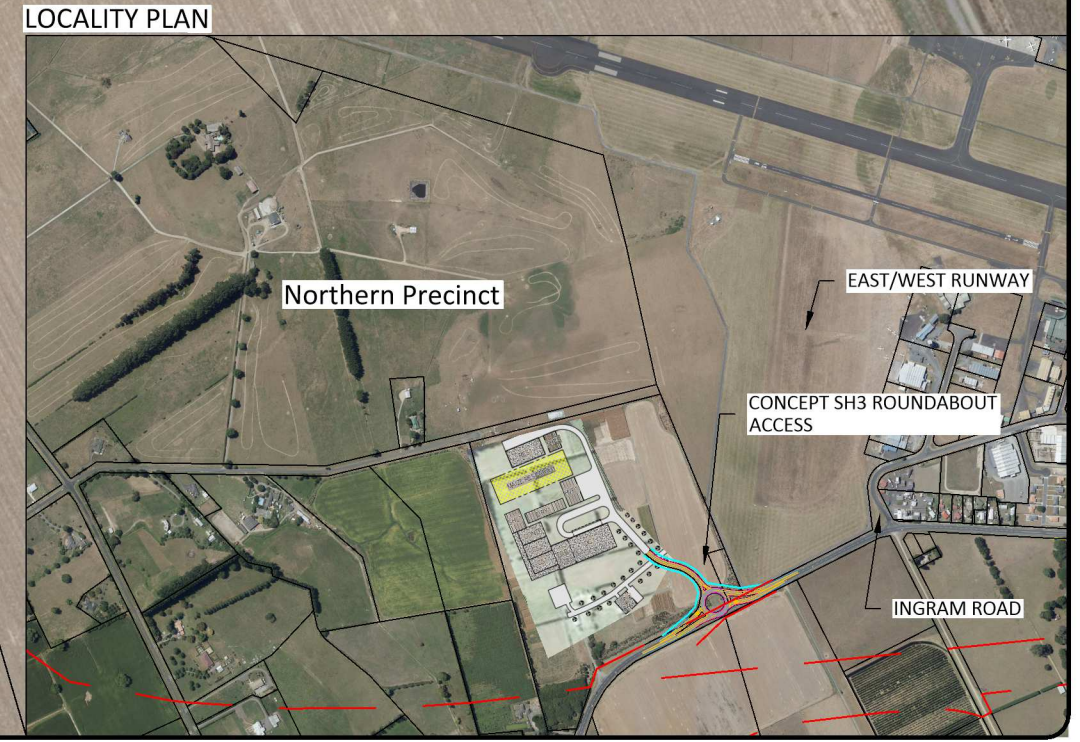
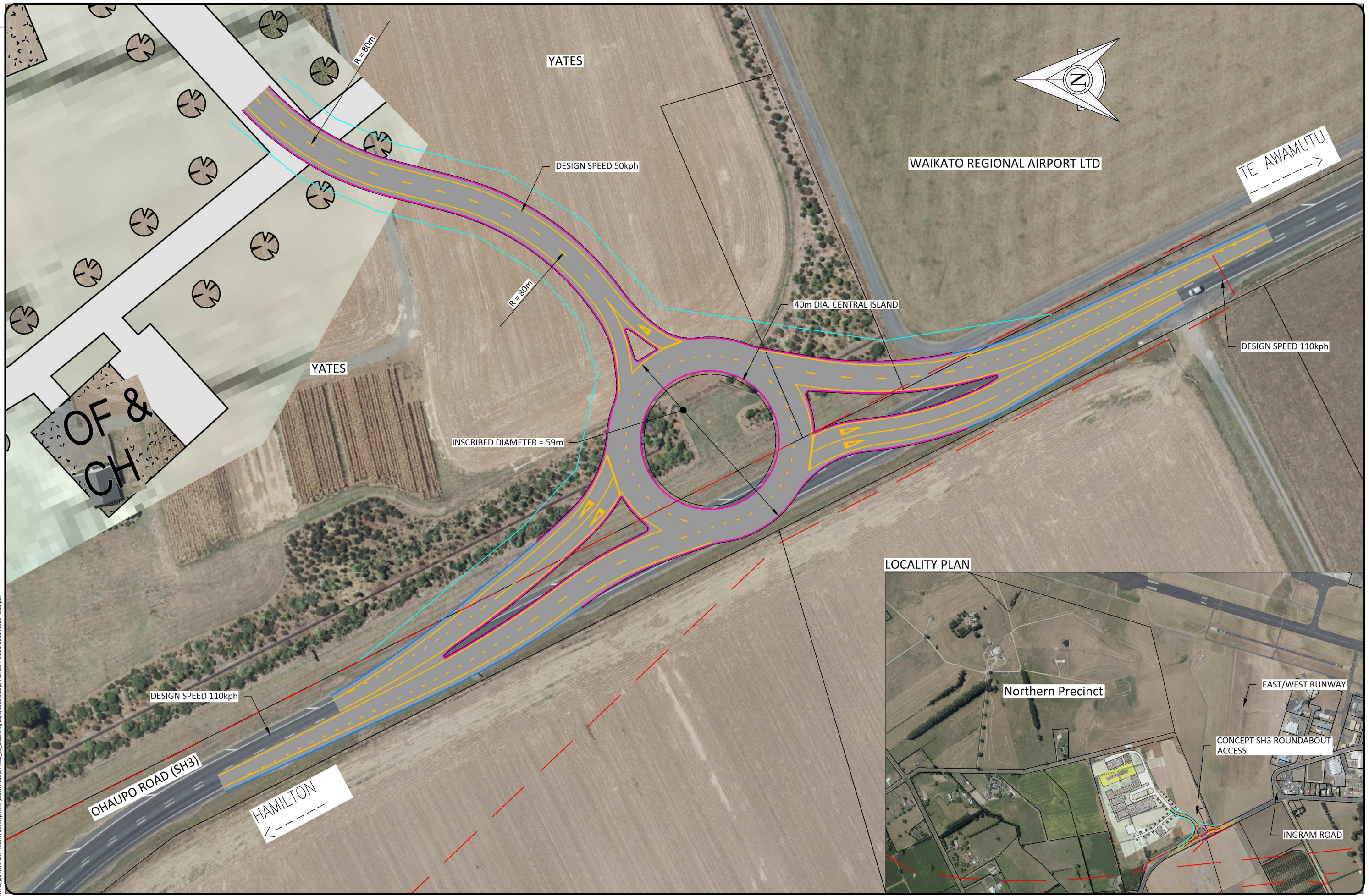
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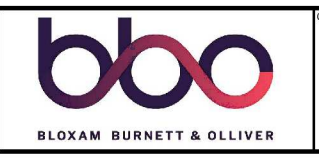
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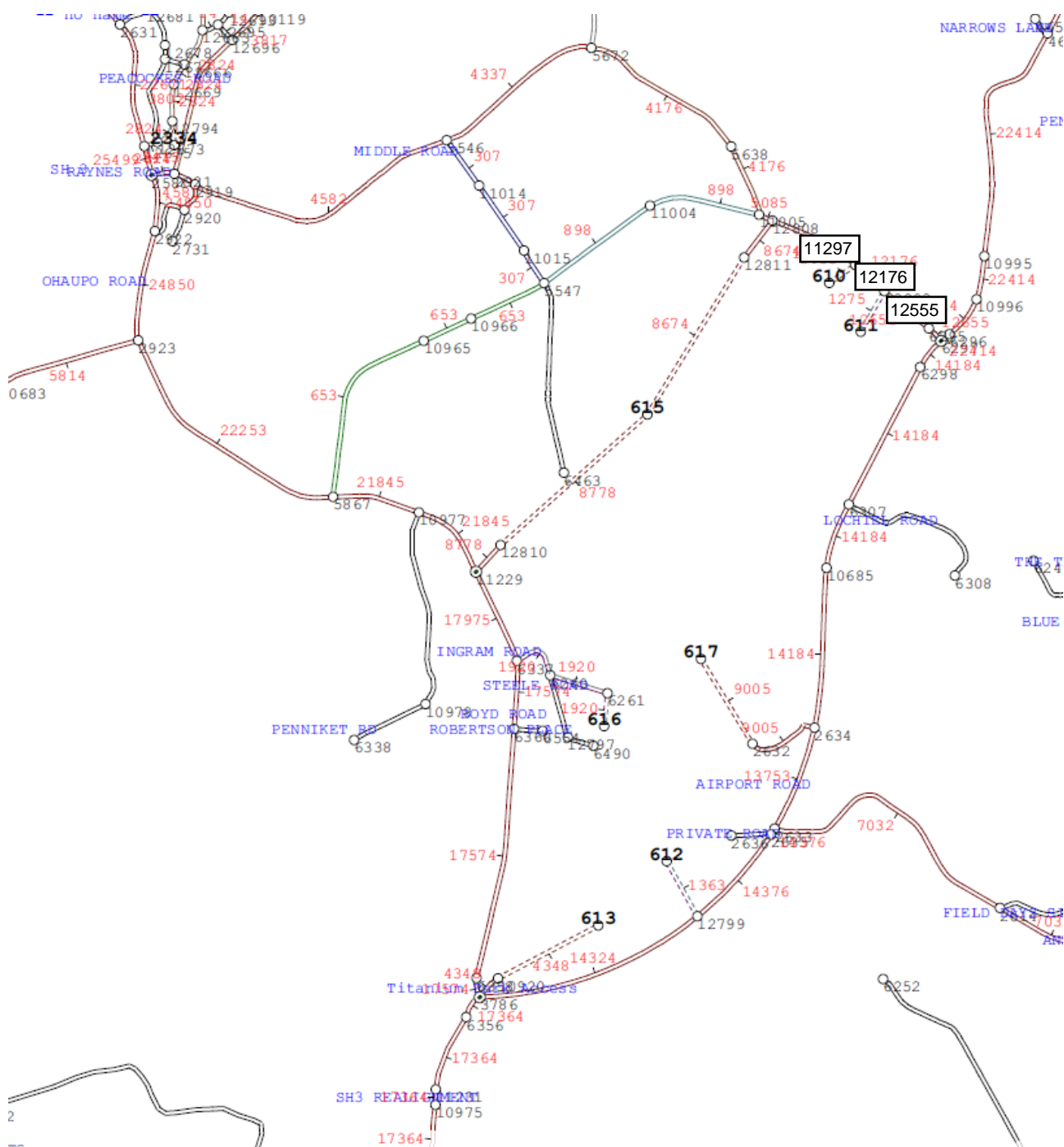
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Attachment 2



Option 6 – 2031 Two-way Full Day Volumes



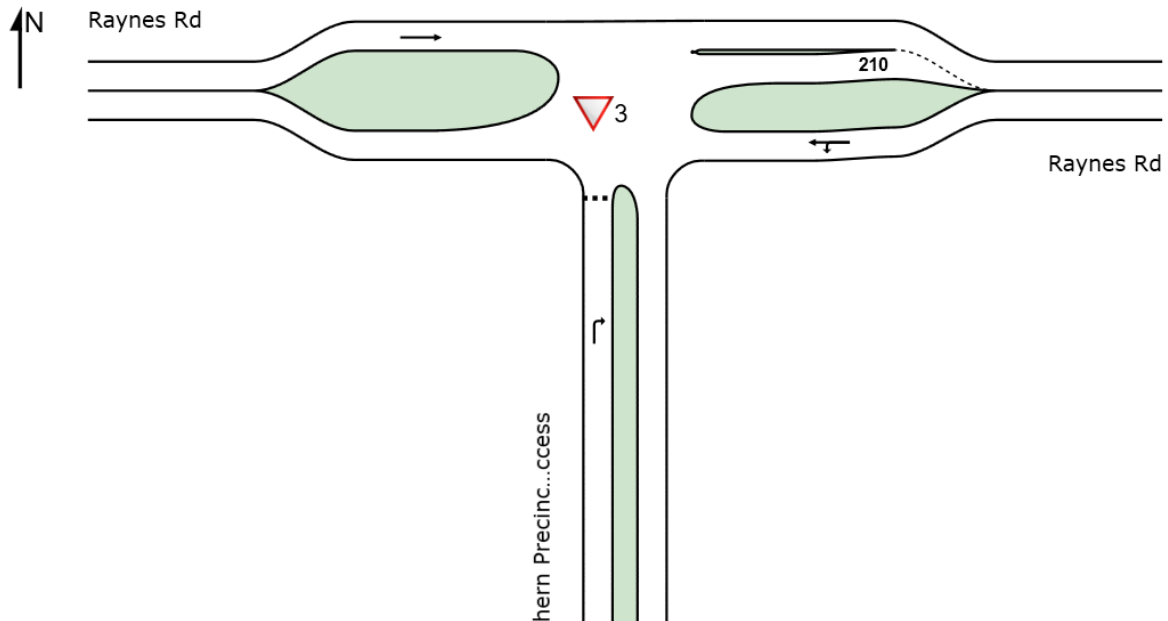
Option 4; Raynes Road Access, No Southern Links

SITE LAYOUT

▽ Site: 3 [2031 Raynes Road access - PM Peak (Site Folder: Manual Dist - 100ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - No SL)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



2031 PM Peak (worst case period)

MOVEMENT SUMMARY

▽ Site: 3 [2031 Raynes Road access - PM Peak (Site Folder: Manual Dist - 100ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - No SL)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h %		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Northern Precinct Access														
3	R2	659	10.0	659	10.0	0.953	30.4	LOS D	21.6	164.1	0.95	2.52	4.95	34.8
Approach		659	10.0	659	10.0	0.953	30.4	LOS D	21.6	164.1	0.95	2.52	4.95	34.8
East: Raynes Rd														
4	L2	252	20.0	252	20.0	0.375	6.4	LOS A	0.0	0.0	0.00	0.23	0.00	59.0
5	T1	422	5.0	422	5.0	0.375	0.1	LOS A	0.0	0.0	0.00	0.23	0.00	62.8
Approach		674	10.6	674	10.6	0.375	2.5	NA	0.0	0.0	0.00	0.23	0.00	61.3
West: Raynes Rd														
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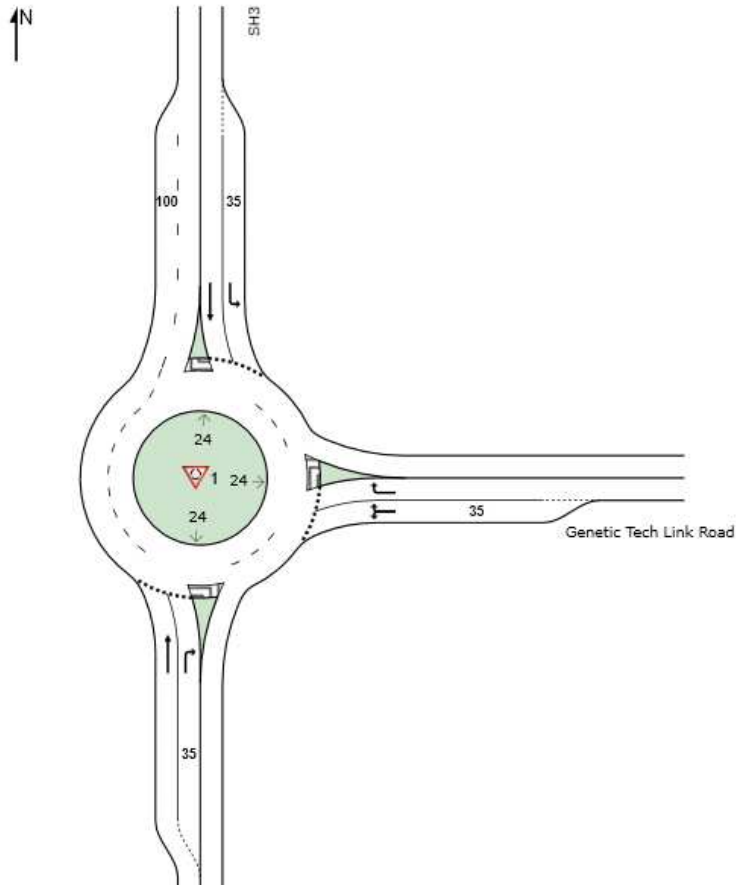
Option 4; SH 3 / GTL Roundabout Access, No Southern Links

SITE LAYOUT

Site: 1 [2031 SH3 / Genetic Tech RAB - PM Peak (Site Folder: Manual Dist - 100ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - No SL)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



2031 PM Peak (worst case period)

MOVEMENT SUMMARY

Site: 1 [2031 SH3 / Genetic Tech RAB - PM Peak (Site Folder: Manual Dist - 100ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - No SL)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: SH3														
2	T1	521	7.0	521	7.0	0.717	18.3	LOS B	9.7	71.7	1.00	1.20	1.54	47.2
3	R2	73	20.0	73	20.0	0.175	15.5	LOS B	1.0	8.3	0.81	0.90	0.81	42.7
Approach		594	8.6	594	8.6	0.717	18.0	LOS B	9.7	71.7	0.98	1.16	1.45	46.6
East: Genetic Tech Link Road														
4	L2	270	10.0	270	10.0	0.511	8.5	LOS A	4.0	30.7	0.79	0.89	0.90	44.1
6	R2	795	10.0	795	10.0	0.664	14.4	LOS B	7.5	57.3	0.86	0.97	1.08	43.7
Approach		1065	10.0	1065	10.0	0.664	12.9	LOS B	7.5	57.3	0.84	0.95	1.03	43.8
North: SH3														
7	L2	251	20.0	251	20.0	0.229	3.6	LOS A	1.5	12.2	0.31	0.43	0.31	47.2
8	T1	535	5.0	535	5.0	0.354	4.2	LOS A	2.8	20.6	0.32	0.40	0.32	55.7
Approach		786	9.8	786	9.8	0.354	4.0	LOS A	2.8	20.6	0.32	0.41	0.32	52.7
All Vehicles		2445	9.6	2445	9.6	0.717	11.3	LOS B	9.7	71.7	0.71	0.83	0.90	47.0

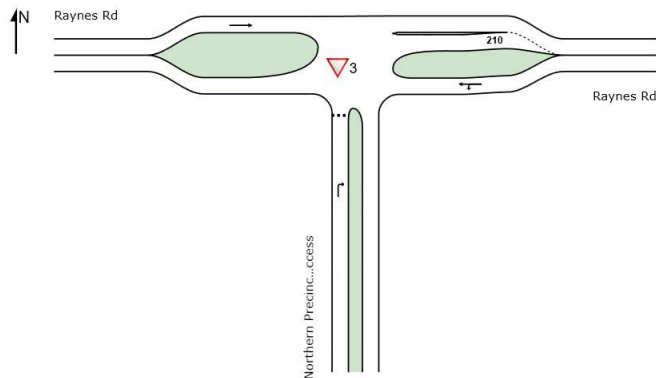
Option 5; Raynes Access, Southern Links, Restricted movements at Raynes Access

SITE LAYOUT

▽ Site: 3 [2031 Raynes Road access - AM Peak (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - With SL)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



2031 AM Peak

MOVEMENT SUMMARY

▽ Site: 3 [2031 Raynes Road access - AM Peak (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - With SL)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Northern Precinct Access														
3	R2	283	20.0	283	20.0	0.449	10.3	LOS B	2.2	17.8	0.63	0.94	0.89	42.9
Approach		283	20.0	283	20.0	0.449	10.3	LOS B	2.2	17.8	0.63	0.94	0.89	42.9
East: Raynes Rd														
4	L2	1036	10.0	1036	10.0	0.610	5.1	LOS A	0.0	0.0	0.00	0.51	0.00	46.6
5	T1	36	5.0	36	5.0	0.610	0.4	LOS A	0.0	0.0	0.00	0.51	0.00	47.2
Approach		1072	9.8	1072	9.8	0.610	4.9	NA	0.0	0.0	0.00	0.51	0.00	46.6
West: Raynes Rd														
11	T1	180	5.0	180	5.0	0.094	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		180	5.0	180	5.0	0.094	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.9
All Vehicles		1535	11.1	1535	11.1	0.610	5.3	NA	2.2	17.8	0.12	0.53	0.16	48.2

2031 PM Peak

MOVEMENT SUMMARY

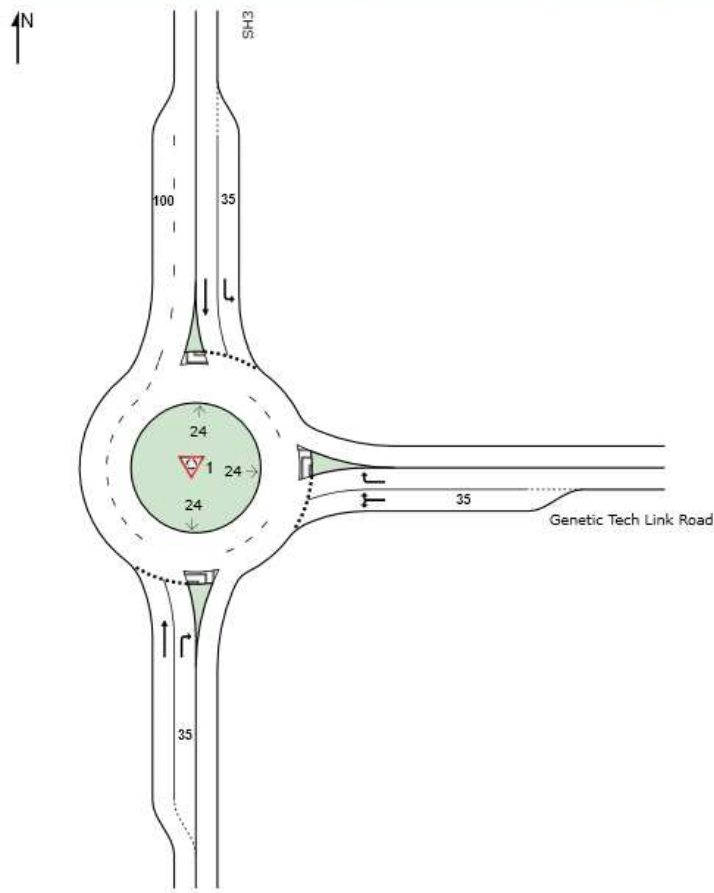
▽ Site: 3 [2031 Raynes Road access - PM Peak (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - With SL)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Northern Precinct Access														
3	R2	642	10.0	642	10.0	0.789	12.7	LOS B	9.0	68.4	0.76	1.29	1.70	41.8
Approach		642	10.0	642	10.0	0.789	12.7	LOS B	9.0	68.4	0.76	1.29	1.70	41.8
East: Raynes Rd														
4	L2	322	20.0	322	20.0	0.328	5.9	LOS A	0.0	0.0	0.00	0.33	0.00	54.6
5	T1	252	5.0	252	5.0	0.328	0.1	LOS A	0.0	0.0	0.00	0.33	0.00	57.0
Approach		574	13.4	574	13.4	0.328	3.3	NA	0.0	0.0	0.00	0.33	0.00	55.6
West: Raynes Rd														
11	T1	28	5.0	28	5.0	0.015	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		28	5.0	28	5.0	0.015	0.2	NA	0.0	0.0	0.00	0.00	0.00	80.0
All Vehicles		1244	11.5	1244	11.5	0.789	8.1	NA	9.0	68.4	0.39	0.82	0.88	47.8

Option 5; SH3 / GTL Access, Southern Links, Restricted movements at Raynes Access

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



2031 AM Peak

MOVEMENT SUMMARY

Site: 1 [2031 SH3 / Genetic Tech RAB - AM Peak (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - With SL)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: SH3														
2	T1	115	5.0	115	5.0	0.118	4.6	LOSA	0.6	4.6	0.31	0.42	0.31	55.8
3	R2	408	10.0	408	10.0	0.284	7.9	LOSA	1.9	14.3	0.31	0.57	0.31	46.2
Approach		523	8.9	523	8.9	0.284	7.2	LOSA	1.9	14.3	0.31	0.54	0.31	48.0
East: Genetic Tech Link Road														
4	L2	80	20.0	80	20.0	0.081	4.4	LOSA	0.4	3.6	0.47	0.51	0.47	46.8
6	R2	94	20.0	94	20.0	0.083	8.7	LOSA	0.5	3.9	0.45	0.61	0.45	45.7
Approach		174	20.0	174	20.0	0.083	6.7	LOSA	0.5	3.9	0.46	0.56	0.46	46.2
North: SH3														
7	L2	693	10.0	693	10.0	0.629	7.3	LOSA	6.4	48.9	0.79	0.81	0.91	45.5
8	T1	258	8.0	258	8.0	0.325	7.2	LOSA	1.9	14.6	0.65	0.69	0.65	54.1
Approach		951	9.5	951	9.5	0.629	7.3	LOSA	6.4	48.9	0.75	0.78	0.84	47.5
All Vehicles		1648	10.4	1648	10.4	0.629	7.2	LOSA	6.4	48.9	0.58	0.68	0.63	47.5

2031 PM Peak

MOVEMENT SUMMARY

Site: 1 [2031 SH3 / Genetic Tech RAB - PM Peak - no additional northbound exit lane (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - With SL)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/m]	[HV] %	[Total veh/h]	[HV] %				[Veh. veh]	[Dist] m				
South: SH3														
2	T1	264	7.0	264	7.0	0.392	10.3	LOS B	3.1	23.0	0.94	0.90	0.94	52.2
3	R2	86	20.0	86	20.0	0.206	16.2	LOS B	1.3	10.3	0.85	0.92	0.85	42.3
Approach		350	10.2	350	10.2	0.392	11.7	LOS B	3.1	23.0	0.91	0.90	0.91	49.3
East: Genetic Tech Link Road														
4	L2	287	10.0	287	10.0	0.298	4.3	LOSA	1.8	13.6	0.43	0.51	0.43	46.9
6	R2	868	10.0	868	10.0	0.626	8.7	LOSA	5.9	45.0	0.56	0.61	0.56	45.6
Approach		1155	10.0	1155	10.0	0.626	7.6	LOSA	5.9	45.0	0.52	0.59	0.52	45.9
North: SH3														
7	L2	200	20.0	200	20.0	0.150	3.4	LOSA	1.0	7.8	0.30	0.42	0.30	47.2
8	T1	159	5.0	159	5.0	0.126	4.3	LOSA	0.8	5.6	0.30	0.40	0.30	55.9
Approach		359	13.4	359	13.4	0.150	3.8	LOSA	1.0	7.8	0.30	0.41	0.30	50.7
All Vehicles		1864	10.7	1864	10.7	0.626	7.7	LOSA	5.9	45.0	0.55	0.61	0.55	47.4

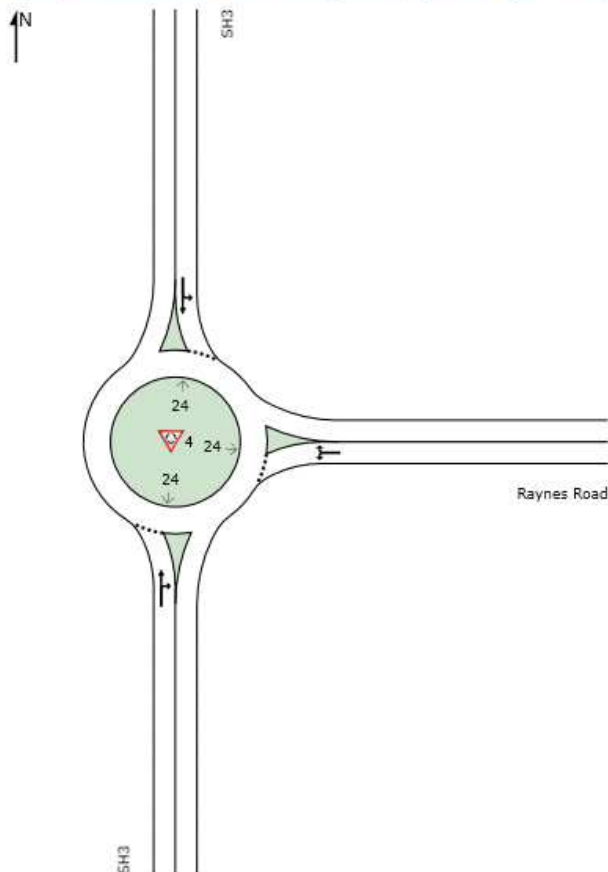
Option 5; SH3 / Raynes Rd, Southern Links, Restricted movements at Raynes Access

SITE LAYOUT

Site: 4 [2031 SH3 / Raynes Road RAB - PM Peak - NZTA Layout (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - With SL)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



2031 AM Peak

MOVEMENT SUMMARY

Site: 4 [2031 SH3 / Raynes Road RAB - AM Peak - NZTA Layout (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - With SL)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: SH3														
2	T1	287	5.0	287	5.0	0.250	4.0	LOSA	1.8	13.2	0.20	0.42	0.20	54.9
3	R2	66	8.0	66	8.0	0.250	7.6	LOSA	1.8	13.2	0.20	0.42	0.20	51.5
Approach		353	5.6	353	5.6	0.250	4.7	LOSA	1.8	13.2	0.20	0.42	0.20	54.2
East: Raynes Road														
4	L2	251	1.0	251	1.0	0.435	9.7	LOSA	3.2	23.0	0.86	0.93	0.94	44.0
6	R2	38	3.0	38	3.0	0.435	14.5	LOS B	3.2	23.0	0.86	0.93	0.94	45.3
Approach		289	1.3	289	1.3	0.435	10.3	LOS B	3.2	23.0	0.86	0.93	0.94	44.1
North: SH3														
7	L2	115	4.0	115	4.0	0.621	3.3	LOSA	6.2	46.1	0.38	0.41	0.38	49.9
8	T1	753	8.0	753	8.0	0.621	4.5	LOSA	6.2	46.1	0.38	0.41	0.38	54.9
Approach		868	7.5	868	7.5	0.621	4.3	LOSA	6.2	46.1	0.38	0.41	0.38	54.2
All Vehicles		1510	5.8	1510	5.8	0.621	5.6	LOSA	6.2	46.1	0.43	0.51	0.45	51.9

2031 PM Peak

MOVEMENT SUMMARY

Site: 4 [2031 SH3 / Raynes Road RAB - PM Peak - NZTA Layout (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - With SL)]

New Site
Site Category: (None)
Roundabout

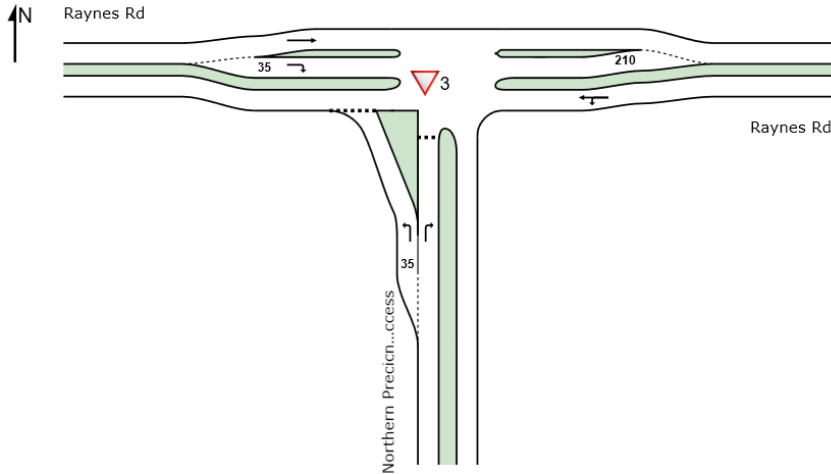
Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: SH3														
2	T1	886	7.0	886	7.0	0.931	9.7	LOSA	26.4	194.8	1.00	0.69	1.11	50.6
3	R2	308	5.0	308	5.0	0.931	13.2	LOS B	26.4	194.8	1.00	0.69	1.11	47.8
Approach		1194	6.5	1194	6.5	0.931	10.6	LOS B	26.4	194.8	1.00	0.69	1.11	49.9
East: Raynes Road														
4	L2	101	1.0	101	1.0	0.255	5.0	LOSA	1.6	11.6	0.62	0.69	0.62	45.4
6	R2	130	4.0	130	4.0	0.255	9.8	LOSA	1.6	11.6	0.62	0.69	0.62	46.8
Approach		231	2.7	231	2.7	0.255	7.7	LOSA	1.6	11.6	0.62	0.69	0.62	46.2
North: SH3														
7	L2	43	4.0	43	4.0	0.453	4.9	LOSA	3.5	25.7	0.70	0.62	0.70	48.8
8	T1	386	5.0	386	5.0	0.453	6.1	LOSA	3.5	25.7	0.70	0.62	0.70	53.6
Approach		429	4.9	429	4.9	0.453	6.0	LOSA	3.5	25.7	0.70	0.62	0.70	53.1
All Vehicles		1854	5.6	1854	5.6	0.931	9.2	LOSA	26.4	194.8	0.88	0.67	0.96	50.1

Option 6; Raynes Access, No Southern Links, All movements at Raynes Access (except HCV)

▽ Site: 3 [2031 Raynes Road access - AM Peak - Seagull (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - HCV Ban - No SL)]

2031 Raynes Road access
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



2031 AM Peak

MOVEMENT SUMMARY

▽ Site: 3 [2031 Raynes Road access - AM Peak - Seagull (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - HCV Ban - No SL)]

2031 Raynes Road access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h HV]		DEMAND FLOWS [Total veh/h HV]		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist]		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Northern Precinct Access														
1	L2	4	0.0	4	0.0	0.003	4.6	LOS A	0.0	0.1	0.13	0.46	0.13	46.9
3	R2	253	20.0	253	20.0	0.739	26.9	LOS D	5.2	42.4	0.90	1.34	2.01	35.9
Approach		257	19.7	257	19.7	0.739	26.5	LOS D	5.2	42.4	0.89	1.33	1.98	36.1
East: Raynes Rd														
4	L2	883	10.0	883	10.0	0.533	5.0	LOS A	0.0	0.0	0.00	0.50	0.00	47.2
5	T1	56	5.0	56	5.0	0.533	0.3	LOS A	0.0	0.0	0.00	0.50	0.00	47.8
Approach		939	9.7	939	9.7	0.533	4.7	NA	0.0	0.0	0.00	0.50	0.00	47.2
West: Raynes Rd														
11	T1	331	5.0	331	5.0	0.175	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	319	0.0	319	0.0	0.559	14.5	LOS B	3.1	21.8	0.84	1.10	1.37	41.3
Approach		650	2.5	650	2.5	0.559	7.2	NA	3.1	21.8	0.41	0.54	0.67	54.8
All Vehicles		1846	8.6	1846	8.6	0.739	8.6	NA	5.2	42.4	0.27	0.63	0.51	47.5

2031 PM Peak

MOVEMENT SUMMARY

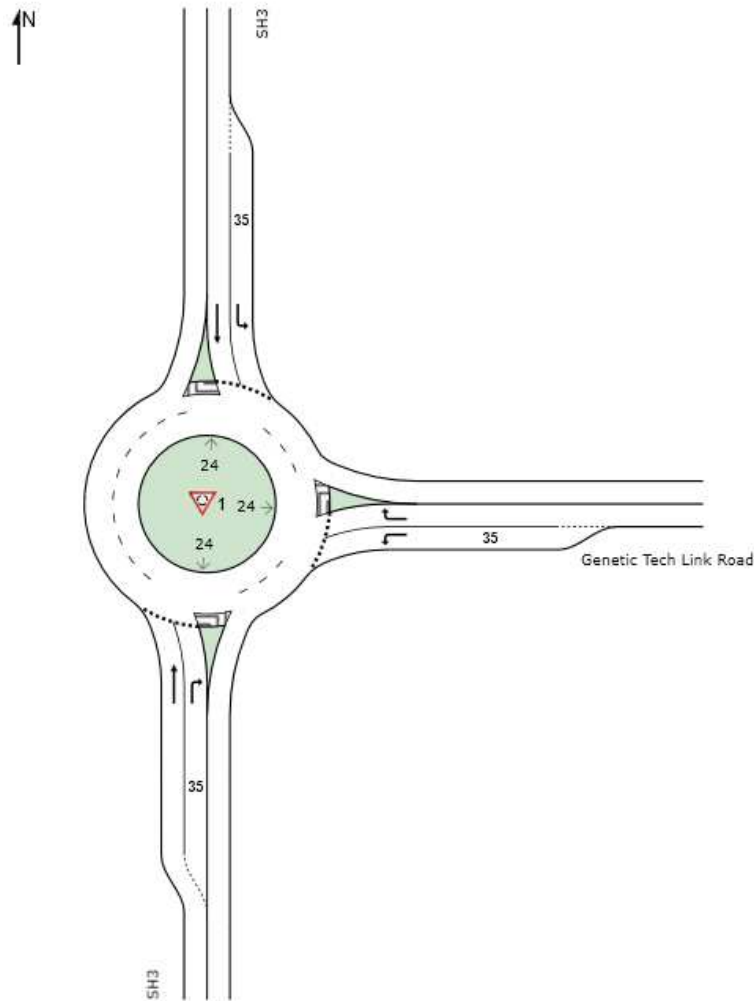
▽ Site: 3 [2031 Raynes Road access - PM Peak - Seagull (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - HCV Ban - No SL)]

2031 Raynes Road access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h HV]		DEMAND FLOWS [Total veh/h HV]		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist]		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Northern Precinct Access														
1	L2	542	0.0	542	0.0	0.442	6.6	LOS A	2.9	20.3	0.51	0.71	0.61	45.9
3	R2	544	10.0	544	10.0	0.889	25.6	LOS D	15.6	118.6	0.89	1.91	3.28	36.4
Approach		1086	5.0	1086	5.0	0.889	16.1	LOS C	15.6	118.6	0.70	1.31	1.95	40.6
East: Raynes Rd														
4	L2	262	20.0	262	20.0	0.335	6.2	LOS A	0.0	0.0	0.00	0.26	0.00	57.5
5	T1	335	5.0	335	5.0	0.335	0.1	LOS A	0.0	0.0	0.00	0.26	0.00	60.7
Approach		597	11.6	597	11.6	0.335	2.8	NA	0.0	0.0	0.00	0.26	0.00	59.2
West: Raynes Rd														
11	T1	62	5.0	62	5.0	0.032	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
12	R2	4	0.0	4	0.0	0.004	6.9	LOS A	0.0	0.1	0.54	0.59	0.54	45.2
Approach		66	4.7	66	4.7	0.032	0.6	NA	0.0	0.1	0.03	0.04	0.03	76.4
All Vehicles		1749	7.2	1749	7.2	0.889	11.0	NA	15.6	118.6	0.44	0.91	1.21	46.4

Option 6; SH3 / GTL Access, No Southern Links, All movements at Raynes Access (except HCV)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



2031 AM Peak

MOVEMENT SUMMARY

Site: 1 [2031 SH3 / Genetic Tech RAB - AM Peak (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - HCV Ban - No SL)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: SH3														
2	T1	385	5.0	385	5.0	0.269	4.3	LOS A	1.8	13.4	0.35	0.43	0.35	55.6
3	R2	361	10.0	361	10.0	0.291	8.1	LOS A	2.0	15.0	0.37	0.58	0.37	46.0
Approach		746	7.4	746	7.4	0.291	6.2	LOS A	2.0	15.0	0.36	0.50	0.36	50.5
East: Genetic Tech Link Road														
4	L2	92	20.0	92	20.0	0.122	6.1	LOS A	0.7	5.9	0.66	0.66	0.66	46.1
6	R2	110	20.0	110	20.0	0.121	10.1	LOS B	0.8	6.2	0.65	0.70	0.65	45.2
Approach		202	20.0	202	20.0	0.122	8.3	LOS A	0.8	6.2	0.65	0.68	0.65	45.6
North: SH3														
7	L2	574	10.0	574	10.0	0.508	5.4	LOS A	3.9	29.6	0.68	0.67	0.68	46.3
8	T1	500	8.0	500	8.0	0.511	6.9	LOS A	3.9	29.2	0.70	0.70	0.72	53.8
Approach		1074	9.1	1074	9.1	0.511	6.1	LOS A	3.9	29.6	0.69	0.69	0.70	49.6
All Vehicles		2022	9.6	2022	9.6	0.511	6.3	LOS A	3.9	29.6	0.57	0.62	0.57	49.5

2031 PM Peak

MOVEMENT SUMMARY

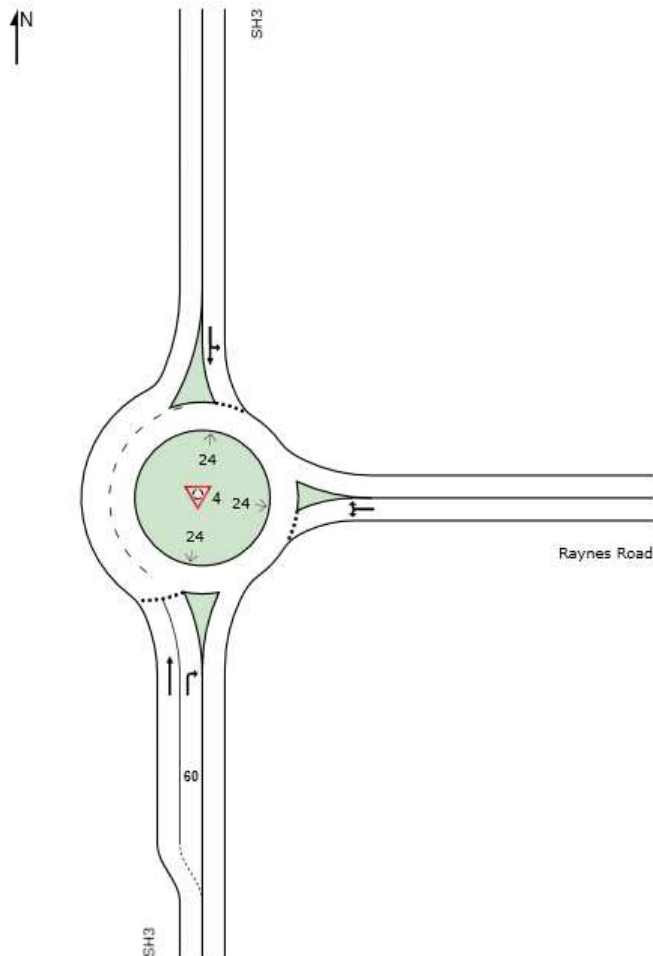
▼ Site: 1 [2031 SH3 / Genetic Tech RAB - PM Peak (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - HCV Ban - No SL)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h HV] %		DEMAND FLOWS [Total veh/h HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh Dist] m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: SH3														
2	T1	629	7.0	629	7.0	0.638	9.1	LOS A	7.1	53.0	0.90	0.89	1.06	52.9
3	R2	92	20.0	92	20.0	0.163	12.0	LOS B	0.9	7.5	0.69	0.79	0.69	44.4
Approach		721	8.7	721	8.7	0.638	9.5	LOS A	7.1	53.0	0.87	0.88	1.01	51.6
East: Genetic Tech Link Road														
4	L2	240	10.0	240	10.0	0.330	7.4	LOS A	2.1	15.6	0.73	0.77	0.73	45.4
6	R2	477	10.0	477	10.0	0.499	11.9	LOS B	4.1	31.2	0.80	0.86	0.87	44.5
Approach		717	10.0	717	10.0	0.499	10.4	LOS B	4.1	31.2	0.78	0.83	0.82	44.8
North: SH3														
7	L2	257	20.0	257	20.0	0.243	3.7	LOS A	1.5	12.7	0.35	0.45	0.35	47.1
8	T1	578	5.0	578	5.0	0.390	4.3	LOS A	3.1	22.6	0.36	0.42	0.36	55.5
Approach		835	9.6	835	9.6	0.390	4.1	LOS A	3.1	22.6	0.36	0.43	0.36	52.7
All Vehicles		2273	9.4	2273	9.4	0.638	7.8	LOS A	7.1	53.0	0.65	0.70	0.71	49.6

Option 6; SH3 / Raynes Road, No Southern Links, All movements at Raynes Access (except HCV)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



2031 AM Peak

MOVEMENT SUMMARY

Site: 4 [2031 SH3 / Raynes Road RAB - AM Peak - NZTA Layout (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - HCV Ban - No SL)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h HV] %		DEMAND FLOWS [Total veh/h HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: SH3														
2	T1	532	5.0	532	5.0	0.425	4.1	LOS A	3.9	28.6	0.29	0.41	0.29	55.0
3	R2	72	8.0	72	8.0	0.425	7.7	LOS A	3.9	28.6	0.29	0.41	0.29	51.6
Approach		604	5.4	604	5.4	0.425	4.5	LOS A	3.9	28.6	0.29	0.41	0.29	54.6
East: Raynes Road														
4	L2	121	1.0	121	1.0	0.508	19.2	LOS B	4.4	31.6	1.00	1.09	1.21	39.2
6	R2	47	3.0	47	3.0	0.508	24.1	LOS C	4.4	31.6	1.00	1.09	1.21	40.2
Approach		168	1.6	168	1.6	0.508	20.6	LOS C	4.4	31.6	1.00	1.09	1.21	39.5
North: SH3														
7	L2	368	4.0	368	4.0	0.983	8.8	LOS A	50.9	377.5	1.00	0.54	1.07	46.9
8	T1	1029	8.0	1029	8.0	0.983	10.2	LOS B	50.9	377.5	1.00	0.54	1.07	51.3
Approach		1397	6.9	1397	6.9	0.983	9.8	LOS A	50.9	377.5	1.00	0.54	1.07	50.0
All Vehicles		2169	6.1	2169	6.1	0.983	9.2	LOS A	50.9	377.5	0.80	0.55	0.86	50.2

2031 PM Peak

MOVEMENT SUMMARY

Site: 4 [2031 SH3 / Raynes Road RAB - PM Peak - RT on south app (Site Folder: WRTM Vol - 104ha NP + 28ha Genetic - Access to SH3 and Raynes Rd - HCV Ban - No SL)]

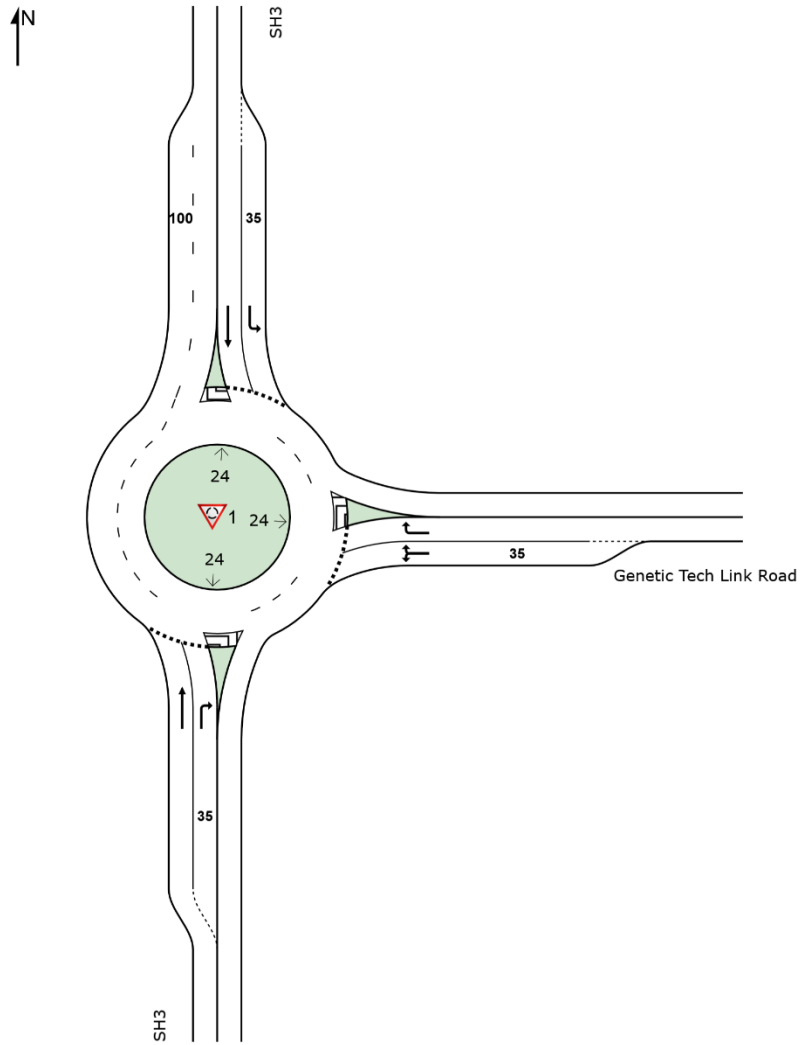
New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h HV] %		DEMAND FLOWS [Total veh/h HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: SH3														
2	T1	894	7.0	894	7.0	0.791	9.9	LOS A	12.7	94.4	0.97	0.90	1.20	52.5
3	R2	277	5.0	277	5.0	0.362	10.3	LOS B	2.4	17.9	0.68	0.76	0.68	45.3
Approach		1171	6.5	1171	6.5	0.791	10.0	LOS A	12.7	94.4	0.90	0.87	1.07	50.6
East: Raynes Road														
4	L2	82	1.0	82	1.0	0.826	27.4	LOS C	12.2	88.1	1.00	1.39	1.88	35.4
6	R2	338	4.0	338	4.0	0.826	32.3	LOS C	12.2	88.1	1.00	1.39	1.88	36.2
Approach		420	3.4	420	3.4	0.826	31.4	LOS C	12.2	88.1	1.00	1.39	1.88	36.1
North: SH3														
7	L2	64	4.0	64	4.0	0.824	10.0	LOS B	14.4	104.9	0.98	0.93	1.24	46.8
8	T1	799	5.0	799	5.0	0.824	11.2	LOS B	14.4	104.9	0.98	0.93	1.24	51.2
Approach		863	4.9	863	4.9	0.824	11.2	LOS B	14.4	104.9	0.98	0.93	1.24	50.9
All Vehicles		2454	5.4	2454	5.4	0.826	14.0	LOS B	14.4	104.9	0.95	0.98	1.27	47.4

Appendix D – SIDRA Movement Summaries



SIDRA Results – SH3 / GTL Roundabout (Access 1)



Site: 1 [SH3 / GTL RAB – Year 2031 - AM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: SH3														
2	T1	377	5.0	377	5.0	0.293	4.5	LOS A	2.0	14.7	0.36	0.43	0.36	55.5
3	R2	392	10.0	392	10.0	0.279	8.0	LOS A	1.9	14.6	0.34	0.57	0.34	46.1
Approach		769	7.5	769	7.5	0.293	6.2	LOS A	2.0	14.7	0.35	0.50	0.35	50.2
East: Genetic Tech Link Road														
4	L2	88	20.0	88	20.0	0.118	6.2	LOS A	0.7	5.8	0.67	0.67	0.67	46.0
6	R2	103	20.0	103	20.0	0.116	10.2	LOS B	0.7	6.0	0.66	0.71	0.66	45.2
Approach		191	20.0	191	20.0	0.118	8.4	LOS A	0.7	6.0	0.66	0.69	0.66	45.6
North: SH3														
7	L2	564	10.0	564	10.0	0.511	5.7	LOS A	4.0	30.1	0.70	0.70	0.71	46.3
8	T1	512	8.0	512	8.0	0.535	7.6	LOS A	4.3	32.4	0.73	0.75	0.79	53.7
Approach		1076	9.0	1076	9.0	0.535	6.6	LOS A	4.3	32.4	0.72	0.72	0.75	49.5
All Vehicles		2036	9.5	2036	9.5	0.535	6.6	LOS A	4.3	32.4	0.57	0.64	0.59	49.4

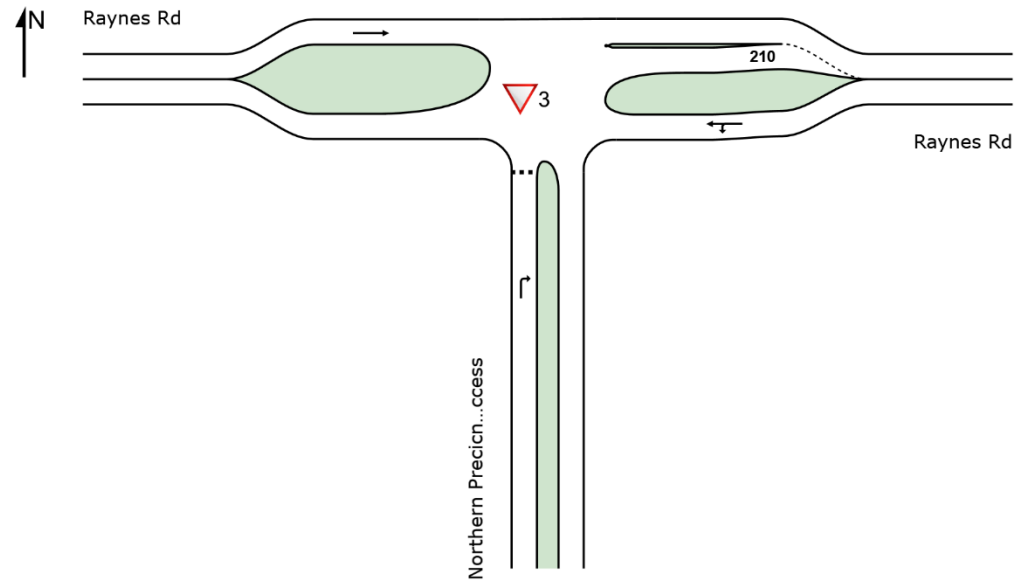


Site: 1 [SH3 / GTL RAB – Year 2031 - PM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: SH3														
2	T1	521	7.0	521	7.0	0.718	18.4	LOS B	9.7	71.9	1.00	1.20	1.54	47.1
3	R2	73	20.0	73	20.0	0.175	15.5	LOS B	1.0	8.3	0.82	0.90	0.82	42.7
Approach		594	8.6	594	8.6	0.718	18.1	LOS B	9.7	71.9	0.98	1.16	1.45	46.5
East: Genetic Tech Link Road														
4	L2	270	10.0	270	10.0	0.512	8.5	LOS A	4.1	30.8	0.79	0.89	0.90	44.0
6	R2	796	10.0	796	10.0	0.665	14.4	LOS B	7.6	57.5	0.86	0.97	1.08	43.7
Approach		1066	10.0	1066	10.0	0.665	12.9	LOS B	7.6	57.5	0.84	0.95	1.03	43.8
North: SH3														
7	L2	251	20.0	251	20.0	0.229	3.6	LOS A	1.5	12.2	0.31	0.43	0.31	47.2
8	T1	535	5.0	535	5.0	0.354	4.2	LOS A	2.8	20.6	0.32	0.40	0.32	55.7
Approach		786	9.8	786	9.8	0.354	4.0	LOS A	2.8	20.6	0.32	0.41	0.32	52.7
All Vehicles		2446	9.6	2446	9.6	0.718	11.3	LOS B	9.7	71.9	0.71	0.83	0.91	47.0



SIDRA Results – Raynes Road Access (Access 2)



Site: 2 [Raynes Rd Access – Year 2031 - AM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Northern Precinct Access														
3	R2	242	20.0	242	20.0	0.416	10.9	LOS B	1.9	15.2	0.65	0.94	0.89	42.7
Approach		242	20.0	242	20.0	0.416	10.9	LOS B	1.9	15.2	0.65	0.94	0.89	42.7
East: Raynes Rd														
4	L2	1100	10.0	1100	10.0	0.659	5.2	LOS A	0.0	0.0	0.00	0.50	0.00	46.8
5	T1	60	5.0	60	5.0	0.659	0.5	LOS A	0.0	0.0	0.00	0.50	0.00	47.4
Approach		1160	9.7	1160	9.7	0.659	5.0	NA	0.0	0.0	0.00	0.50	0.00	46.9
West: Raynes Rd														
11	T1	535	5.0	535	5.0	0.280	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Approach		535	5.0	535	5.0	0.280	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.8
All Vehicles		1937	9.7	1937	9.7	0.659	4.4	NA	1.9	15.2	0.08	0.42	0.11	52.2

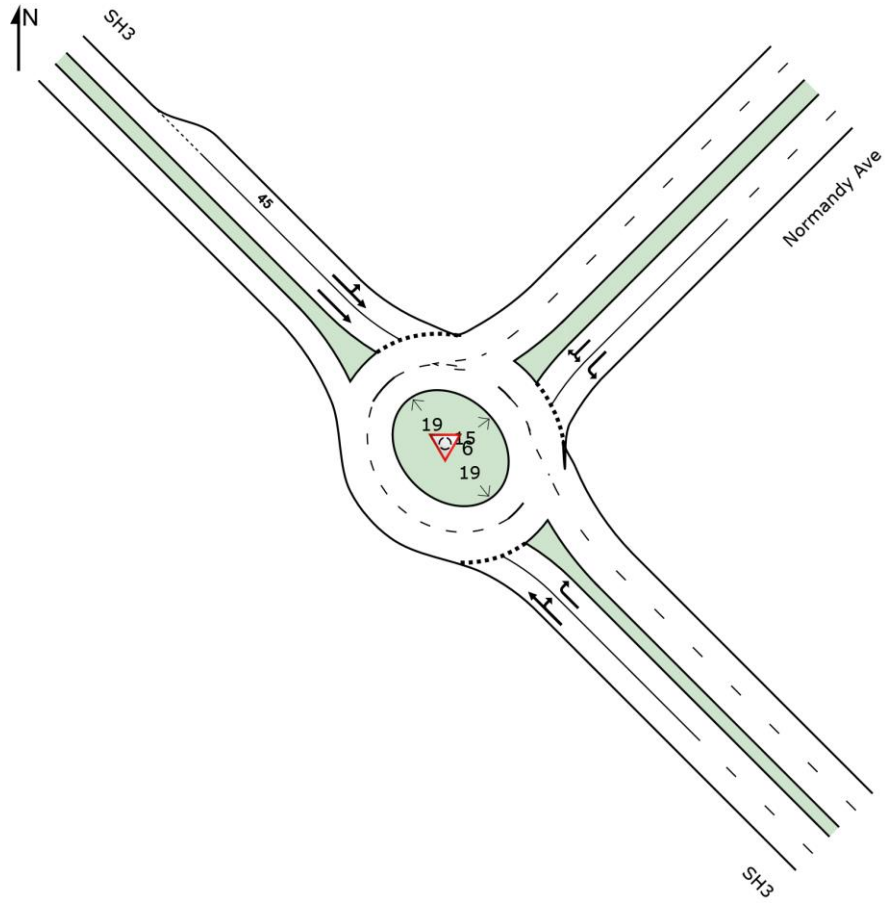


Site: 2 [Raynes Rd Access – Year 2031 - PM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Northern Precinct Access														
3	R2	659	10.0	659	10.0	0.953	30.4	LOS D	21.6	164.1	0.95	2.52	4.95	34.8
Approach		659	10.0	659	10.0	0.953	30.4	LOS D	21.6	164.1	0.95	2.52	4.95	34.8
East: Raynes Rd														
4	L2	252	20.0	252	20.0	0.375	6.4	LOS A	0.0	0.0	0.00	0.23	0.00	59.0
5	T1	422	5.0	422	5.0	0.375	0.1	LOS A	0.0	0.0	0.00	0.23	0.00	62.8
Approach		674	10.6	674	10.6	0.375	2.5	NA	0.0	0.0	0.00	0.23	0.00	61.3
West: Raynes Rd														
11	T1	54	5.0	54	5.0	0.028	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		54	5.0	54	5.0	0.028	0.2	NA	0.0	0.0	0.00	0.00	0.00	80.0
All Vehicles		1387	10.1	1387	10.1	0.953	15.6	NA	21.6	164.1	0.45	1.31	2.35	45.3



SIDRA Results – SH3 / Normandy Avenue Roundabout



Site: 3 [SH3 / Normandy Avenue RAB – Year 2031 - AM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
SouthEast: SH3														
2	T1	999	1.0	999	1.0	0.819	5.9	LOS A	12.5	88.3	0.81	0.56	0.81	52.4
3	R2	332	2.0	332	2.0	0.425	10.4	LOS B	2.9	20.9	0.48	0.66	0.48	51.8
Approach		1331	1.2	1331	1.2	0.819	7.0	LOS A	12.5	88.3	0.73	0.59	0.73	52.2
NorthEast: Normandy Ave														
4	L2	352	2.0	352	2.0	0.394	9.4	LOS A	2.1	14.7	0.74	0.90	0.81	50.6
6	R2	117	1.0	117	1.0	0.394	13.6	LOS B	2.1	14.7	0.74	0.92	0.81	50.1
Approach		469	1.8	469	1.8	0.394	10.4	LOS B	2.1	14.8	0.74	0.91	0.81	50.5
NorthWest: SH3														
7	L2	32	1.0	32	1.0	0.483	7.1	LOS A	3.3	23.4	0.66	0.70	0.66	51.4
8	T1	810	2.0	810	2.0	0.483	7.3	LOS A	3.3	23.4	0.66	0.70	0.66	52.8
Approach		842	2.0	842	2.0	0.483	7.3	LOS A	3.3	23.4	0.66	0.70	0.66	52.7
All Vehicles		2642	1.6	2642	1.6	0.819	7.7	LOS A	12.5	88.3	0.71	0.68	0.72	52.0

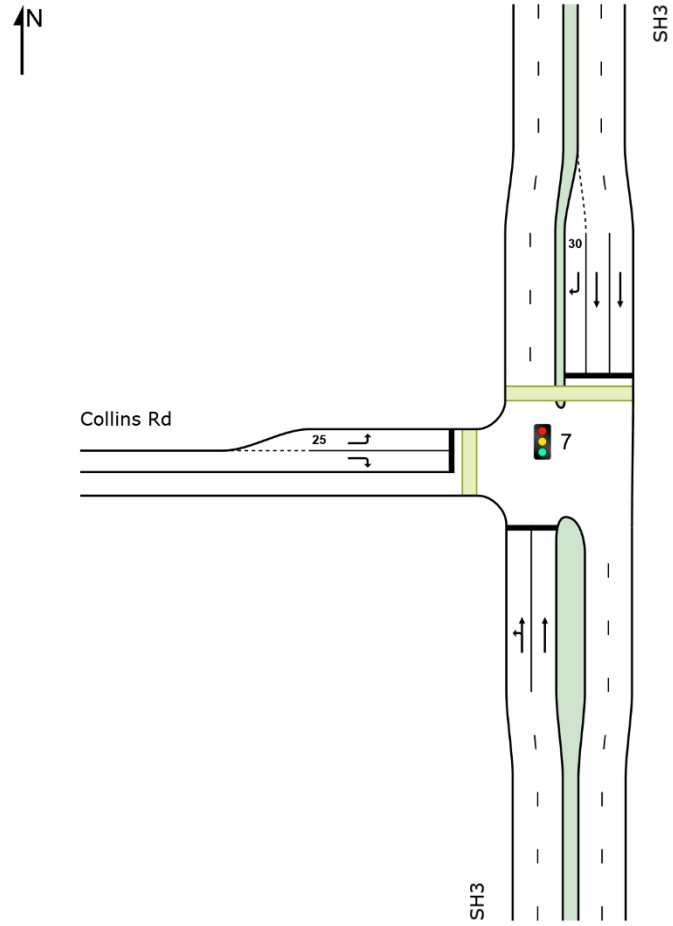


Site: 3 [SH3 / Normandy Avenue RAB – Year 2031 - PM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
SouthEast: SH3														
2	T1	947	5.0	947	5.0	0.849	8.5	LOS A	15.7	114.3	0.96	0.72	1.05	51.6
3	R2	271	1.0	271	1.0	0.414	11.3	LOS B	2.7	19.2	0.55	0.71	0.55	51.5
Approach		1218	4.1	1218	4.1	0.849	9.1	LOS A	15.7	114.3	0.87	0.71	0.94	51.6
NorthEast: Normandy Ave														
4	L2	548	1.0	548	1.0	0.674	14.4	LOS B	4.8	33.9	0.87	1.06	1.25	47.4
6	R2	154	2.0	154	2.0	0.674	18.8	LOS B	4.8	34.0	0.87	1.07	1.25	46.6
Approach		702	1.2	702	1.2	0.674	15.4	LOS B	4.8	34.0	0.87	1.07	1.25	47.2
NorthWest: SH3														
7	L2	49	2.0	49	2.0	0.558	6.9	LOS A	4.4	31.7	0.67	0.68	0.69	51.3
8	T1	1001	3.0	1001	3.0	0.558	7.1	LOS A	4.4	31.7	0.67	0.68	0.69	52.7
Approach		1050	3.0	1050	3.0	0.558	7.1	LOS A	4.4	31.7	0.67	0.68	0.69	52.6
All Vehicles		2970	3.0	2970	3.0	0.849	9.9	LOS A	15.7	114.3	0.80	0.79	0.92	50.8



SIDRA Results – SH3 / Collins Road Intersection



Site: 4 [SH3 / Collins Rd Intersection – Year 2031 - AM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: SH3														
1	L2	152	1.0	152	1.0	0.820	35.7	LOS D	25.4	179.2	0.97	0.95	1.08	28.6
2	T1	1017	1.0	1017	1.0	* 0.820	32.2	LOS C	25.7	181.2	0.97	0.95	1.08	34.6
Approach		1169	1.0	1169	1.0	0.820	32.7	LOS C	25.7	181.2	0.97	0.95	1.08	33.6
North: SH3														
8	T1	931	2.0	931	2.0	0.362	6.1	LOS A	8.6	61.2	0.44	0.39	0.44	52.9
9	R2	288	0.0	288	0.0	* 0.834	30.7	LOS C	9.2	64.5	1.00	0.97	1.26	30.0
Approach		1219	1.5	1219	1.5	0.834	11.9	LOS B	9.2	64.5	0.57	0.53	0.63	43.2
West: Collins Rd														
10	L2	302	0.0	302	0.0	0.420	17.8	LOS B	7.9	55.3	0.64	0.71	0.64	33.6
12	R2	169	2.0	169	2.0	* 0.797	46.1	LOS D	7.6	54.2	0.96	0.95	1.25	23.9
Approach		471	0.7	471	0.7	0.797	28.0	LOS C	7.9	55.3	0.75	0.80	0.86	30.0
All Vehicles		2859	1.2	2859	1.2	0.834	23.1	LOS C	25.7	181.2	0.77	0.74	0.85	36.3

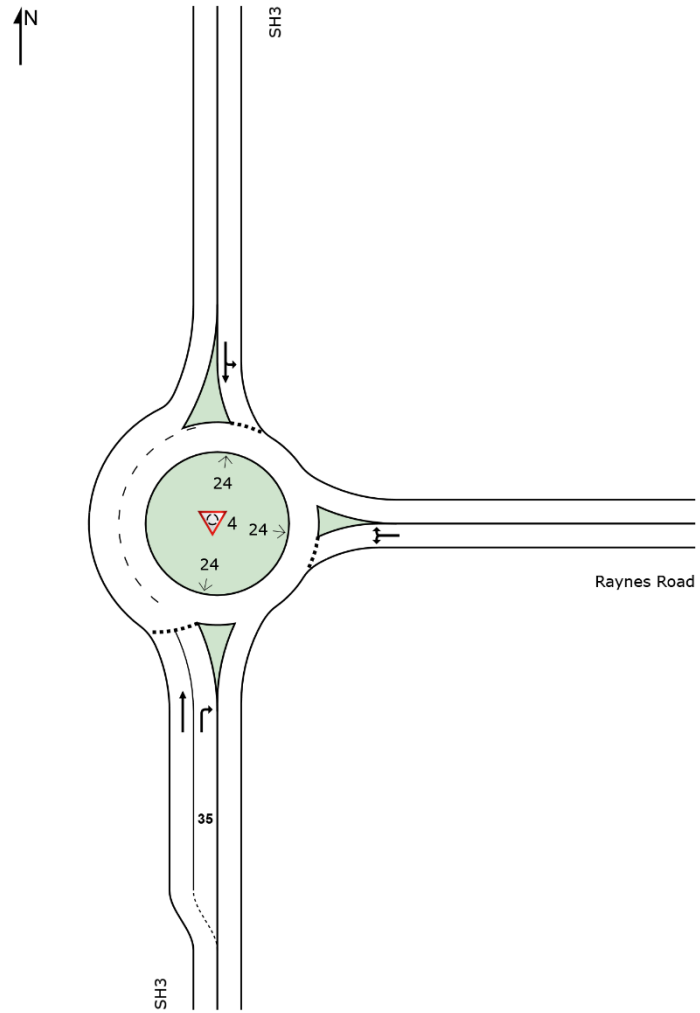


Site: 4 [SH3 / Collins Rd Intersection – Year 2031 - PM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: SH3														
1	L2	177	1.0	177	1.0	0.830	37.5	LOS D	25.1	181.2	0.98	0.97	1.11	27.9
2	T1	945	5.0	945	5.0	* 0.830	34.0	LOS C	25.2	184.3	0.98	0.97	1.11	33.7
Approach		1122	4.4	1122	4.4	0.830	34.6	LOS C	25.2	184.3	0.98	0.97	1.11	32.6
North: SH3														
8	T1	1403	2.0	1403	2.0	0.598	6.0	LOS A	17.6	125.4	0.49	0.44	0.49	53.0
9	R2	299	0.0	299	0.0	* 0.815	28.3	LOS C	9.3	65.3	0.97	0.94	1.19	30.6
Approach		1702	1.6	1702	1.6	0.815	9.9	LOS A	17.6	125.4	0.57	0.53	0.61	45.6
West: Collins Rd														
10	L2	281	0.0	281	0.0	0.367	17.0	LOS B	7.1	49.5	0.62	0.70	0.62	33.8
12	R2	137	1.0	137	1.0	* 0.523	43.4	LOS D	5.8	40.9	0.97	0.79	0.97	24.5
Approach		418	0.3	418	0.3	0.523	25.6	LOS C	7.1	49.5	0.73	0.73	0.73	30.7
All Vehicles		3242	2.4	3242	2.4	0.830	20.5	LOS C	25.2	184.3	0.73	0.71	0.80	37.9



SIDRA Results – SH3 / Raynes Road Roundabout



Site: 5 [SH3 / Raynes Rd RAB – Year 2031 - AM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: SH3														
2	T1	527	5.0	527	5.0	0.334	4.0	LOS A	2.8	20.5	0.26	0.38	0.26	56.1
3	R2	62	8.0	62	8.0	0.064	7.8	LOS A	0.4	2.7	0.23	0.56	0.23	46.4
Approach		589	5.3	589	5.3	0.334	4.4	LOS A	2.8	20.5	0.25	0.40	0.25	54.8
East: Raynes Road														
4	L2	84	1.0	84	1.0	0.429	17.6	LOS B	3.5	25.0	1.00	1.05	1.11	39.7
6	R2	49	3.0	49	3.0	0.429	22.6	LOS C	3.5	25.0	1.00	1.05	1.11	40.8
Approach		133	1.7	133	1.7	0.429	19.5	LOS B	3.5	25.0	1.00	1.05	1.11	40.1
North: SH3														
7	L2	333	4.0	333	4.0	0.964	5.8	LOS A	41.4	307.1	1.00	0.48	1.01	47.4
8	T1	1063	8.0	1063	8.0	0.964	7.1	LOS A	41.4	307.1	1.00	0.48	1.01	51.8
Approach		1396	7.0	1396	7.0	0.964	6.8	LOS A	41.4	307.1	1.00	0.48	1.01	50.7
All Vehicles		2118	6.2	2118	6.2	0.964	6.9	LOS A	41.4	307.1	0.79	0.49	0.81	50.9

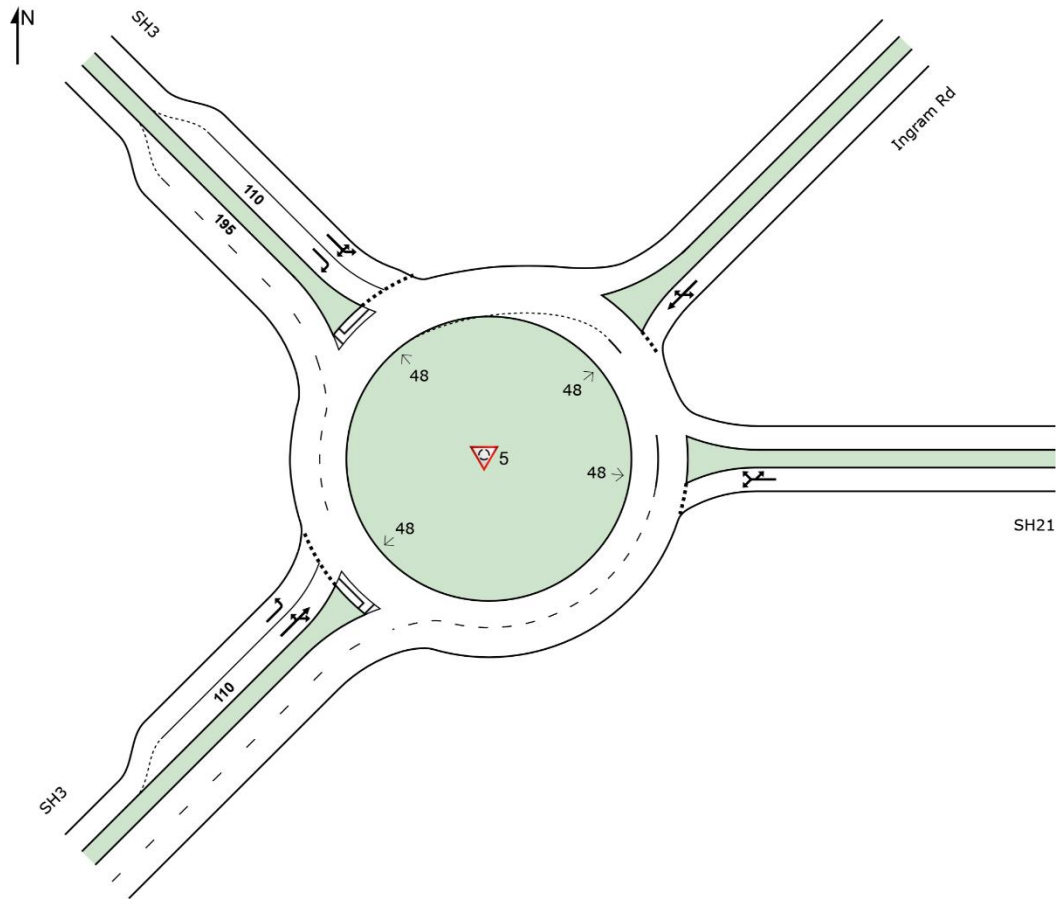


Site: 5 [SH3 / Raynes Rd RAB – Year 2031 - PM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: SH3														
2	T1	1011	7.0	1011	7.0	0.741	5.4	LOS A	9.6	71.5	0.76	0.54	0.76	53.5
3	R2	369	5.0	369	5.0	0.373	8.8	LOS A	2.7	20.0	0.52	0.64	0.52	45.7
Approach		1380	6.5	1380	6.5	0.741	6.3	LOS A	9.6	71.5	0.70	0.57	0.70	51.2
East: Raynes Road														
4	L2	59	1.0	59	1.0	0.441	10.0	LOS A	3.6	25.7	0.96	1.00	1.04	42.5
6	R2	167	4.0	167	4.0	0.441	14.9	LOS B	3.6	25.7	0.96	1.00	1.04	43.7
Approach		226	3.2	226	3.2	0.441	13.6	LOS B	3.6	25.7	0.96	1.00	1.04	43.3
North: SH3														
7	L2	70	4.0	70	4.0	0.897	18.0	LOS B	21.1	153.8	1.00	1.24	1.75	42.5
8	T1	789	5.0	789	5.0	0.897	19.2	LOS B	21.1	153.8	1.00	1.24	1.75	46.1
Approach		859	4.9	859	4.9	0.897	19.1	LOS B	21.1	153.8	1.00	1.24	1.75	45.8
All Vehicles		2465	5.6	2465	5.6	0.897	11.4	LOS B	21.1	153.8	0.83	0.84	1.10	48.4



SIDRA Results – SH3 / SH21 Roundabout



Site: 6 [SH3 / SH21 RAB – Year 2031 - AM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
East: SH21														
4a	L1	163	12.0	163	12.0	0.587	6.7	LOS A	4.6	33.5	0.62	0.72	0.63	60.7
6a	R1	236	3.0	236	3.0	0.587	13.2	LOS B	4.6	33.5	0.62	0.72	0.63	62.6
6b	R3	247	4.0	247	4.0	0.587	16.4	LOS B	4.6	33.5	0.62	0.72	0.63	64.4
Approach		646	5.7	646	5.7	0.587	12.8	LOS B	4.6	33.5	0.62	0.72	0.63	62.8
NorthEast: Ingram Rd														
24b	L3	40	20.0	40	20.0	0.114	4.1	LOS A	0.5	3.8	0.52	0.62	0.52	46.3
25	T1	12	20.0	12	20.0	0.114	2.7	LOS A	0.5	3.8	0.52	0.62	0.52	48.8
26	R2	41	20.0	41	20.0	0.114	9.8	LOS A	0.5	3.8	0.52	0.62	0.52	50.2
Approach		93	20.0	93	20.0	0.114	6.4	LOS A	0.5	3.8	0.52	0.62	0.52	48.2
NorthWest: SH3														
27	L2	165	0.0	165	0.0	0.242	7.2	LOS A	1.7	12.4	0.67	0.64	0.67	66.3
27a	L1	148	3.0	148	3.0	0.242	6.9	LOS A	1.7	12.4	0.67	0.64	0.67	67.6
29	R2	195	12.0	195	12.0	0.217	16.1	LOS B	1.4	10.5	0.67	0.78	0.67	59.1
Approach		508	5.5	508	5.5	0.242	10.5	LOS B	1.7	12.4	0.67	0.69	0.67	63.5
SouthWest: SH3														
30	L2	554	10.0	554	10.0	0.399	7.8	LOS A	3.2	24.3	0.74	0.72	0.74	63.0
31	T1	89	5.0	89	5.0	0.399	8.4	LOS A	2.9	21.8	0.75	0.78	0.75	63.9
32a	R1	213	12.0	213	12.0	0.399	14.6	LOS B	2.9	21.8	0.75	0.78	0.75	61.3
Approach		856	10.0	856	10.0	0.399	9.5	LOS A	3.2	24.3	0.74	0.74	0.74	62.6
All Vehicles		2103	8.0	2103	8.0	0.587	10.6	LOS B	4.6	33.5	0.68	0.72	0.68	62.1

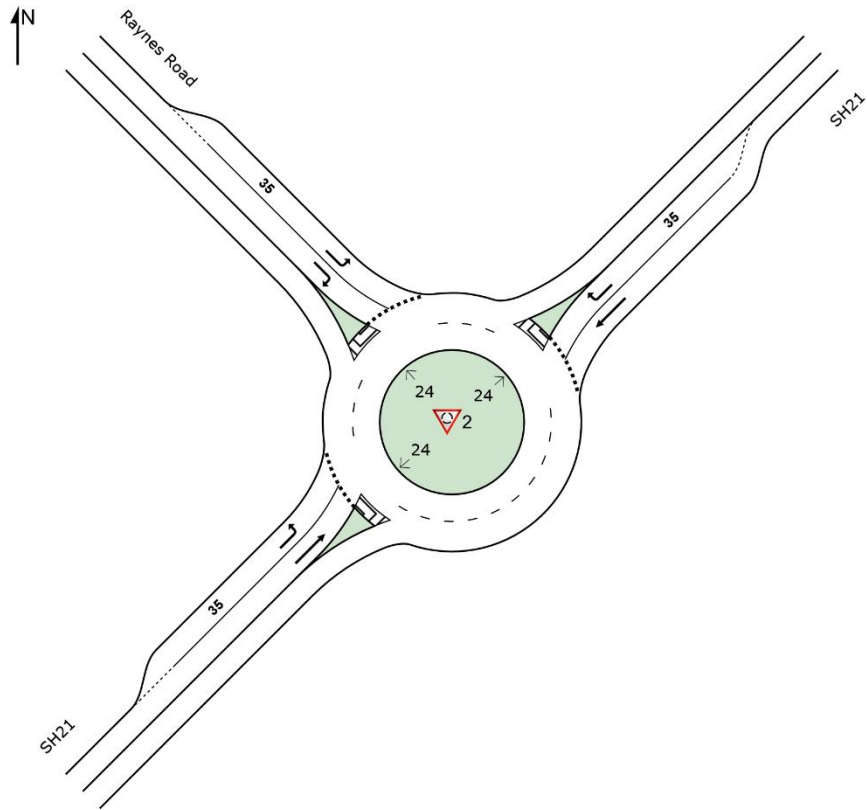


Site: 6 [SH3 / SH21 RAB – Year 2031 - PM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
East: SH21														
4a	L1	231	8.0	231	8.0	0.513	9.5	LOS A	3.4	25.7	0.74	0.93	0.87	62.3
6a	R1	117	10.0	117	10.0	0.513	16.2	LOS B	3.4	25.7	0.74	0.93	0.87	61.6
6b	R3	58	11.0	58	11.0	0.513	19.5	LOS B	3.4	25.7	0.74	0.93	0.87	63.4
Approach		406	9.0	406	9.0	0.513	12.8	LOS B	3.4	25.7	0.74	0.93	0.87	62.3
NorthEast: Ingram Rd														
24b	L3	222	9.0	222	9.0	0.680	10.1	LOS B	5.2	39.1	0.85	1.06	1.23	43.5
25	T1	75	8.0	75	8.0	0.680	8.7	LOS A	5.2	39.1	0.85	1.06	1.23	45.7
26	R2	159	12.0	159	12.0	0.680	15.8	LOS B	5.2	39.1	0.85	1.06	1.23	47.0
Approach		456	9.9	456	9.9	0.680	11.8	LOS B	5.2	39.1	0.85	1.06	1.23	45.0
NorthWest: SH3														
27	L2	86	0.0	86	0.0	0.342	6.3	LOS A	2.4	18.9	0.57	0.59	0.57	65.8
27a	L1	306	20.0	306	20.0	0.342	6.4	LOS A	2.4	18.9	0.57	0.59	0.57	62.9
29	R2	454	9.0	454	9.0	0.342	14.8	LOS B	2.4	18.9	0.59	0.71	0.59	61.1
Approach		846	12.1	846	12.1	0.342	10.9	LOS B	2.4	18.9	0.58	0.66	0.58	62.2
SouthWest: SH3														
30	L2	251	8.0	251	8.0	0.210	6.8	LOS A	1.3	10.0	0.53	0.61	0.53	64.7
31	T1	23	6.0	23	6.0	0.210	6.4	LOS A	1.3	10.0	0.51	0.65	0.51	63.4
32a	R1	262	7.0	262	7.0	0.210	12.4	LOS B	1.3	10.0	0.51	0.65	0.51	62.3
Approach		536	7.4	536	7.4	0.210	9.5	LOS A	1.3	10.0	0.52	0.64	0.52	63.4
All Vehicles		2244	10.0	2244	10.0	0.680	11.1	LOS B	5.2	39.1	0.65	0.78	0.75	58.0



SIDRA Results – SH21 / Raynes Road Roundabout



Site: 7 [SH21 / Raynes Rd RAB – Year 2031 - AM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
NorthEast: SH21														
2	T1	486	6.0	486	6.0	0.455	5.4	LOS A	3.4	25.0	0.54	0.54	0.54	54.6
3	R2	974	10.0	974	10.0	0.727	9.3	LOS A	8.4	63.8	0.72	0.65	0.72	45.2
Approach		1460	8.7	1460	8.7	0.727	8.0	LOS A	8.4	63.8	0.66	0.61	0.66	47.9
NorthWest: Raynes Road														
4	L2	319	20.0	319	20.0	0.277	4.2	LOS A	1.9	15.9	0.52	0.53	0.52	46.6
6	R2	175	20.0	175	20.0	0.189	9.0	LOS A	1.2	9.5	0.50	0.64	0.50	45.6
Approach		494	20.0	494	20.0	0.277	5.9	LOS A	1.9	15.9	0.51	0.57	0.51	46.3
SouthWest: SH21														
7	L2	156	10.0	156	10.0	0.389	13.8	LOS B	2.9	22.1	0.97	1.01	1.04	42.0
8	T1	211	12.0	211	12.0	0.406	12.7	LOS B	3.4	26.4	1.00	0.98	1.05	50.4
Approach		367	11.1	367	11.1	0.406	13.2	LOS B	3.4	26.4	0.99	0.99	1.04	46.5
All Vehicles		2321	11.5	2321	11.5	0.727	8.4	LOS A	8.4	63.8	0.68	0.66	0.69	47.3

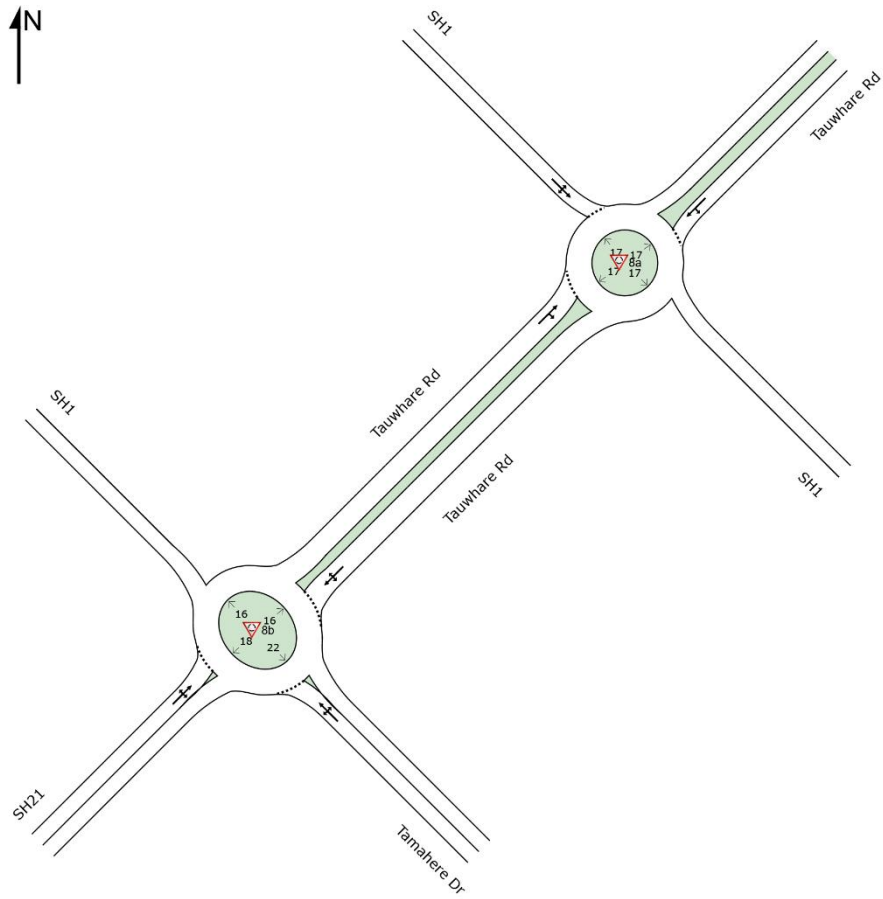


Site: 7 [SH21 / Raynes Rd RAB – Year 2031 - PM Peak]

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
NorthEast: SH21														
2	T1	335	10.0	335	10.0	0.221	4.1	LOS A	1.5	11.5	0.22	0.38	0.22	56.1
3	R2	297	20.0	297	20.0	0.234	7.8	LOS A	1.6	12.8	0.24	0.55	0.24	46.2
Approach		632	14.7	632	14.7	0.234	5.8	LOS A	1.6	12.8	0.23	0.46	0.23	50.9
NorthWest: Raynes Road														
4	L2	707	10.0	707	10.0	0.827	18.2	LOS B	14.8	112.3	1.00	1.33	1.75	40.0
6	R2	52	10.0	52	10.0	0.097	12.7	LOS B	0.5	4.1	0.72	0.79	0.72	44.1
Approach		759	10.0	759	10.0	0.827	17.9	LOS B	14.8	112.3	0.98	1.29	1.68	40.3
SouthWest: SH21														
7	L2	190	20.0	190	20.0	0.254	5.9	LOS A	1.4	11.4	0.56	0.63	0.56	46.2
8	T1	632	8.0	632	8.0	0.523	5.9	LOS A	4.0	30.0	0.64	0.60	0.64	54.1
Approach		822	10.8	822	10.8	0.523	5.9	LOS A	4.0	30.0	0.62	0.60	0.62	52.1
All Vehicles		2213	11.6	2213	11.6	0.827	10.0	LOS A	14.8	112.3	0.63	0.80	0.87	47.1



SIDRA Results – Tamahere Interchange



Site: 8 [Tamahere Interchange (NE RAB) – Year 2031 - AM Peak]

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
NorthEast: Tauwhare Rd														
1	L2	22	4.0	22	4.0	1.272	281.0	LOS F	36.6	275.7	1.00	3.62	9.57	9.7
2	T1	531	9.0	531	9.0	1.272	282.1	LOS F	36.6	275.7	1.00	3.62	9.57	6.3
Approach		553	8.8	553	8.8	1.272	282.0	LOS F	36.6	275.7	1.00	3.62	9.57	6.4
NorthWest: SH1														
3	L2	70	4.0	70	4.0	0.842	16.7	LOS B	5.7	41.1	0.91	0.96	1.33	54.6
5	T1	1	0.0	1	0.0	0.842	17.7	LOS B	5.7	41.1	0.91	0.96	1.33	52.4
4	R2	779	4.0	779	4.0	0.842	21.8	LOS C	5.7	41.1	0.91	0.96	1.33	40.2
Approach		850	4.0	850	4.0	0.842	21.4	LOS C	5.7	41.1	0.91	0.96	1.33	42.1
SouthWest: Tauwhare Rd														
5	T1	185	20.0	185	20.0	0.200	4.2	LOS A	0.0	0.0	0.00	0.62	0.00	55.3
6	R2	139	6.0	139	6.0	0.200	8.2	LOS A	0.0	0.0	0.00	0.62	0.00	56.4
Approach		324	14.0	324	14.0	0.200	5.9	LOS A	0.0	0.0	0.00	0.62	0.00	55.7
All Vehicles		1727	7.4	1727	7.4	1.272	102.0	LOS F	36.6	275.7	0.77	1.75	3.72	14.4



Site: 8 [Tamahere Interchange (NE RAB) – Year 2031 - PM Peak]

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
NorthEast: Tauwhare Rd														
1	L2	14	3.0	14	3.0	0.354	10.1	LOS B	1.0	7.1	0.78	0.83	0.78	59.1
2	T1	240	8.0	240	8.0	0.354	11.1	LOS B	1.0	7.1	0.78	0.83	0.78	54.8
Approach		254	7.7	254	7.7	0.354	11.0	LOS B	1.0	7.1	0.78	0.83	0.78	55.1
NorthWest: SH1														
3	L2	159	5.0	159	5.0	0.671	15.0	LOS B	2.9	21.7	0.84	0.98	1.14	56.7
5	T1	1	0.0	1	0.0	0.671	15.9	LOS B	2.9	21.7	0.84	0.98	1.14	54.9
4	R2	414	11.0	414	11.0	0.671	20.5	LOS C	2.9	21.7	0.84	0.98	1.14	42.9
Approach		574	9.3	574	9.3	0.671	19.0	LOS B	2.9	21.7	0.84	0.98	1.14	48.4
SouthWest: Tauwhare Rd														
5	T1	324	6.0	324	6.0	0.301	4.2	LOS A	0.0	0.0	0.00	0.60	0.00	61.3
6	R2	184	4.0	184	4.0	0.301	8.2	LOS A	0.0	0.0	0.00	0.60	0.00	57.9
Approach		508	5.3	508	5.3	0.301	5.7	LOS A	0.0	0.0	0.00	0.60	0.00	60.3
All Vehicles		1336	7.5	1336	7.5	0.671	12.4	LOS B	2.9	21.7	0.51	0.81	0.64	53.8



Site: 8 [Tamahere Interchange (SW RAB) – Year 2031 - AM Peak]

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
SouthEast: Tamahere Dr														
1	L2	311	8.0	311	8.0	0.883	71.2	LOS E	7.2	53.6	1.00	1.64	3.17	23.9
5	T1	60	7.0	60	7.0	0.883	71.8	LOS E	7.2	53.6	1.00	1.64	3.17	19.3
2	R2	9	8.0	9	8.0	0.883	76.3	LOS E	7.2	53.6	1.00	1.64	3.17	9.7
Approach		380	7.8	380	7.8	0.883	71.4	LOS E	7.2	53.6	1.00	1.64	3.17	23.0
NorthEast: Tauwhare Rd														
7	L2	38	0.0	35	0.0	0.740	3.5	LOS A	3.7	27.2	0.14	0.49	0.14	50.6
3	T1	1109	8.0	1015	7.8	0.740	4.2	LOS A	3.7	27.2	0.14	0.49	0.14	61.3
4	R2	163	2.0	149	1.9	0.740	8.2	LOS A	3.7	27.2	0.14	0.49	0.14	57.7
Approach		1310	7.0	1199 N1	6.8	0.740	4.7	LOS A	3.7	27.2	0.14	0.49	0.14	60.7
SouthWest: SH21														
5	L2	241	8.0	241	8.0	0.533	8.9	LOS A	1.7	13.1	0.60	0.67	0.60	65.8
6	T1	315	20.0	315	20.0	0.533	10.3	LOS B	1.7	13.1	0.60	0.67	0.60	64.2
3	R2	10	0.0	10	0.0	0.533	13.6	LOS B	1.7	13.1	0.60	0.67	0.60	61.2
Approach		566	14.5	566	14.5	0.533	9.8	LOS A	1.7	13.1	0.60	0.67	0.60	65.0
All Vehicles		2256	9.0	2145 N1	9.5	0.883	17.8	LOS B	7.2	53.6	0.41	0.74	0.80	46.7



Site: 8 [Tamahere Interchange (SW RAB) – Year 2031 - PM Peak]

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
SouthEast: Tamahere Dr														
1	L2	122	9.0	122	9.0	0.260	10.1	LOS B	0.6	4.5	0.68	0.78	0.68	54.4
5	T1	72	2.0	72	2.0	0.260	10.5	LOS B	0.6	4.5	0.68	0.78	0.68	53.2
2	R2	15	3.0	15	3.0	0.260	14.9	LOS B	0.6	4.5	0.68	0.78	0.68	39.2
Approach		209	6.2	209	6.2	0.260	10.6	LOS B	0.6	4.5	0.68	0.78	0.68	53.5
NorthEast: Tauwhare Rd														
7	L2	60	0.0	60	0.0	0.417	3.5	LOS A	1.2	9.1	0.09	0.51	0.09	51.0
3	T1	508	9.0	508	9.0	0.417	4.2	LOS A	1.2	9.1	0.09	0.51	0.09	61.1
4	R2	90	6.0	90	6.0	0.417	8.2	LOS A	1.2	9.1	0.09	0.51	0.09	56.8
Approach		658	7.8	658	7.8	0.417	4.7	LOS A	1.2	9.1	0.09	0.51	0.09	60.0
SouthWest: SH21														
5	L2	564	6.0	564	6.0	0.882	13.3	LOS B	7.6	56.0	1.00	0.75	1.16	61.7
6	T1	492	7.0	492	7.0	0.882	14.4	LOS B	7.6	56.0	1.00	0.75	1.16	57.9
3	R2	11	0.0	11	0.0	0.882	18.0	LOS B	7.6	56.0	1.00	0.75	1.16	56.9
Approach		1067	6.4	1067	6.4	0.882	13.8	LOS B	7.6	56.0	1.00	0.75	1.16	60.3
All Vehicles		1934	6.8	1934	6.8	0.882	10.4	LOS B	7.6	56.0	0.65	0.67	0.75	59.4

