Project Number: 2-37400.00

Nukuhau Private Plan Change, Taupō

Traffic Impact Assessment

28 October 2020

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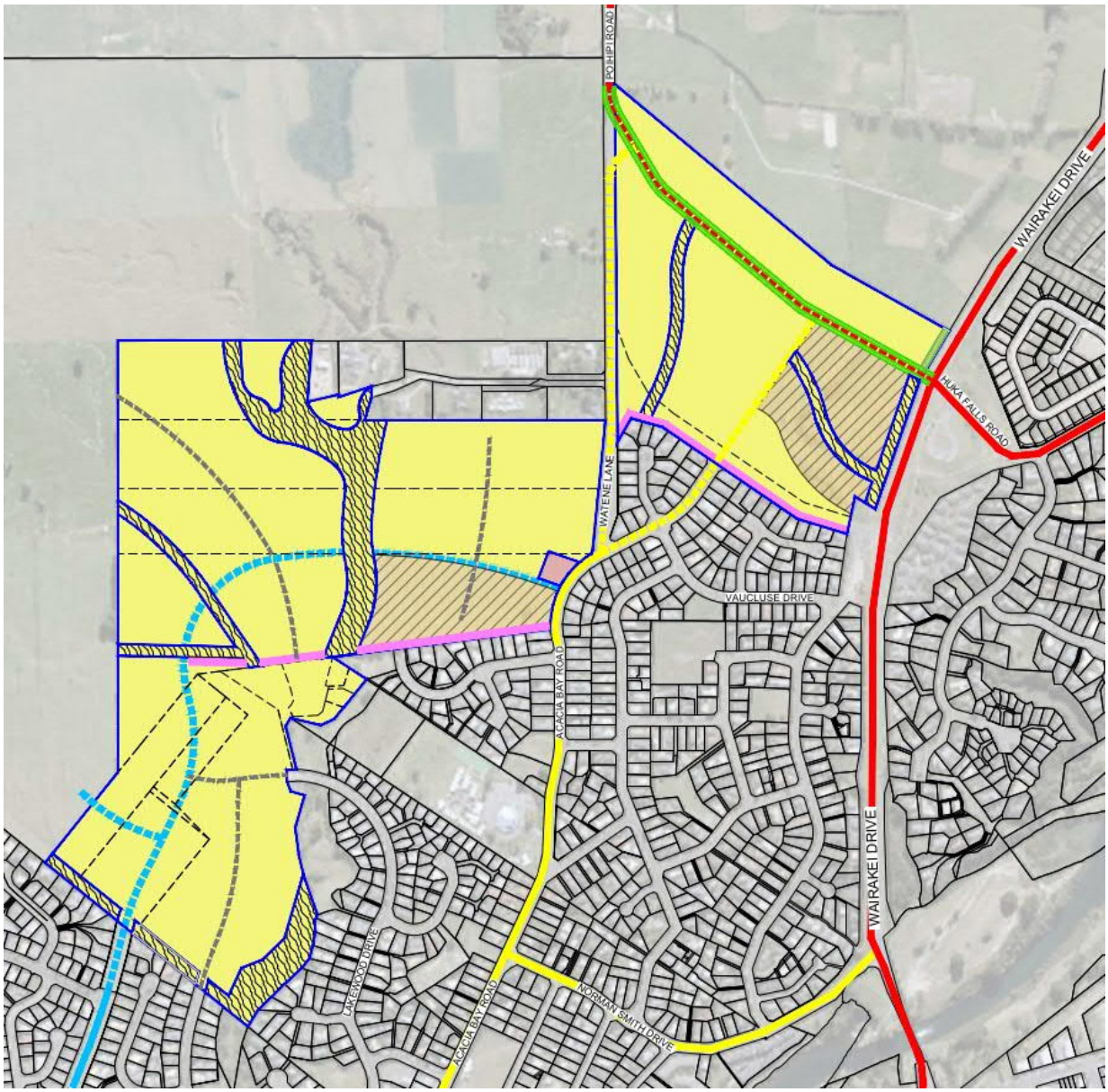

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Revision	Details
Issue 1	For review
Issue 2	Minor amendments/additions in-line with PPC application changes

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Disclaimers and Limitations

This Traffic Impact Assessment report ('Report') has been prepared by WSP exclusively for a group of three private landowners, CN Top Ltd, Lexus Trustees 11 Ltd and Rajasingham Family Trust ('Client'), as part of the project to prepare a Structure Plan (SP) and lodge an application for a Private Plan Change (PPC) to Taupō District Council (TDC) ('Purpose') and in accordance with the agreement(s) with the Client.

The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

1 Introduction

1.1 Background

WSP was commissioned by three private landowners, CN Top Ltd, Lexus Trustees 11 Ltd and Rajasingham Family Trust, to prepare a Structure Plan (SP) and lodge an application for a Private Plan Change (PPC) to Taupō District Council (TDC). This Traffic Impact Assessment report ('Report') has been prepared in support of the PPC application.

The intention of the Plan Change is to rezone 77.78 hectares of land and enable residential development for approximately 780 new residential lots, a neighbourhood shopping centre (local shops), and areas of open space. The PPC also includes the notification for the future re-routing and therefore revoking of an area of existing Road Reserve, being part of Poihipi Road, at the applicable time.

The locality and extents of the project is depicted in **Figure 1-1** below.

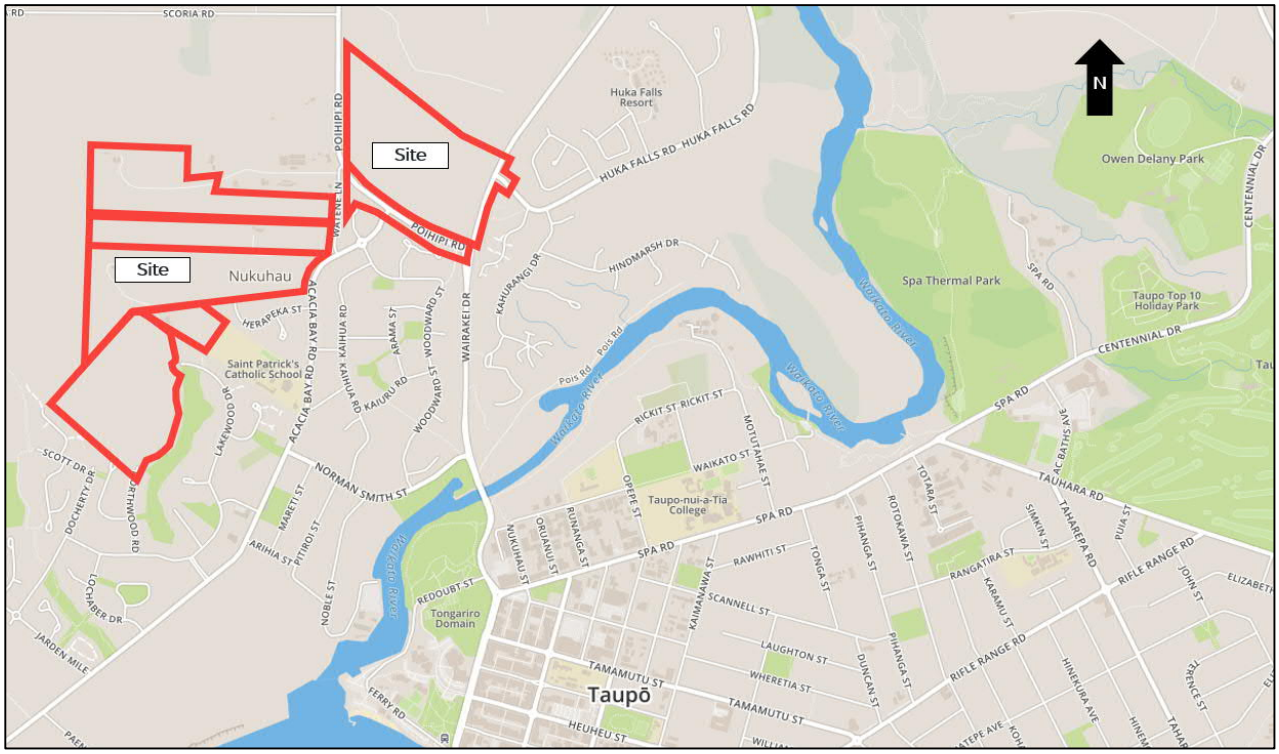


Figure 1-1 Locality plan showing project extents
Source: LINZ, 2019

1.2 Report Purpose

The purpose of this Traffic Impact Assessment (TIA) is to identify and assess the potential transportation effects of the proposed rezoning along with suitable mitigation measures to address or remedy such effects on the safe and efficient operation of the transport network, where necessary.

This TIA report inter alia considers the following aspects:

- Review of the rezoning proposal regarding existing policy and the existing surrounding transport network and land use, particularly in the context of the Structure Plan;
- Assessment of the proposed accesses to the various land parcels in relation to the existing road network and assesses compliance with the access standards in the Taupo District Plan;
- Assessment of the level of trip generation associated with the proposed residential and neighbourhood shopping centre (local shops) land-uses and the distribution of trips on the transport network;
- Traffic modelling of key intersections effected by the proposal to determine the necessary form of intersection and control type, and well as improvements to mitigate the impact on the transport network; and
- The TIA further considers active modes (walking and cycling) as well as public transportation requirements.

1.3 Reference Documents

Following are the main documents that have been used and/or referred to in the compilation of this report:

- Taupō Urban Structure Plan, prepared by TDC, 2004;
- TDC Cycling and Walking Strategy, prepared by TDC, 2005;
- Operative Taupo District Plan (District Plan), prepared by TDC, 2007;
- Taupō District Council Code of Practice for Development of Land, prepared by TDC, 2009;
- Taupō Urban Commercial and Industrial Structure Plan, prepared by TDC, 2011;
- Trips and Parking Related to Land Use, prepared by New Zealand Transport Agency research report 453, 2011;
- Taupō District 2050 District Growth Management Strategy, prepared by TDC, 2018;
- Taupō District Council Long Term Plan 2018-2028, prepared by TDC, 2018;
- Taupō Northern Outlet and CBD Investigation (the Taupo Investigation), prepared by TDG, 2018; and
- TDC Speed Limit Bylaw, prepared by TDC, 2018.

2 Study Area and Existing Transport Network

2.1 Overview

This section of the report provides further detail of the size and location of the proposed plan change (the Nukuhau development), as well as a brief description of the adjacent land use and local transport network around the land to be rezoned.

2.2 Site Size and Location

The rezoning applies to approximately 77.78 ha of land located in Nukuhau, north-west of Taupō. The land is shown in Figure 2-1. The site is made up by 16 individual properties. These properties have been combined into seven land parcels as noted in Table 2-1 and illustrated in Figure 2-2.

Table 2-1 Land Parcels

LAND PARCEL	LAND REFERENCE
Parcel 1	Land H
Parcel 2	Land I
Parcel 3	Land A
Parcel 4	Land A1
Parcel 5	Land B and G
Parcel 6	Land J, K and L
Parcel 7	Land M, N, O, P, Q and R (with S excluded)

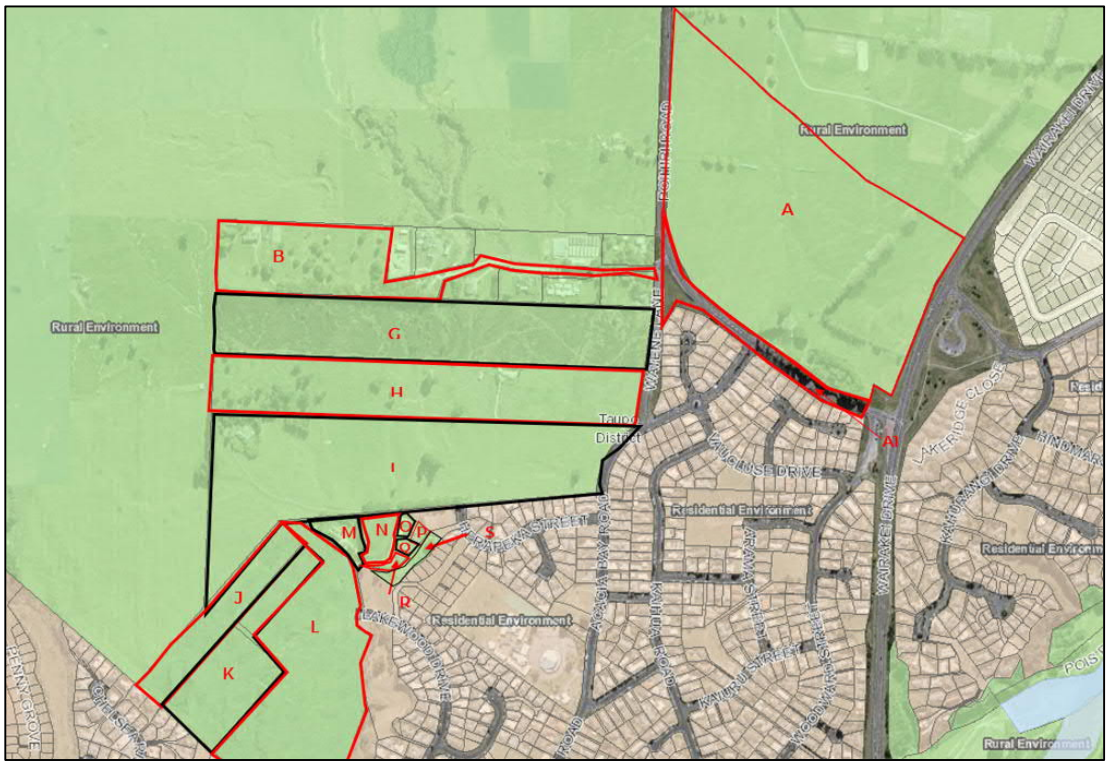


Figure 2-1 Location of Various Land Parcels

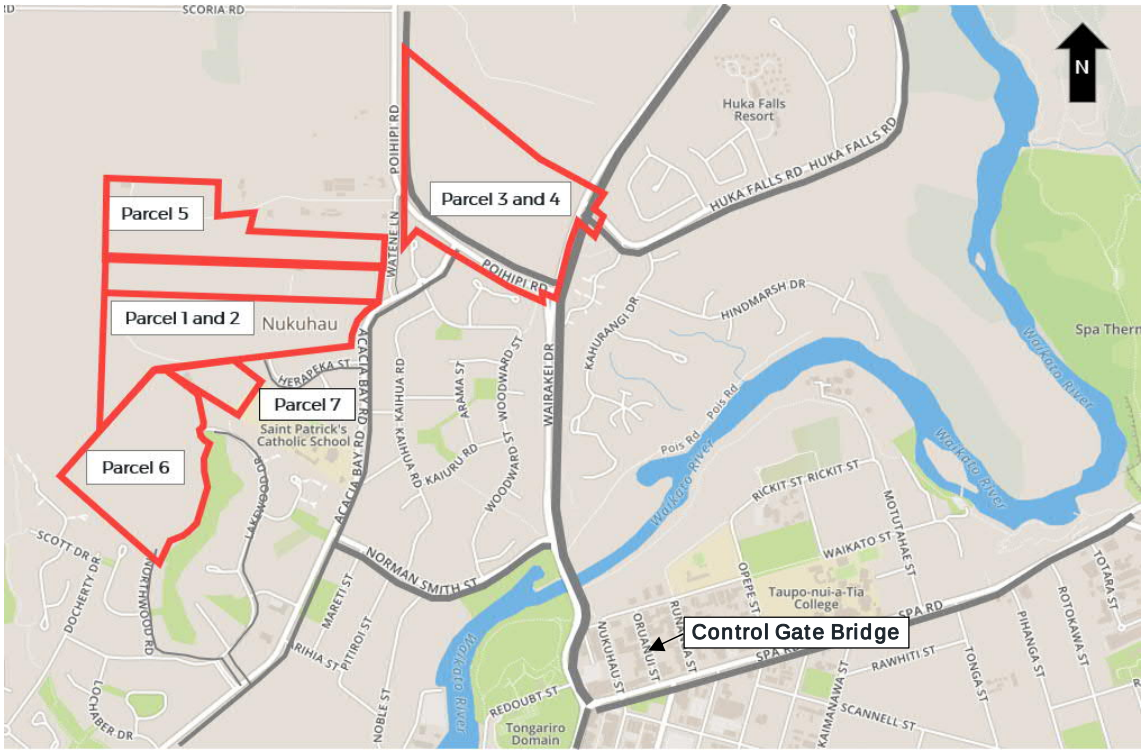


Figure 2-2 Local Transport Network
Source: LINZ Map, 2019

2.3 Surrounding Land Use

The existing land use surrounding the Site is one of the following three categories within the District Plan:

- Rural Environment
- Residential Environment
- Low Density Residential

There is no major ongoing development in any of these areas (based on development shown in aerial imagery since 2009), with the exception of the Jarden Mile residential area located approximately 1.0 km to the south of the Site on the western side of Acacia Bay Road and the Huka Heights Drive residential area, which is located by the Huka Falls Road and Wairakei Drive Intersection.

2.4 Traffic Network Background

The TDC transport network is classified in the RAMM database in the following hierarchy based on the One Network Road Classification (ONRC). The local transport network consists of several roads that will provide connections to the Site and, key roads considered relevant to the study. Table 2-2 below summarised the Average Daily Traffic (ADT)[1], speed at the proposed access locations (where applicable) and their role with the road hierarchy as classified in the District Plan.

[1]From Mobile Road Estimate 11/01/2019

Table 2-2 Local Transport Network

ROAD NAME	ROAD HIERARCHY	LANES	SPEED (KM/H)	ADT
Poihipi Road	Arterial	2	100	7 376
Wairakei Drive (Thermal Explorer Highway)	Arterial	3	80	-
Huka Falls Road	Arterial	2	80	3 624
Spa Road	Arterial	2	50	9 000
Tongariro Street	Arterial	4	50	7 217
Acacia Bay Road	Primary Collector	2	50	670
Norman Smith Street	Primary Collector	2	50	10 582
Docherty Drive	Access	2	50	400 (2003)
Watene Lane	Access	2	50	370
Herapeka Street	Low Volume	2	50	54 (2012)

Source: NZTA ONRC Map, 2019

Major roads and infrastructure around the Nukuhau Development are described in the following sections.

2.4.1 Wairakei Drive (Thermal Explorer Highway)

The northern outlet to Taupō essentially begins at Wairakei Drive, where State Highway 1 (SH1) and the East Taupō Arterial (ETA) intersects with Wairakei Drive and State Highway 5 (SH5) (part of the Thermal Explorer Highway route). Wairakei Drive is the primary northern gateway into the Taupō Town centre providing regional roading connections for both inter- and intra-regional travel. Prior to the ETA opening in 2010, Wairakei Drive formed part of the SH1 route.

Figure 2-3 Wairakei Drive Approaching Control Gate Bridge Looking South

2.4.2 East Taupō Arterial (ETA)

The ETA was primarily built to address the issue of heavy traffic passing through the Taupō CBD and the high concentration of tourist accommodation located along Lake Terrace. It was intended to provide an alternative to Wairakei Drive and the Control Gates Bridge, which was approaching capacity during most peak periods and for extended parts of the day during holidays. The ETA was opened in 2010, and while there has been an initial reduction in the amount of traffic (particularly heavy traffic) passing through the CBD and especially on Wairakei Drive as a result of the ETA. However, a general improvement in the economy and increased local development has recently resulted in an increase in traffic both along the ETA, and into and through the CBD.

2.4.3 Control Gate Bridge

The Taupō Investigation (TDG 2018) identified the current transport issues in the northern outlet and the CBD area within Taupō, including Wairakei Drive from Huka Falls Road to and from the Taupō town centre. The Taupō Investigation then assessed the case for investment in options that improve traffic flow based on the transport issues identified. TDG has analysed the traffic volumes on Control Gate Bridge as part of the Taupō Investigation (2018). The investigation shows the traffic on the Control Gates Bridge over the past 10 years has changed significantly. In 2010 the ETA opened, and the traffic flow on the Control Gates Bridge dropped from 29,000-30,000 vpd (measured in 2007 and 2009) respectively to just under 24,800 vpd.

In 2013, the traffic flow was measured at 25,700 vpd and has been steadily increasing since then, with an average growth of approximately 1% increase per year.

In September 2017 the average weekday traffic flow at the bridge was measured at 26,150 vpd.

Figure 2-4 Control Gate Bridge Looking South

2.5 Safety

A search of the NZ Transport Agency Crash Analysis System (CAS) database was undertaken. The data was used to identify reported crashes that have occurred on the road network around the Nukuhau Development during the past 5 years between 01/09/2013 – 31/08/2018. The crash numbers and locations are illustrated in Figure 2-5 and summarised in Table 2-3 and Table 2-4. Note that in Figure 2-5, the red circles show the locations of the access points providing connections to the Nukuhau Development.

There were 71 reported crashes in this area during the 5-year period from 2013 to 2018.The number and severities of these crashes are summarised in Table 2-3. The annual number of reported crashes has tripled from 2014 (6 crashes) to 2015 (18 crashes) and slightly decreased since 2015. Among the 71 crashes 15 resulted in injuries to road users. None of the crashes resulted in fatalities, 1 crash resulted in serious injuries and 14 crashes resulted in minor injuries. The one serious injury crash was due to a single vehicle losing control at the Noble Street and Norman Smith Street Intersection. The vehicle lost control going westbound on Norman Smith Road, crossed a kerb and crashed into a raised retaining wall. Most of the crashes were due to rear end/obstruction (24) and crossing/turning movements (21), details of which are included in Table 2-4.

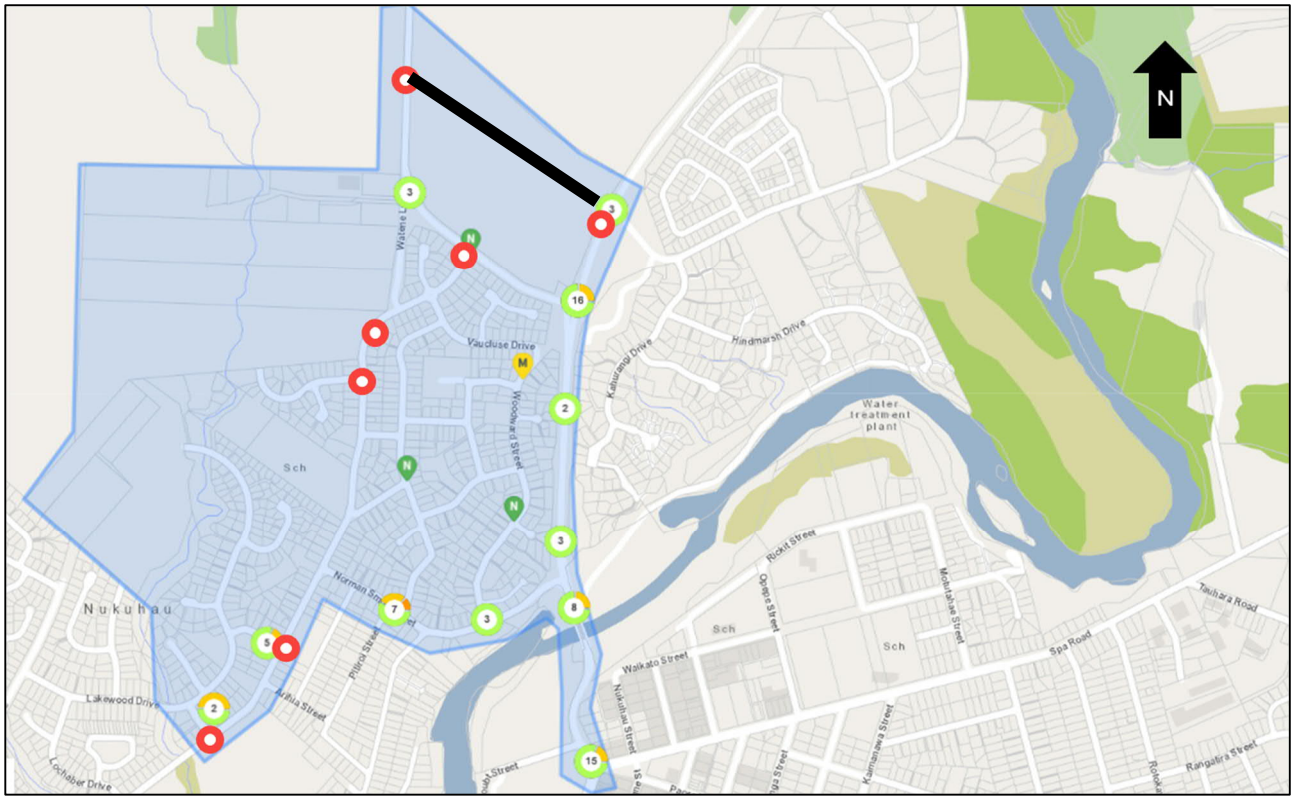


Figure 2-5 Crash Locations

Table 2-3 2013 - 2018 Crash Number from CAS

CRASH YEAR	SERIOUS CRASH	MINOR CRASH	NON-INJURY CRASH	TOTAL
2014		2	4	6
2015	1	2	15	18 ↑
2016		5	12	17 ↓
2017		4	12	16 ↓
2018		1	13	14 ↓
Total	**1**	**14**	**56**	**71**

Table 2-4 Crash Movement Code

ROAD SAFETY REPORT MOVEMENT GROUP	SERIOUS CRASH	MINOR CRASH	NON-INJURY CRASH	TOTAL
Bend-Lost control/Head on	1	4	8	13
Crossing/Turning		7	14	21
Overtaking		1	7	8
Rear end/obstruction		1	23	24
Straight-Lost control/Head on		1	4	5
Total	**1**	**14**	**56**	**71**

2.5.1 Crash Analysis Findings

The crash history indicates that the proposed accesses to and from the Nukuhau Development are located in areas that have a low number of crashes, which is prefered from a traffic safety perspective.

The NZ Transport Agency assessed all vehicle crashes within the 10-year period between 2003-2012 and listed the Top 100 High Risk Interesections within New Zealand. The Poihipi Road and Wairakei Drive Intersection was identified as the second most dangerous intersection in NZ. The crash history shows that 16 crashes were reported at the Poihipi Road and Wairakei Drive Intersection, of which 12 of them were associated with cross and turning crashes including 4 minor crashes. This is consistent with this intersection being located in a higher speed environment of 80 km/h.

The proposed Plan Change proposes to close and relocate the current Poihipi Road and Wairakei Drive Intersection and realign Poihipi Road to form a new intersection with Wairakei Drive and Huka Falls Road, which is likely to significantly reduce the crash risk of this section of Wairakei Drive.

Speed limits over the section of Wairakei Drive, Acacia Bay Road and Poihipi Road in the vicinity of the Site have been reduced to be in line with the Speed Limit Bylaw dated December 2018, details can be found in Section 4 of this report. After the speed reduced to align with the Speed Limit Bylaw, all proposed accesses to the Nukuhau Development are located on 50 km/hr roads. In the safe system persepective, the frequency and severity of crashes are likely to be reduced with the reduced speed limit.

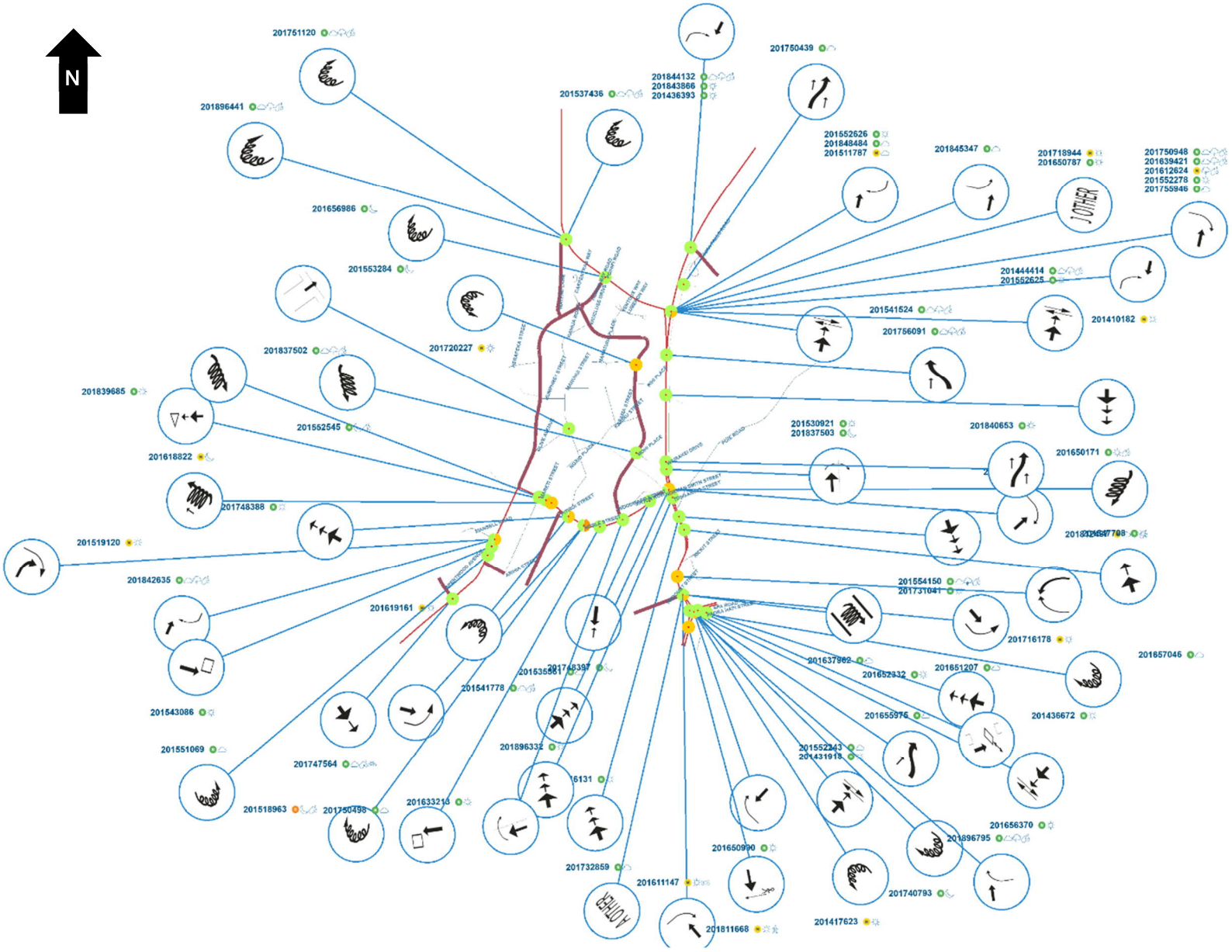


Figure 2-6 Collision Diagram

3 Taupō District Plan and Strategic Context

3.1 District Plan and Zoning

The District Plan outlines permitted land-use around the Nukuhau Development. All the land parcels within the Nukuhau Development area are zoned as 'Rural Environment'. The north-east land parcel also includes a section of the existing (and proposed) Poihipi Road corridor reserve. There is no other zoning or overlay matters affecting the site. The existing land-use surrounding the Nukuhau Development is one of the following three categories within the District Plan, as depicted in Figure 3-1.

- Rural Environment
- Low Density Residential
- Residential Environment

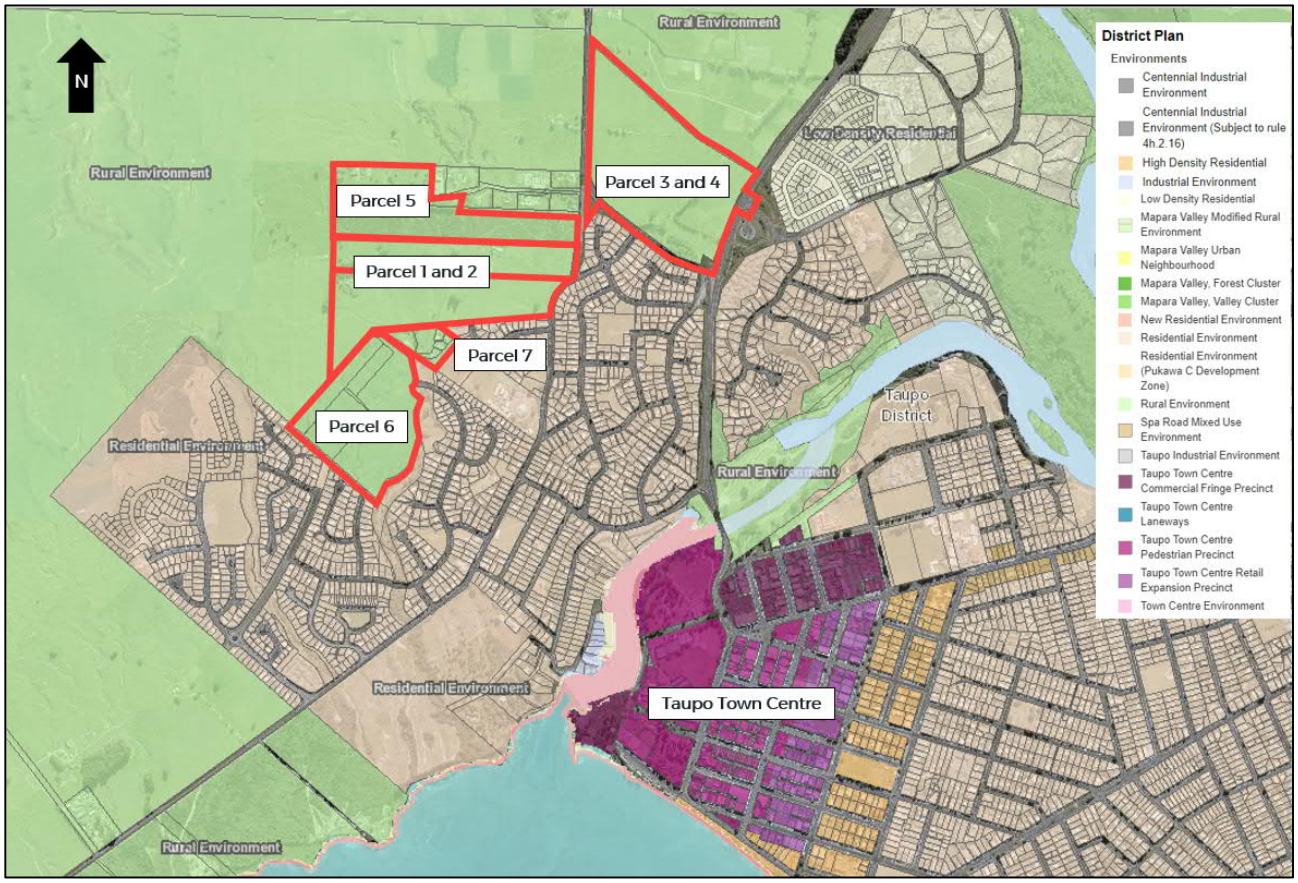


Figure 3-1 District Plan Zoning

3.2 Strategic Context

The strategic context for the investigation is provided by two key strategic planning documents:

- Taupō District 2050 District Growth Management Strategy (2018); and
- Taupō District Long Term Plan 2018-28 (2018).

The Taupō District Long Term Plan 2018-28 (2018) indicates that the district population is projected to increase from 34,800 in March 2013 to a peak of 39,100 in 2038 before declining. It is projected that approximately 3000 lots are required to meet residential land demand over the next 30 years.

Section 3 of the Taupō District 2050 District Growth Management Strategy (2018) identifies that the site is within a "Future residential growth" area. The proposed rezoning will potentially provide around 750 residential dwellings.

Figure 3-2 Taupō Future Residential Growth Areas
Source: Taupō District 2050 District Growth Management Strategy (2018)

3.3 Taupō Urban Structure Plan

The Future Growth Concept Map from the Taupō Urban Structure Plan (2004) illustrates some of the future urban growth and road network concepts around Taupō, Acacia Bay and surrounds. An extract from the Future Growth Concept Map is included in Figure 3-3.

There are a few indicative future roading planned around the Nukuhau Development, the indicative road networks from the concept map has informed the conceptual internal and external road network proposed for the Nukuhau Development.

It is to note that we understand from our meeting with TDC on Wednesday, 2 October 2019 that work had been undertaken post 2004 Urban Structure Plan that made amendments to the classification and routes of roads. Docherty Drive is still classified as a secondary collector road however with a narrower boundary – 20 m cross section and 11 m carriageway, linking to Acacia Bay Road near Watene Lane. These changes have been incorporated in the development layout planning.

The northern extension of Docherty Drive (A) and Acacia Bay Road (B), as well as the realignment of Poihipi Road form part of the road network proposed for the Nukuhau Development and this is discussed in Section 5.2 of this report.

The PPC road layout proposals were discussed in a separate meeting with Mr Roger Stokes of TDC on Friday, 18 October 2019.

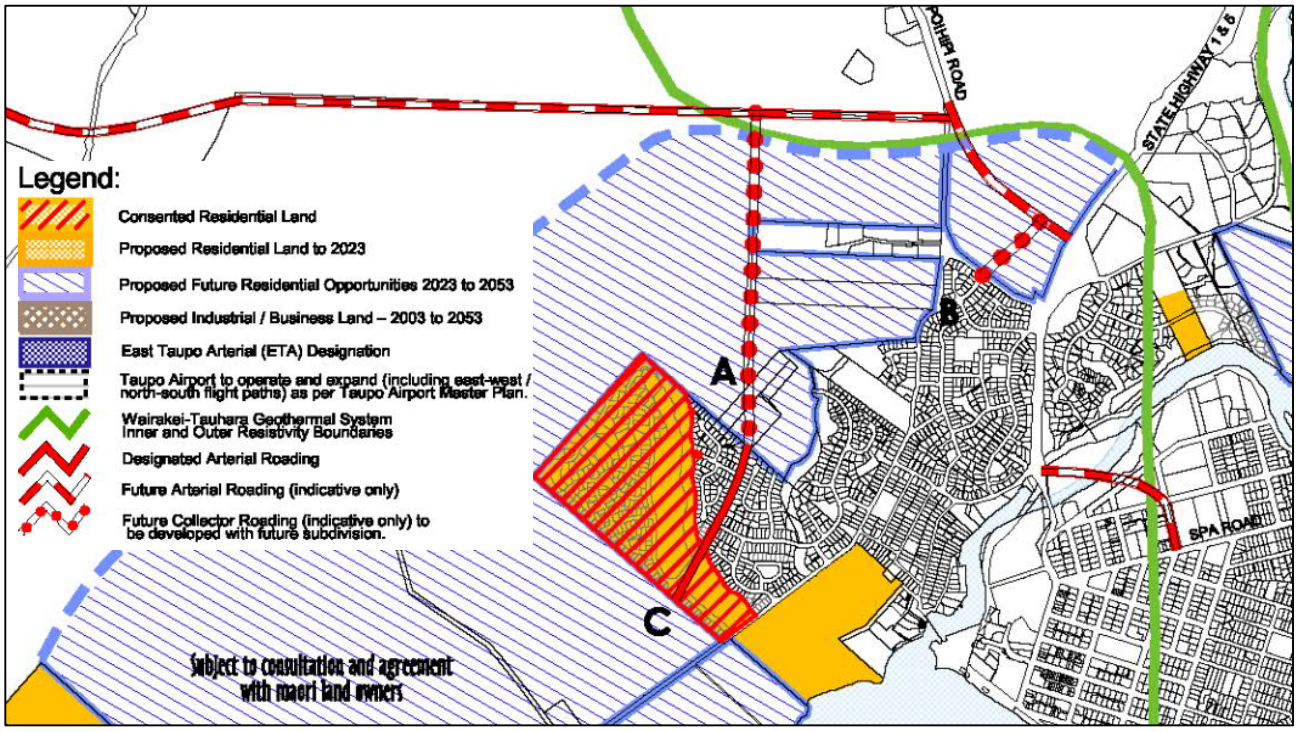


Figure 3-3 Future Urban Growth Concepts
Source: Taupō Urban Structure Plan

4 Transport Network Improvements

4.1 Taupō Northern Corridor Improvements

The northern gateway to the Taupō town centre along Wairakei Drive has undergone several improvements, as illustrated in Figure 4-1. The project was referred to as the 'Northern Corridor Improvements' and divided into 5 phases, including the installation of traffic signals at the intersection of Norman Smith Street and Wairakei Drive.

Improving safety, particularly for pedestrians and cyclists, was the main driver for the decision that also included for the implementation of traffic calming measures, minor changes to the Poihipi Road and Wairakei Drive intersection, and completion of the widening of the shared path on the Control Gates Bridge. TDC noted on their website that the Taupō North Improvement work was expected to help improve travel times for those travelling from the north into the central business district.

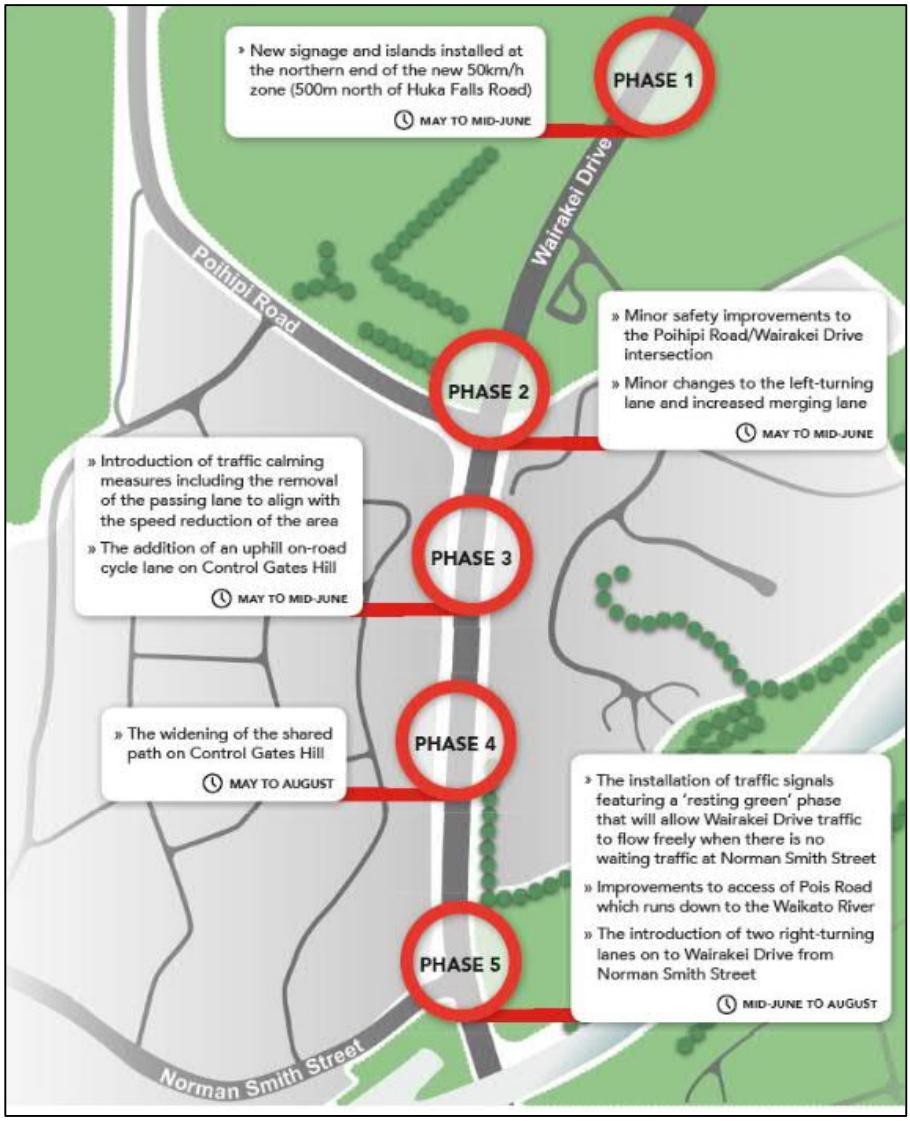


Figure 4-1 Taupō Northern Corridor Improvements
Source: Taupō District Council website

4.1.1 Norman Smith Street and Wairakei Drive intersection plan

A layout plan for the Norman Smith Street and Wairakei Drive signal intersection is shown in Figure 4-2. The project provides for safe entry of Wairakei Drive traffic into Norman Smith Street and controlled crossings for use by pedestrians, amongst other improvements.

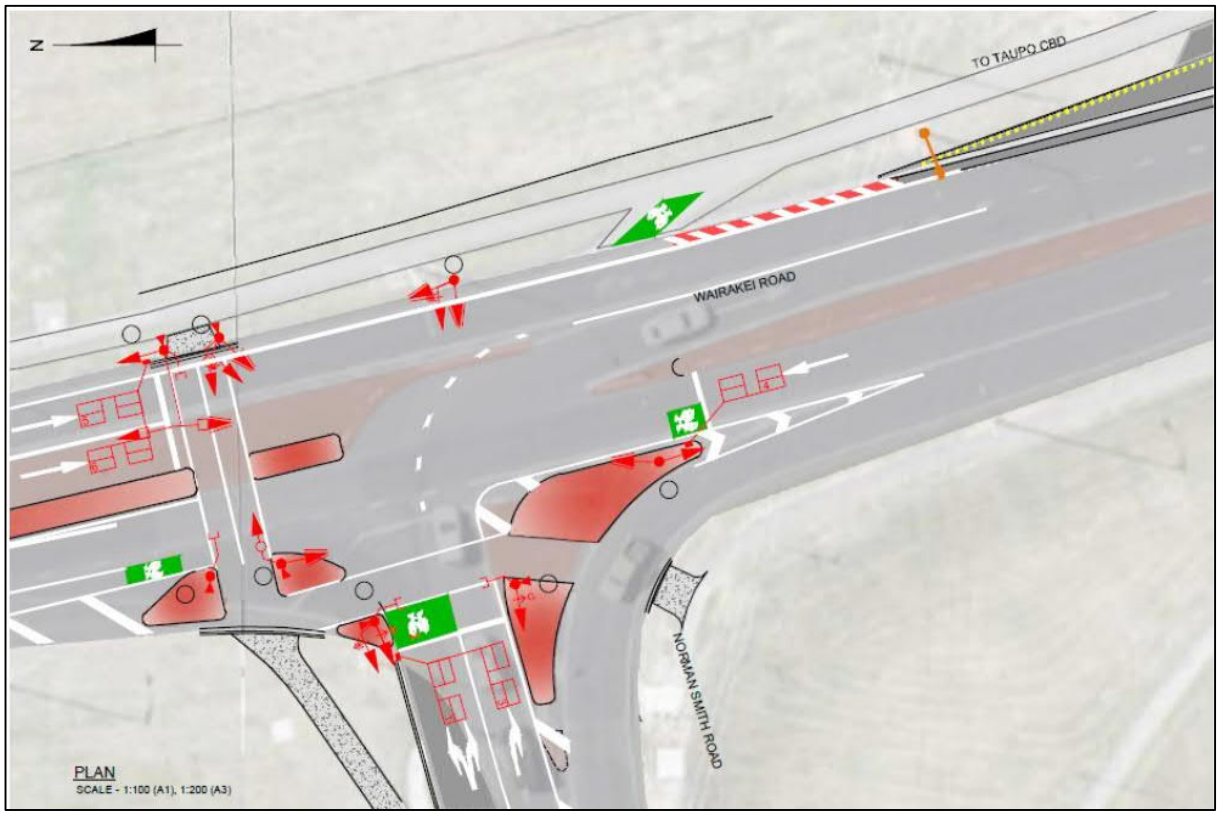


Figure 4-2 Norman Smith Street and Wairakei Drive signal indicative intersection plan
Source: Taupō District Council website

4.2 Speed Limit Changes

Reduced speed limits have been implemented in line with the Speed Limit Bylaw which came into force on 1 December 2018. The speed limit changes include:

- Section of Wairakei Drive from the SH1 / Wairakei Drive Intersection to 500 m north of Huka Falls Road reduced from 100 km/h to 80 km/h;
- Section of Wairakei Drive from 500 m north of Huka Falls Road to 100 m north of Norman Smith Street reduced from 80 km/h to 50 km/h; and
- Sections of the Pohipi Road and Acacia Bay Road reduced to 50 km/h.

Figure 4-3 shows details of the sections of the road in the vicinity of the Nukuhau Development where the speed limits have been reduced to 50 km/h. Speeding is one of the common causes of crashes, and from a safety perspective, the reduced speed limits are likely to have a possitive impact on the number and the severity of the crashes in the Northern part of Taupō.

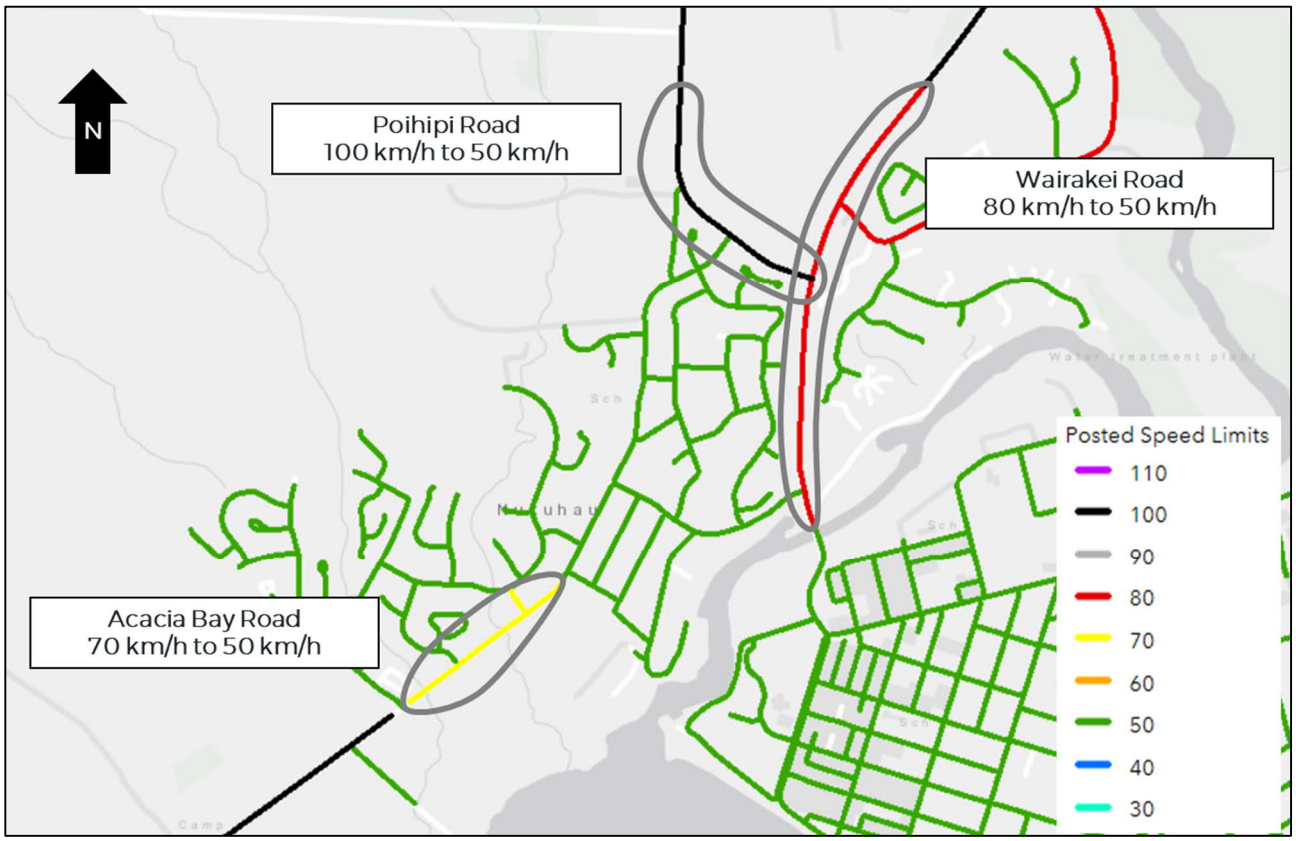


Figure 4-3 Speed Limit Update
Source: NZTA Mega Map

5 Rezoning Proposal

5.1 Overview

This section of the report provides an outline of anticipated future network conditions following the proposed rezoning of the land within the Nukuhau Development to residential. This section commences with a brief discussion of the suitability of the Nukuhau Development and its proposed accesses followed by an outline of the estimated trip generation potential of the Nukuhau Development.

5.2 Proposal Details

As mentioned in Section 3.1 of this report, the Site is presently zoned as 'Rural Environment' in the District Plan. Land-use zoning details of the PPC can be found in Figure 5-1 below (copies of the zoning plan and staging plan is included in Appendix C).

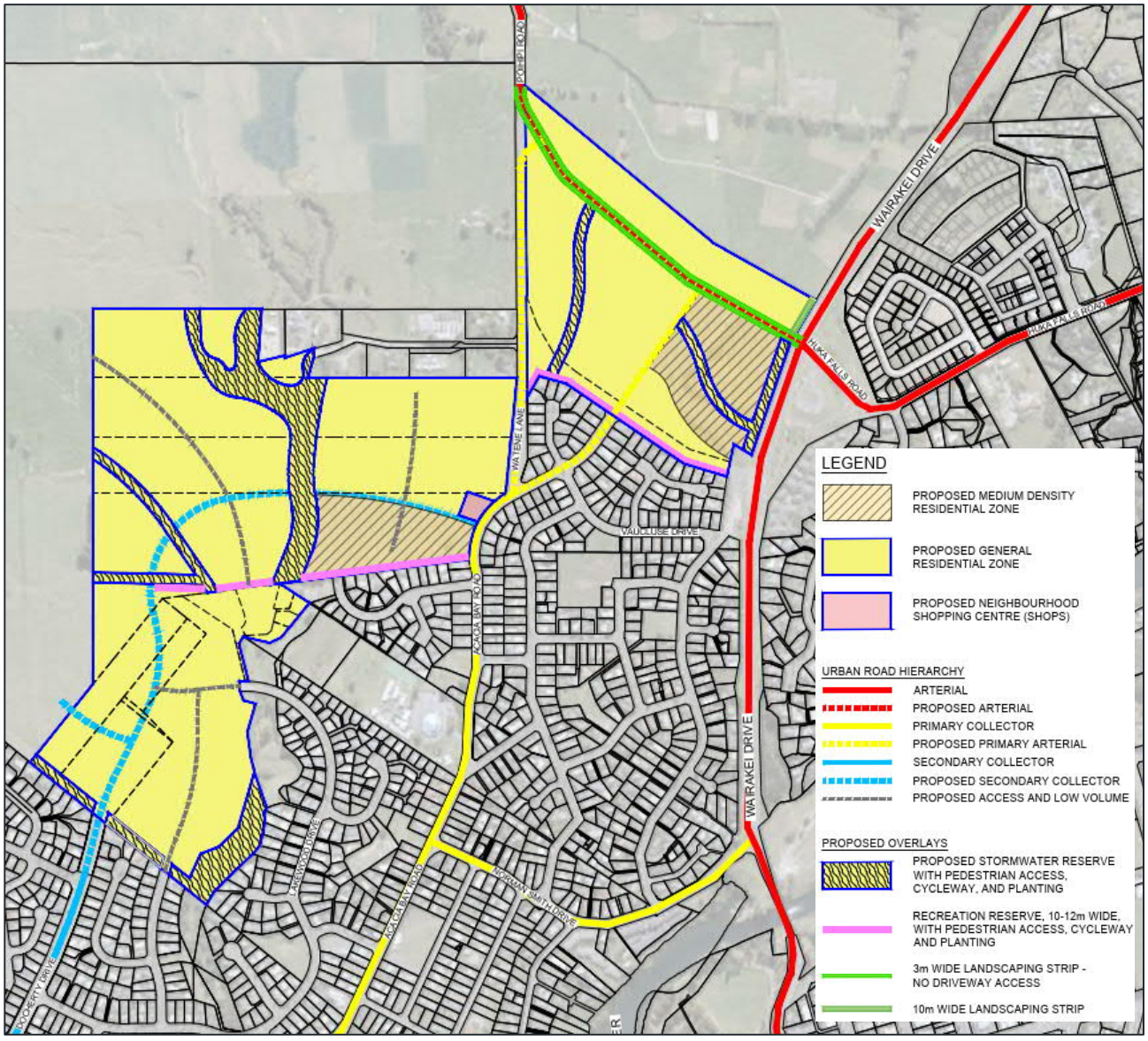


Figure 5-1 Nukuhau Development Road Hierarchy Map with Proposed Zoning
Source: WSP, 2020

The PPC seeks to predominantly rezone the Site; apart from Land parcel S (Refer to Figure 2-1); from 'Rural Environment' zone to 'Residential Environment'. Land parcel S is council reserve (area of 3,866 m^2) and is excluded from the plan change.

The Proposal includes for 'General Residential' zones and 'Medium Density Residential' zones in selected areas, as shown in Figure 5-1. An overall residential density of 10 dwellings/hectare has been used in this TIA. The overall density is based on the total area of the Nukuhau Development land including land occupied by roads, other infrastructure, landscaping and effect from topography. The 10 dwellings/hectare density is used to determine the maximum number of dwellings that can be developed and thus the maximum trip generation. The conservative trip generation has been used in the traffic model to analyse the effect of the Nukuhau Development on the road network.

Note that the 10 dwellings/hectare density only apply to Land Parcels 1 to 6 and does not apply to land parcel 7. This is because most of the land parcels (including O, P, Q and R) in Land Parcel 7 have already been part developed with residential dwellings. A maximum of three houses could potentially be developed on land parcel N (refer to Figure 2-1), because part of land parcel N is a gully area and unlikely to be developed. Land parcel M (refer to Figure 2-1) has one existing house and one additional house could potentially be developed. Therefore, a maximum of four additional houses could potential be developed on land parcel 7 after the plan change. These Parcels can be accessed through the existing accessways; therefore, the impact of land parcel 7 is minimum from a traffic perspective.

Details of each of land parcels 1 to 7 including size and approximate dwellings are included in Table 5-1 (the parcel numbers refer to Figure 2-2). The number of dwellings is calculated based on the size of the parcel and the overall density (10 dwellings/ha). The table indicates that some 780 residential lots could be achieved on the Site under the maximum density of 10 dwellings/ha.

Table 5-1 Development Details

Parcel Number	Area (ha)	Density (dwellings/ha)	No. Dwellings (Approx.)	Combined No. Dwellings (Parcel)	Current Zoning	Proposed Zoning
1	9.093	10	90	236	Rural	Residential
2	14.554	10	150		Rural	Residential
3	22.2778	10	225	240	Rural	Residential
4	1.689	10	17		Poihipi Road Corridor	Residential
5	14.3	10	143	143	Rural	Residential
6	15	10	150	150	Rural	Residential
7 (part)		-	5	5	Rural	Residential
Total	77.78	10	780			

In addition, a local convenience centre for shops and services are provided for on a part of land parcel 2 with a land area of approx. 2 500 m^2. It is envisaged that the building footprint will be around 1 000 m^2.

5.2.1 Parcels 1, 2, 5 and 6 Development

These 4 parcels are approximately 53 hectares in area and are located on the western side of Nukuhau and Acacia Bay Road. Table 5-1 indicates that a maximum of 533 residential dwellings could be achieved within these parcels.

As shown in Figure 5-2, there are five proposed accesses to and from these parcels, all trips in and out from the Nukuhau Development will end up on Acacia Bay Road. All property accesses within the parcels will be provided by the internal road network.

5.2.2 Parcels 3 and 4 Development

Parcels 3 and 4 are comprised of approximately 24 hectares, located on the eastern side of Acacia Bay Road, bounded by Poihipi Road and Watene Lane to the west and Wairakei Drive to the east. A maximum yield of 242 dwellings could be achieved. Parcels 3 and 4 are bounded by residential zone to the south, rural land to the north, Poihipi Road to the west and Wairakei Drive to the east.

As shown in Figure 5-2, there are three accesses proposed to and from these parcels from the existing road network. Proposed Accesses 6, 7 and 8 join up with Poihipi Road, Acacia Bay Road and Wairakei Drive respectively. No direct access to properties will be allowed from Poihipi Road or Wairakei Drive.

5.3 Road Network

Eight accesses to the roading network are proposed to provide connections to the trips to and from the Nukuhau Development, five of the accesses are via continuation of an existing road, the remaining three accesses are new intersections. Each of these accesses are listed below and discussed in more details in the next sections of this report. Figure 5-1 shows an indicative layout of internal road network.

- Access 1 – Parcels 1, 2, 5 and 6 (formed new intersection with Acacia Bay Road)
- Access 2 (cul-de-sac) – Parcels 2 approximately 10 residential lots (cul-de-sac of Herapeka Street then joins Acacia Bay Road)
- Access 3 – Parcels 1, 2, 5 and 6 (continuation of Lakewood Drive then joins Acacia Bay Road through Mansell Road)
- Access 4 – Parcels 1, 2, 5 and 6 (continuation of Northwood Road then joins Acacia Bay Road through Brentwood Avenue)
- Access 5 – Parcels 1, 2, 5 and 6 (continuation of Docherty Drive then joins Acacia Bay Road)
- Access 6 – Parcels 3 and 4 (formed new intersection with Poihipi Road)
- Access 7 – Parcels 3 and 4 (continuation of Acacia Bay Road)
- Access 8 – Parcels 3 and 4 (formed new intersection with Wairakei Drive)

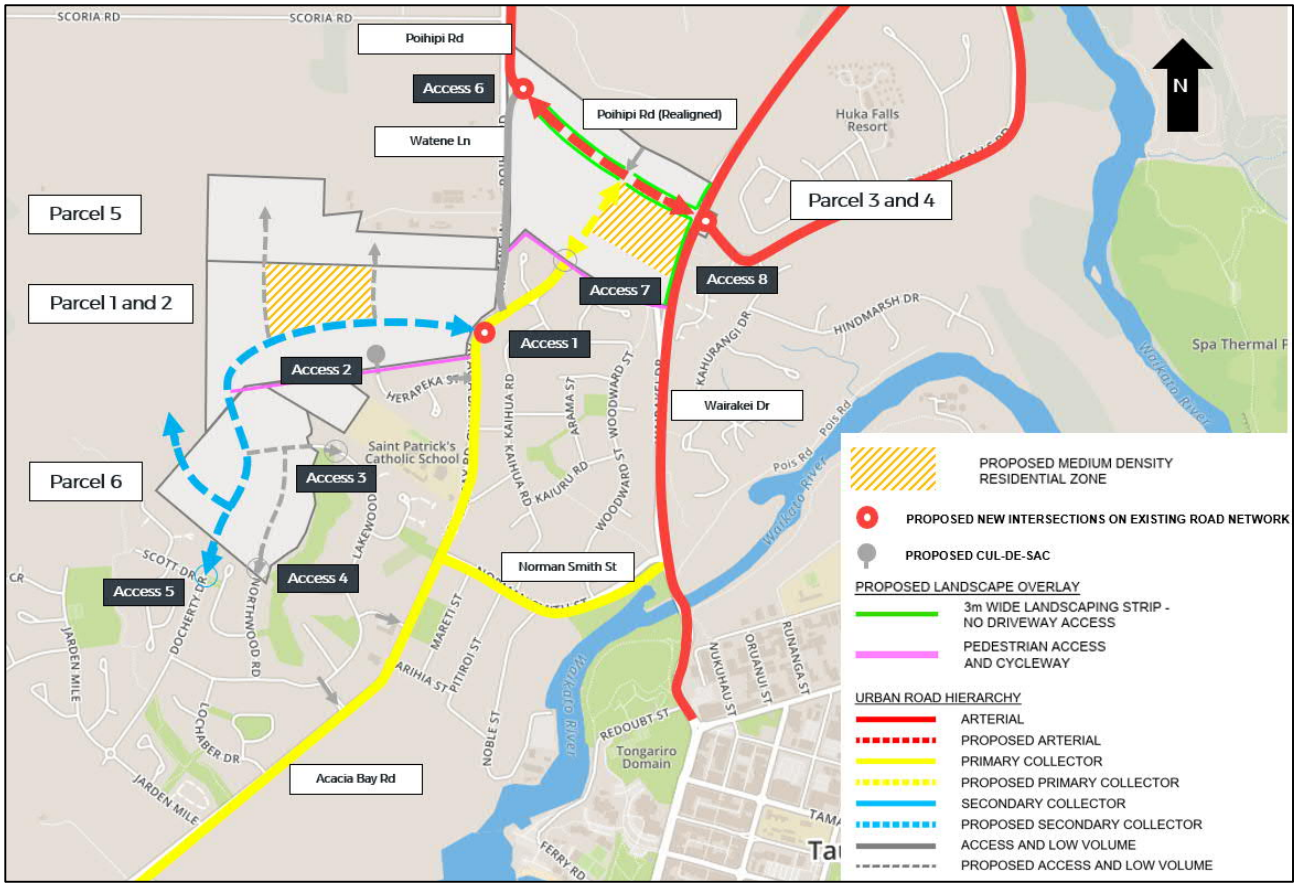


Figure 5-2 Proposed Access and Network Connection

5.3.1 Poihipi Road Realignment and Watene Lane Extension

The proposed Plan Change seeks to accommodate the proposed realignment of Poihipi Road as illustrated in Figure 5-1. A section of the existing Poihipi Road is proposed to be closed and relocated/realigned further north and form a 4-leg intersection with Huka Falls Road and Wairakei Drive.

Watene Lane is proposed to be extended further north along the current alignment of Poihipi Road and join with the realigned Poihipi Road. The proposed Poihipi Road realignment is consistent with the conceptual road network illustrated in the Taupō Urban Structure Plan as shown in Figure 3-3 of this report.

One of the long-term options proposed by the Taupō Investigation (TDG 2018) was to "Install signals at Huka Falls Road in conjunction with developer led construction of the eastern end of the WEKA". The Taupo Investigation (TDG 2018) noted that if the eastern end of the WEKA was constructed, Poihipi Road will be realigned to join Wairakei Drive and form a four-leg signal intersection with Huka Falls Road. It is unlikely that the full WEKA will now be built, but the eastern end could be built as part of the Nukuhau Development.

A signalised intersection at the Poihipi Road/Huka Falls Road/Wairakei Drive intersection was suggested by the Taupō Investigation (TDG 2018). Whereas a signal intersection is preferred, a roundabout could be an alternative option. Further investigation is required by TDC to determine the form of the intersection to be constructed.

To maintain a relative high road function of Poihipi Road which is classed as an Arterial Road, it is recommended that residential dwellings from the Nukuhau Development do not have direct access to the realigned Poihipi Rd.

5.3.2 Docherty Drive Extension

As mentioned in Section 3.3 of this TIA, Docherty Drive is planned to link to Acacia Bay Road near Watene Lane instead of being extended further north (Figure 5-2). As a result, the extension of Docherty Drive will go through Parcel 1 and Parcel 2 of the Nukuhau Development, providing direct property accesses.

The existing constructed Docherty Drive is classified as an "Access Road". The extended Docherty Drive as well as the existing section is proposed to be functioning as a "Secondary Collector Road".

Therefore, it is recommended that there is direct property access from the Nukuhau Development onto the planed future extension of Docherty Drive, to match the road function of the downgraded Docherty Drive, which is favourable from a traffic impact perspective.

5.3.3 Acacia Bay Road Extension

Acacia Bay Road is planned to be extended further north-east to join up with the realigned Poihipi Road (Taupō Urban Structure Plan Section 3.3 of this TIA) within Parcels 3 and 4 of the Nukuhau Development.

The extended section of Acacia Bay Road is identified as "Future Collector Road" in the Taupō Urban Structure Plan. It is recommended that the Nukuhau Development provides direct residential accesses from the extended section of the Acacia Bay Road to match with the existing road environment, as the existing Acacia Bay Road is providing direct accesses to the current residential dwellings.

5.3.4 Herapeka Street Cul-de-sac

Based on our observation of the existing alignment of Herapeka Street, the western end of Herapeka Street was not terminated and left open for potential extension. However, based on the result and feedback from our public engagement and our meeting with TDC, we decided to make provision for a cul-de-sac arrangement as part of the Nukuhau Development. It is to note that a small number of the residential lots from the Nukuhau Development will gain access through the Herapeka Street as part of the cul-de-sac implementation.

5.3.5 Design Recommendations

In general, the TDC Code of Practice (2009) is recommended to be used for planning and design purpose for the internal and external road and transport infrastructure. TDC Code of Practice (2009, page 75) has specified the TDC roading guidelines. The Nukuhau Development will make provision for road reserve widths that comply with these requirements.

According to the TDC Code of Practice, for public roads within urban residential environment, the minimum road cross section width is 19 m with a design speed of 40 km/h. At this stage, a 40 km/h design speed is recommended for the internal road networks within the proposed Nukuhau Development. The lower speed environment is to cater for pedestrians and other vulnerable road users within the residential area which also aligns with the Safe System Approach.

TDC has specified an approximate 30 m wide road reserve for the realigned Poihipi Road on the TDC GIS Map[2].The cross-section width aligns with the TDC Code of Practice (2009) for an arterial road within an urban area. The width of the realigned Poihipi Road is to incorporate with the relatively high road function and potentially a 3 m wide shared path on one side to connect with any future path along Wairakei Drive.

As shown in Figure 3-3, Docherty Drive is classified as collector road in the Taupō Urban Structure Plan. To incorporate the future road function of Docherty Drive, the minimum cross section width for the extension of Docherty Drive is 22 m according to the TDC Code of Conduct, with a design speed of 50 km/h. However, based on our understanding from the meeting the TDC, a 20 m cross section is required for Docherty Drive extension with a 11 m carriageway (7 m for traffic lanes with 2 m parking on both sides).

No detailed information has been provided on the design of the internal roads in terms of proposed cross section and gradients at this stage.

5.3.6 Road Network Summary

This TIA has not identified any fundamental issues or constraints with the road network that could not be addressed during future design development. The proposed road network (Figure 5-1 and Figure 5-2) aligns with the conceptual road layout in amended Taupō Urban Structure Plan and will be adequate to accommodate the Nukuhau Development traffic.

5.4 Pedestrian and Cycling Network

Figure 5-3 below is an extract from TDC's Cycling and Walking Strategy, Taupō Cycle Network, 2005) which shows the current and proposed cycle and shared paths in Taupō

There is a proposed cycle lane on Acacia Bay Road and Norman Smith Street near the Nukuhau Development area. The shared path on Wairakei Drive is proposed to be extended to the intersection with Huka Falls Road, where the realigned Poihipi Road will join in future.

Two additional shared paths are proposed as part of the Nukuhau Development as depicted in Figure 5-1. The existing section of the Poihipi Road that being replaced by the proposed realignment will be converted to a shared path only to be used by pedestrians and cyclists. The existing driveway that currently providing access to 38 Acacia Bay Road is proposed to be converted to the other shared path as part of the Nukuhau Development.

The Nukuhau Development will make provision for active modes, such as sidewalks and crossings along internal roads with connectivity to the wider external Taupō Walking and Cycling network. It is noted that all pedestrian and cycle facilities will need to comply with the applicable council design requirements.

[2] http://gis.taupodc.govt.nz/Html5Viewer/?viewer=map

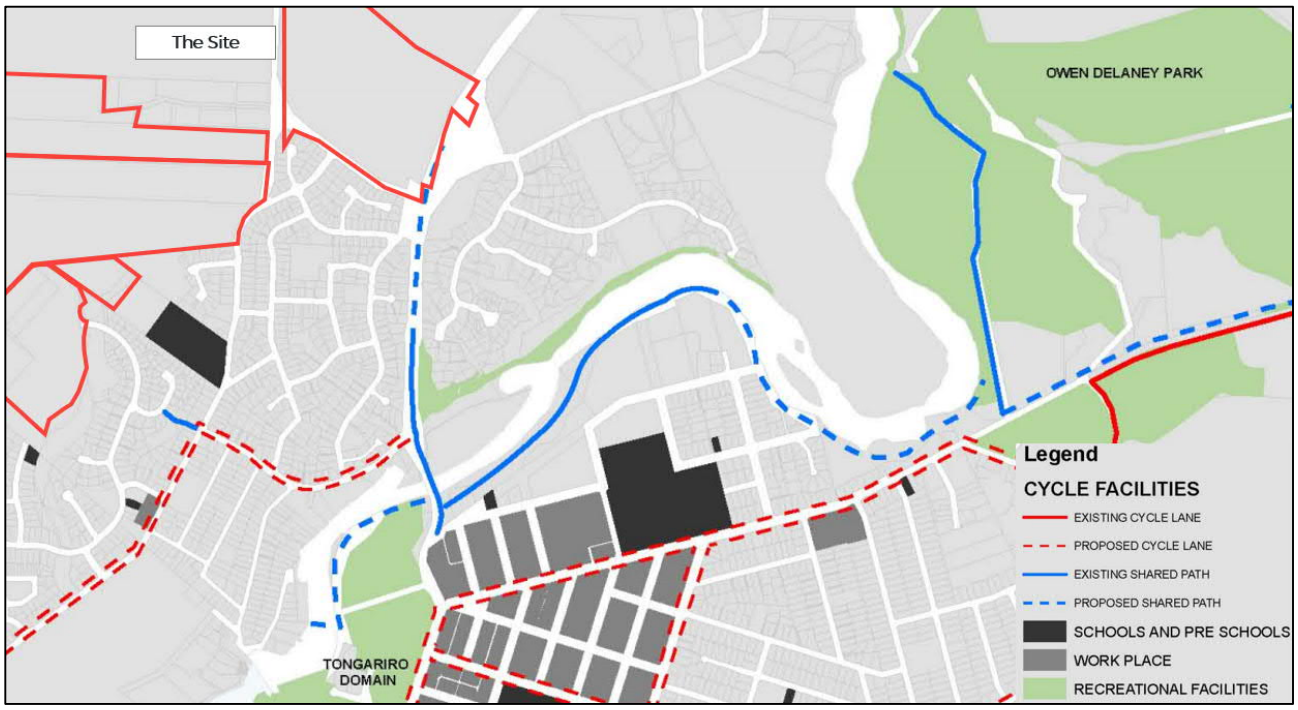


Figure 5-3 TDC Proposed Cycle and Shared Path Facilities

5.5 Public Transportation

Although a bus service is not currently serving the Nukuhau Development area directly, there are two current scheduled bus routes in operation close by.

The Taupō West route provides access to residential areas located to the south and southwest of the site to and from the Taupō town centre. The Taupō North route provides access between Taupō town centre and Wairakei.

With the Nukuhau Development and other potential future development in the north and northwest parts of Taupō, it can be expected that the public transport services and routes will be expanded and/or amended to service these areas as well.

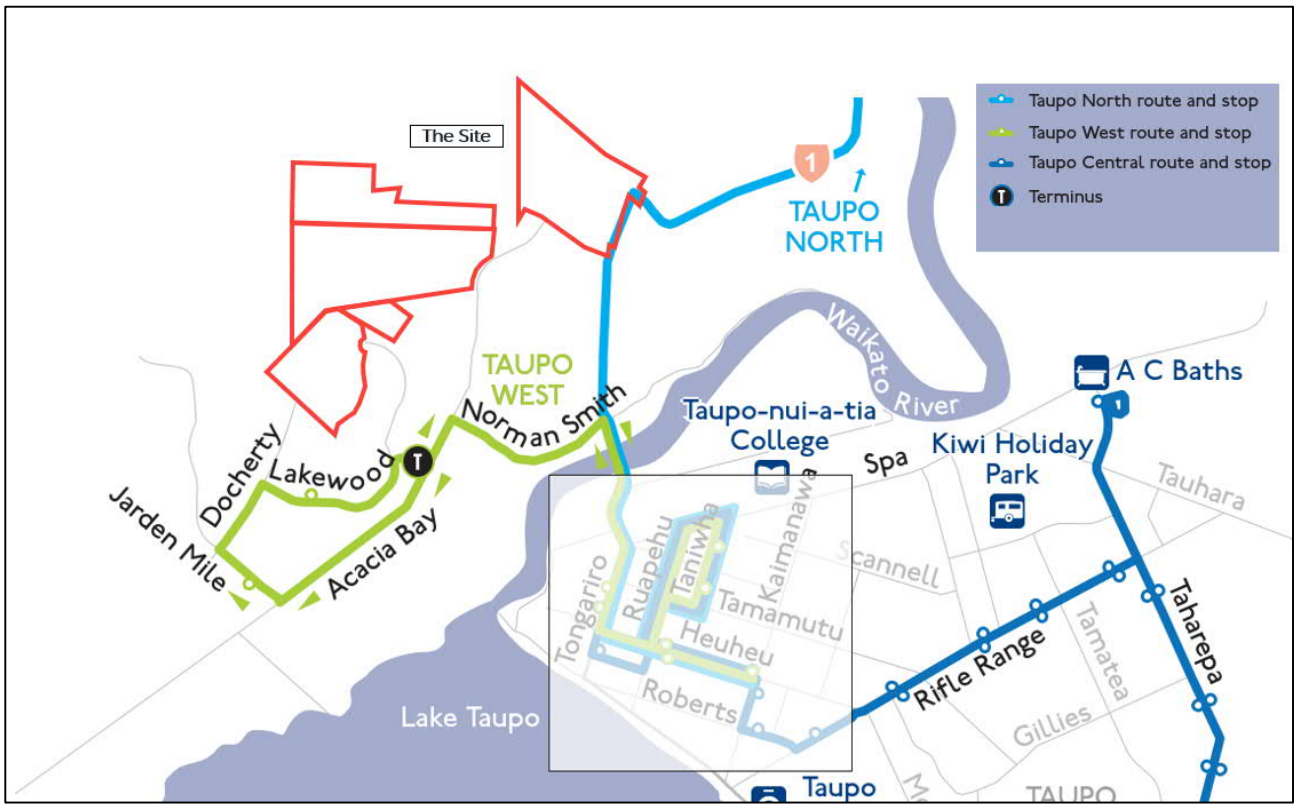


Figure 5-4 TDC Current Bus Network
Source: BUSIT, 2019

6 Access Assessment

6.1 Overview

WSP carried out a site inspection on Thursday, 21 February 2019 at each of the proposed access locations. This access assessment has utilised the Access Standards in section 6.5 of the District Plan. The standards assessed are sight distance and accessway separation distance.

6.2 Sight Distance

The District Plan sets the minimum requirement for access sight distance, as shown in Figure 6-1 below. As noted in Section 5.2 of this TIA, four accesses are a continuation of an existing road where intersection sight distances are not applicable. It is found that the accesses where a new intersection is proposed meet the intersection sight distance requirement, refer to Table 6-1. Note that sight distance is measured from Google Earth.

Minimum Sight distance* (m)

	a.	b.	c.
Posted Speed	**Local Road ****	**Collector Road****	**District Arterial Road****
50/60 km/h	40m***	50m***	90m
70/80 km/h	90m	100m	150m
>80 km/h	160m	160m	200m

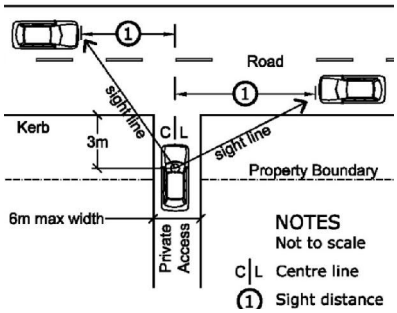


Figure 6-1 TDC Minimum Sight Distance Requirement

Table 6-1 Sight Distance Assessment

ACCESS	ROAD NAME	ROAD TYPE	POSTED SPEED (KM/H)	REQUIRED SIGHT DISTANCE (M)	SIGHT DISTANCE (M)		REQUIMENT MEET?
1	Acacia Bay Rd	Collector	50	50	>150 N	>130 S	✓
2	Herapeka St	Local – Cul-de-sac	50	n/a	-	-	-
3	Lakewood Dr	Local – Continuation	50	n/a	-	-	-
4	Northwood Rd	Local – Continuation	50	n/a	-	-	-
5	Docherty Dr	Collector – Continuation	50	n/a	-	-	-
6	Poihipi Rd	Arterial	50	90	>300	>300	✓
7	Acacia Bay Rd	Collector - Continuation	50	n/a	-	-	-
8	Wairakei Rd	Arterial	50	90	>300	>300	✓

6.3 Access Way Separation

Section 6.5.5 of District Plan sets the minimum requirement for access way separation, as shown in Figure 6-2 below. It is found that all the accesses where a new intersection is proposed meet the requirement. The proposed Access 1 on Acacia Bay Road just meets the minimum access way separation requirement with approximate 15 m on both sides of the access point. Access way separation is measured from Google Earth.

		a.	b.
	Posted Speed Km/hr	Arterial*	Local and Collector*
i.	50/60	20m	15m
ii.	70/80	50m	30m
iii.	>80	60m	60m

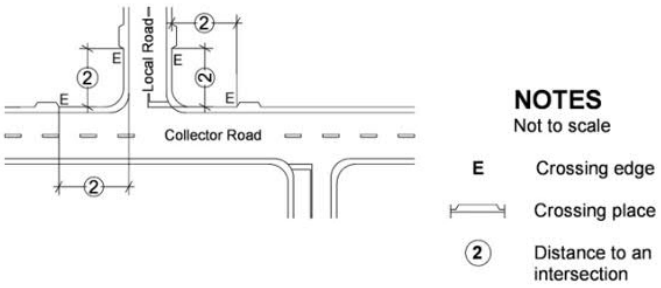


Figure 6-2 TDC Minimum Access Separation Requirements

Table 6-2 Access Way Separation Check

ACCESS	MAJOR ROAD NAME	ROAD TYPE	POSTED SPEED (KM/H)	WAY SEPERATION DISTANCE REQUIRED (M)	WAY SEPERATION DISTANCE (M)		REQUIMENT MEET?	
1	Acacia Bay Rd	Collector	50	15	>50 N	>50 S	✓	✓
2	Herapeka St	Local – Cul-de-sac	50	n/a	-	-	-	-
3	Lakewood Dr	Local – Continuation	50	n/a	-	-	-	-
4	Northwood Rd	Local – Continuation	50	n/a	-	-	-	-
5	Docherty Dr	Collector – Continuation	50	n/a	-	-	-	-
6	Poihipi Rd	Arterial	50	20	>100	>100	✓	✓
7	Acacia Bay Rd	Collector - Continuation	50	n/a	-	-	-	-
8	Wairakei Rd	Arterial	50	20	>100	>100	✓	✓

7 Trip Generation and Distribution

7.1 Residential Trip Generation

The Taupō Traffic Model has been used to determine the residential trip generation rate per household of the Nukuhau Development based on the Taupō local conditions. The trip generation rates used in the Taupō Traffic Model are as follows:

- 0.72 trips/household per hour in AM peak
- 0.85 trips/household per hour in PM peak

The calculated trips generated from Nukuhau Development are summarised in Table 7-1 below. The total number of the residential trips expected to be generated by the Nukuhau Development amounts to approximately 562 trips/hour during the AM and PM peak hours, respectively.

Table 7-1 Summary of Estimated Residential Trip Generation by Land Parcel

Parcel Number	Area (ha)	No. Dwellings	Trip Generation	
			AM Peak Hour	PM Peak Hour
1	9.09	90	65	77
2	14.55	150	108	128
3	22.28	225	162	191
4	1.69	17	12	14
5	14.30	143	103	122
6	15.00	150	108	128
Total	**76.9144**	**780**	**562**	**663**

The TTM was used to assign and distribute the trips generated from the Nukuhau Development to the local road network, taking into consideration of the conceptual internal road and connections to the external road network discussed in Section 5.3 of this report. The detailed traffic volumes distributions from the Nukuhau Development as extracted from the Taupō Traffic Model is included in **Appendix A**.

7.2 Local Convenience Store Trip Generation

7.2.1 Design Trip Generation Rates

The vehicle trip generation rates for the proposed local convenience store facility (approx. 1 000 m^2 gross floor area) was estimated from the design trip generation rates for a small shopping centre from the Transport Agency's Research Report 453 'Trips and Parking Related to Land Use' (from Table 8.10), as summarised in Table 7-2 below.

Table 7-2: Convenience Centre Trip Generation Rates for Design Purposes

Land use	Design Trip Generation Rates (Weekday)	
	Daily (vpd)	Peak hour (vph)
Small shopping centres (< 4000-sqm)	141 trips / 100-m^2 GFA	18.9 trips / 100-m^2 GFA

Notes:
1. GFA = gross floor area
2. New Zealand figures are based on 85% figures from available surveys. For retail uses the 85% trip generation rates may be 1.15 to 1.25 higher than the average.

Source: NZTA, 2011. Trips and parking related to land use. NZ Transport Agency Research Report 453. November.

7.2.2 Retail trip types

7.2.2.1 Internalised trip types

The Transportation Impact Handbook (FDOT 2010) states Internalised trips are where both the origin and destination are contained in the same area or model zone, for example a place of residence to a local store. These destinations can vary in terms of the purpose of the trip and are classed as internalised trips as long as they do not impact on the road network outside of a small, localised area. From a trip rate perspective, these trips require special attention as they are not distributed onto the wider network, but instead stay within the confines of the adjacent road network to access an amenity.

Trip rates should bebroken down by the three main types of trip function: pass-by/diverted trips, cross linkage trips and internalised trips as relevant.

For the development's local convenience store, it is estimated that approx. 60% of the trips will be internalised to the new residential development and the existing residential areas to the east and south.

It is expected that actual level of internalised trips will be less than indicated in Table 7-3 as residents from the new development and the surrounding residential areas would be able to reach the centre on foot with relative ease based on short walking distances and the availability of sidewalks/shared paths and cycleways (where provided).

7.2.2.2 Pass-by and diverted trip types

The establishment of a new activity will attract trips from a variety of sources. Some of the trips will be completely new to the transport network, while others will be diverted from trips already being made on the network. Diverted trips are trips that, under normal circumstances would already be on the network, and may be considered as 'convenience-oriented' trips'. They can be split into two trip types: pass-by trips and link diverted trips.

The ITE (2008) defines a pass-by trip as '…trips [to a site, that] are made as intermediate stops on the way from an origin to a primary trip destination without a route diversion'. Whereas 'link diverted trips' are trips that normally use adjacent sections of the transport network around the site and change their route choice to 'divert' to the site.

The extent of diverted trips (pass-by and link diverted) varies by activity and is also dependent on the geographical location of the site and where it is in comparison to similar land-use activities. While the proportion of diverted trips may reduce the traffic generation effects of a new activity on the wider transport network, it does not change the number of trips that arrive 'at the gate' Therefore, it is important to derive the total external trip generation before applying any reduction that can be attributed to trips of a diverted nature.

For the development's local convenience store, it is estimated that approx. 35% of the external trips will be pass-by trips with the remainder being 'new' trips including diverted and/or cross linkage trips (65%), as indicated in Table 7-3.

7.2.3 Local Convenience Store Trip Generation Summary

The calculated trip generation for the proposed local convenience centre (local shops) are summarised in Table 7-3 below.

Table 7-3: Local Convenience Store Trip Generation Summary

Trip assessment period	Trips (2-way) for 1,000-sqm GFA local convenience centre (local shops)	Internal Trips (60%)	External Trips (40%)	New trips including diverted and/or cross linkage trips (65%)	Pass-by Trips (35%)
Daily (vpd)	1,410	846	564	367	197
Peak hour (vph)	189	113	76	49	26

It is estimated that some 49 'new' trips (including diverted and/or cross linkage trips) will be generated during the weekday peak hour (i.e. less than 1 vehicle trip per minute). Similarly, some 367 'new' trips are expected to be generated on a daily basis.

The relatively low level of traffic of traffic generation can be easily accommodated on the local road network. It is noted that the trip generation of the proposed local convenience store (local shops) have not been modelled in the Taupō Traffic Model (see Section 8) as the expected weekday peak hour is not expected to directly overlap with the commuter peak hour (i.e. during the weekday PM peak hours). The Acacia Bay Road intersection will however need to be assessed in detail from a traffic engineering perspective once more details of the individual uses within the local convenience centre are finalised in due course (i.e. in consideration of the development's final road and residential layout and associated trip distribution and assignment).

8 Future Traffic Performance

8.1 Taupō Traffic Model

WSP engaged Stantec, an independent professional services company, to model the residential component of the proposed Nukuhau Development using the Taupō Traffic Model. The modelling output is used to understand the current and future traffic condition and the impact of the Nukuhau Development on the surrounding road network.

8.1.1 Assumptions

In this TIA, a 2-lane second bridge alongside the existing Control Gate Bridge option has been included for 2041 Taupō Traffic Models with and without the Nukuhau Development. The second 2-lane bridge and the existing 2-lane Control Gate Bridge will form a 4-lane bridge crossing at the current Control Gate location.

The Taupō Traffic Model has been run for the years 2021 and 2041. Year 2021 has been used as the base year scenario with 2041 being the scenario with full development of the Nukuhau site.

8.1.2 Taupō Traffic Model Scenarios

The Taupō Traffic Model has been run with the following five scenarios, with each scenario including traffic models for the AM and PM peak hours:

- Scenario 1: 2021 Base Model – without the Nukuhau Development – 1 bridge
- Scenario 2: 2041 Future Model – without the Nukuhau Development – 1 bridge
- Scenario 3: 2041 Future Model – without the Nukuhau Development – 2 bridges
- Scenario 4: 2041 Future Model – with the Nukuhau Development – 1 bridge
- Scenario 5: 2041 Future Model – with the Nukuhau Development – 2 bridges

Scenarios 2 and 3 are 2041 Future Models with the existing road network and no Nukuhau Development. Scenarios 4 and 5 are 2041 Future Models with traffic from the fully developed Nukuhau Development and proposed road network (Figure 5-1). Comparisons have been made to these scenarios to determine the traffic effects generated from the Nukuhau Development.

8.1.3 Future Traffic volumes

The future traffic volumes used in this TIA are obtained from the Taupō Traffic Model.

The Taupō Traffic Model is demand driven and the modelled traffic volumes will not be restricted by road or bridge capacity. Therefore, the traffic volumes obtained from the 2041 Future Models with or without a second bridge are very similar.

The link traffic volumes obtained from Taupō Traffic Model is used in SIDRA (version 8) to analyse the performance of the key intersections.

Due to the limitation of the Taupō Traffic Model as mentioned above, the traffic volumes extracted from the Taupō Traffic Model are representing the expected traffic situations.

The 2041 Future Model traffic volumes from the 2 bridges scenarios (Scenario 3 and 5) are used in SIDRA models.

The traffic turning volumes from the intersections and routes indicated in Figure 8-1 are extracted from Taupō Traffic Model, detailed intersection turning traffic volumes of the intersections along the three main routes are included in Appendix A. The three main routes are listed below:

- Yellow Route – Acacia Bay Road (Scenario 1, 3 and 5)
- Orange Route – Current Poihipi Road/Wairakei Drive (Scenario 1 and 3)
- Blue Route – Proposed Poihipi Road/Wairakei Drive (Scenario 5)

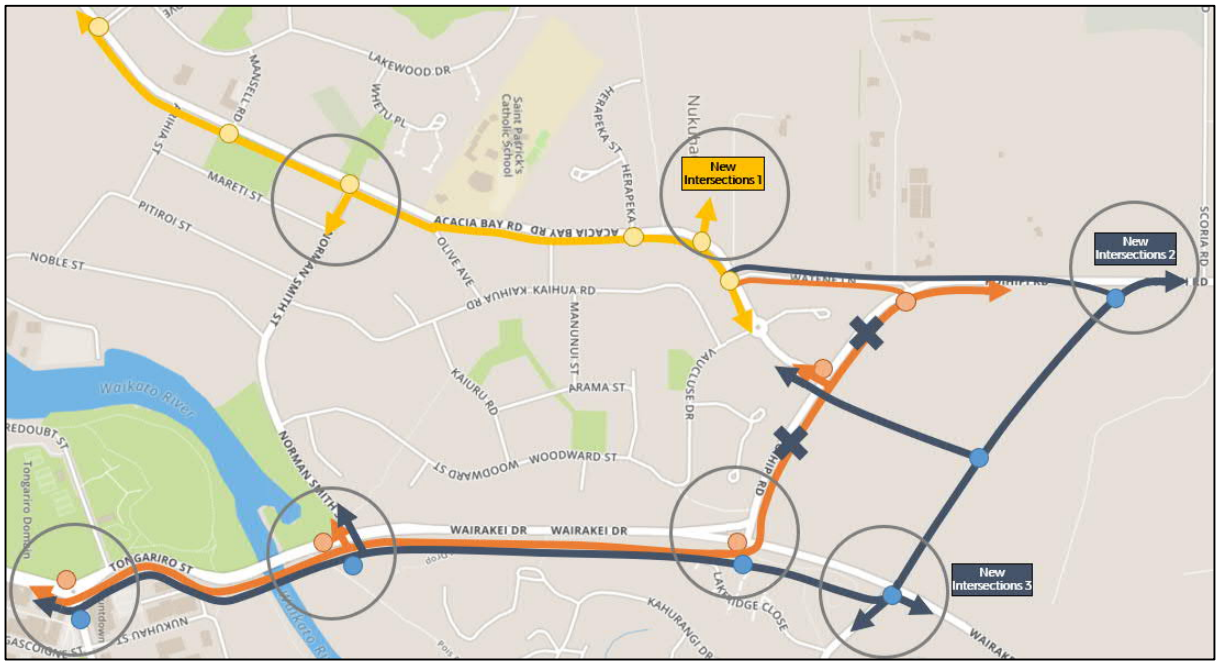


Figure 8-1 Key Routes and Intersections

8.1.4 Control Gate Bridge Capacity

The Taupō Investigation (TDG 2018) noted the capacity of the bridge is about 1450 vph in either direction, as this is the maximum level of traffic that can be accommodated over the bridge before queues develop. The 2041 Future Model without the Nukuhau Development indicates that, for instance, there will be a southbound peak of 1627 vph going past the bridge in the AM peak, which is over the derived capacity. The 2041 Future Model shows that the bridge will be operating with Level of Service (LOS) F with extensive queues developed north of the bridge. Table 8-1 summarises the Control Gate Bridge performance under different scenarios.

Therefore, it is evident that by 2041, another bridge crossing will be required to cope with the traffic demand in Taupō with or without the Nukuhau Development.

We understand that Mighty River Power is carrying out an assessment of the existing Control Gate Bridge structure and that TDC is planning to carry out a feasibility study in 2019/2020 to analyse different options for the location and design of a second bridge crossing.

Table 8-1 Control Gate Bridge Performance

SCENARIO	LANES INTO TOWN		LANES OUT FROM TOWN	
2021 Model AM Peak No Development	1441 vph / LOS E		624 / LOS D or better	
2021 Model PM Peak No Development	957 / LOS D or better		1390 / LOS E	
	1 Bridge 1-lane per direction	**2 Bridges 2-lane per direction**	**1 Bridge 1-lane per direction**	**2 Bridges 2-lane per direction**
2041 Model AM Peak No Development	1627 / LOS F	1634 / LOS D or better	643 / LOS D or better	644 / LOS D or better
2041 Model PM Peak No Development	1023 / LOS D or better	1027 / LOS D or better	1511 / LOS F	1512 / LOS D or better
2041 Model AM Peak with Development	1836 / LOS F	1853 / LOS D or better	669 / LOS D or better	684 / LOS D or better
2041 Model PM Peak with Development	1141 / LOS D or better	1115 / LOS D or better	1783 / LOS F	1766 / LOS D or better

8.2 SIDRA Model

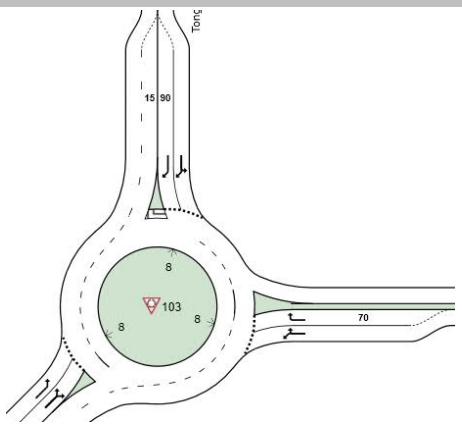
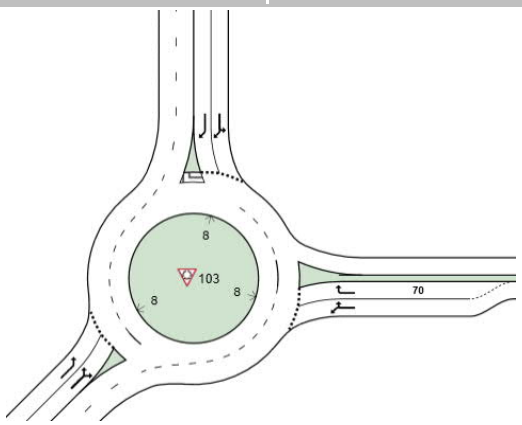
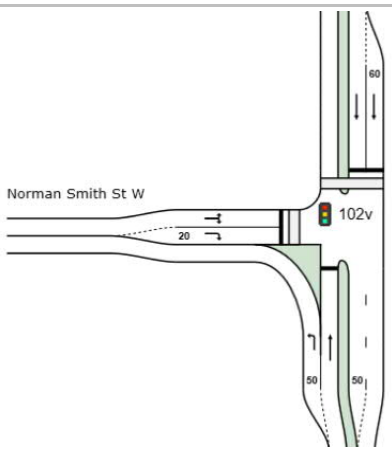
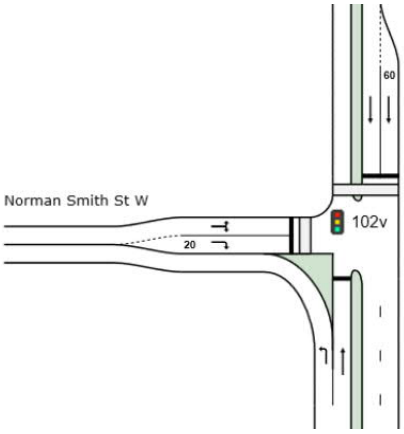
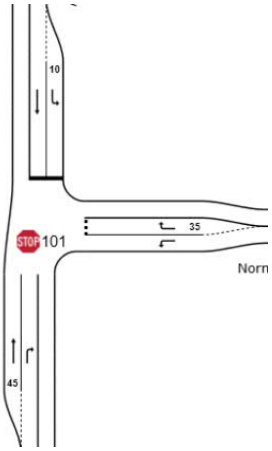
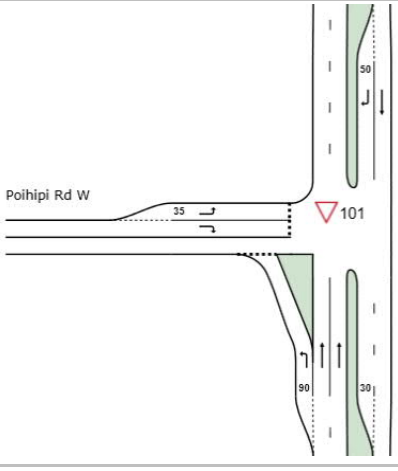
SIDRA is used to analyse the performance of the seven key intersections (circled in Figure 8-1) around the Nukuhau Development. Intersection turning volumes are extracted from the Taupō Traffic Model (Scenario 1, 3 and 5) and used in SIDRA models for intersections below for both AM and PM peaks:

- Existing Intersections
  - Spa Road/Tongariro Street - Roundabout (Scenario 1, 3 and 5)
  - Norman Smith Street/Wairakei Drive - Signal Intersection (Scenario 1, 3 and 5)
  - Norman Smith Street/Acacia Bay Road - Stop Intersection (Scenario 1, 3 and 5)
  - Poihipi Road/Wairakei Drive - Stop Intersection (Scenario 1 and 3)
- Proposed New Intersections (Scenario 5)
  - New Intersection 1 (Figure 5-2 – Access 1):
    - New Access 1 Road / Acacia Bay Road - Give-Way Controlled Intersection
  - New Intersection 2 (Figure 5-2 – Access 6):
    - Realigned Poihipi Road / Extended Watene Ln - Give-Way Controlled Intersection
  - New Intersection 3 (Figure 5-2 – Access 8):
    - Realigned Poihipi Road / Huka Falls Road/Wairakei Drive - Signal Intersection

8.2.1 SIDRA Model Layouts

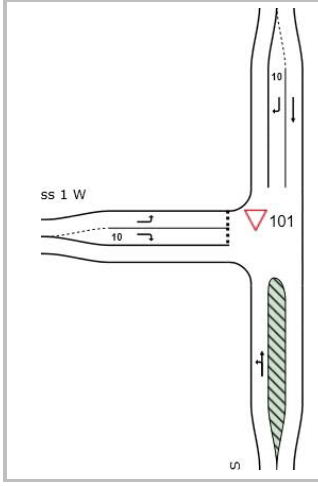
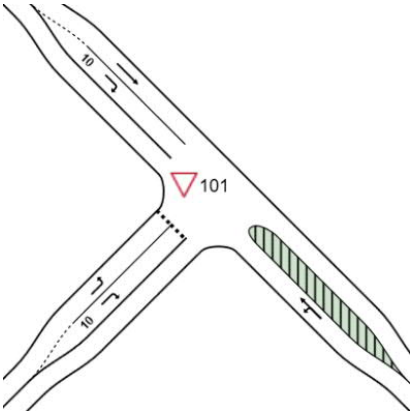
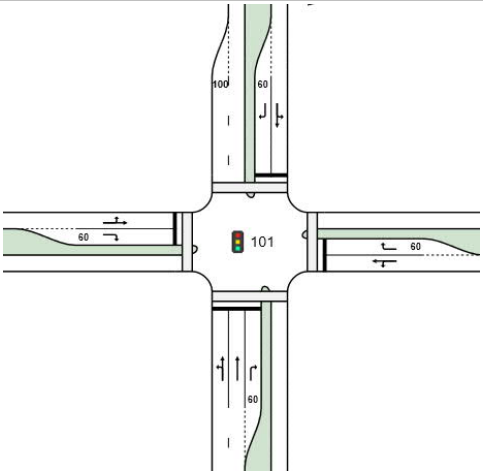
Table 8-2 and Table 8-3 show the SIDRA model layouts of the seven intersections listed above. Table 8-2 includes intersection layouts of the four existing intersections and Table 8-3 includes intersection layouts of the three new intersections proposed as part of the Nukuhau Development. The layouts for Spa Road/Tongariro Street Intersection and Norman Smith Street/Wairakei Drive Intersection change after Scenario 1 (2021 Base). This is because the assumption of an additional 2-lane bridge being constructed beside the existing 2-lane Control Gate Bridge by 2041 to form a 4-lane crossing. The north leg of Spa Road/Tongariro Street Intersection and the south leg of Norman Smith Street/Wairakei Drive Intersection where the bridge would connect to would change from 2-lane to 4-lane.

Table 8-2 SIDRA Model Layouts for Existing Intersections

	Scenario 1	Scenario 3	Scenario 5
Spa Road / Tongariro Street Intersection			
Norman Smith Street / Wairakei Drive Intersection			
Norman Smith Street / Acacia Bay Road Intersection			
Poihipi Road / Wairakei Drive Intersection		Intersection Closed	

As illustrated in Figure 8-1 and Figure 8-3, there are three new intersections proposed as part of the Nukuhau Development. The new intersections are only modelled with traffic volumes extracted from Taupō Traffic Model Scenario 5, assuming full Nukuhau Development at 2041 with 2 bridges (4-lane crossing).

Table 8-3 SIDRA Layouts for Proposed Intersections

New Intersection 1 New Access Road 1 / Acacia Bay Road (Figure 5-2 Access 1)	**New Intersection 2** Realigned Poihipi Road / Extended Watene Ln (Figure 5-2 Access 6)	**New Intersection 3** Realigned Poihipi Road/Huka Falls Road/Wairakei Drive (Figure 5-2 Access 8)
		

8.2.2 Intersection Performance

The capacity and performance of the key intersections surrounding the Nukuhau Development have been modelled for the scenarios discussed in previous section. The outcomes of the modelling are summarised in Table 8-4. Detailed modelling outputs are included in Appendix B.

- **Norman Smith St / Acacia Bay Rd Intersection (Scenario 5 2041 with Development PM Peak)**

  The Acacia Bay Road northern approach (southbound traffic) at the Norman Smith Street / Acacia Bay Road Intersection is the only movement that operates at LOS E (PM peak hour) with the additional traffic generated from the Nukuhau Development in 2041. The volume of the southbound traffic on Acacia Bay Road is around 200 vph during the PM peak, the modelling results indicate an average delay time of 39 seconds. Based on the low level of traffic and the relatively short delay time, the LOS E is acceptable for a stop-controlled movement.

- **Intersection Performance Findings**

  In general, the modelling results show that the existing four key intersections and the three proposed new intersections will provide sufficient capacity and satisfactory performance (≤ LOS D) during the AM and PM peak hours in the modelling horizon year, viz. 2041, both with and without the Nukuhau Development.

Table 8-4 Summary of Modelling Results for Key Intersections

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Scenario		Level of Services (LOS)		
		Scenario 1 2021 Base	Scenario 3 2041 with No Development	Scenario 5 2041 with Development
Spa Rd / Tongariro St	**AM**	**A**	**A**	**A**
	PM	**B**	**A**	**A**
Spa Rd (East)	AM	B	B	B
	PM	B	B	B
Tongariro St (North)	AM	A	A	A
	PM	A	A	A
Tongariro St (Southwest)	AM	A	A	A
	PM	B	A	A
Norman Smith St / Wairakei Dr	**AM**	**C**	**C**	**D**
	PM	**B**	**B**	**B**
Wairakei Dr (South)	AM	B	B	B
	PM	B	B	B
Wairakei Dr (North)	AM	C	B	D
	PM	B	A	A
Norman Smith St (West)	AM	C	C	D
	PM	B	B	C
Norman Smith St / Acacia Bay Rd	**AM**	**NA**	**NA**	**NA**
	PM	**NA**	**NA**	**NA**
Acacia Bay Rd (South)	AM	NA	NA	NA
	PM	NA	NA	NA
Norman Smith St (East)	AM	A	A	A
	PM	A	A	A
Acacia Bay Rd (North)	AM	B	C	C
	PM	C	C	E (Stop Controlled) *
Poihipi Rd / Wairakei Dr	**AM**	**NA**	**NA**	**Intersection Closed**
	PM	**NA**	**NA**	
Wairakei Dr (South)	AM	A	A	Intersection Closed
	PM	A	A	
Wairakei Dr (North)	AM	NA	NA	Intersection Closed
	PM	NA	NA	
Poihipi Rd (West)	AM	B	C	Intersection Closed
	PM	B	B	
New Intersection 3	**AM**	**No Intersection**	**No Intersection**	**D**
	PM			**D**
Wairakei Dr (South)	AM	No Intersection	No Intersection	C
	PM			C
Huka Falls Rd (East)	AM	No Intersection	No Intersection	D
	PM			D
Wairakei Dr (North)	AM	No Intersection	No Intersection	C
	PM			D
Poihipi Rd (West)	AM	No Intersection	No Intersection	D
	PM			D
New Intersection 1	**AM**	**No Intersection**	**No Intersection**	**NA**
	PM			**NA**
New Intersection 2	**AM**	**No Intersection**	**No Intersection**	**NA**
	PM			**NA**

Notes:
* The average delay is moderate (39 second/vehicle) and deemed acceptable during the PM peak hour assessed (2041 with Development Scenario 5), please refer to Section 8.2.2 of this TIA for more details.

9 Conclusions and Recommendations

9.1 Summary

The TIA undertaken for the Nukuhau Development has considered the following:

- Safety assessment of surrounding road network
- Layout of future road network around the Nukuhau Development
- Access assessment
- General traffic demand and trip distribution around the site
- Performance assessment of surrounding intersections

It is expected that a second bridge crossing either adjacent to or in the vicinity of the Control Gate Bridge will be necessary regardless of the future Nukuhau Development before 2041. The performance of the key intersections surrounding the sites are expected to remain acceptable from now to 2041, with or without the additional Nukuhau Development traffic.

The impact of the development traffic on local intersection safety is considered to be minor. The proposed realignment of Poihipi Road and the Taupō Speed Limit Bylaw dated December 2018 are likely to reduce the injury crash risk at the section of Wairakei Drive and the existing road network in the vicinity of the Nukuhau Development area.

In summary, the TIA has not identified any effects associated with the proposed rezoning that could not be overcome during the ongoing design development of the site and surrounding road network. The TIA illustrates that with appropriate mitigation, the effects of the rezoning on the safe and efficient operation of the transport network are considered to be acceptable.

9.2 Design Standards and Requirements

Although cross sections and designs for the internal road network have not been assessed as part of this TIA, it is recommended that the internal roading network within the Nukuhau Development area be designed and constructed to conform with its intended network hierarchy and adhere with the relevant requirements of the Taupō District Council. This includes (but is not limited to) driveway and intersection spacing, sight distance, and parking requirements.

Appropriate infrastructure standards such as the Taupō District Council Code of Practice (2009) for Development of Land is recommended to be used for planning and design purposes for the internal road and transport infrastructure.

Sections of the existing roads are recommended to be realigned or extended to provided connections to the Nukuhau Development. The road will be upgraded and urbanised to appropriate standards as the site development occurs; including the installation of footpaths, lighting within the site. This will also need to conform to the relevant TDC design and engineering standards.

9.3 Future Road Network

9.3.1 Control Gate Bridge

The Taupō Traffic Model shows the existing Control Gate Bridge is likely to operate at LOS F both in the AM and PM peaks by 2041 with or without the Nukuhau Development. The modelling results indicates that another bridge or upgrade/replacement of the existing Control Gate Bridge will be required by 2041.

The future traffic demand around the Taupō road network, both with or without the Nukuhau Development traffic in place, gives rises to a requirement for a second bridge crossing either adjacent to or in the vicinity of the Control Gate Bridge to cope with the future growth of Taupō. An appropriate long-term monitoring of the bridge performance and safety is recommended.

9.3.2 Road Network

The recommended road network as shown in Figure 5-1 aligns with the conceptual road layout in the Taupō Urban Structure Plan and is considered adequate to accommodate the Nukuhau Development traffic.

9.3.3 Intersection Forms and Control Method

The recommended forms for the three proposed new intersections are listed below (with reference to Figure 8-1 and Table 8-3):

- New Intersection 1: New Access Road 1/Acacia Bay Road - priority controlled (give-way) intersection
- New Intersection 2: Realigned Poihipi Road/Extended Watene Lane - priority controlled (give-way) intersection
- New Intersection 3: Realigned Poihipi Road/Huka Falls Road/Wairakei Drive - signalised intersection.

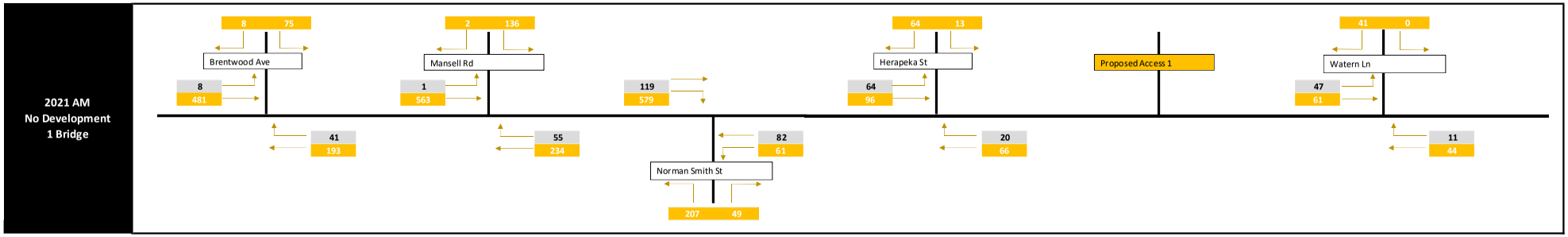
It is noted that the intersection forms and control methods will need to be re-assessed in detail following finalisation of the development and roading layout in due course, as this may affect trip generation and assignment and distribution of the trips to the local road network.

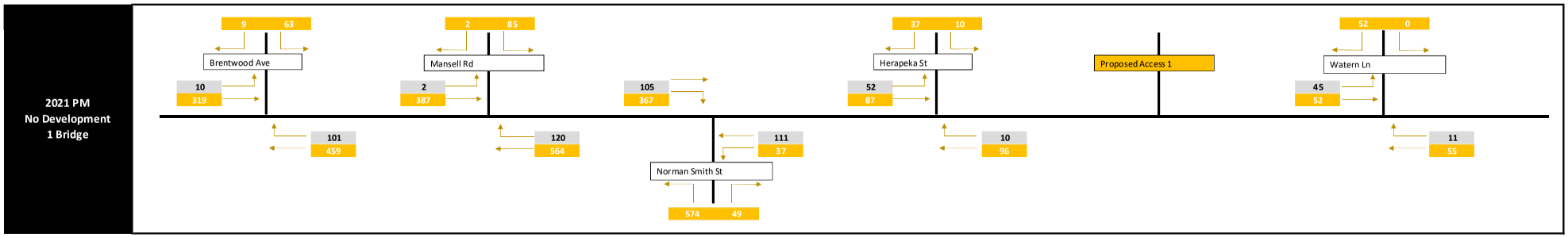
9.4 Recommendations

From a traffic and transportation perspective, we recommended that this Private Plan Change application be supported by the Taupō District Council, as the likely traffic and transportation impacts can be suitably mitigated by local intersection and other improvements as assessed in this Traffic Impact Assessment.

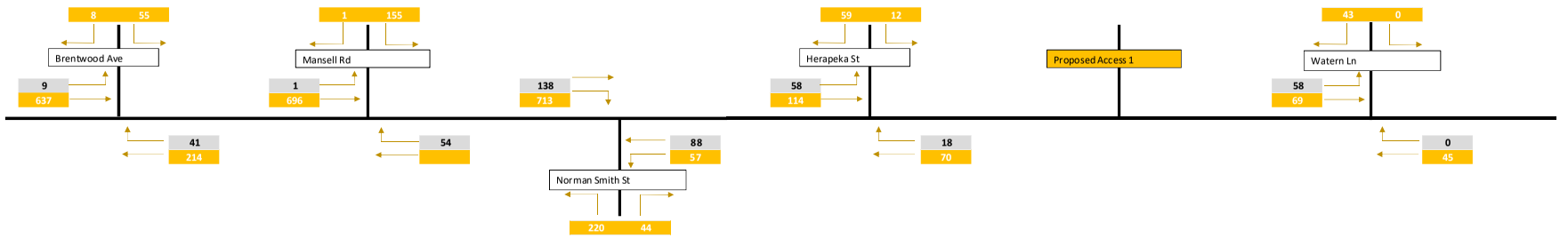
Appendix A
Taupō Traffic Model Traffic Volumes


New Intersections 1
New Intersections 2
New Intersections 3
ACACIA BAY RD
KAIHUA RD
WOODWARD ST
WAIRAKEI DR
TONGARIRO ST
NORMAN SMITH ST
ARAMA ST
KAIURU RD
MANUNUI ST
LAKEWOOD DR
MARETI ST
PITIROI ST
NOBLE ST
REDOUBT ST
KAHURANGI DR
LAKERIDGE CLOSE
Waikato River

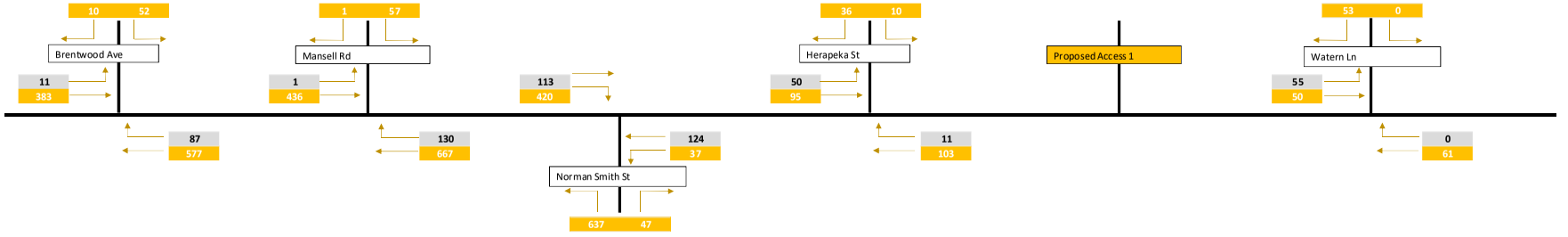

2021 AM
No Development
1 Bridge
Brentwood Ave
Mansell Rd
Herapeka St
Proposed Access 1
Watern Ln
Norman Smith St
8 75
8 481
2 136
1 563
119 579
64 13
64 96
41 0
47 61
41 193
55 234
82 61
20 66
11 44
207 49


2021 PM
No Development
1 Bridge
Brentwood Ave
Mansell Rd
Herapeka St
Proposed Access 1
Watern Ln
Norman Smith St
9 63
10 319
2 85
2 387
105 367
37 10
52 87
52 0
45 52
101 459
120 564
111 37
10 96
11 55
574 49

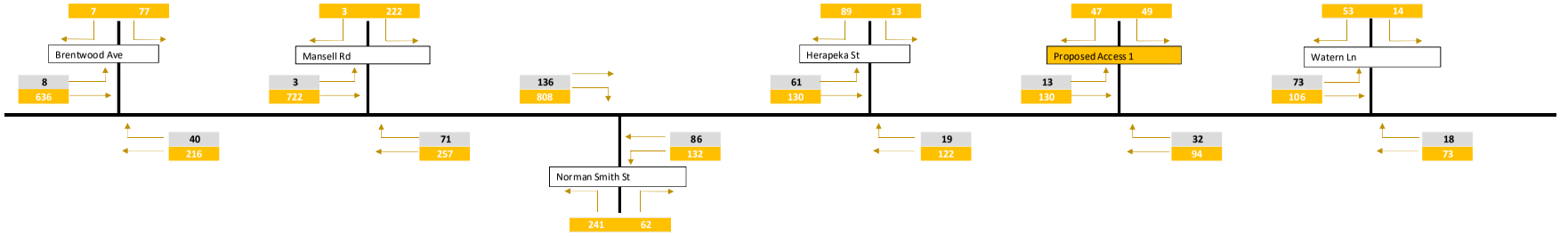
2041 AM
No Development
2 Bridges



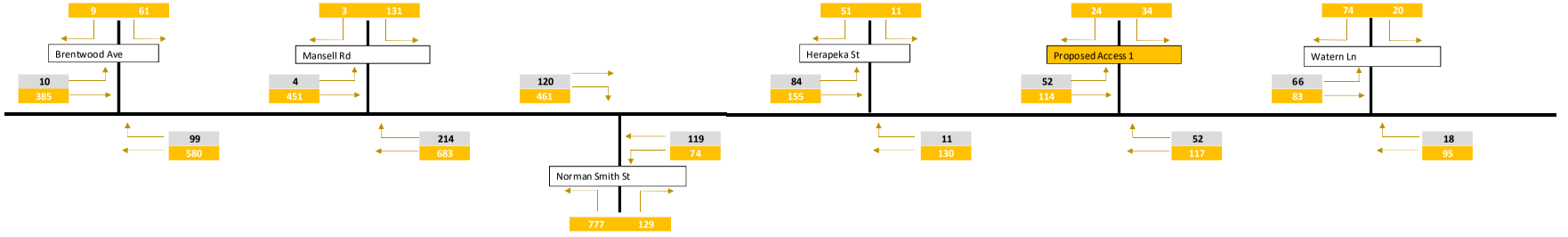
2041 PM
No Development
2 Bridges



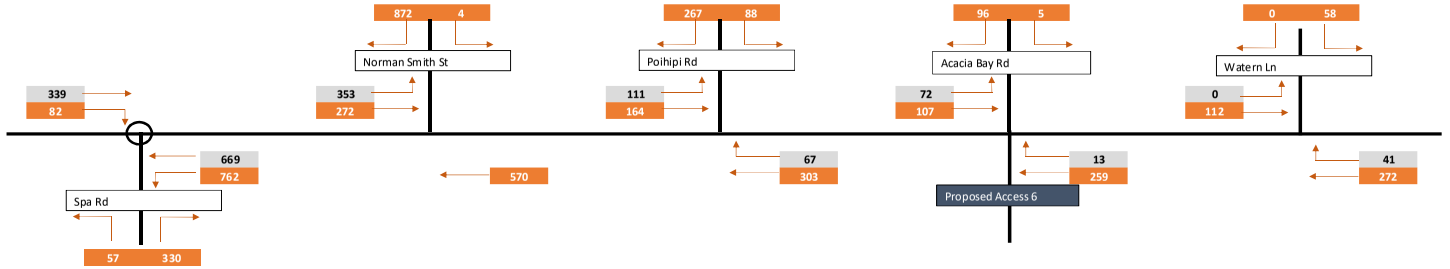
2041 AM
With Development
2 Bridges



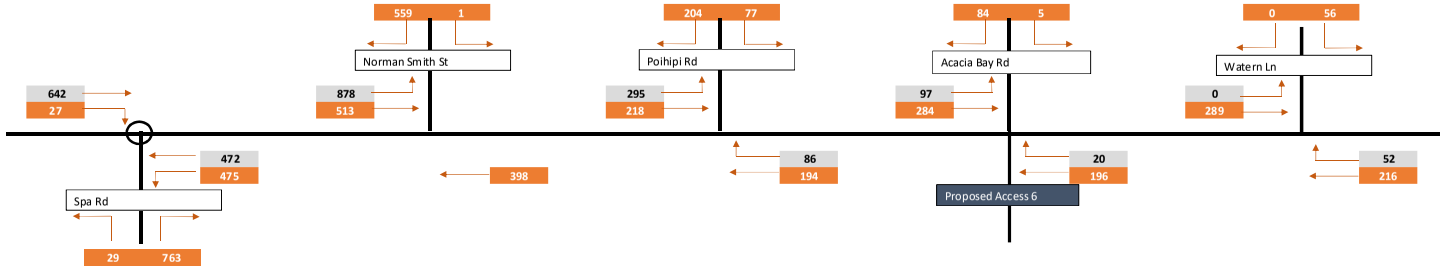
2041 PM
With Development
2 Bridges



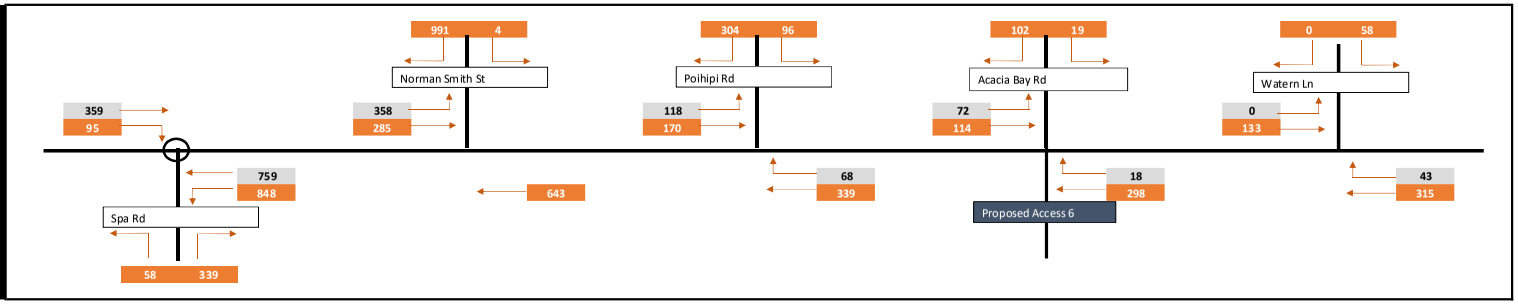
2021 AM
No Development
1 Bridge



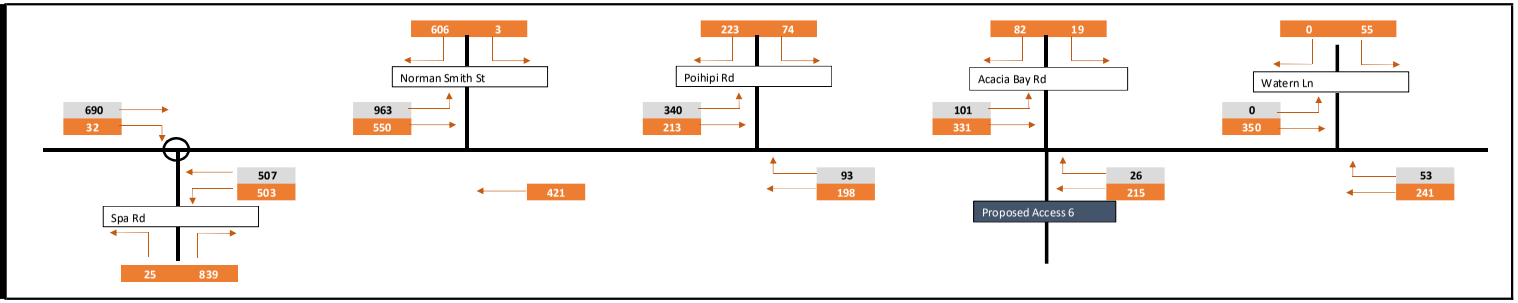
2021 PM
No Development
1 Bridge



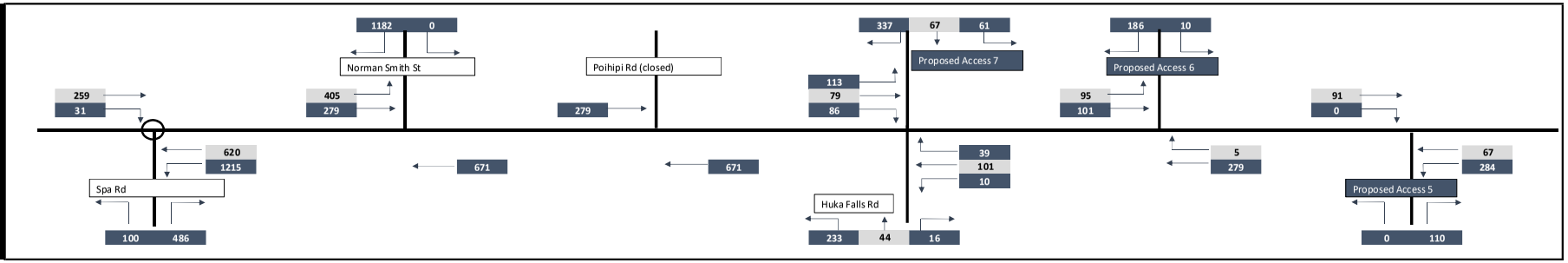
2041 AM
No Development
2 Bridges



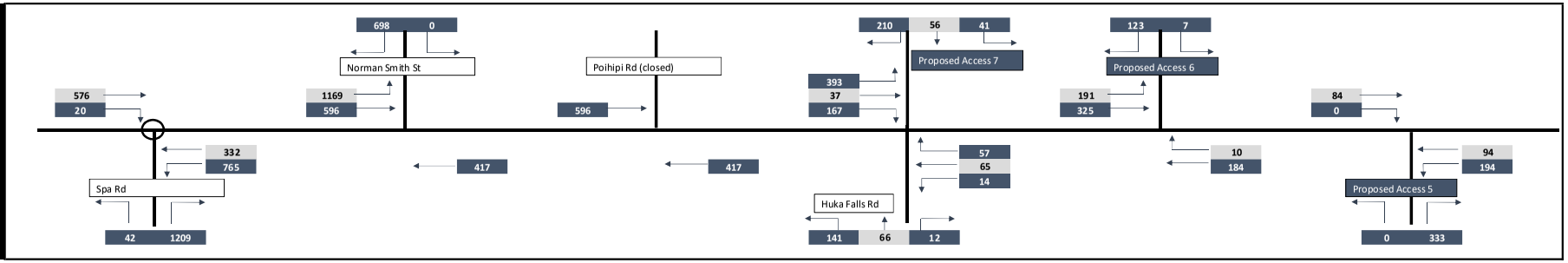
2041 PM
No Development
2 Bridges



2041 AM
With Development
2 Bridges



2041 PM
With Development
2 Bridges



Appendix B
SIDRA Intersection modelling output

USER REPORT FOR SITE

Project: Taupo 2041

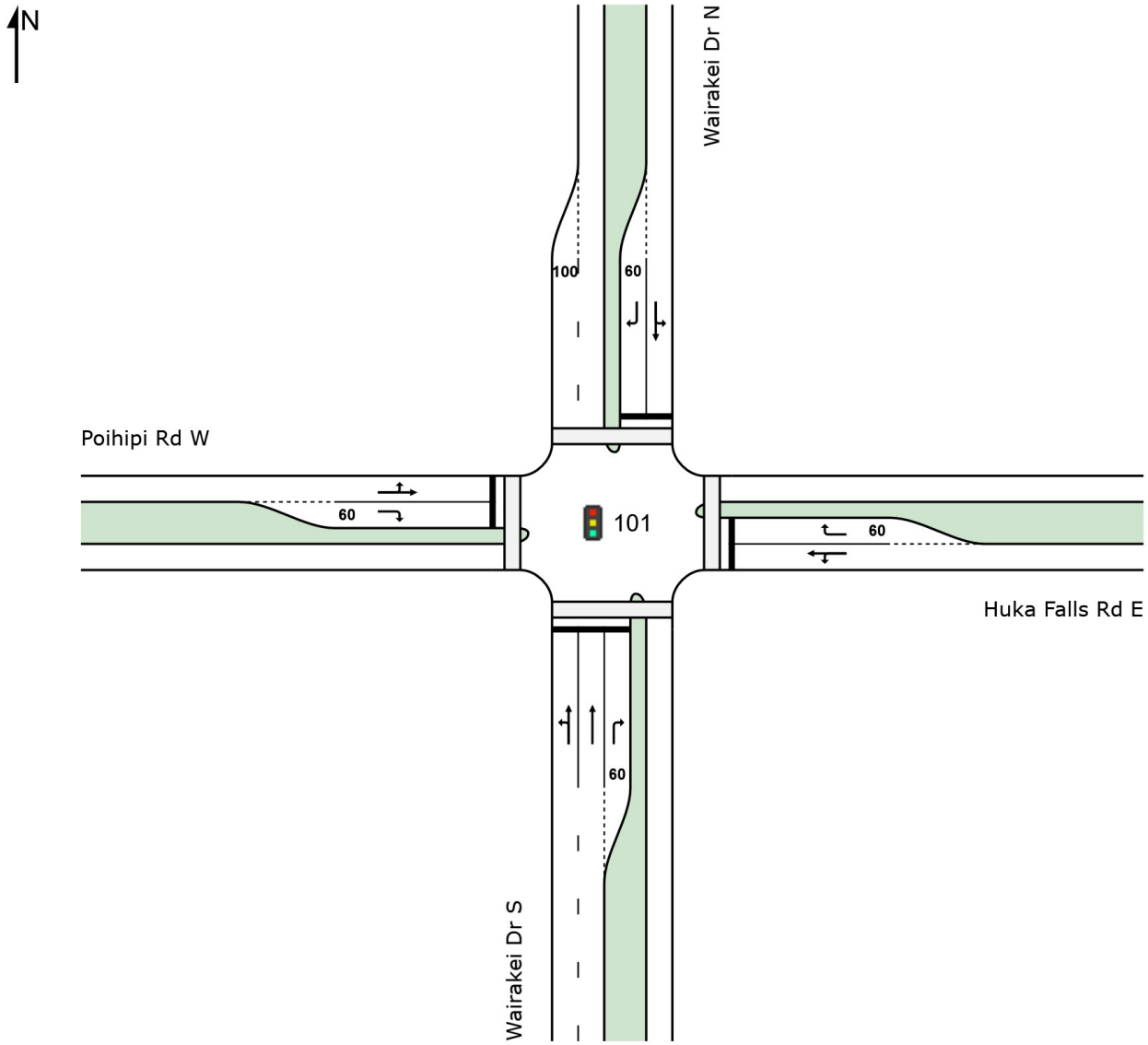
Template: Default Site User Report

Site: 101 [Pohipi / Huka 2041 AM + Dev]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Split Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout

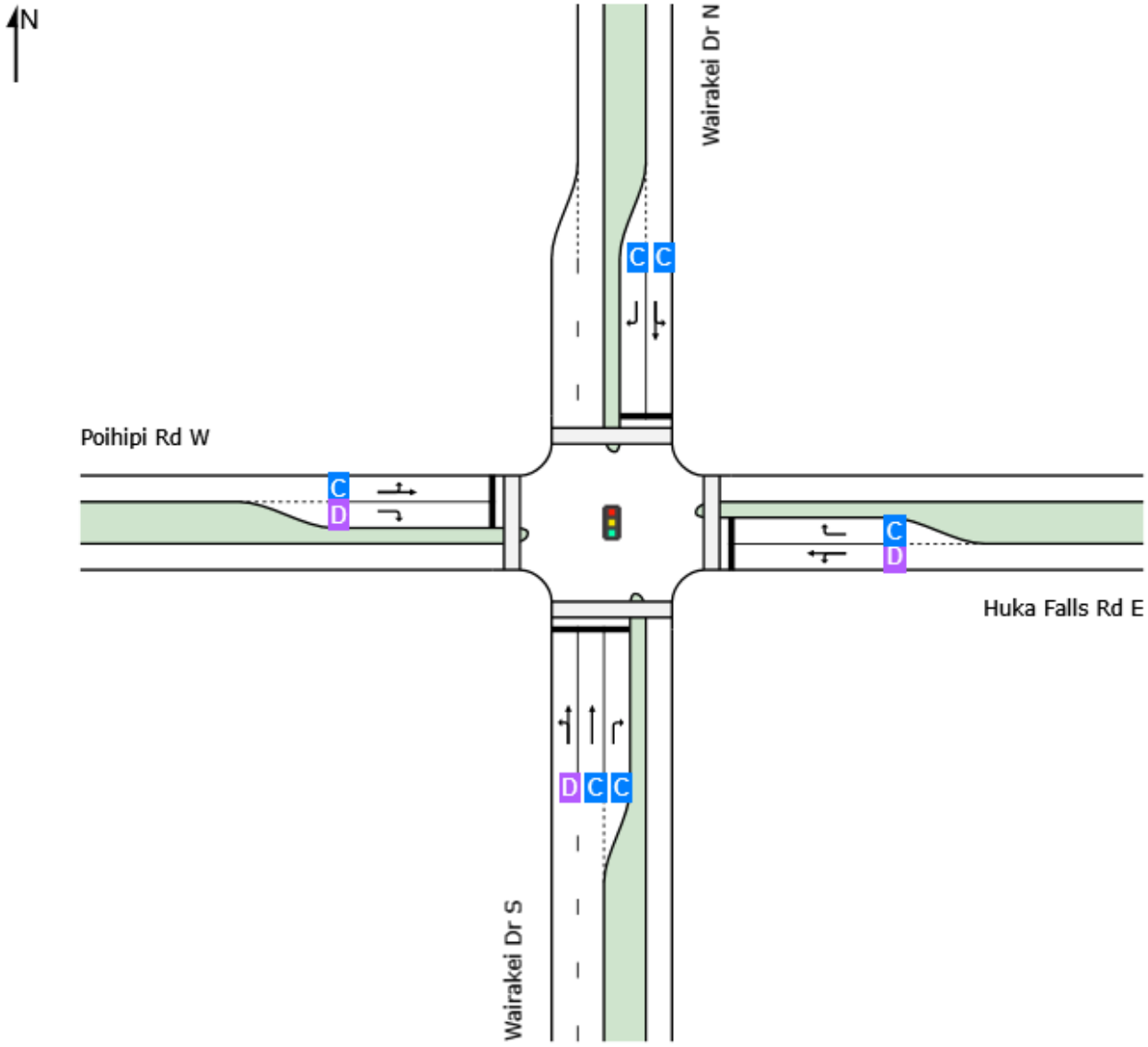

N
Wairakei Dr N
100
60
Poihipi Rd W
60
101
60
Huka Falls Rd E
60
Wairakei Dr S

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	119	2.0	0.650	35.8	LOS D	3.7	26.5	1.00	0.84	1.14	33.3
2	T1	83	2.0	0.432	29.5	LOS C	2.5	17.6	0.98	0.75	0.98	35.6
3	R2	91	2.0	0.494	34.5	LOS C	2.7	19.4	0.99	0.77	0.99	33.6
Approach		293	2.0	0.650	33.6	LOS C	3.7	26.5	0.99	0.79	1.05	34.0
East: Huka Falls Rd E												
4	L2	245	2.0	0.862	38.6	LOS D	10.1	72.0	1.00	1.06	1.44	32.7
5	T1	46	2.0	0.862	34.0	LOS C	10.1	72.0	1.00	1.06	1.44	33.0
6	R2	17	2.0	0.050	26.9	LOS C	0.4	3.0	0.85	0.68	0.85	36.1
Approach		308	2.0	0.862	37.2	LOS D	10.1	72.0	0.99	1.04	1.41	32.9
North: Wairakei Dr N												
7	L2	11	2.0	0.610	35.2	LOS D	3.6	25.7	1.00	0.82	1.09	34.8
8	T1	106	2.0	0.610	30.7	LOS C	3.6	25.7	1.00	0.82	1.09	35.1
9	R2	41	2.0	0.224	33.3	LOS C	1.2	8.5	0.95	0.72	0.95	34.1
Approach		158	2.0	0.610	31.7	LOS C	3.6	25.7	0.99	0.80	1.06	34.8
West: Poihipi Rd W												
10	L2	64	2.0	0.331	26.8	LOS C	3.5	24.6	0.89	0.74	0.89	37.2
11	T1	71	2.0	0.331	22.2	LOS C	3.5	24.6	0.89	0.74	0.89	37.5
12	R2	355	2.0	0.894	41.0	LOS D	13.1	93.0	1.00	1.09	1.52	31.9
Approach		489	2.0	0.894	36.4	LOS D	13.1	93.0	0.97	1.00	1.34	33.2
All Vehicles		1248	2.0	0.894	35.3	LOS D	13.1	93.0	0.98	0.93	1.25	33.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches				Intersection
	South	East	North	West	
LOS	C	D	C	D	D



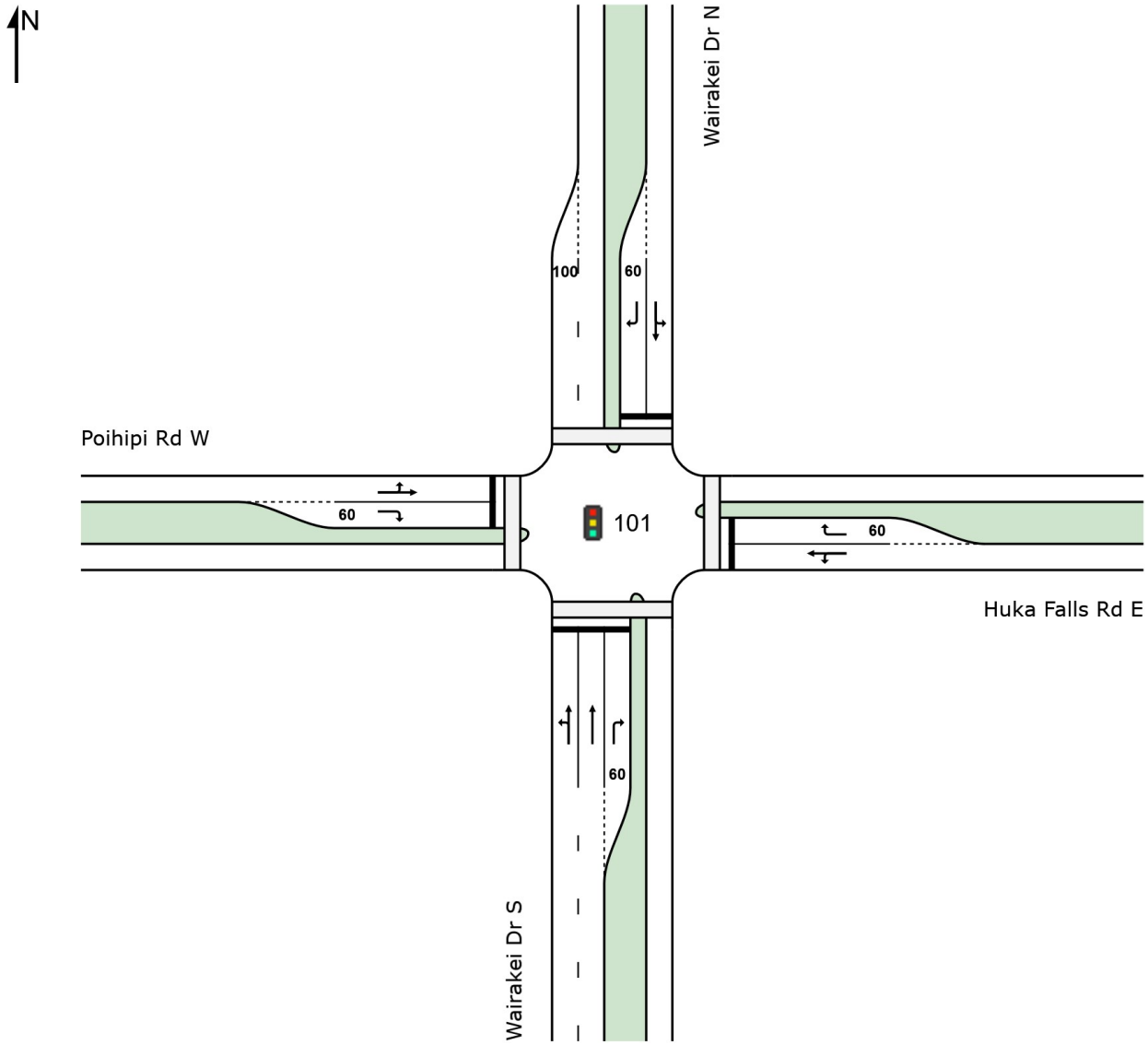
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Pohipi / Huka 2041 PM + Dev]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Split Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout

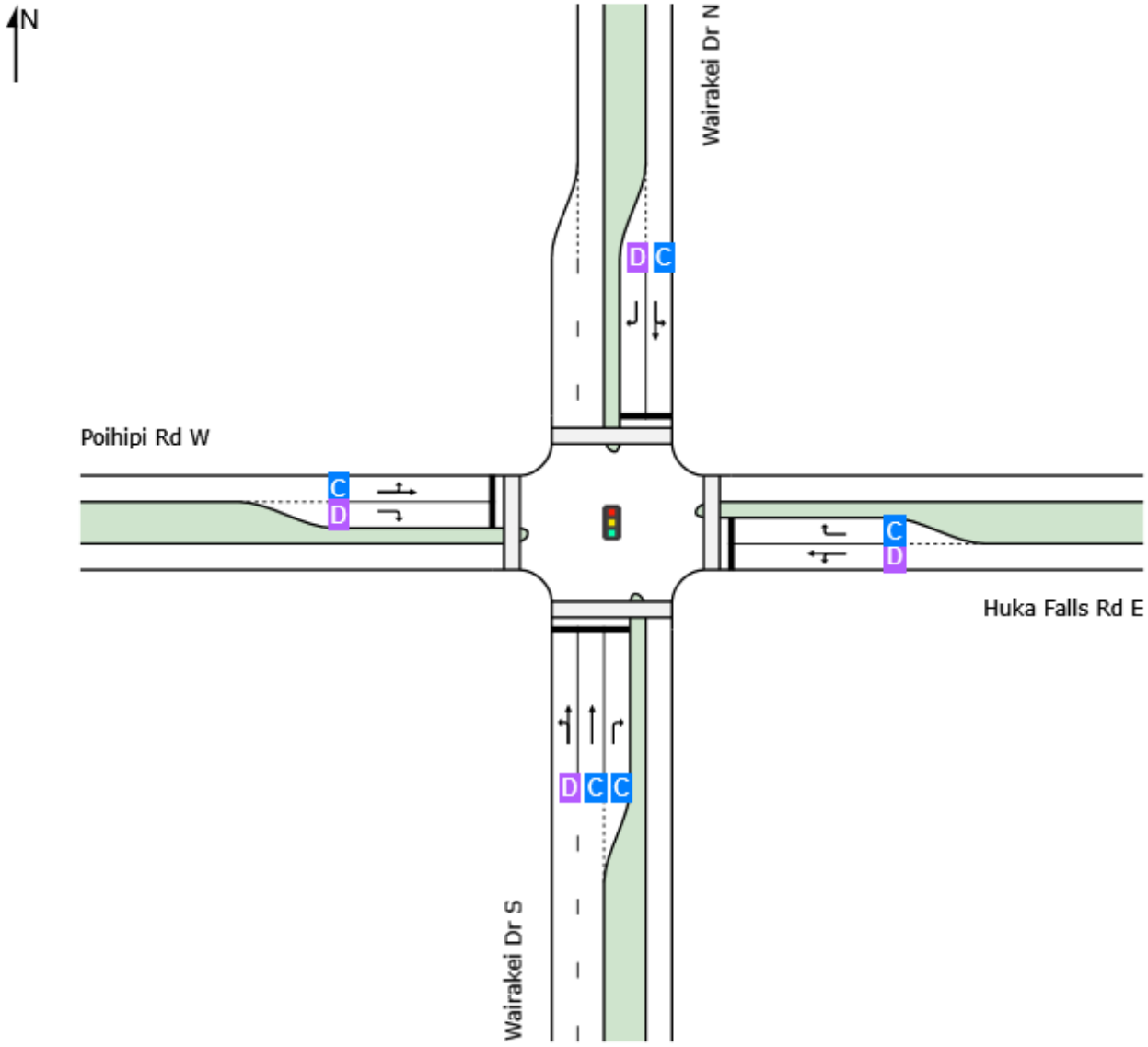

N
Wairakei Dr N
100
60
Poihipi Rd W
60
101
60
Huka Falls Rd E
60
Wairakei Dr S

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	414	2.0	0.832	37.0	LOS D	15.5	110.5	1.00	0.97	1.24	33.0
2	T1	39	2.0	0.075	20.6	LOS C	1.0	7.1	0.77	0.58	0.77	39.0
3	R2	176	2.0	0.354	27.2	LOS C	5.0	35.3	0.85	0.78	0.85	36.0
Approach		628	2.0	0.832	33.2	LOS C	15.5	110.5	0.94	0.89	1.10	34.1
East: Huka Falls Rd E												
4	L2	148	2.0	0.820	42.1	LOS D	8.3	59.3	1.00	0.99	1.33	31.9
5	T1	69	2.0	0.820	37.5	LOS D	8.3	59.3	1.00	0.99	1.33	32.1
6	R2	13	2.0	0.048	33.3	LOS C	0.4	2.7	0.89	0.67	0.89	34.0
Approach		231	2.0	0.820	40.3	LOS D	8.3	59.3	0.99	0.98	1.30	32.1
North: Wairakei Dr N												
7	L2	15	2.0	0.436	38.7	LOS D	2.9	20.4	0.98	0.75	0.98	33.6
8	T1	68	2.0	0.436	34.1	LOS C	2.9	20.4	0.98	0.75	0.98	33.8
9	R2	60	2.0	0.328	38.3	LOS D	2.0	14.5	0.97	0.74	0.97	32.6
Approach		143	2.0	0.436	36.4	LOS D	2.9	20.4	0.98	0.75	0.98	33.3
West: Poihipi Rd W												
10	L2	43	2.0	0.379	35.3	LOS D	3.3	23.6	0.95	0.75	0.95	34.3
11	T1	59	2.0	0.379	30.7	LOS C	3.3	23.6	0.95	0.75	0.95	34.6
12	R2	221	2.0	0.845	43.6	LOS D	8.7	61.6	1.00	1.01	1.39	31.2
Approach		323	2.0	0.845	40.2	LOS D	8.7	61.6	0.98	0.93	1.25	32.1
All Vehicles		1325	2.0	0.845	36.5	LOS D	15.5	110.5	0.97	0.90	1.16	33.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches				Intersection
	South	East	North	West	
LOS	C	D	D	D	D



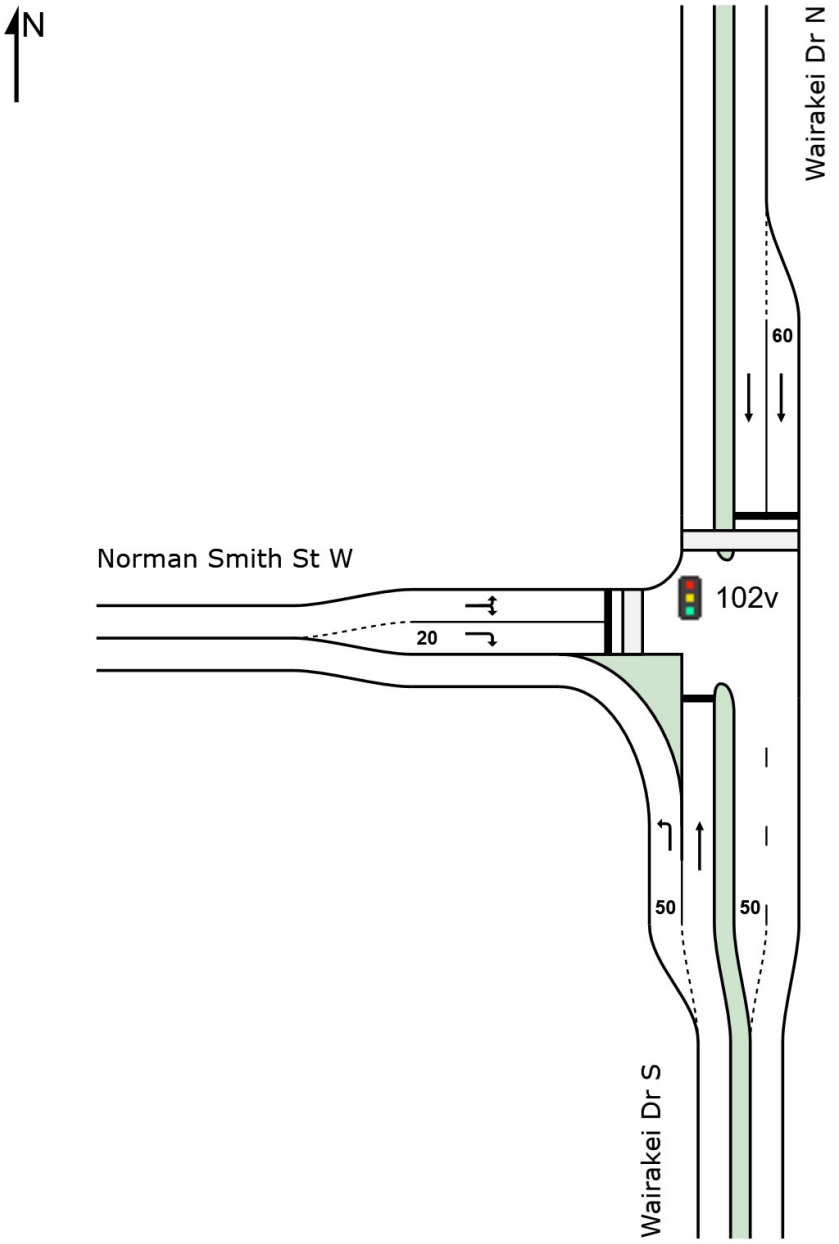
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 102v [Norman / Wairakei 2021 AM Base]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Opposed Turns
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout

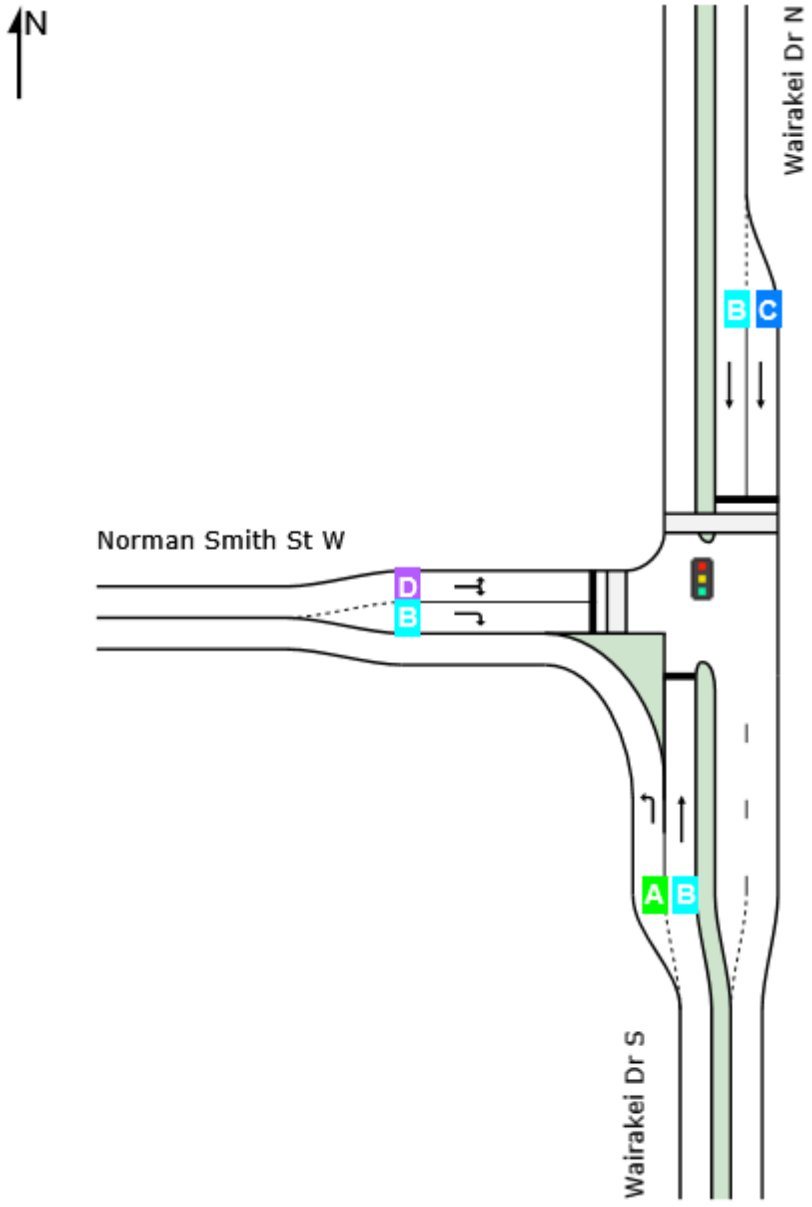


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	372	2.0	0.203	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	65.6
2	T1	286	2.0	0.572	18.1	LOS B	6.3	45.2	0.92	0.77	0.92	57.3
Approach		658	2.0	0.572	12.2	LOS B	6.3	45.2	0.40	0.67	0.40	61.7
North: Wairakei Dr N												
8	T1	600	2.0	0.913	29.2	LOS C	15.1	107.7	0.96	1.01	1.44	48.8
Approach		600	2.0	0.913	29.2	LOS C	15.1	107.7	0.96	1.01	1.44	48.8
West: Norman Smith St W												
10	L2	11	2.0	0.919	35.1	LOS D	21.6	153.8	0.84	1.09	1.42	37.1
12	R2	918	2.0	0.919	28.7	LOS C	21.6	153.8	0.78	0.99	1.19	39.6
Approach		928	2.0	0.919	28.7	LOS C	21.6	153.8	0.78	0.99	1.19	39.6
All Vehicles		2186	2.0	0.919	23.9	LOS C	21.6	153.8	0.72	0.90	1.02	47.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	B	C	C	C



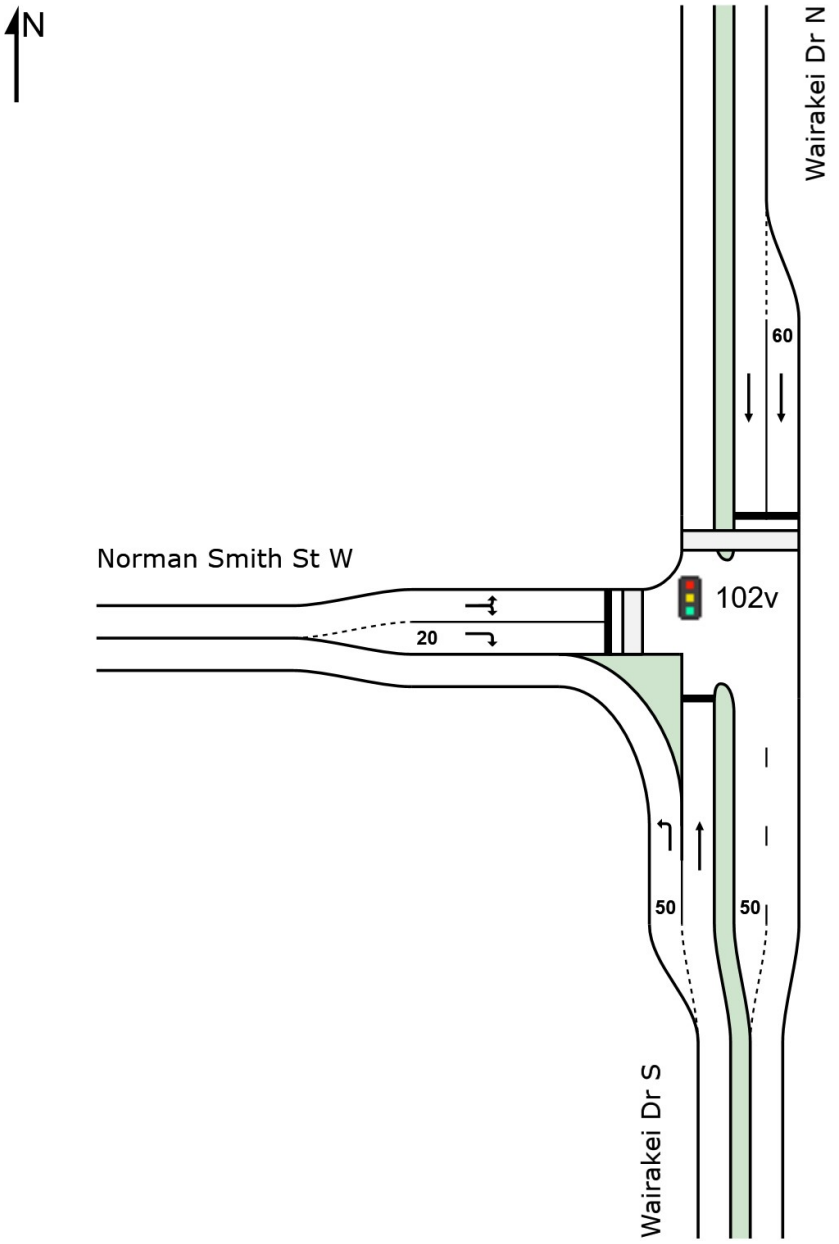
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 102v [Norman / Wairakei 2021 PM Base]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 40 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Opposed Turns
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout

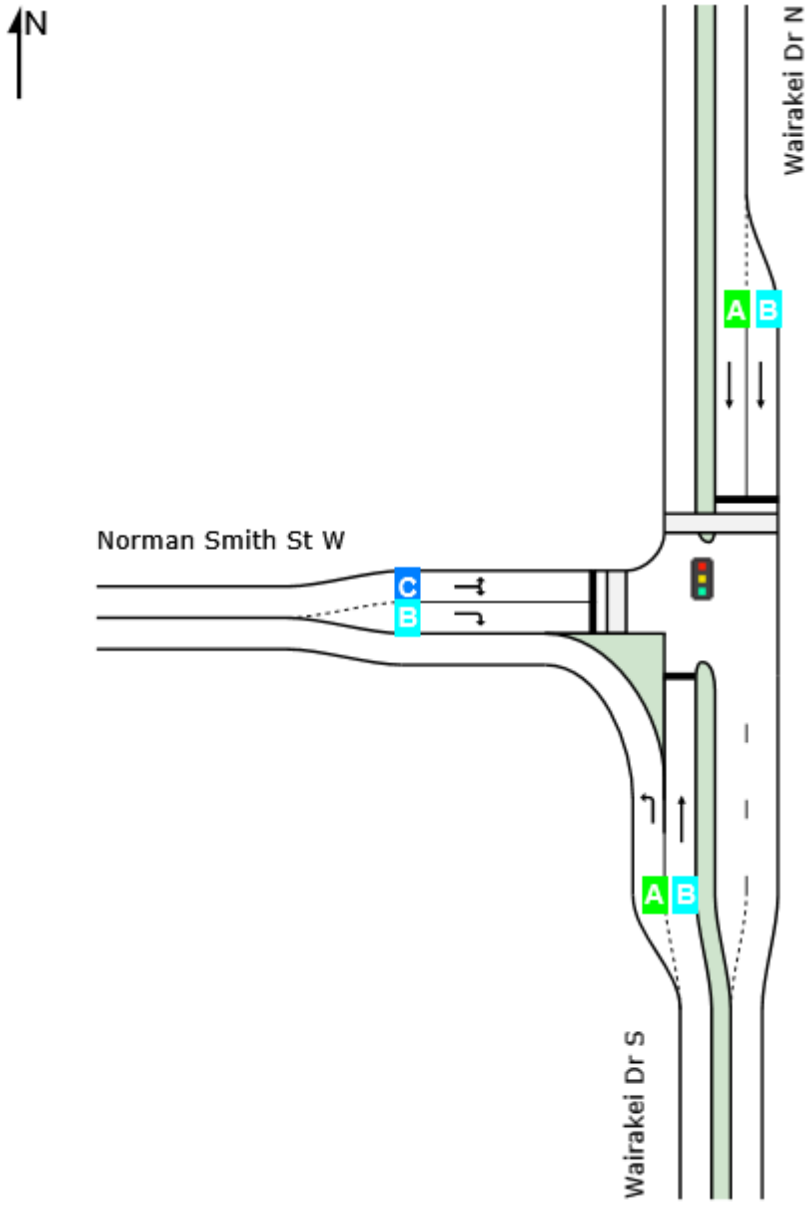


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	924	2.0	0.505	7.7	LOS A	0.0	0.0	0.00	0.60	0.00	65.5
2	T1	540	2.0	0.801	17.0	LOS B	11.5	82.0	0.96	0.95	1.22	58.3
Approach		1464	2.0	0.801	11.1	LOS B	11.5	82.0	0.36	0.73	0.45	62.6
North: Wairakei Dr N												
8	T1	419	2.0	0.474	11.0	LOS B	5.1	36.0	0.80	0.66	0.80	64.4
Approach		419	2.0	0.474	11.0	LOS B	5.1	36.0	0.80	0.66	0.80	64.4
West: Norman Smith St W												
10	L2	11	2.0	0.779	20.6	LOS C	8.9	63.5	0.91	0.94	1.16	43.5
12	R2	588	2.0	0.779	19.1	LOS B	8.9	63.5	0.87	0.89	1.05	44.2
Approach		599	2.0	0.779	19.1	LOS B	8.9	63.5	0.87	0.89	1.05	44.2
All Vehicles		2482	2.0	0.801	13.0	LOS B	11.5	82.0	0.55	0.76	0.65	57.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	B	B	B	B



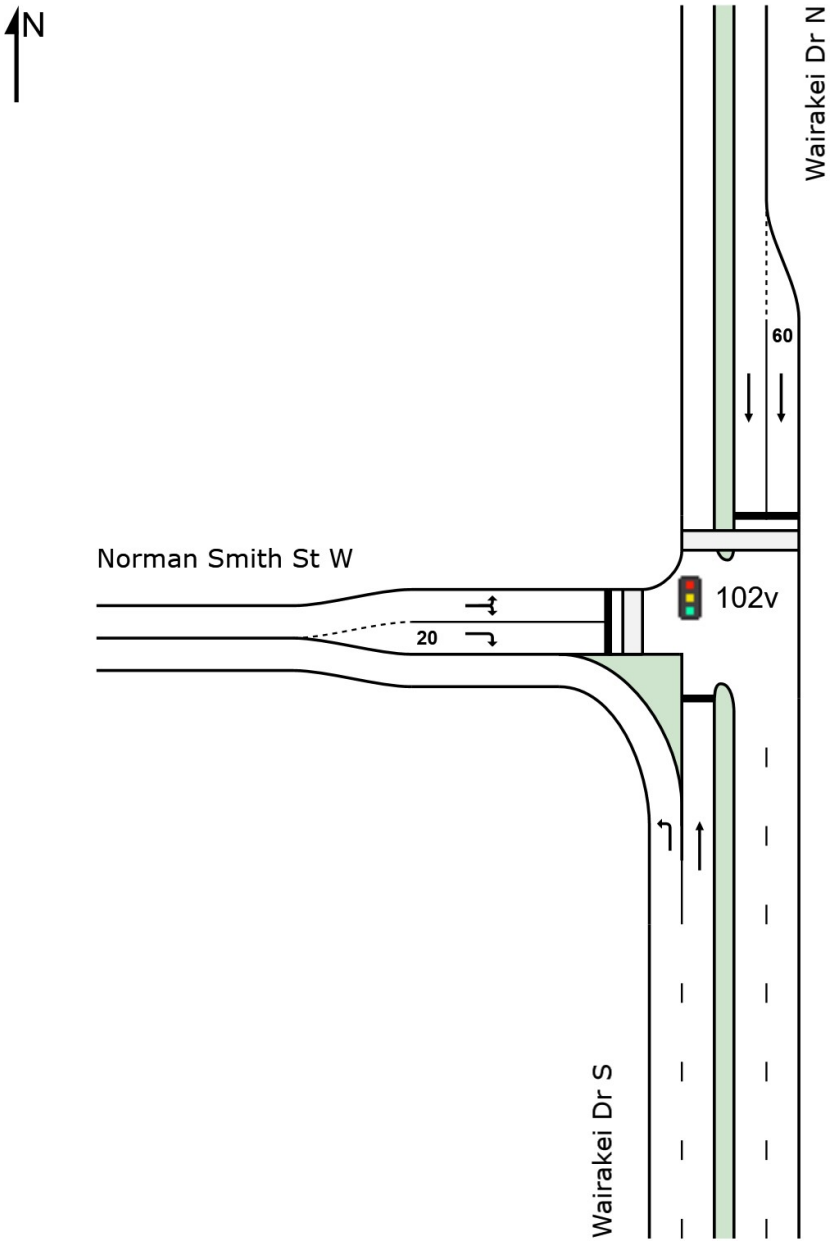
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 102v [Norman / Wairakei 2041 AM No Dev]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 40 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Opposed Turns
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout

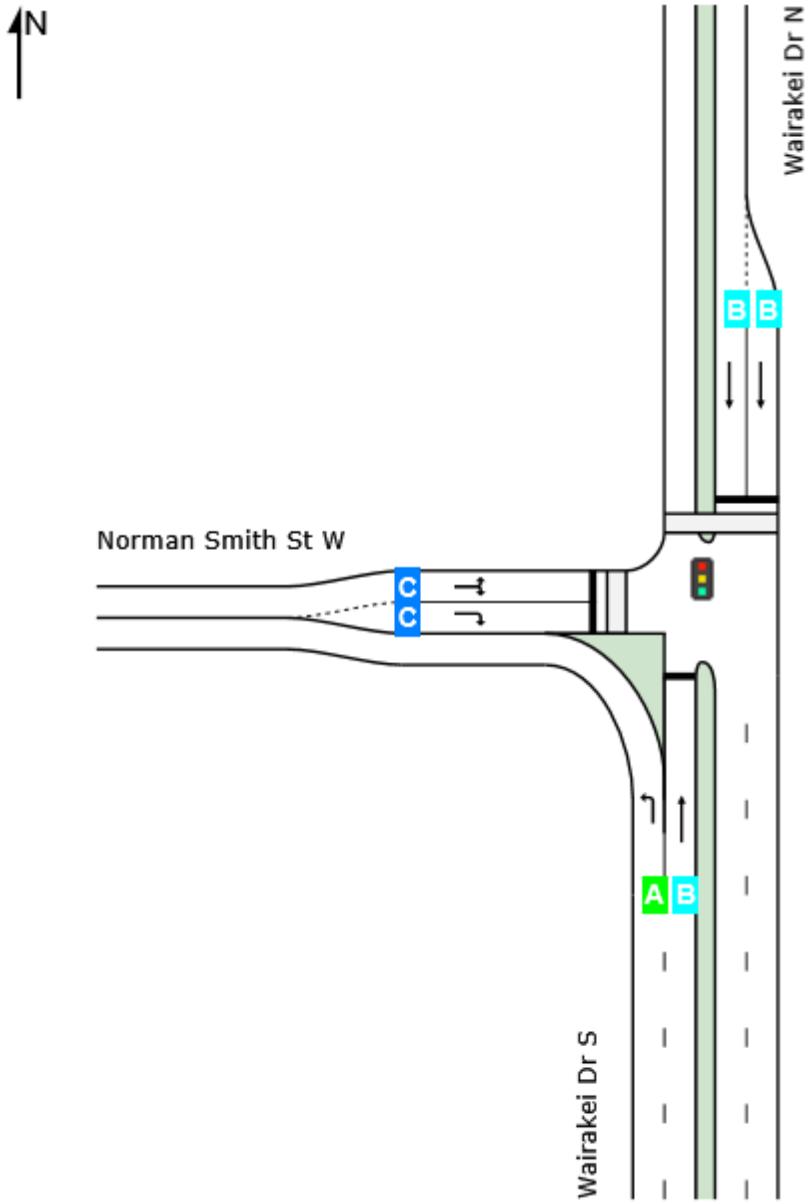


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	377	2.0	0.206	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	65.6
2	T1	300	2.0	0.693	17.5	LOS B	6.0	42.9	0.97	0.86	1.12	57.8
Approach		677	2.0	0.693	12.0	LOS B	6.0	42.9	0.43	0.72	0.50	61.9
North: Wairakei Dr N												
8	T1	677	2.0	0.781	19.6	LOS B	7.3	52.2	0.99	0.94	1.29	56.0
Approach		677	2.0	0.781	19.6	LOS B	7.3	52.2	0.99	0.94	1.29	56.0
West: Norman Smith St W												
10	L2	11	2.0	0.893	27.8	LOS C	12.8	91.4	0.79	1.08	1.41	40.0
12	R2	1043	2.0	0.893	27.8	LOS C	12.8	91.4	0.79	1.08	1.41	40.0
Approach		1054	2.0	0.893	27.8	LOS C	12.8	91.4	0.79	1.08	1.41	40.0
All Vehicles		2407	2.0	0.893	21.0	LOS C	12.8	91.4	0.75	0.94	1.12	48.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	B	B	C	C



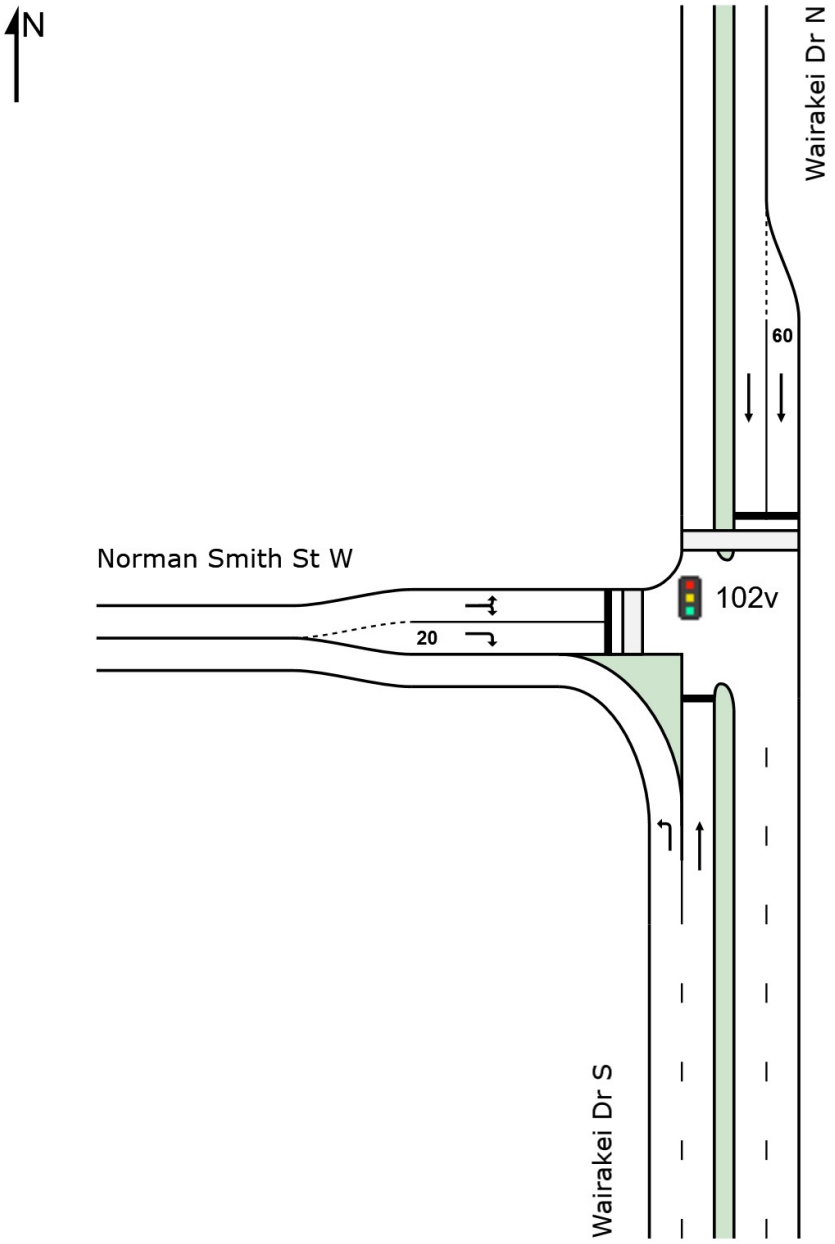
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 102v [Norman / Wairakei 2041 PM No Dev]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Opposed Turns
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout

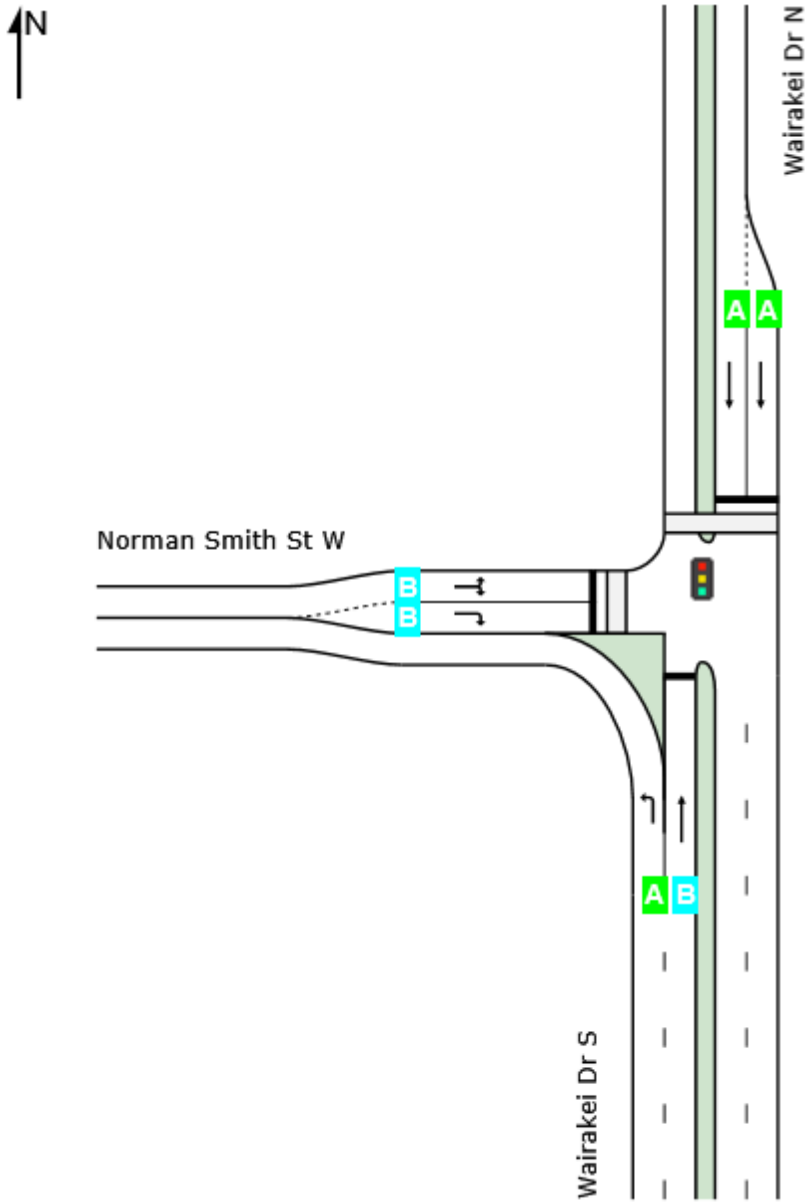


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	1014	2.0	0.554	7.7	LOS A	0.0	0.0	0.00	0.60	0.00	65.4
2	T1	579	2.0	0.820	14.2	LOS B	10.0	70.9	0.97	0.98	1.34	61.0
Approach		1593	2.0	0.820	10.0	LOS B	10.0	70.9	0.35	0.74	0.49	63.8
North: Wairakei Dr N												
8	T1	443	2.0	0.314	7.7	LOS A	2.4	17.4	0.75	0.62	0.75	68.4
Approach		443	2.0	0.314	7.7	LOS A	2.4	17.4	0.75	0.62	0.75	68.4
West: Norman Smith St W												
10	L2	11	2.0	0.759	19.3	LOS B	5.3	38.0	0.98	0.97	1.31	44.2
12	R2	638	2.0	0.759	19.3	LOS B	5.3	38.0	0.98	0.97	1.31	44.0
Approach		648	2.0	0.759	19.3	LOS B	5.3	38.0	0.98	0.97	1.31	44.0
All Vehicles		2684	2.0	0.820	11.9	LOS B	10.0	70.9	0.57	0.78	0.73	58.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	B	A	B	B



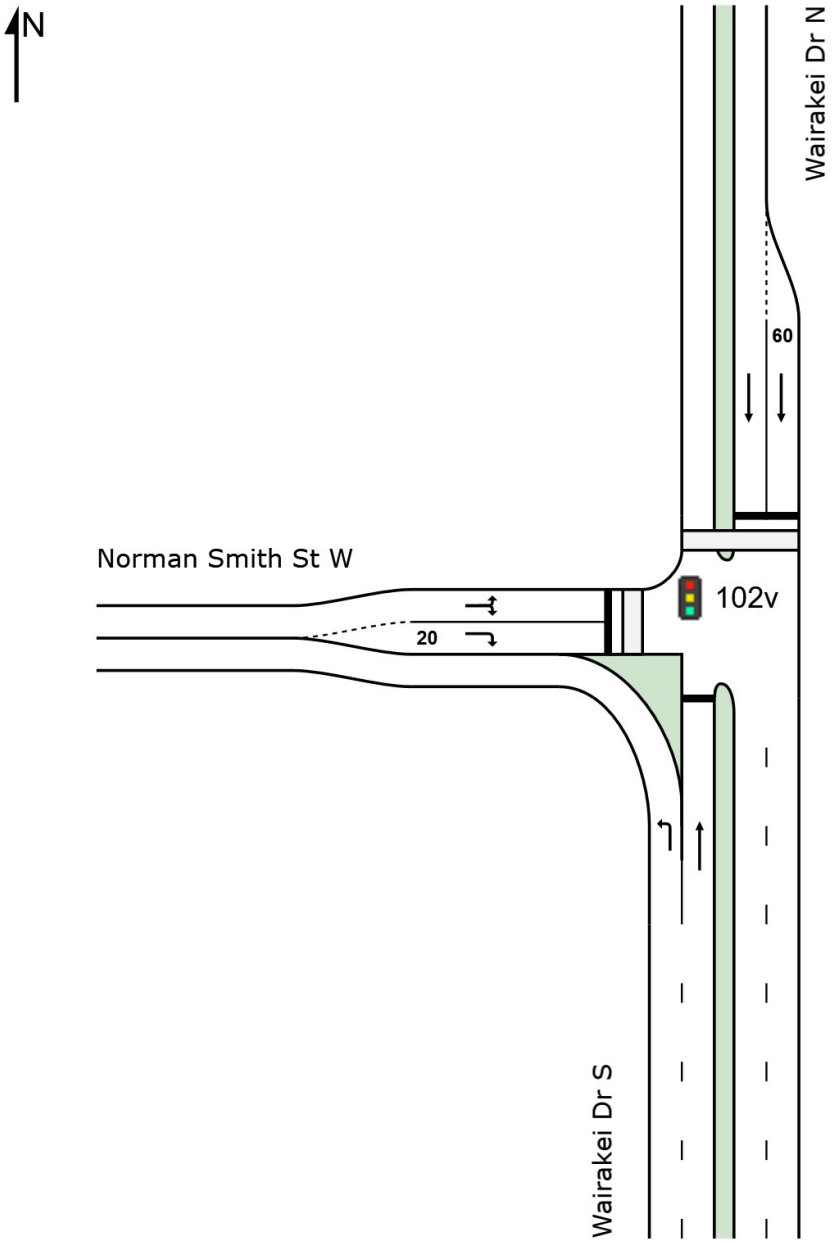
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 102v [Norman / Wairakei 2041 AM + Dev]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Opposed Turns
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout

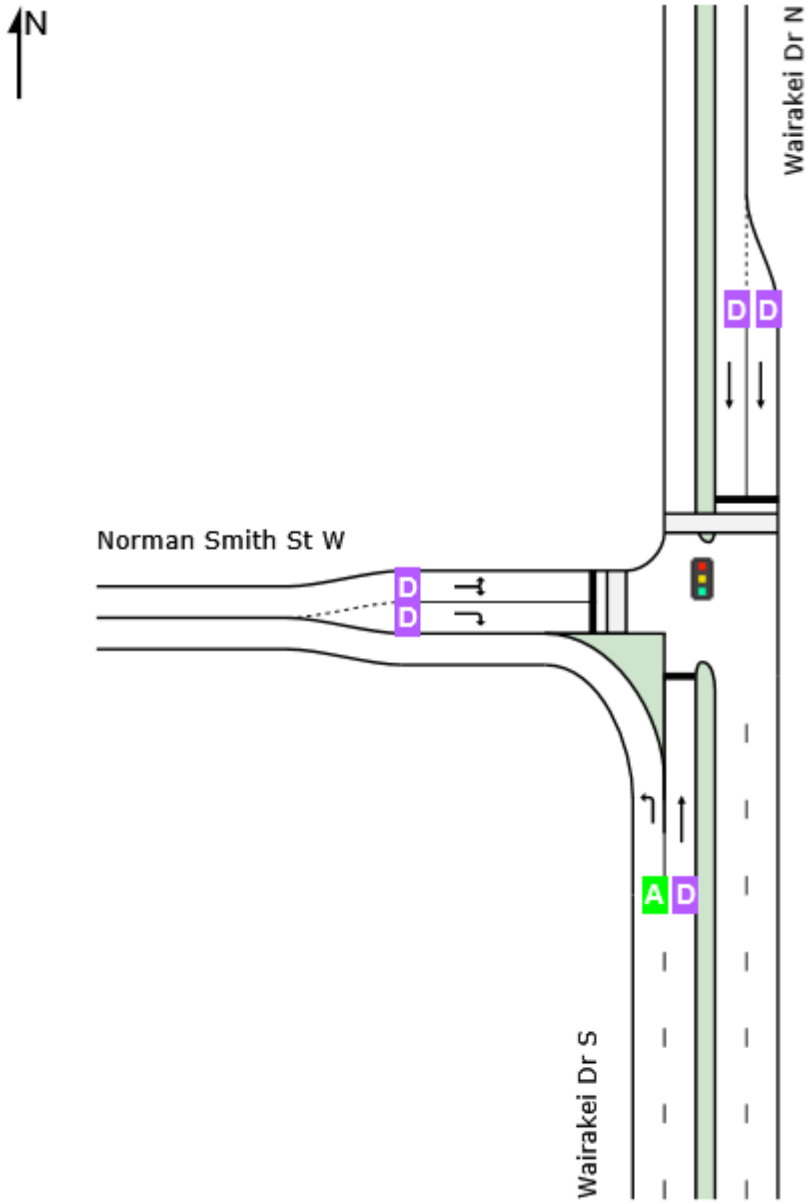


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	426	2.0	0.233	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	65.6
2	T1	294	2.0	0.763	36.1	LOS D	11.8	83.8	1.00	0.90	1.14	44.7
Approach		720	2.0	0.763	19.2	LOS B	11.8	83.8	0.41	0.72	0.46	55.2
North: Wairakei Dr N												
8	T1	706	2.0	0.917	49.4	LOS D	17.3	123.3	1.00	1.07	1.49	38.4
Approach		706	2.0	0.917	49.4	LOS D	17.3	123.3	1.00	1.07	1.49	38.4
West: Norman Smith St W												
10	L2	11	2.0	0.935	45.8	LOS D	26.5	188.6	0.57	0.95	1.05	33.4
12	R2	1244	2.0	0.935	45.8	LOS D	26.5	188.6	0.57	0.95	1.05	33.4
Approach		1255	2.0	0.935	45.8	LOS D	26.5	188.6	0.57	0.95	1.05	33.4
All Vehicles		2681	2.0	0.935	39.6	LOS D	26.5	188.6	0.64	0.92	1.01	38.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	B	D	D	D



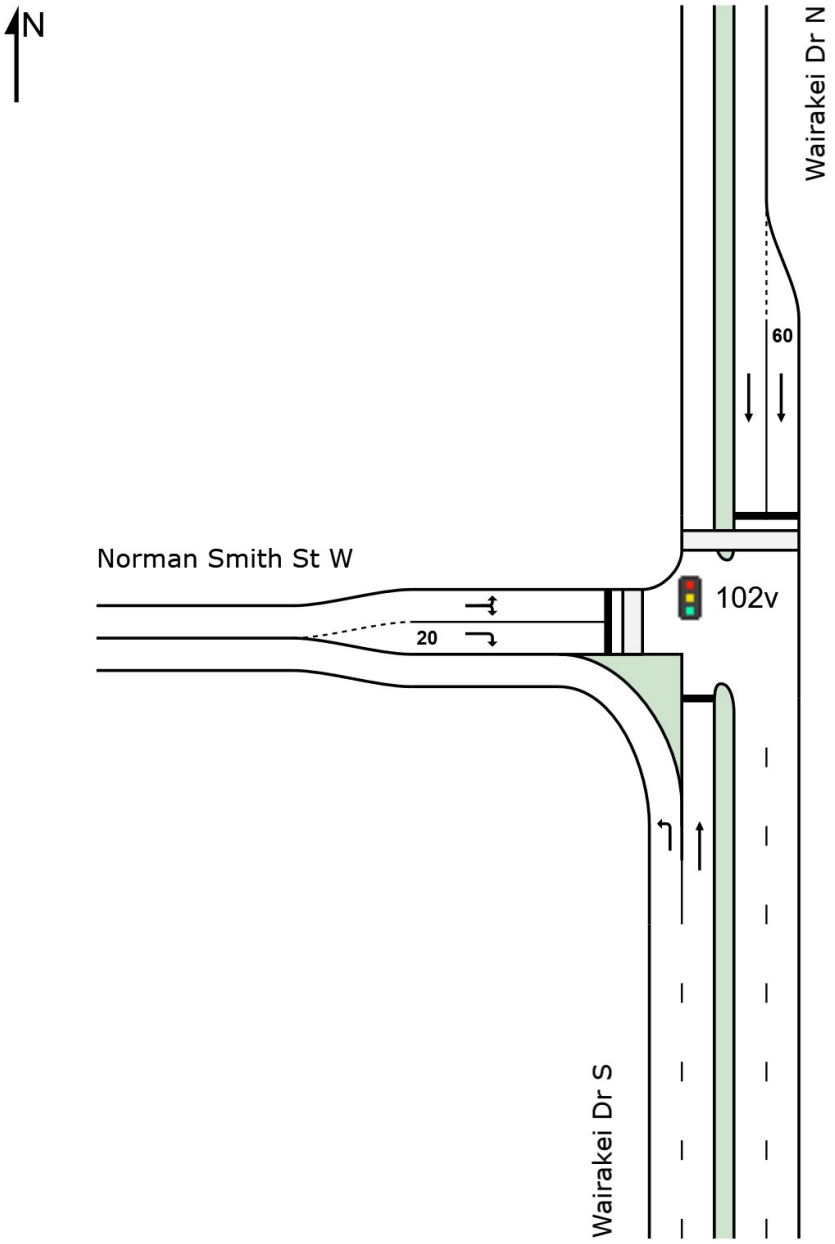
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 102v [Norman / Wairakei 2041 PM + Dev]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 40 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Opposed Turns
Reference Phase: Phase B
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout

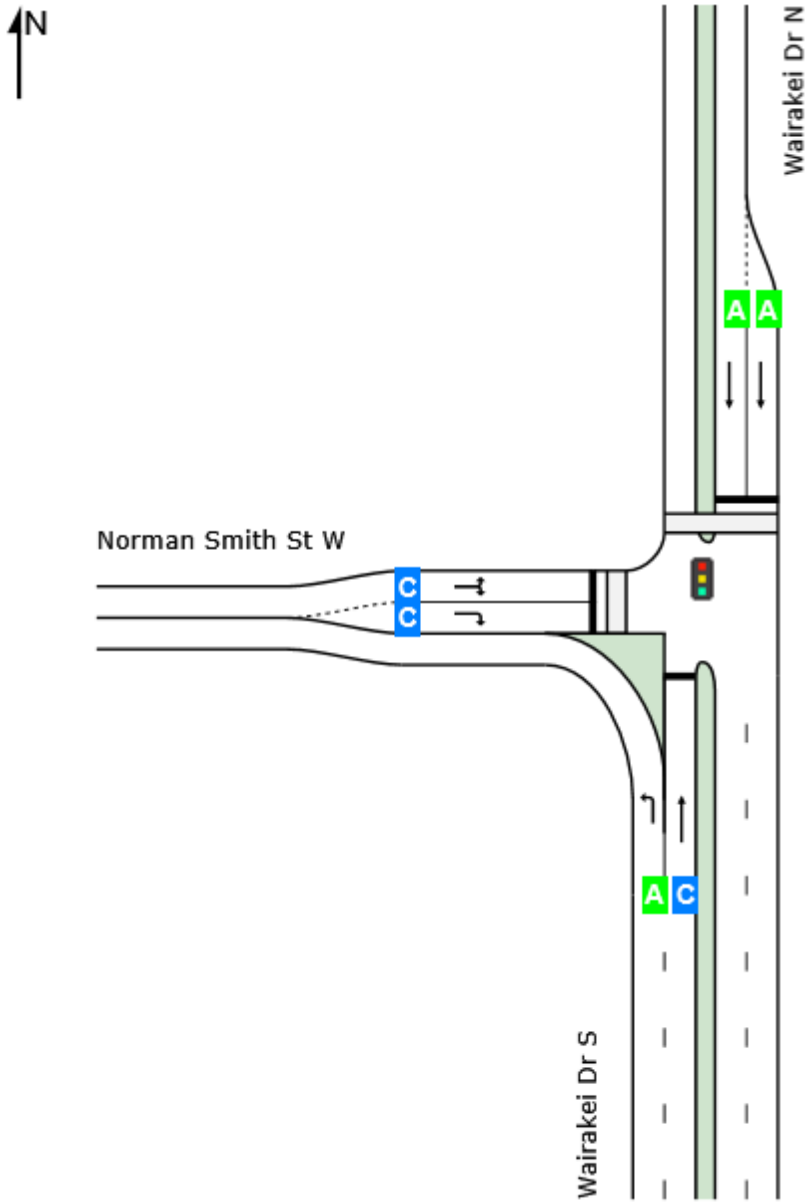


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	1231	2.0	0.672	7.7	LOS A	0.0	0.0	0.00	0.60	0.00	65.3
2	T1	627	2.0	0.869	21.1	LOS C	15.4	109.5	0.99	1.06	1.42	54.7
Approach		1858	2.0	0.869	12.2	LOS B	15.4	109.5	0.33	0.76	0.48	61.3
North: Wairakei Dr N												
8	T1	439	2.0	0.304	9.8	LOS A	3.1	22.3	0.74	0.61	0.74	65.8
Approach		439	2.0	0.304	9.8	LOS A	3.1	22.3	0.74	0.61	0.74	65.8
West: Norman Smith St W												
10	L2	11	2.0	0.783	21.3	LOS C	7.5	53.6	0.90	0.95	1.20	43.1
12	R2	735	2.0	0.783	21.3	LOS C	7.5	53.6	0.90	0.95	1.20	43.0
Approach		745	2.0	0.783	21.3	LOS C	7.5	53.6	0.90	0.95	1.20	43.0
All Vehicles		3042	2.0	0.869	14.1	LOS B	15.4	109.5	0.53	0.78	0.69	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	B	A	C	B

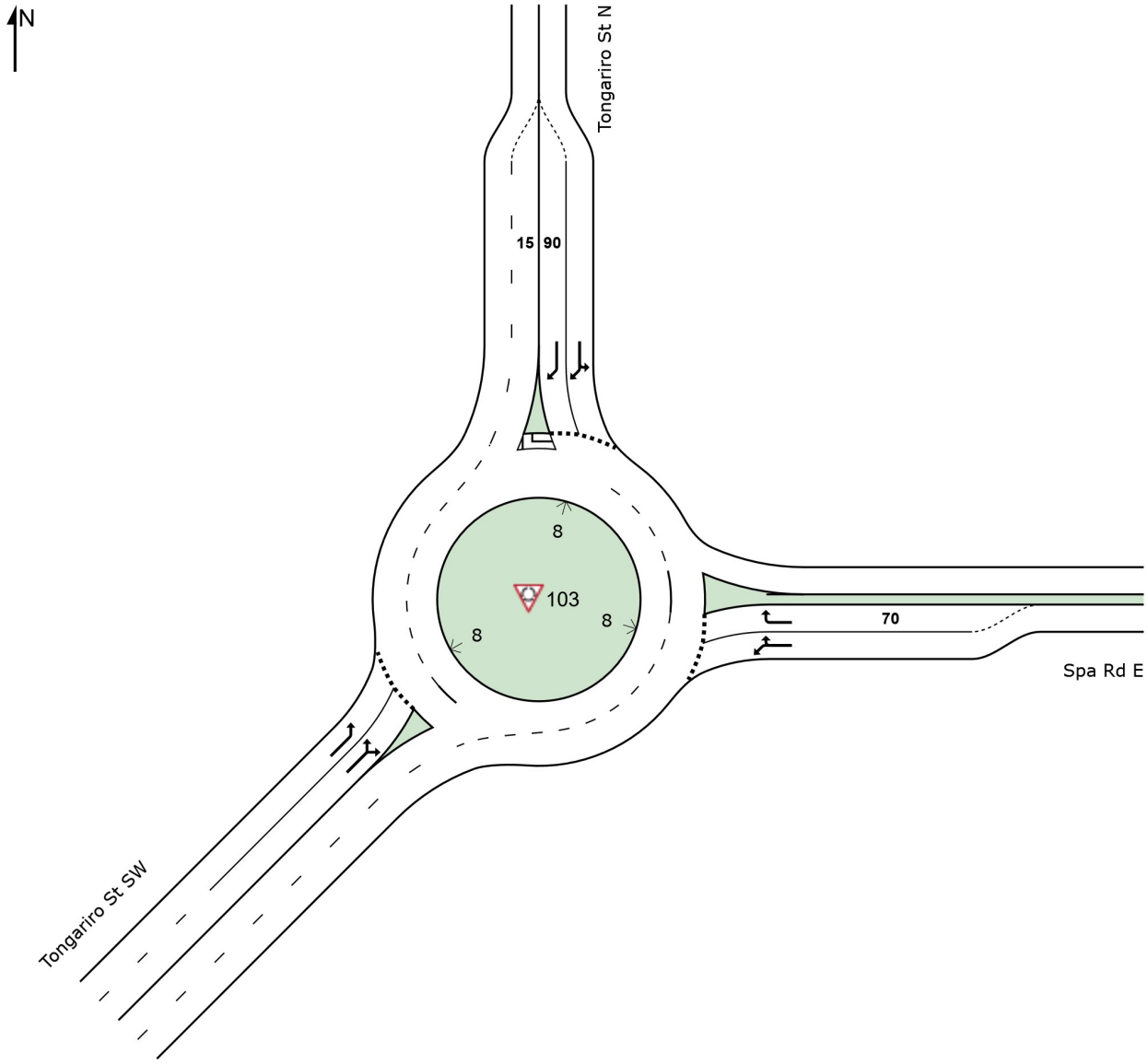


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 103 [Spa / Tongariro 2021 AM Base]

New Site
Site Category: (None)
Roundabout

Site Layout

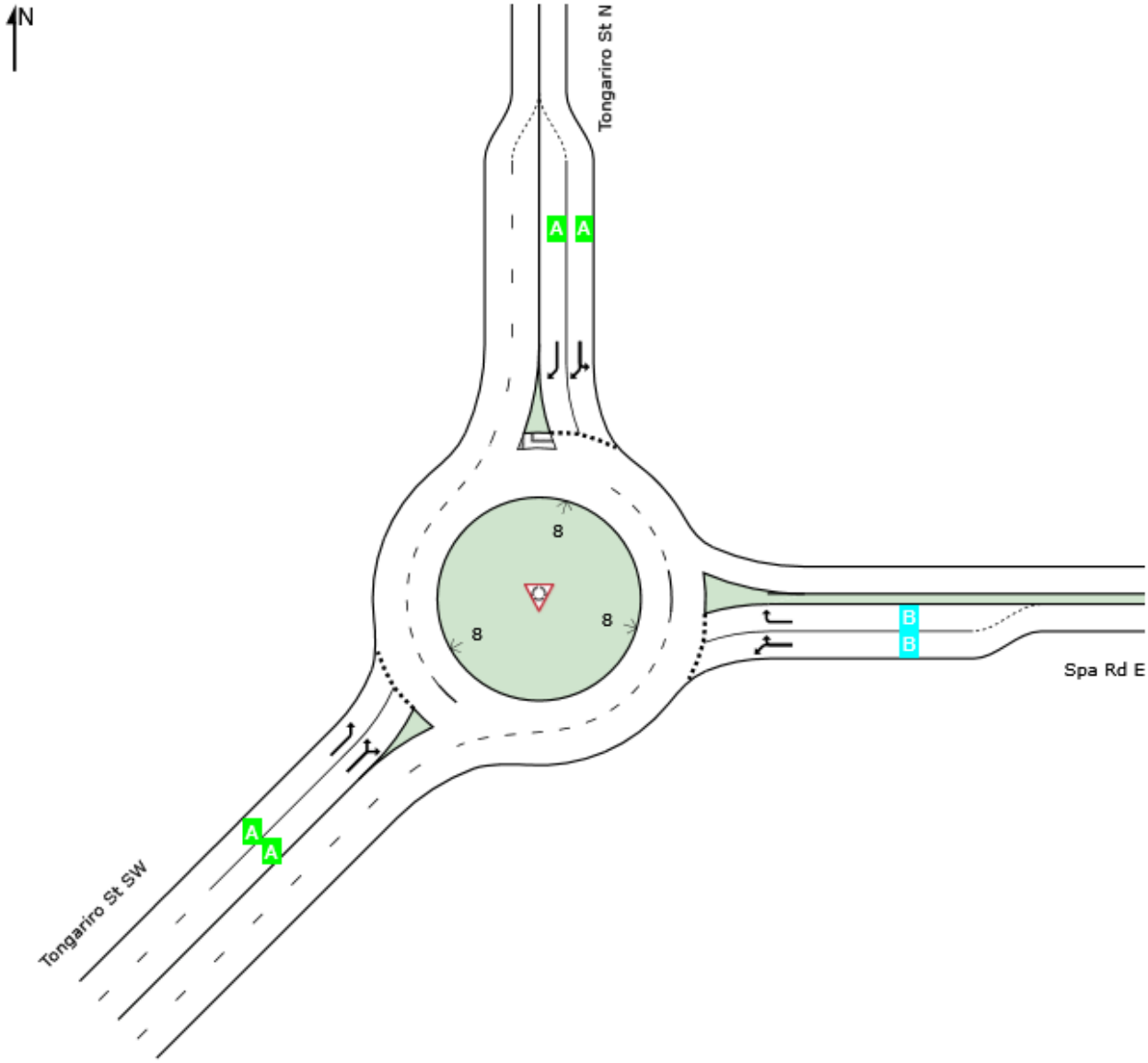


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Spa Rd E												
4a	L1	60	2.0	0.460	8.5	LOS A	3.3	23.5	0.79	0.92	0.87	43.3
6	R2	347	2.0	0.460	12.3	LOS B	3.3	23.5	0.77	0.91	0.84	43.3
Approach		407	2.0	0.460	11.7	LOS B	3.3	23.5	0.77	0.91	0.85	43.3
North: Tongariro St N												
7	L2	802	2.0	0.532	5.0	LOS A	4.9	35.0	0.38	0.52	0.38	45.4
9a	R1	704	2.0	0.528	6.8	LOS A	4.8	34.1	0.40	0.57	0.40	45.1
Approach		1506	2.0	0.532	5.8	LOS A	4.9	35.0	0.39	0.54	0.39	45.3
SouthWest: Tongariro St SW												
30a	L1	357	2.0	0.350	4.8	LOS A	2.0	14.1	0.54	0.62	0.54	46.4
32a	R1	86	2.0	0.146	8.9	LOS A	0.6	4.5	0.52	0.74	0.52	44.4
Approach		443	2.0	0.350	5.6	LOS A	2.0	14.1	0.54	0.64	0.54	46.0
All Vehicles		2357	2.0	0.532	6.8	LOS A	4.9	35.0	0.49	0.63	0.50	45.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	East	North	Southwest	
LOS	B	A	A	A

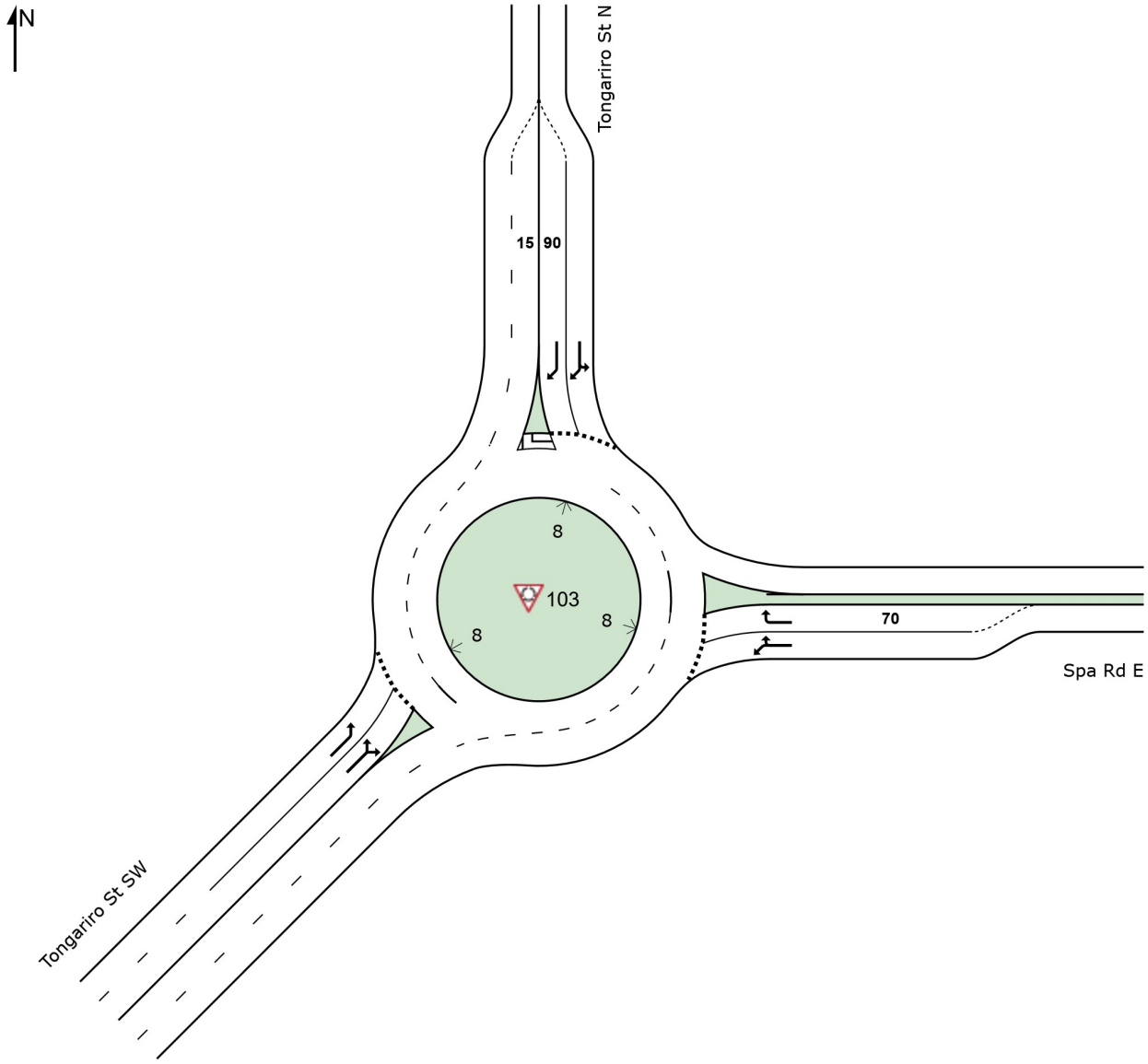


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 103 [Spa / Tongariro 2021 PM Base]

New Site
Site Category: (None)
Roundabout

Site Layout

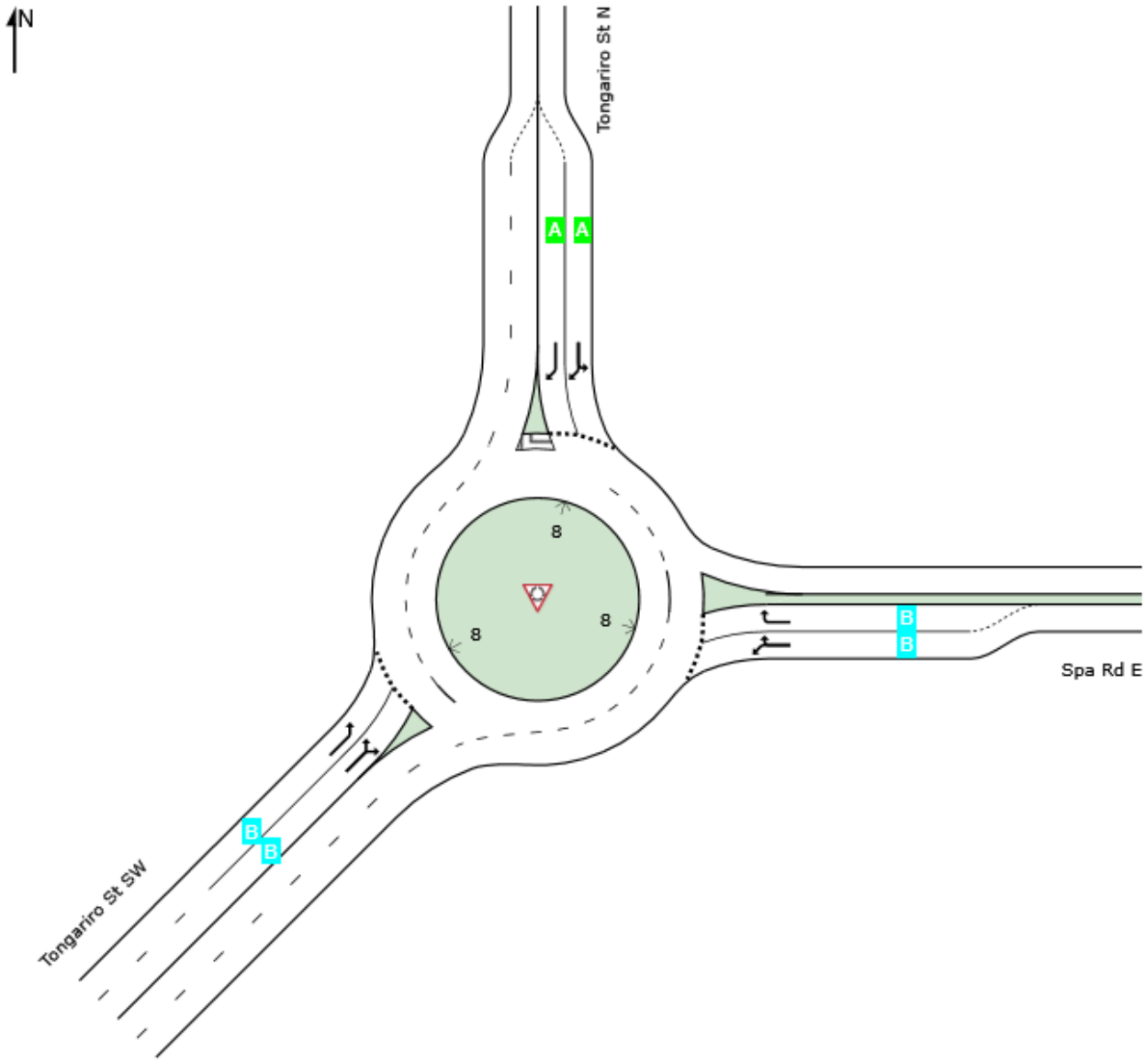


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Spa Rd E												
4a	L1	31	2.0	0.742	9.5	LOS A	7.9	56.1	0.80	1.01	1.08	42.6
6	R2	803	2.0	0.742	12.9	LOS B	7.9	56.1	0.77	0.98	1.02	42.8
Approach		834	2.0	0.742	12.7	LOS B	7.9	56.1	0.77	0.98	1.02	42.8
North: Tongariro St N												
7	L2	500	2.0	0.325	4.6	LOS A	2.5	17.9	0.17	0.51	0.17	45.8
9a	R1	497	2.0	0.325	6.3	LOS A	2.5	17.9	0.18	0.56	0.18	45.6
Approach		997	2.0	0.325	5.4	LOS A	2.5	17.9	0.18	0.53	0.18	45.7
SouthWest: Tongariro St SW												
30a	L1	676	2.0	0.854	16.5	LOS B	11.5	82.0	0.97	1.30	1.70	40.8
32a	R1	28	2.0	0.174	12.0	LOS B	0.8	5.4	0.69	0.85	0.69	43.7
Approach		704	2.0	0.854	16.3	LOS B	11.5	82.0	0.96	1.29	1.66	40.9
All Vehicles		2535	2.0	0.854	10.9	LOS B	11.5	82.0	0.59	0.89	0.87	43.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	East	North	Southwest	
LOS	B	A	B	B

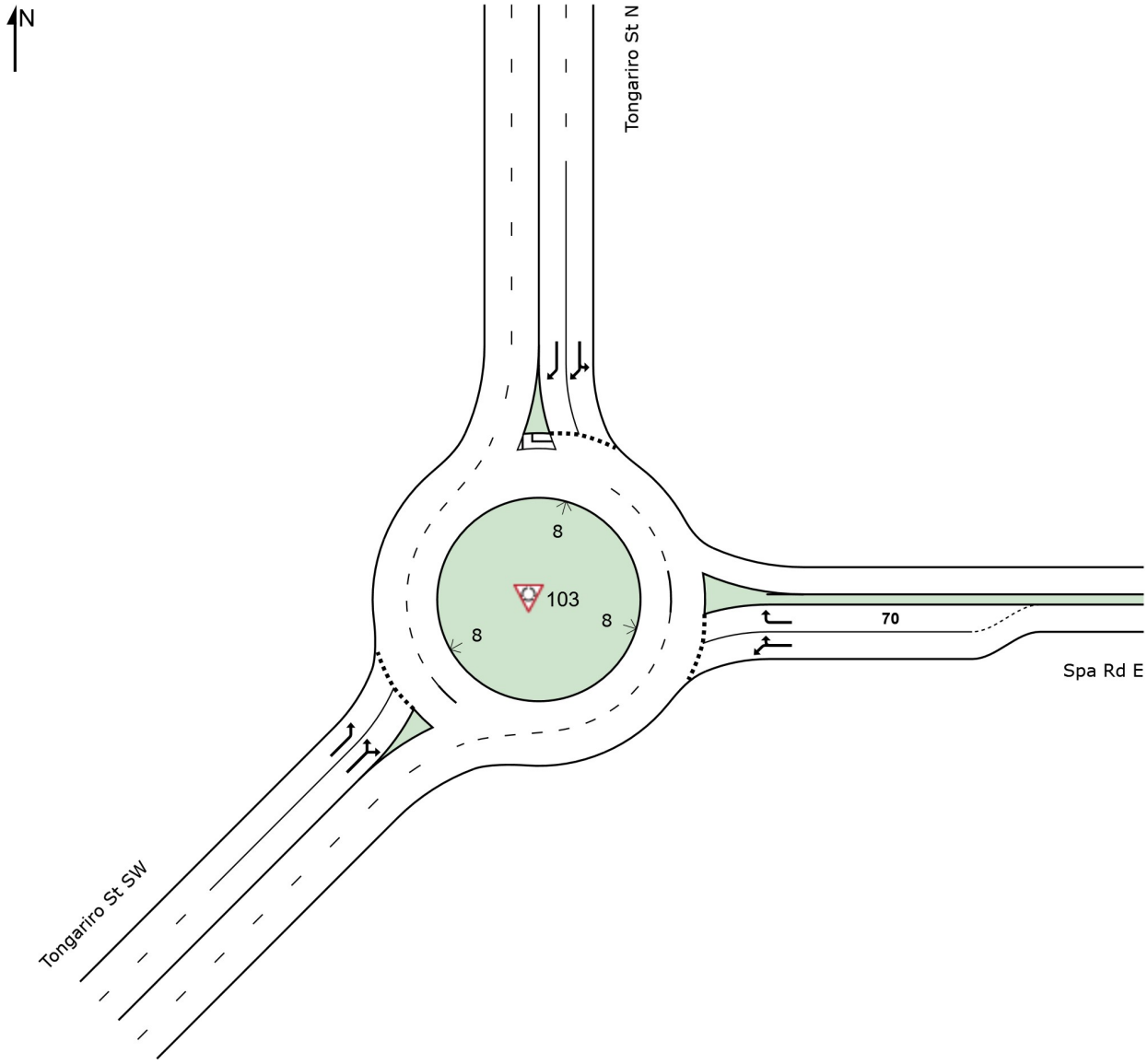


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 103 [Spa / Tongariro 2041 AM No Dev.]

New Site
Site Category: (None)
Roundabout

Site Layout

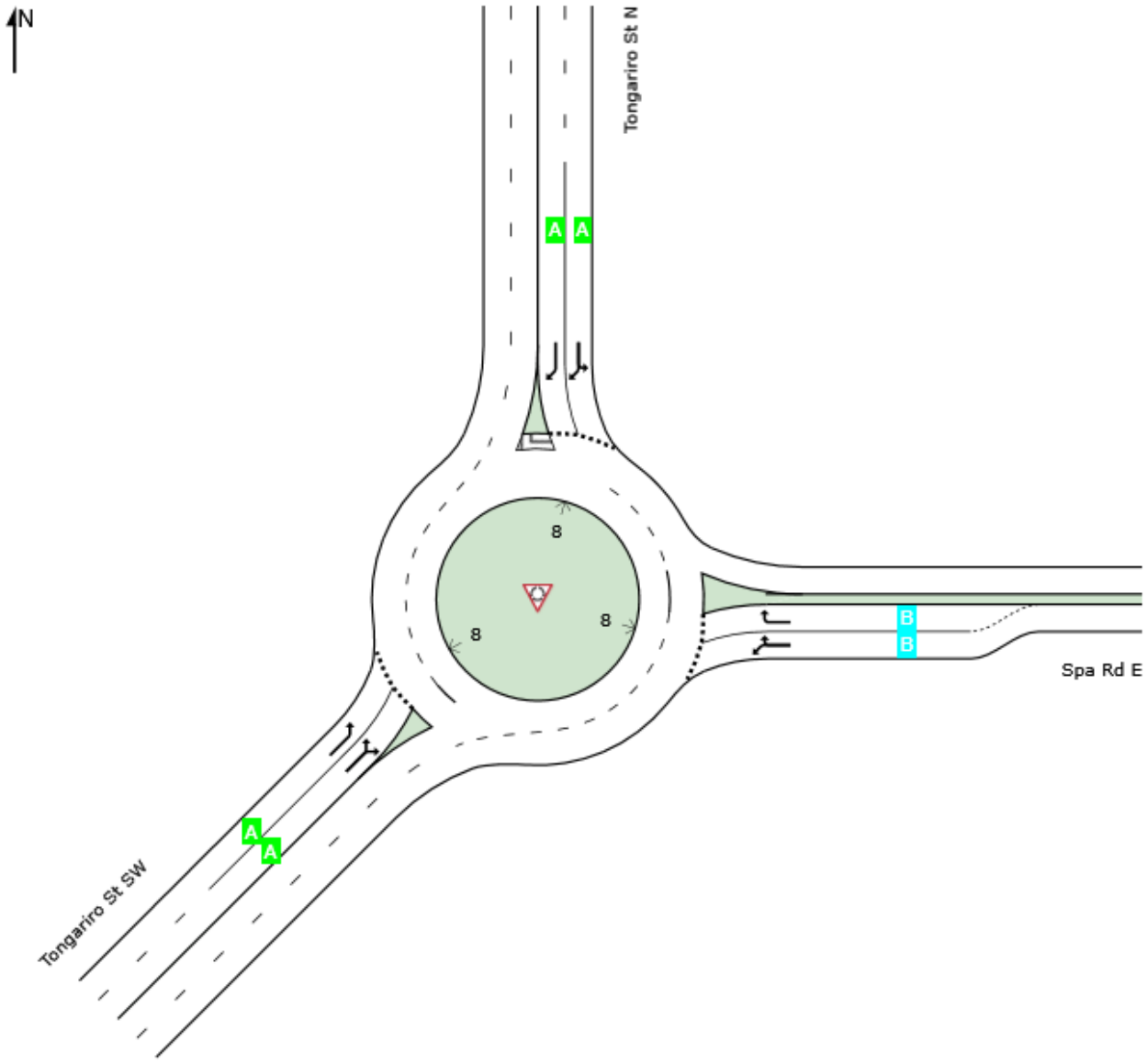


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Spa Rd E												
4a	L1	61	2.0	0.304	7.6	LOS A	1.8	13.1	0.76	0.86	0.76	44.0
6	R2	357	2.0	0.304	11.5	LOS B	1.8	13.1	0.76	0.88	0.76	43.6
Approach		418	2.0	0.304	10.9	LOS B	1.8	13.1	0.76	0.88	0.76	43.7
North: Tongariro St N												
7	L2	893	2.0	0.603	5.2	LOS A	6.1	43.5	0.45	0.53	0.45	45.3
9a	R1	799	2.0	0.603	7.0	LOS A	6.1	43.5	0.48	0.58	0.48	44.9
Approach		1692	2.0	0.603	6.0	LOS A	6.1	43.5	0.47	0.55	0.47	45.1
SouthWest: Tongariro St SW												
30a	L1	378	2.0	0.238	4.6	LOS A	1.2	8.3	0.49	0.61	0.49	46.4
32a	R1	100	2.0	0.238	7.5	LOS A	1.2	8.2	0.49	0.65	0.49	45.8
Approach		478	2.0	0.238	5.2	LOS A	1.2	8.3	0.49	0.62	0.49	46.3
All Vehicles		2587	2.0	0.603	6.7	LOS A	6.1	43.5	0.52	0.62	0.52	45.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	East	North	Southwest	
LOS	B	A	A	A

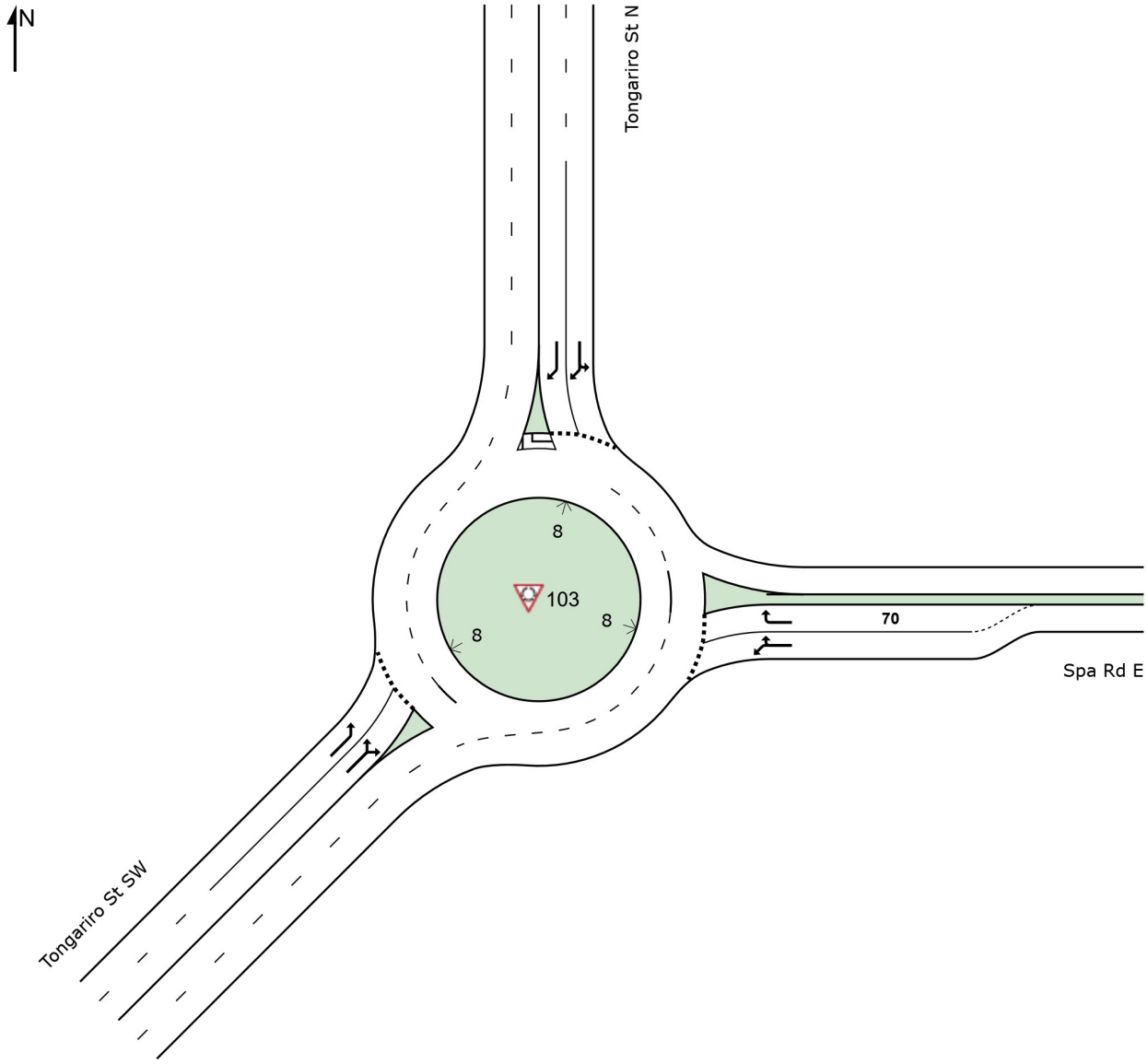


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 103 [Spa / Tongariro 2041 PM No Dev]

New Site
Site Category: (None)
Roundabout

Site Layout

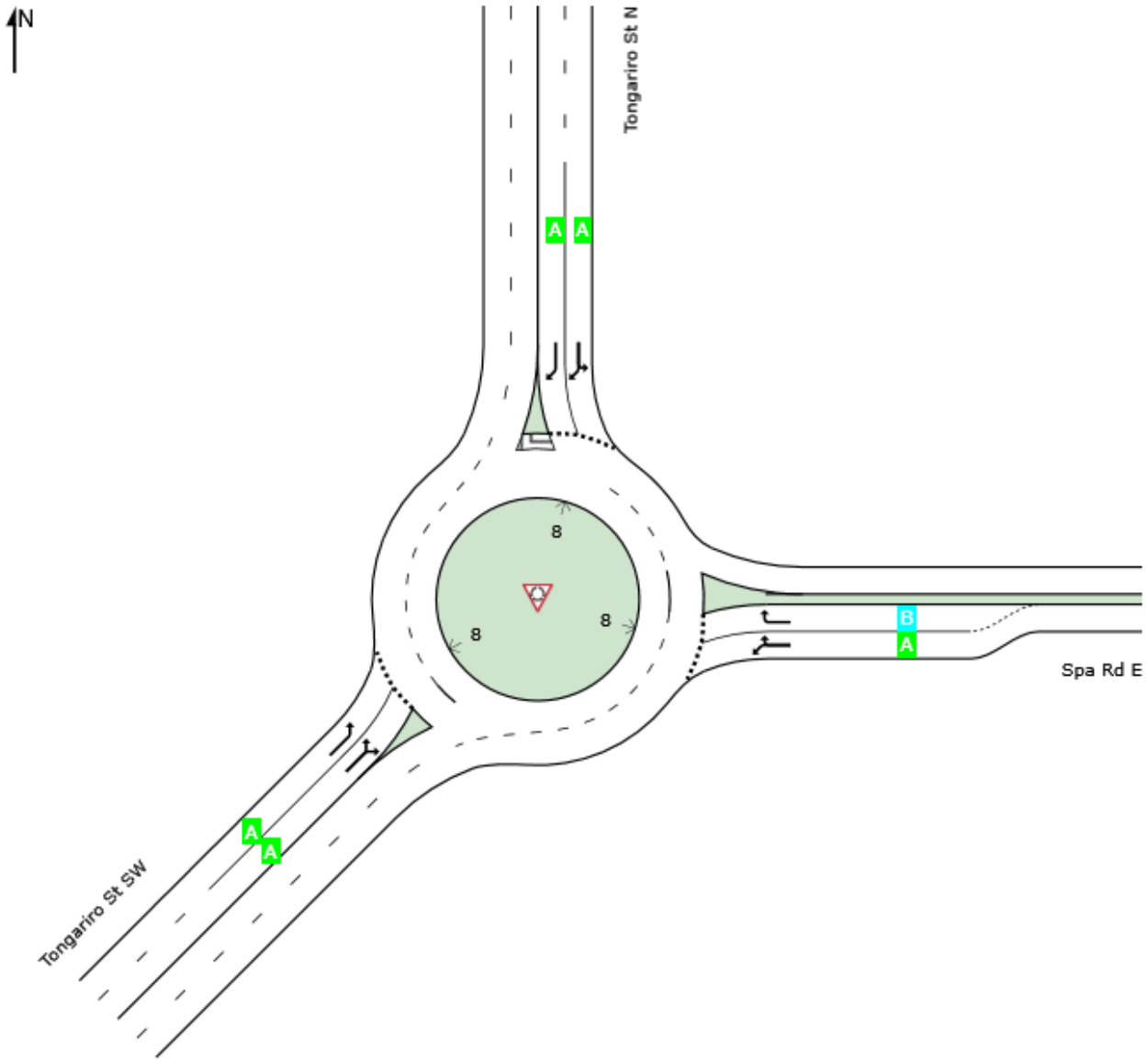


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Spa Rd E												
4a	L1	26	2.0	0.489	6.5	LOS A	3.0	21.6	0.64	0.85	0.70	44.1
6	R2	883	2.0	0.489	10.3	LOS B	3.0	21.6	0.65	0.85	0.71	44.1
Approach		909	2.0	0.489	10.2	LOS B	3.0	21.6	0.65	0.85	0.71	44.1
North: Tongariro St N												
7	L2	529	2.0	0.350	4.6	LOS A	2.8	20.1	0.20	0.50	0.20	45.8
9a	R1	534	2.0	0.350	6.3	LOS A	2.8	20.1	0.21	0.55	0.21	45.6
Approach		1063	2.0	0.350	5.4	LOS A	2.8	20.1	0.20	0.53	0.20	45.7
SouthWest: Tongariro St SW												
30a	L1	726	2.0	0.517	7.6	LOS A	3.1	22.0	0.75	0.91	0.89	45.3
32a	R1	34	2.0	0.517	10.7	LOS B	3.0	21.4	0.75	0.92	0.90	44.8
Approach		760	2.0	0.517	7.7	LOS A	3.1	22.0	0.75	0.91	0.89	45.3
All Vehicles		2733	2.0	0.517	7.6	LOS A	3.1	22.0	0.50	0.74	0.56	45.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	East	North	Southwest	
LOS	B	A	A	A

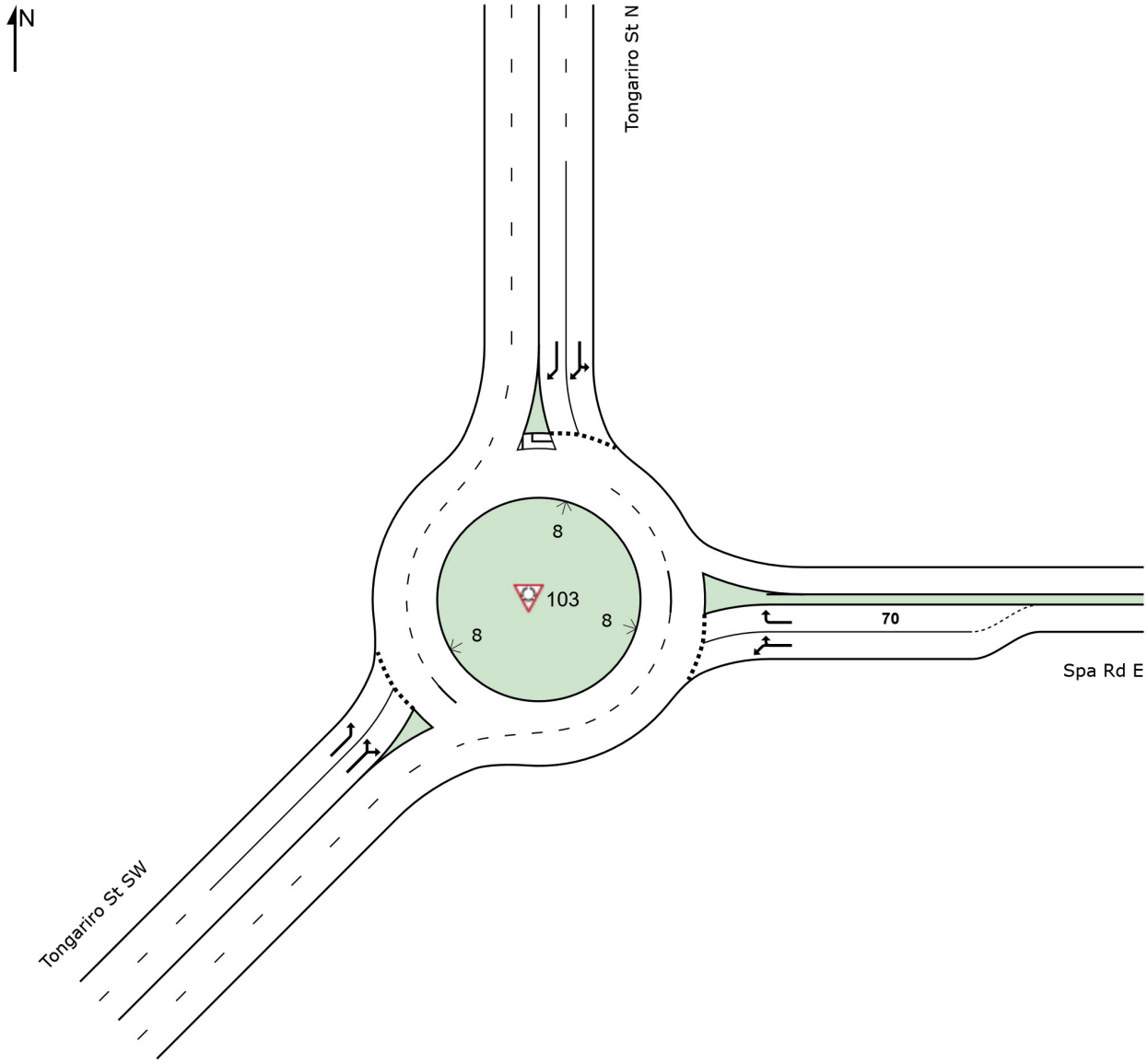


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 103 [Spa / Tongariro 2041 AM + Dev]

New Site
Site Category: (None)
Roundabout

Site Layout



Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Spa Rd E												
4a	L1	105	2.0	0.379	7.1	LOS A	2.3	16.1	0.70	0.82	0.70	44.3
6	R2	512	2.0	0.379	10.9	LOS B	2.3	16.1	0.70	0.84	0.70	43.9
Approach		617	2.0	0.379	10.3	LOS B	2.3	16.1	0.70	0.84	0.70	44.0
North: Tongariro St N												
7	L2	1279	2.0	0.765	4.8	LOS A	13.1	93.4	0.36	0.47	0.36	45.5
9a	R1	653	2.0	0.488	6.4	LOS A	4.4	31.2	0.24	0.55	0.24	45.4
Approach		1932	2.0	0.765	5.3	LOS A	13.1	93.4	0.32	0.50	0.32	45.5
SouthWest: Tongariro St SW												
30a	L1	273	2.0	0.167	5.0	LOS A	0.8	5.4	0.52	0.65	0.52	46.3
32a	R1	33	2.0	0.167	7.9	LOS A	0.7	5.3	0.53	0.67	0.53	45.9
Approach		305	2.0	0.167	5.3	LOS A	0.8	5.4	0.53	0.65	0.53	46.3
All Vehicles		2854	2.0	0.765	6.4	LOS A	13.1	93.4	0.42	0.59	0.42	45.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
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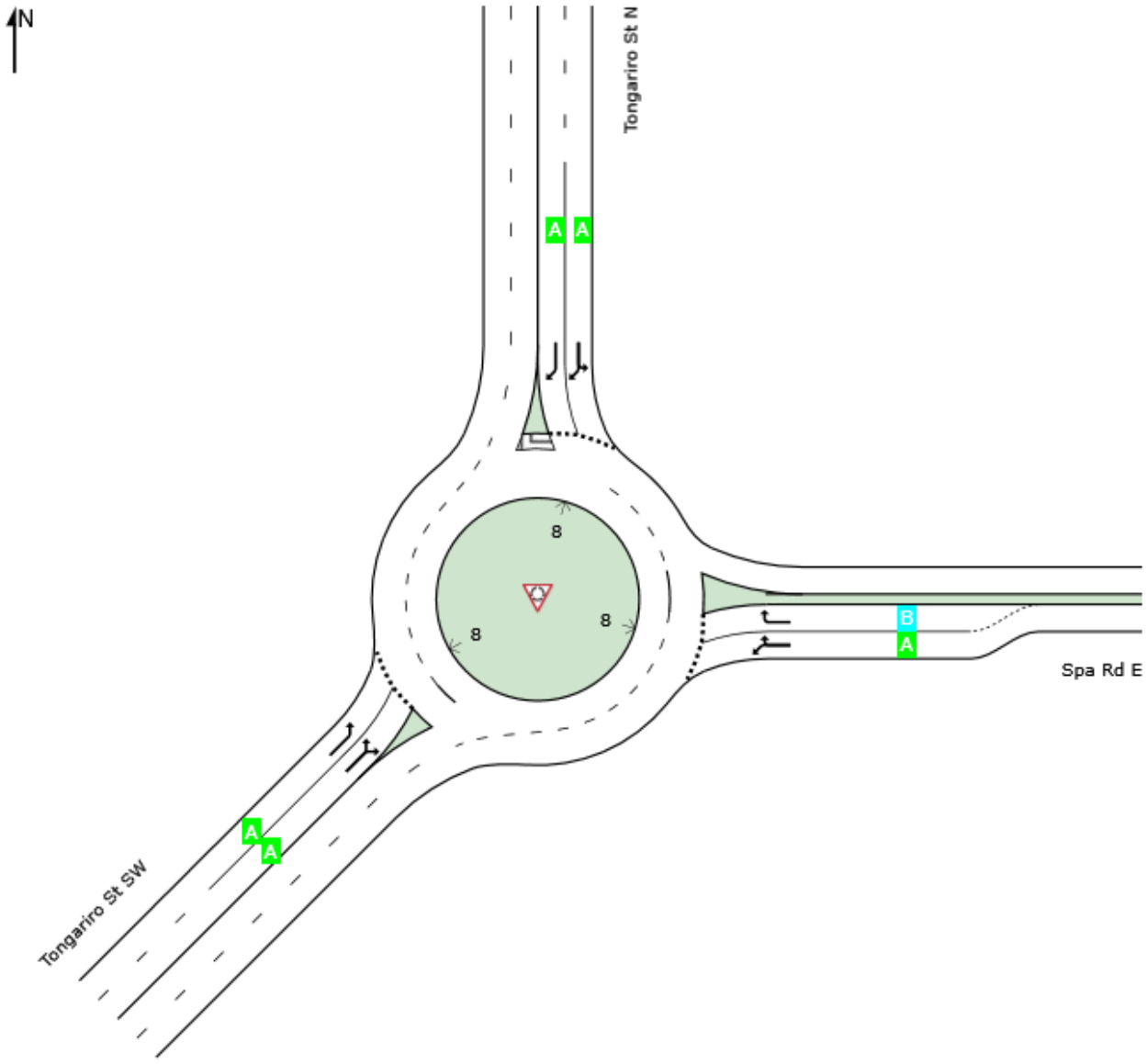
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	East	North	Southwest	
LOS	B	A	A	A

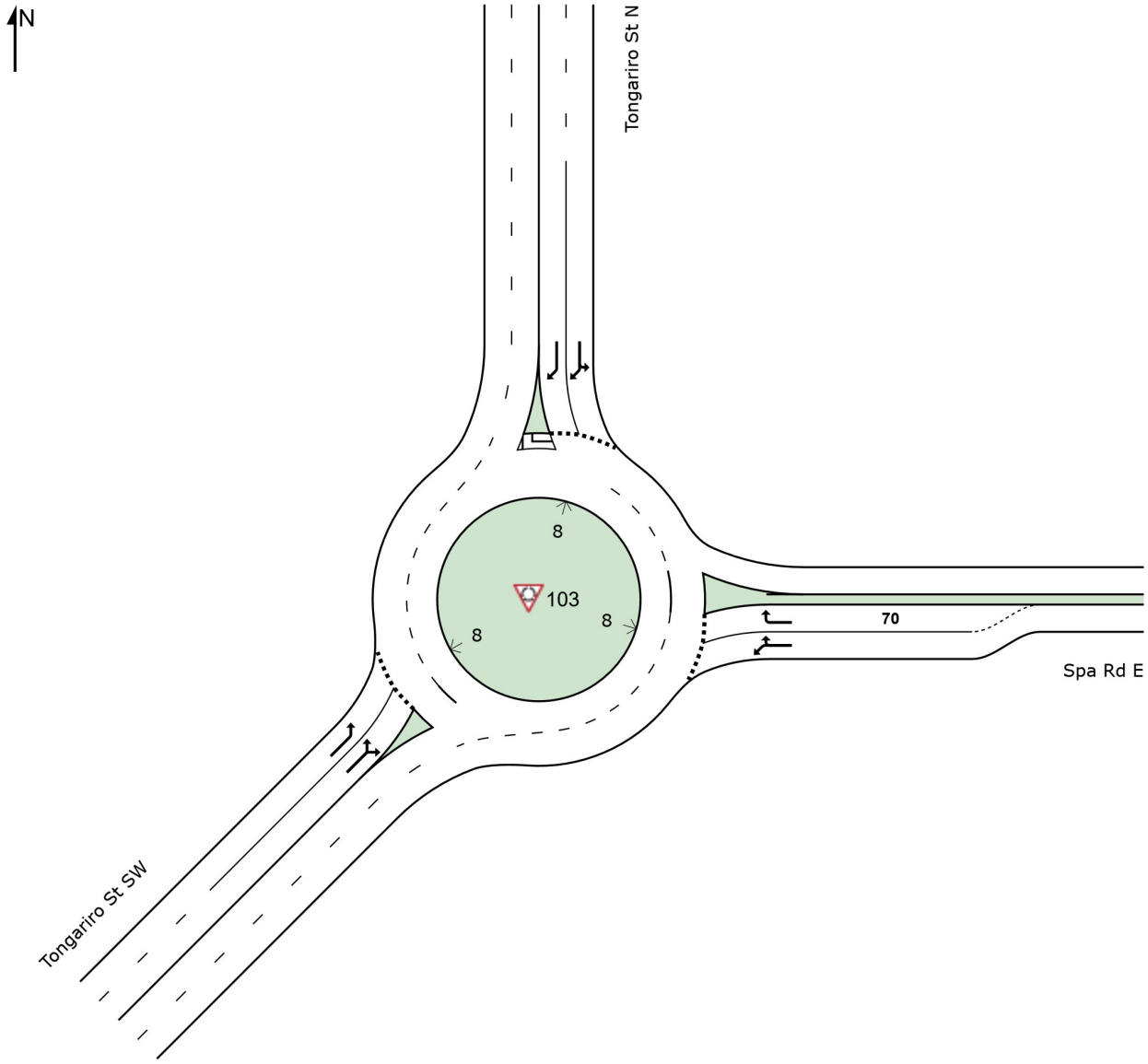


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 103 [Spa / Tongariro 2041 PM + Dev]

New Site
Site Category: (None)
Roundabout

Site Layout

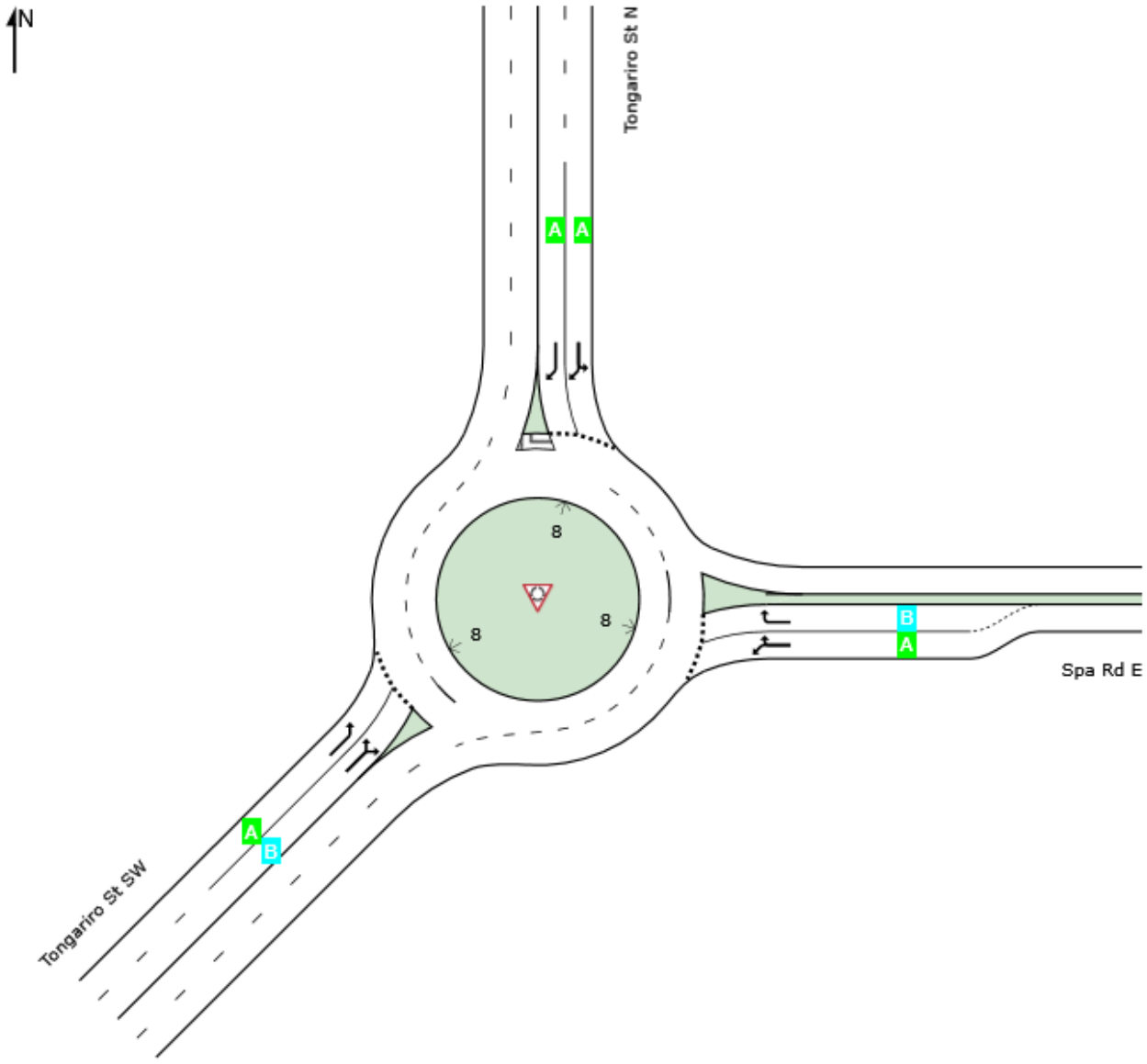


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Spa Rd E												
4a	L1	44	2.0	0.624	6.5	LOS A	5.2	37.2	0.66	0.80	0.74	44.1
6	R2	1273	2.0	0.624	10.3	LOS B	5.2	37.2	0.66	0.80	0.74	44.1
Approach		1317	2.0	0.624	10.1	LOS B	5.2	37.2	0.66	0.80	0.74	44.1
North: Tongariro St N												
7	L2	805	2.0	0.478	4.5	LOS A	4.8	34.0	0.18	0.50	0.18	45.9
9a	R1	349	2.0	0.268	6.2	LOS A	1.9	13.8	0.15	0.57	0.15	45.6
Approach		1155	2.0	0.478	5.1	LOS A	4.8	34.0	0.17	0.52	0.17	45.8
SouthWest: Tongariro St SW												
30a	L1	606	2.0	0.547	9.4	LOS A	3.3	23.5	0.82	0.97	1.03	44.3
32a	R1	21	2.0	0.547	12.9	LOS B	3.1	22.2	0.82	0.98	1.03	43.6
Approach		627	2.0	0.547	9.5	LOS A	3.3	23.5	0.82	0.97	1.03	44.3
All Vehicles		3099	2.0	0.624	8.1	LOS A	5.2	37.2	0.51	0.73	0.59	44.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	East	North	Southwest	
LOS	B	A	A	A

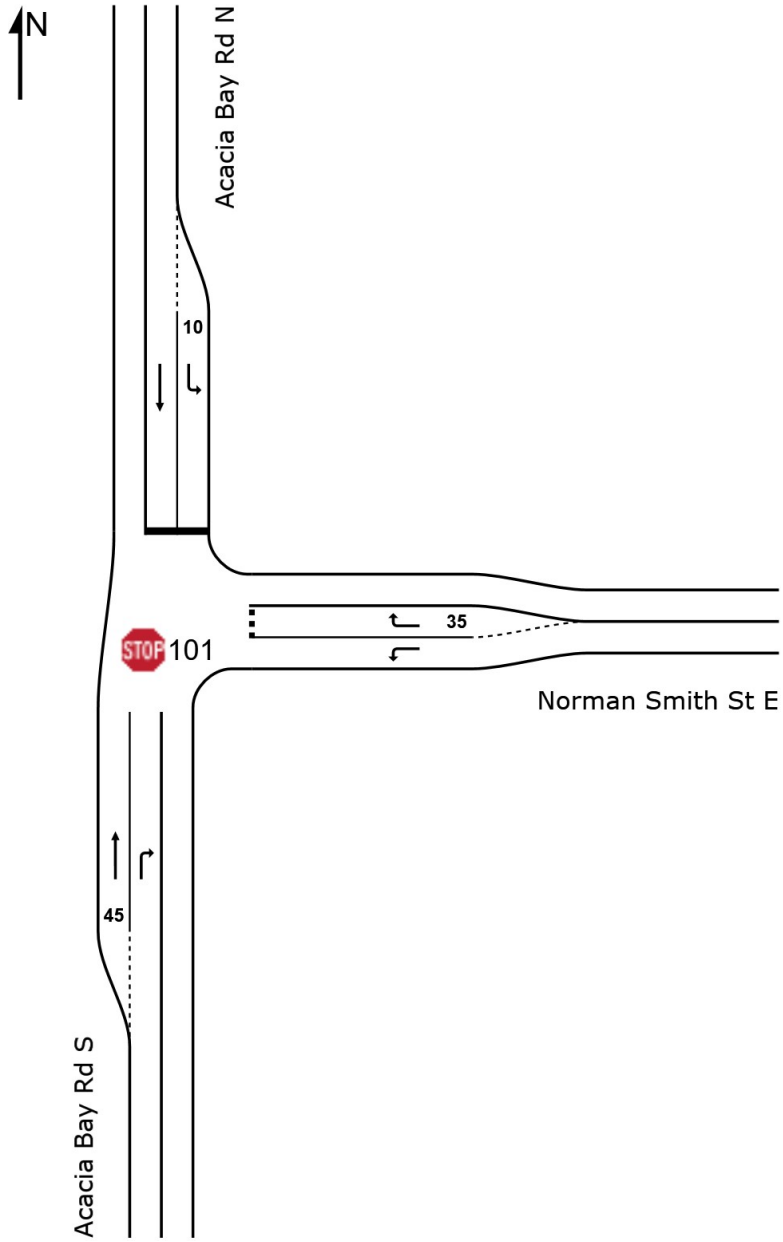


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Acacia / Norman 2021 AM Base]

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

Site Layout

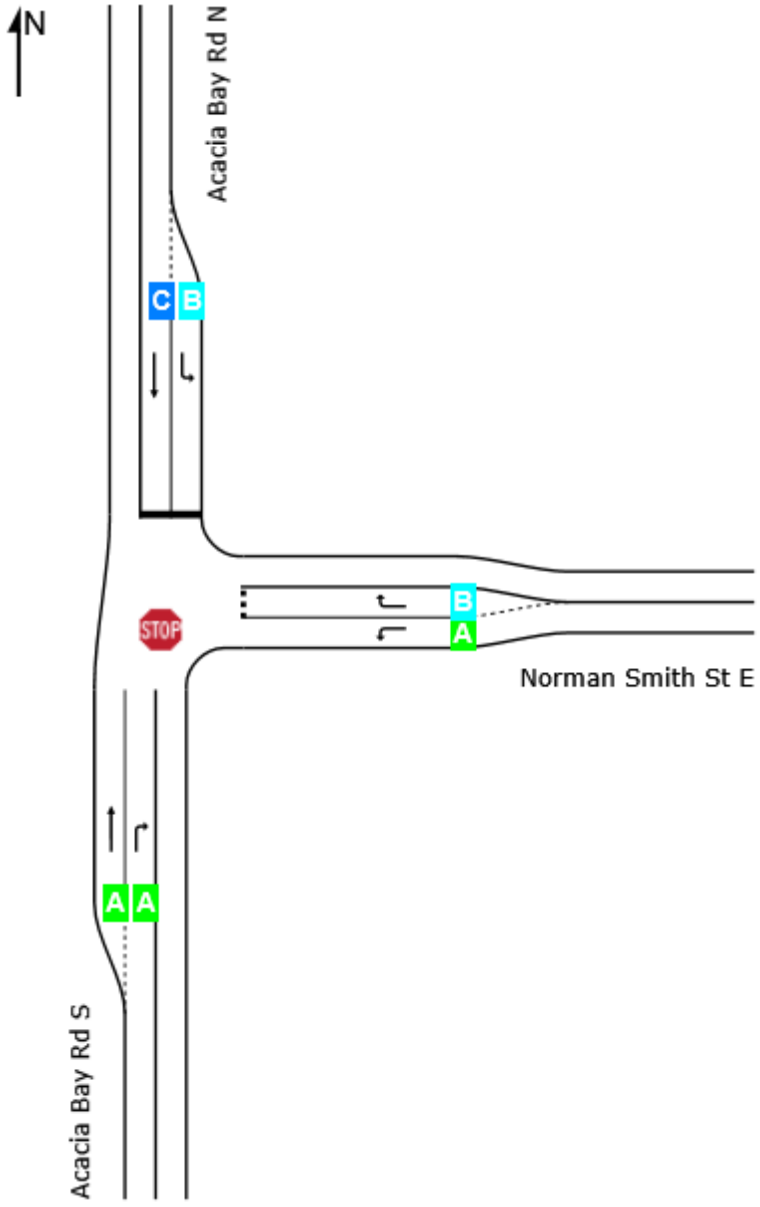

N
Acacia Bay Rd N
10
35
STOP
101
Norman Smith St E
45
Acacia Bay Rd S

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Acacia Bay Rd S												
11	T1	125	2.0	0.065	4.3	LOS A	0.0	0.0	0.00	0.52	0.00	41.3
12	R2	609	2.0	0.333	4.6	LOS A	0.0	0.0	0.00	0.54	0.00	39.4
Approach		735	2.0	0.333	4.6	NA	0.0	0.0	0.00	0.54	0.00	39.8
East: Norman Smith St E												
1	L2	218	2.0	0.119	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	40.0
3	R2	52	2.0	0.137	12.4	LOS B	0.4	3.1	0.69	0.86	0.69	27.9
Approach		269	2.0	0.137	6.1	LOS A	0.4	3.1	0.13	0.59	0.13	37.4
North: Acacia Bay Rd N												
4	L2	64	2.0	0.094	11.3	LOS B	0.3	2.4	0.56	0.97	0.56	30.8
5	T1	86	2.0	0.230	16.4	LOS C	0.8	5.9	0.74	1.02	0.80	31.1
Approach		151	2.0	0.230	14.2	LOS B	0.8	5.9	0.66	1.00	0.70	31.0
All Vehicles		1155	2.0	0.333	6.2	NA	0.8	5.9	0.12	0.61	0.12	37.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	East	North	
LOS	NA	A	B	NA

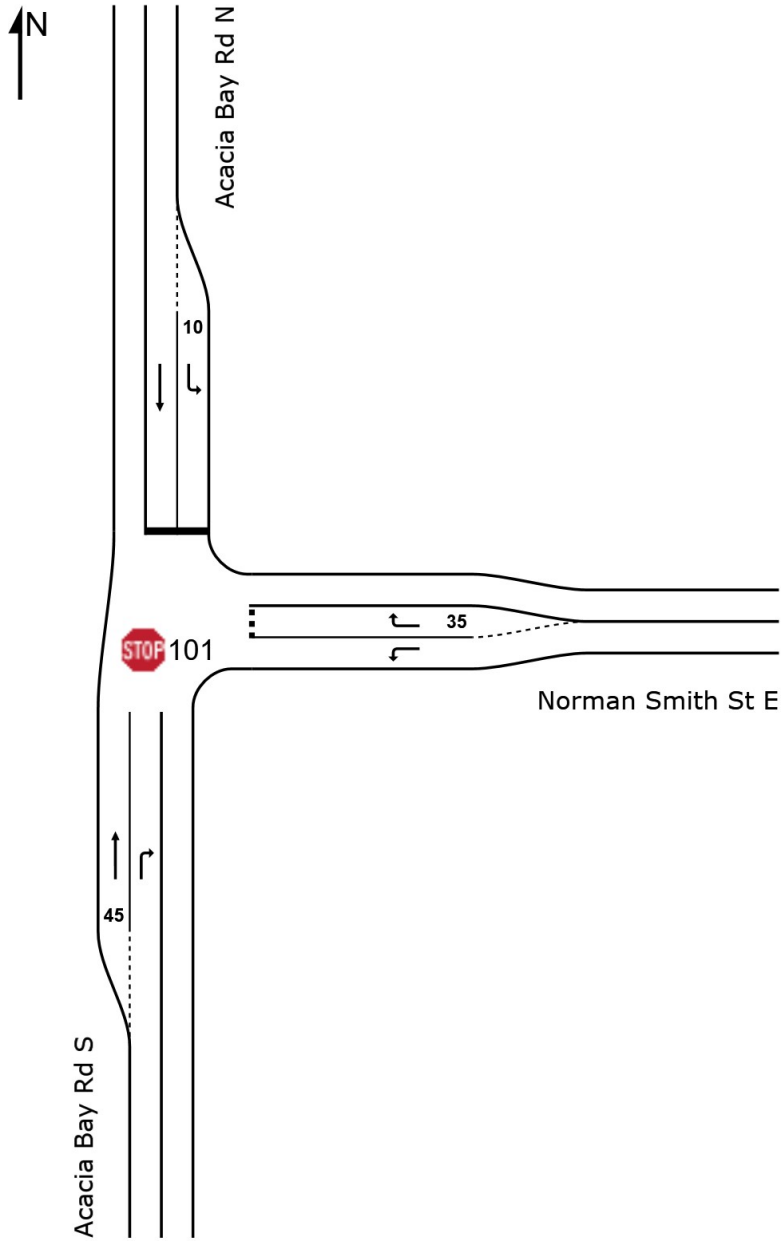


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Acacia / Norman 2021 PM Base]

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

Site Layout

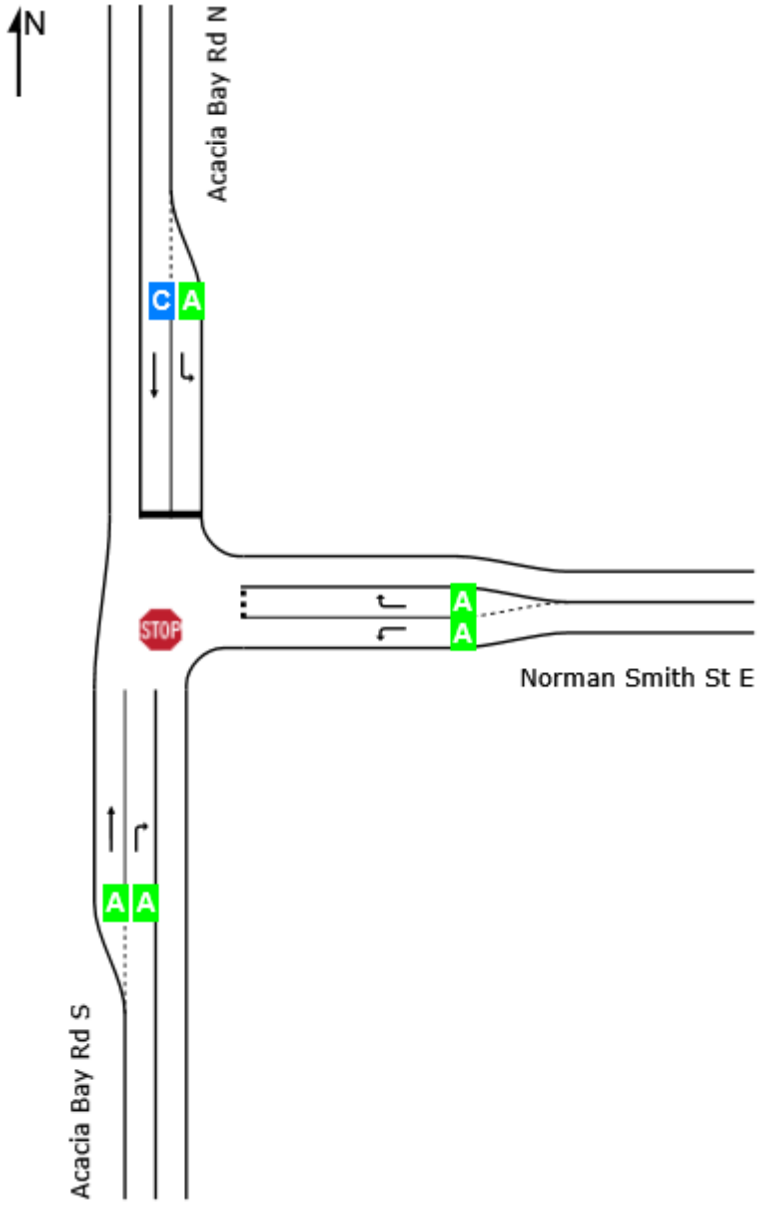

N
Acacia Bay Rd N
10
35
STOP
101
Norman Smith St E
45
Acacia Bay Rd S

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Acacia Bay Rd S												
11	T1	111	2.0	0.057	4.3	LOS A	0.0	0.0	0.00	0.52	0.00	41.3
12	R2	386	2.0	0.211	4.6	LOS A	0.0	0.0	0.00	0.54	0.00	39.4
Approach		497	2.0	0.211	4.5	NA	0.0	0.0	0.00	0.54	0.00	39.9
East: Norman Smith St E												
1	L2	604	2.0	0.330	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	40.0
3	R2	52	2.0	0.096	9.1	LOS A	0.3	2.2	0.54	0.78	0.54	31.3
Approach		656	2.0	0.330	4.9	LOS A	0.3	2.2	0.04	0.55	0.04	39.3
North: Acacia Bay Rd N												
4	L2	39	2.0	0.042	9.3	LOS A	0.2	1.1	0.44	0.88	0.44	32.8
5	T1	117	2.0	0.393	21.8	LOS C	1.6	11.2	0.83	1.08	1.08	27.6
Approach		156	2.0	0.393	18.7	LOS C	1.6	11.2	0.73	1.03	0.92	28.4
All Vehicles		1308	2.0	0.393	6.4	NA	1.6	11.2	0.11	0.60	0.13	37.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	East	North	
LOS	NA	A	C	NA

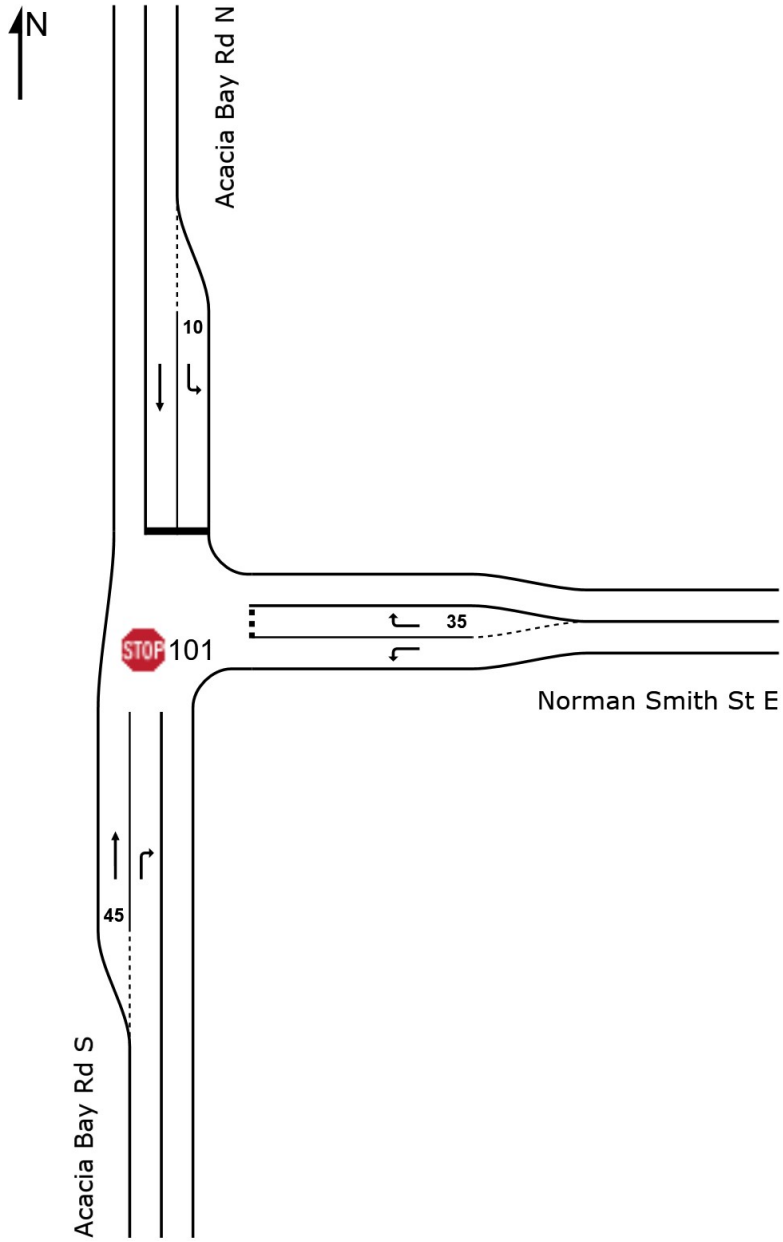


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Acacia / Norman 2041 AM No Dev]

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

Site Layout

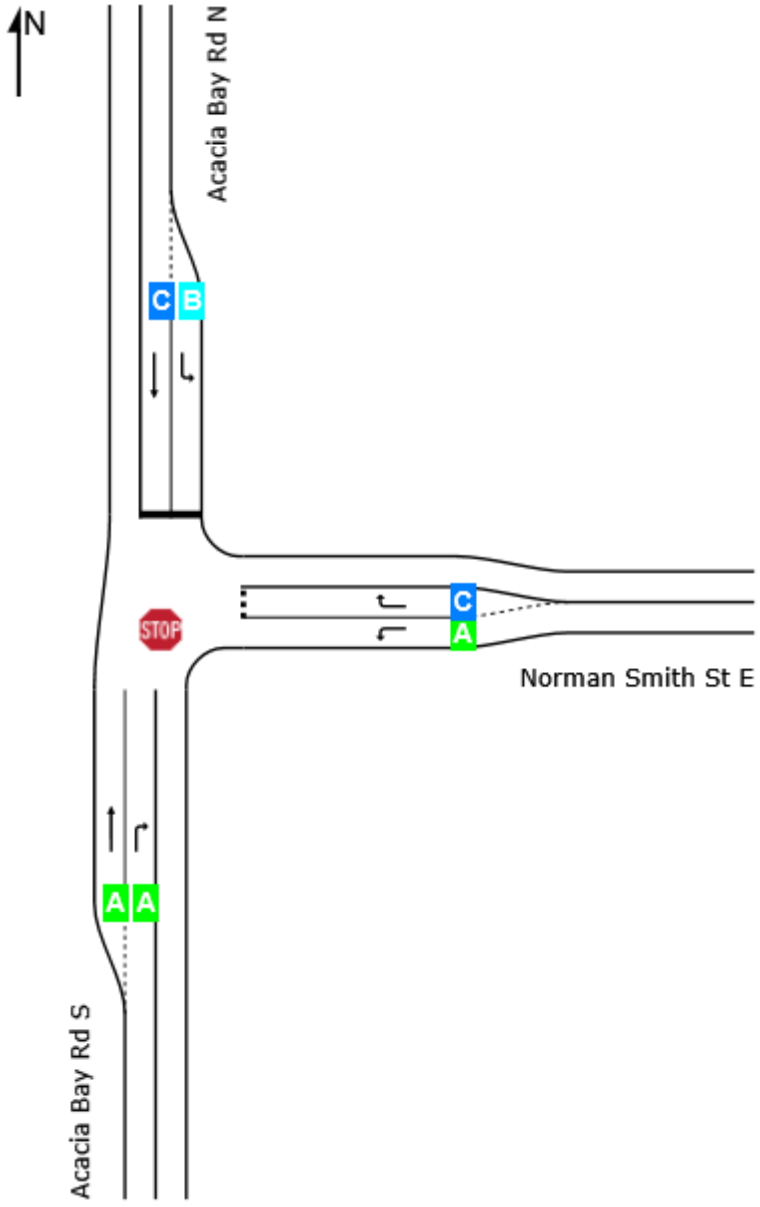

N
Acacia Bay Rd N
10
35
STOP
101
Norman Smith St E
45
Acacia Bay Rd S

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Acacia Bay Rd S												
11	T1	145	2.0	0.075	4.3	LOS A	0.0	0.0	0.00	0.52	0.00	41.3
12	R2	751	2.0	0.410	4.6	LOS A	0.0	0.0	0.00	0.54	0.00	39.4
Approach		896	2.0	0.410	4.6	NA	0.0	0.0	0.00	0.54	0.00	39.7
East: Norman Smith St E												
1	L2	232	2.0	0.126	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	40.0
3	R2	46	2.0	0.165	16.0	LOS C	0.5	3.6	0.78	0.90	0.78	24.9
Approach		278	2.0	0.165	6.5	LOS A	0.5	3.6	0.13	0.59	0.13	36.9
North: Acacia Bay Rd N												
4	L2	60	2.0	0.112	13.0	LOS B	0.4	2.8	0.65	1.00	0.65	29.2
5	T1	93	2.0	0.334	21.9	LOS C	1.2	8.9	0.83	1.06	1.01	27.5
Approach		153	2.0	0.334	18.4	LOS C	1.2	8.9	0.76	1.03	0.87	28.0
All Vehicles		1326	2.0	0.410	6.6	NA	1.2	8.9	0.11	0.60	0.13	37.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	East	North	
LOS	NA	A	C	NA

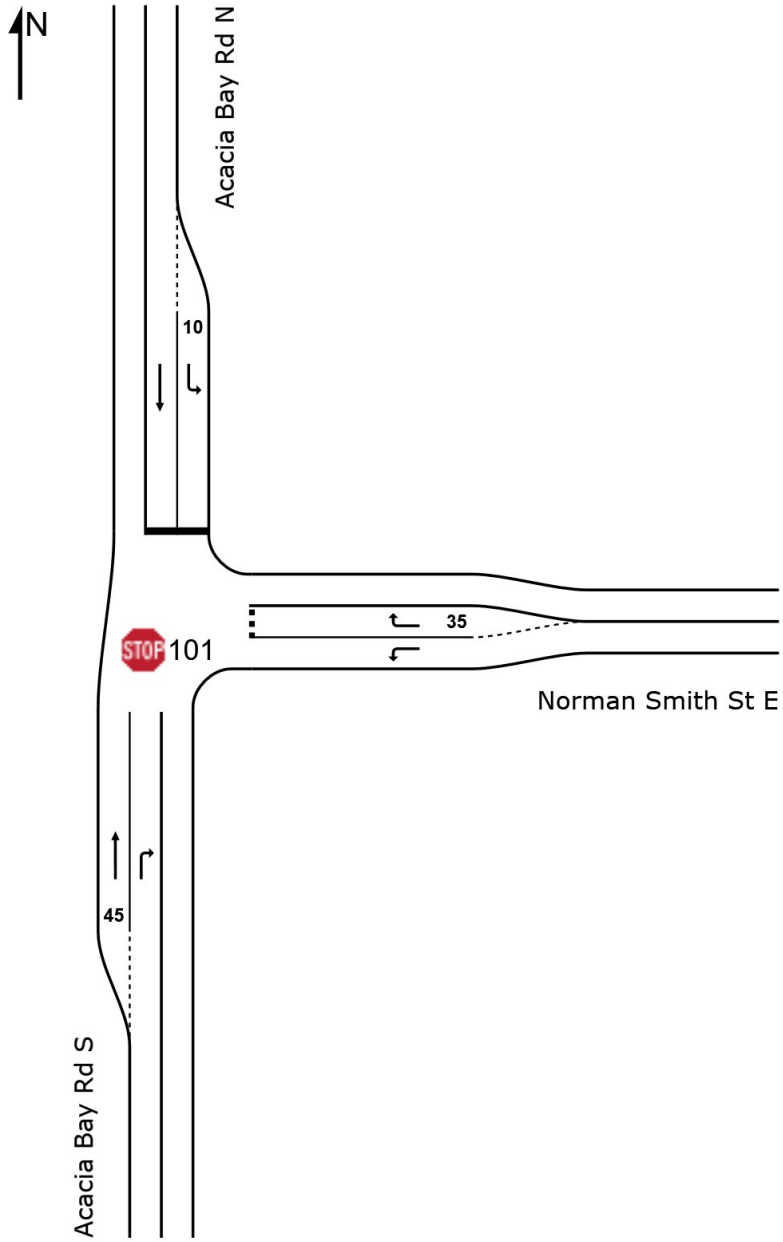


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Acacia / Norman 2041 PM No Dev]

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

Site Layout

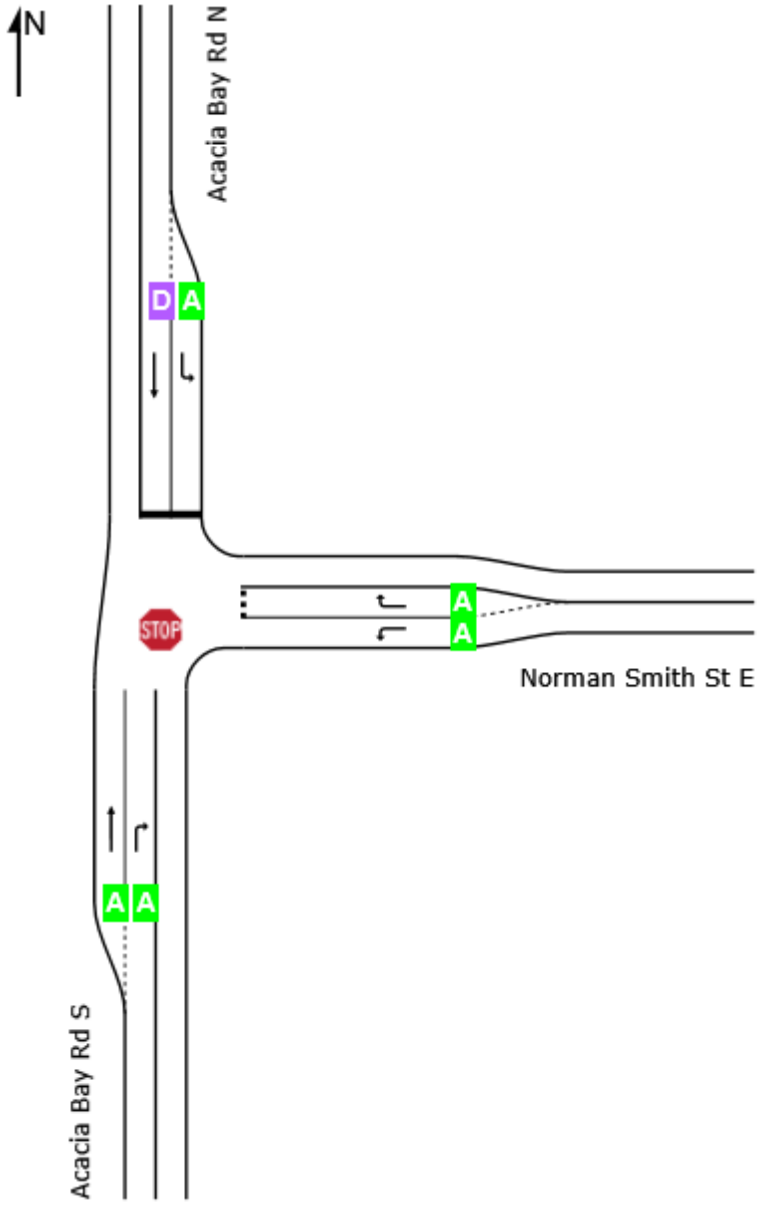

N
Acacia Bay Rd N
10
35
STOP
101
Norman Smith St E
45
Acacia Bay Rd S

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Acacia Bay Rd S												
11	T1	119	2.0	0.062	4.3	LOS A	0.0	0.0	0.00	0.52	0.00	41.3
12	R2	442	2.0	0.241	4.6	LOS A	0.0	0.0	0.00	0.54	0.00	39.4
Approach		561	2.0	0.241	4.5	NA	0.0	0.0	0.00	0.54	0.00	39.8
East: Norman Smith St E												
1	L2	671	2.0	0.366	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	40.0
3	R2	49	2.0	0.103	10.0	LOS A	0.3	2.4	0.60	0.81	0.60	30.3
Approach		720	2.0	0.366	4.9	LOS A	0.3	2.4	0.04	0.55	0.04	39.3
North: Acacia Bay Rd N												
4	L2	39	2.0	0.045	9.7	LOS A	0.2	1.2	0.47	0.89	0.47	32.4
5	T1	131	2.0	0.550	29.4	LOS D	2.3	16.7	0.90	1.14	1.36	23.8
Approach		169	2.0	0.550	24.9	LOS C	2.3	16.7	0.80	1.08	1.15	24.9
All Vehicles		1451	2.0	0.550	7.1	NA	2.3	16.7	0.11	0.60	0.15	36.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	East	North	
LOS	NA	A	C	NA

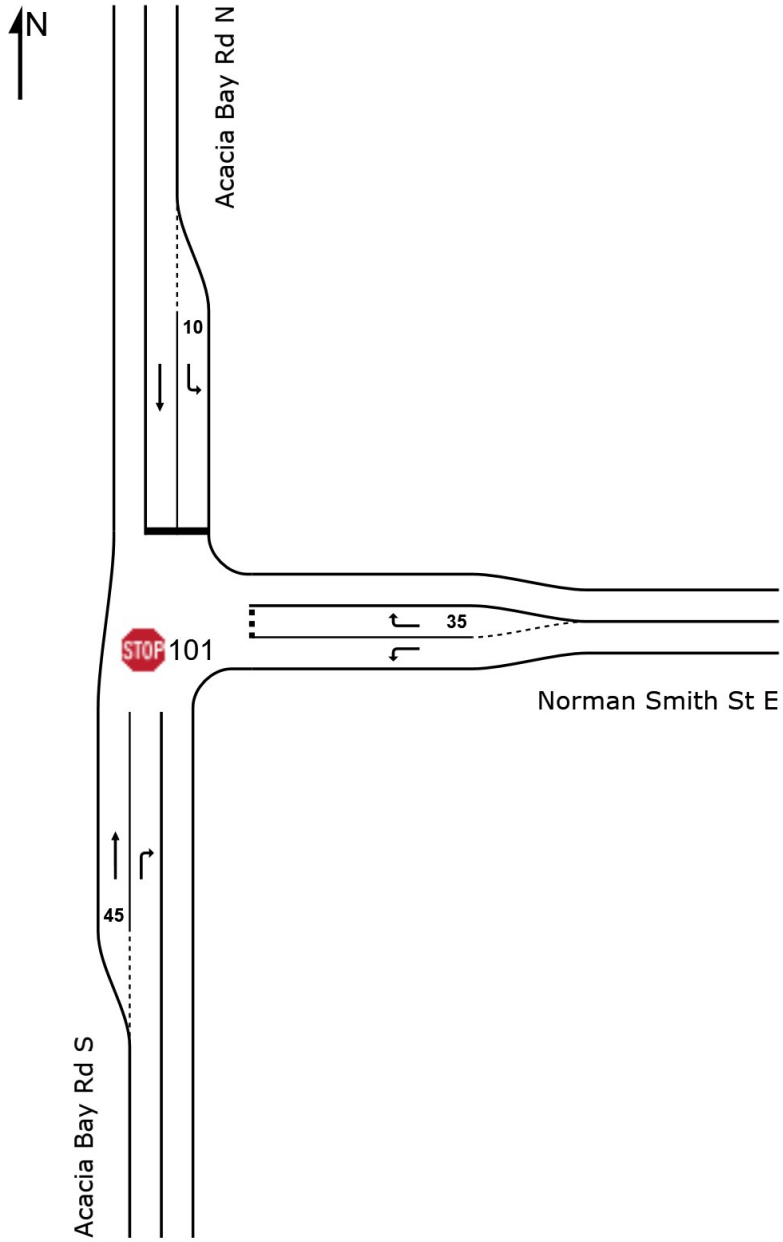


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Acacia / Norman 2041 AM + Dev]

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

Site Layout

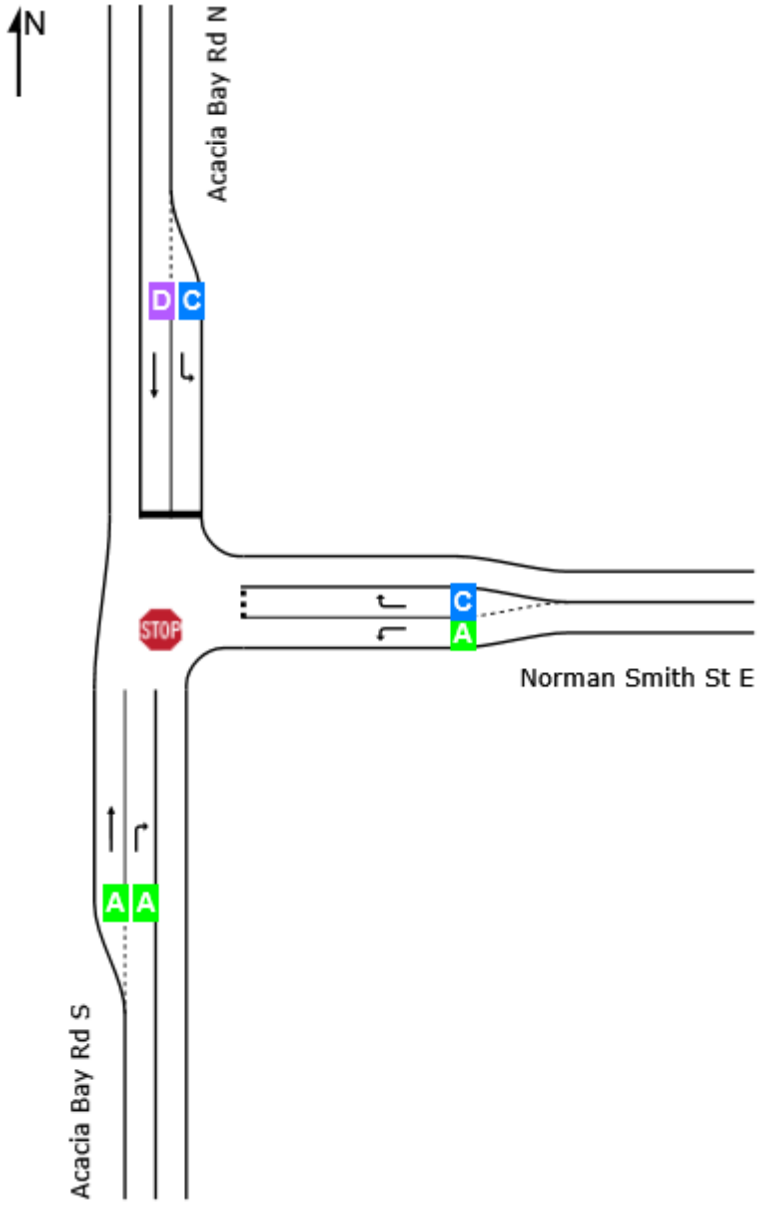

N
Acacia Bay Rd N
10
35
STOP
101
Norman Smith St E
45
Acacia Bay Rd S

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Acacia Bay Rd S												
11	T1	143	2.0	0.074	4.3	LOS A	0.0	0.0	0.00	0.52	0.00	41.3
12	R2	851	2.0	0.465	4.6	LOS A	0.0	0.0	0.00	0.54	0.00	39.4
Approach		994	2.0	0.465	4.6	NA	0.0	0.0	0.00	0.54	0.00	39.7
East: Norman Smith St E												
1	L2	254	2.0	0.139	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	40.0
3	R2	65	2.0	0.309	22.9	LOS C	1.0	7.3	0.86	0.98	1.01	20.8
Approach		319	2.0	0.309	8.3	LOS A	1.0	7.3	0.18	0.62	0.21	34.5
North: Acacia Bay Rd N												
4	L2	139	2.0	0.318	16.4	LOS C	1.3	9.1	0.77	1.05	0.93	26.4
5	T1	91	2.0	0.417	28.1	LOS D	1.6	11.1	0.88	1.08	1.15	24.4
Approach		229	2.0	0.417	21.0	LOS C	1.6	11.1	0.81	1.06	1.02	25.4
All Vehicles		1542	2.0	0.465	7.8	NA	1.6	11.1	0.16	0.63	0.19	35.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	East	North	
LOS	NA	A	C	NA

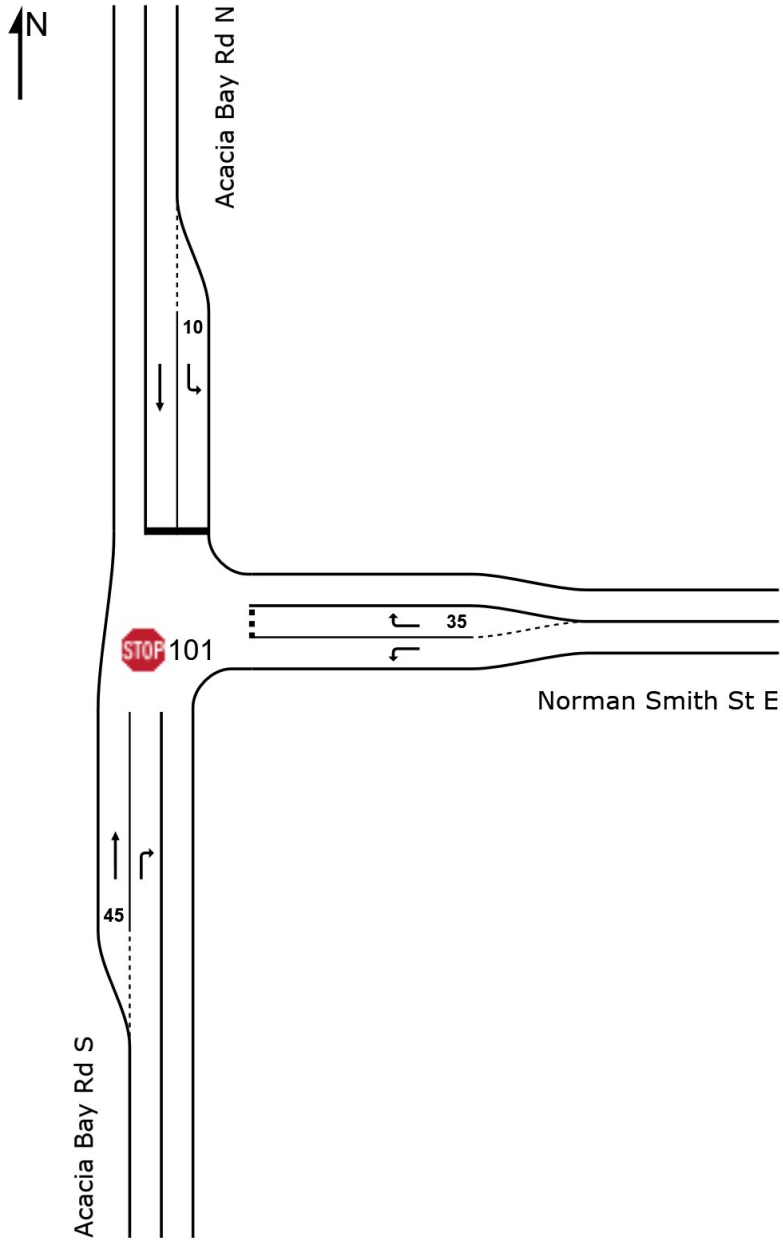


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Acacia / Norman 2041 PM + Dev]

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

Site Layout

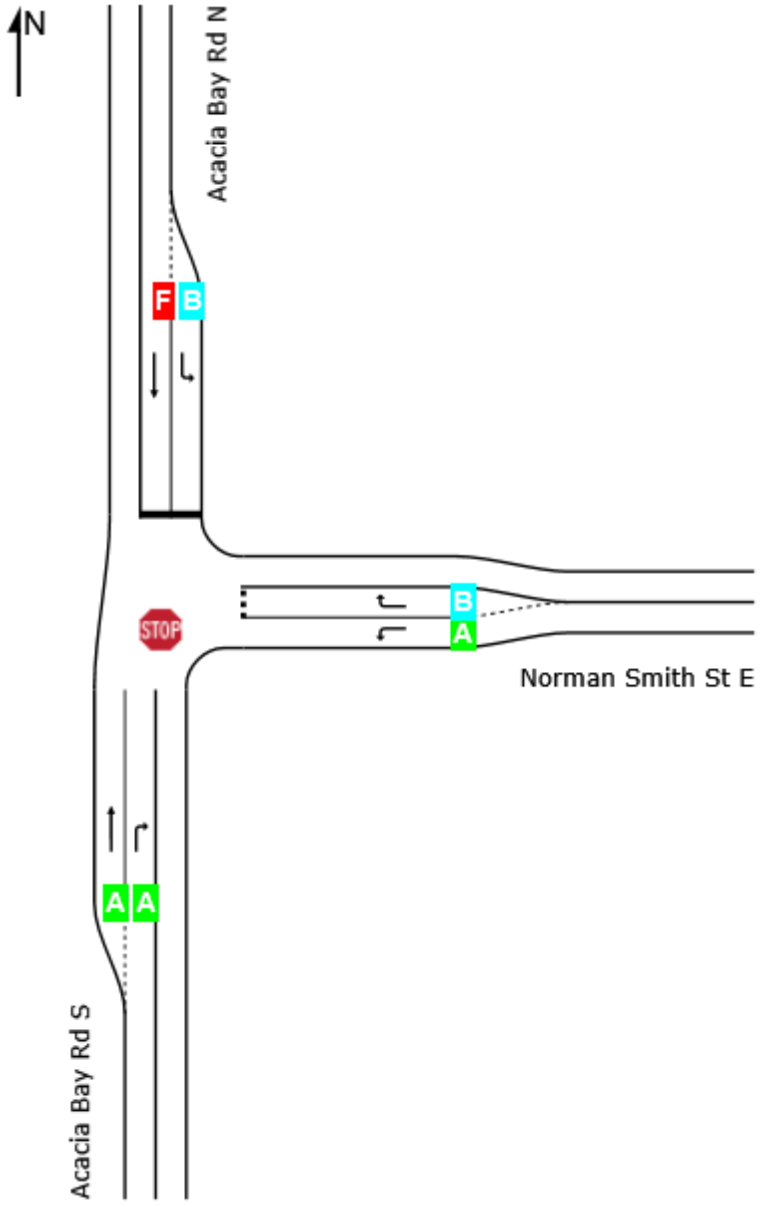

N
Acacia Bay Rd N
10
35
STOP
101
Norman Smith St E
45
Acacia Bay Rd S

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Acacia Bay Rd S												
11	T1	126	2.0	0.066	4.3	LOS A	0.0	0.0	0.00	0.52	0.00	41.3
12	R2	485	2.0	0.265	4.6	LOS A	0.0	0.0	0.00	0.54	0.00	39.4
Approach		612	2.0	0.265	4.5	NA	0.0	0.0	0.00	0.54	0.00	39.8
East: Norman Smith St E												
1	L2	818	2.0	0.447	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	40.0
3	R2	136	2.0	0.312	12.4	LOS B	1.2	8.7	0.69	0.91	0.84	27.9
Approach		954	2.0	0.447	5.7	LOS A	1.2	8.7	0.10	0.58	0.12	38.0
North: Acacia Bay Rd N												
4	L2	78	2.0	0.095	10.1	LOS B	0.4	2.6	0.51	0.93	0.51	31.9
5	T1	125	2.0	0.791	57.3	LOS F	3.9	27.6	0.97	1.29	2.00	15.7
Approach		203	2.0	0.791	39.2	LOS E	3.9	27.6	0.79	1.15	1.43	18.5
All Vehicles		1768	2.0	0.791	9.2	NA	3.9	27.6	0.14	0.63	0.23	34.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	East	North	
LOS	NA	A	E	NA

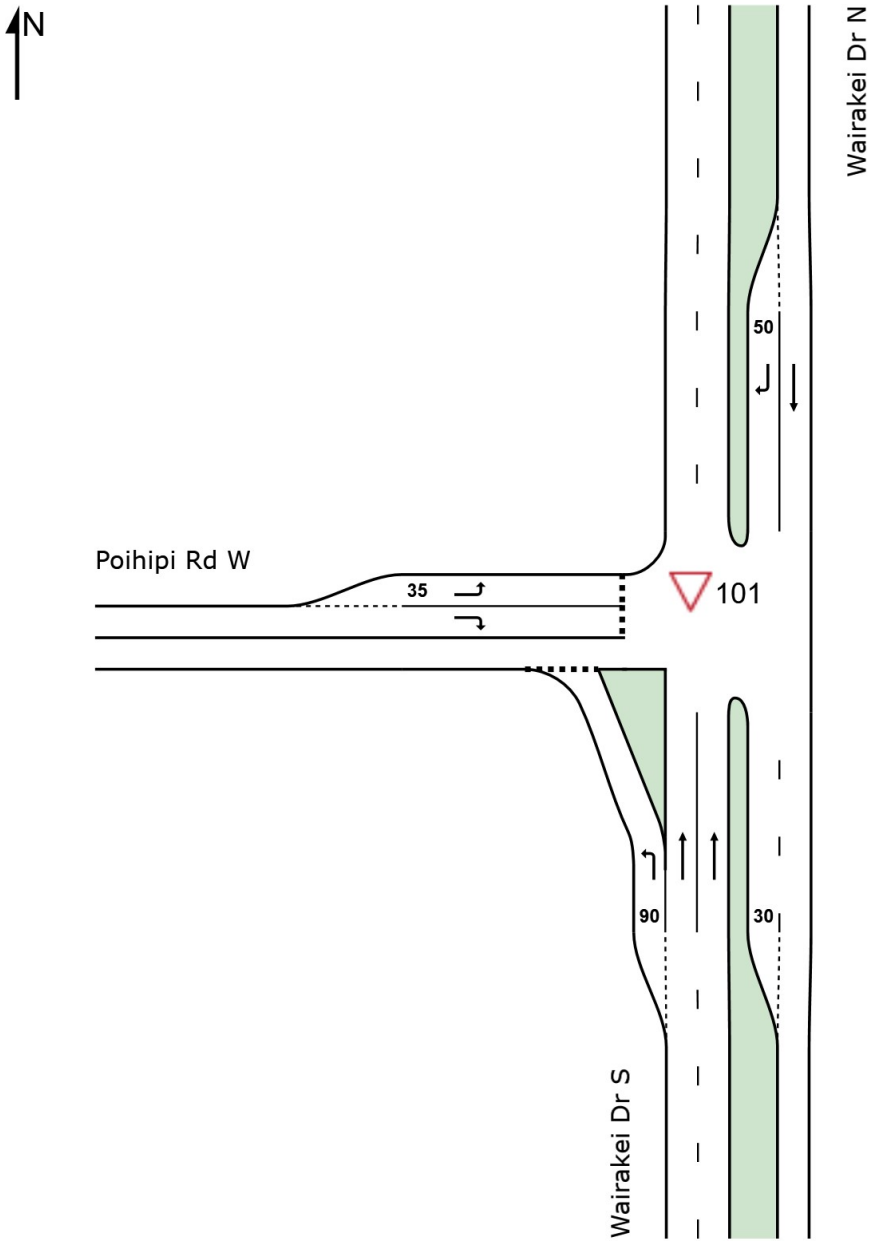


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Poihipi / Wairakei 2021 AM Base]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Site Layout

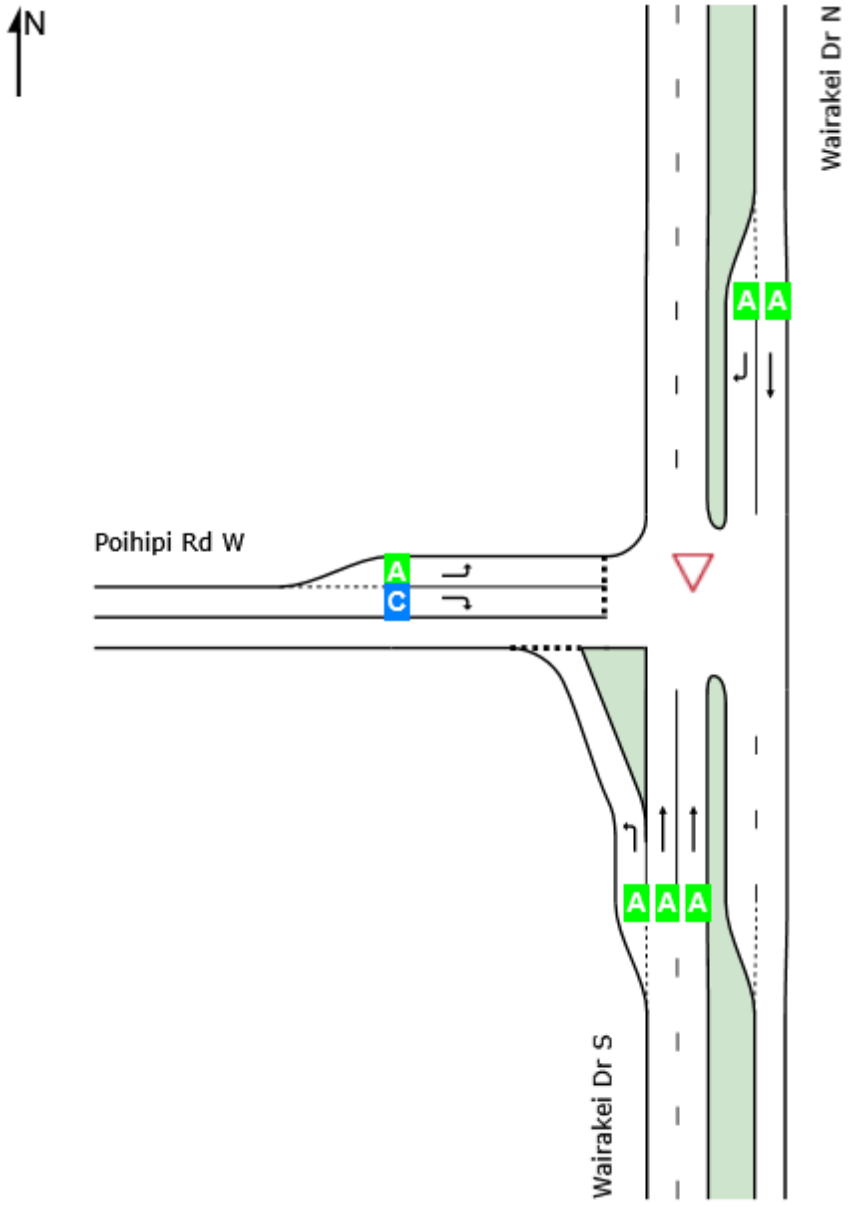


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	117	2.0	0.077	4.7	LOS A	0.3	2.3	0.16	0.47	0.16	46.8
2	T1	173	2.0	0.045	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		289	2.0	0.077	1.9	LOS A	0.3	2.3	0.06	0.19	0.06	48.6
North: Wairakei Dr N												
8	T1	319	2.0	0.167	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
9	R2	71	2.0	0.058	5.3	LOS A	0.2	1.7	0.28	0.53	0.28	45.9
Approach		389	2.0	0.167	1.0	NA	0.2	1.7	0.05	0.10	0.05	49.2
West: Poihipi Rd W												
10	L2	93	2.0	0.076	4.9	LOS A	0.3	2.0	0.18	0.51	0.18	46.2
12	R2	281	2.0	0.620	17.3	LOS C	4.3	30.6	0.78	1.13	1.44	40.2
Approach		374	2.0	0.620	14.2	LOS B	4.3	30.6	0.64	0.98	1.12	41.5
All Vehicles		1053	2.0	0.620	5.9	NA	4.3	30.6	0.26	0.43	0.44	46.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	A	NA	B	NA

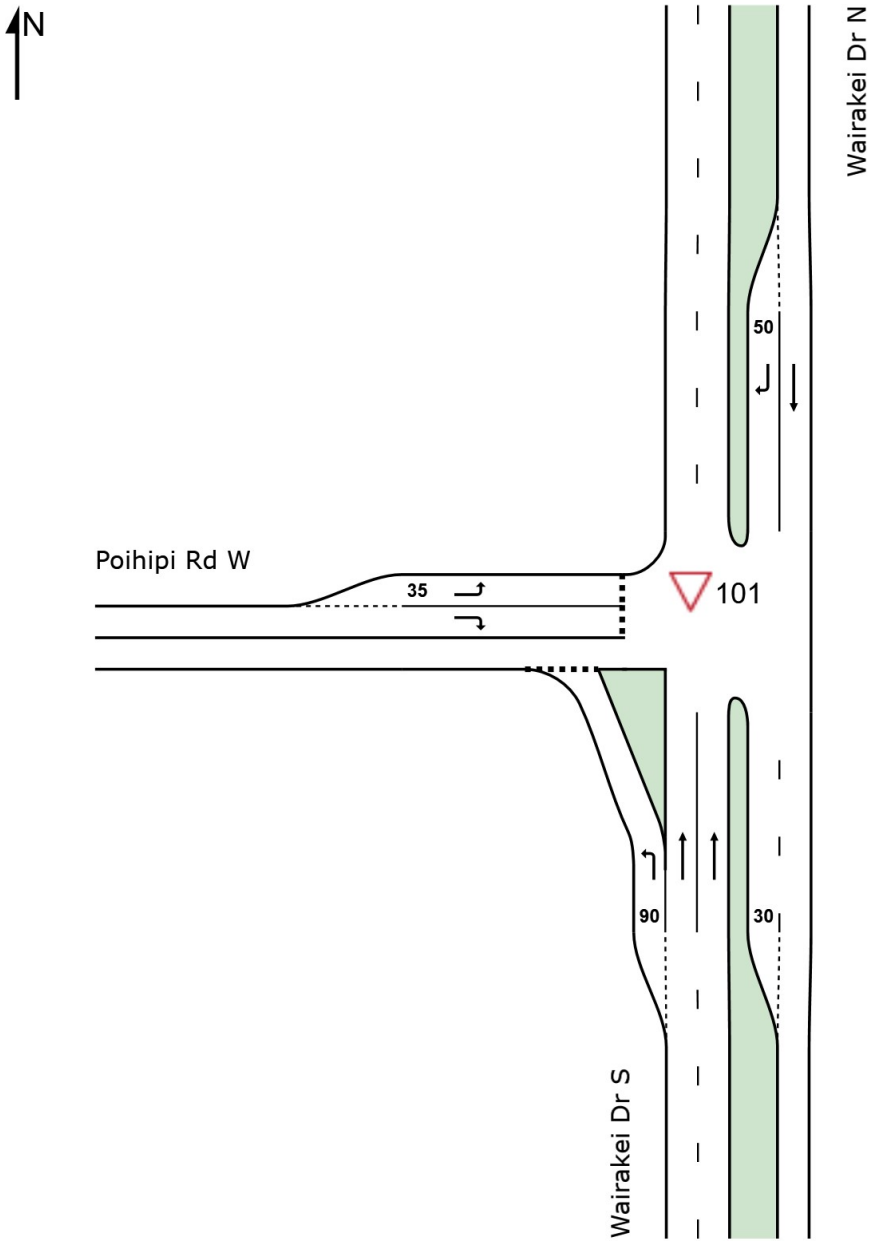


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Poihipi / Wairakei 2021 PM Base]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Site Layout

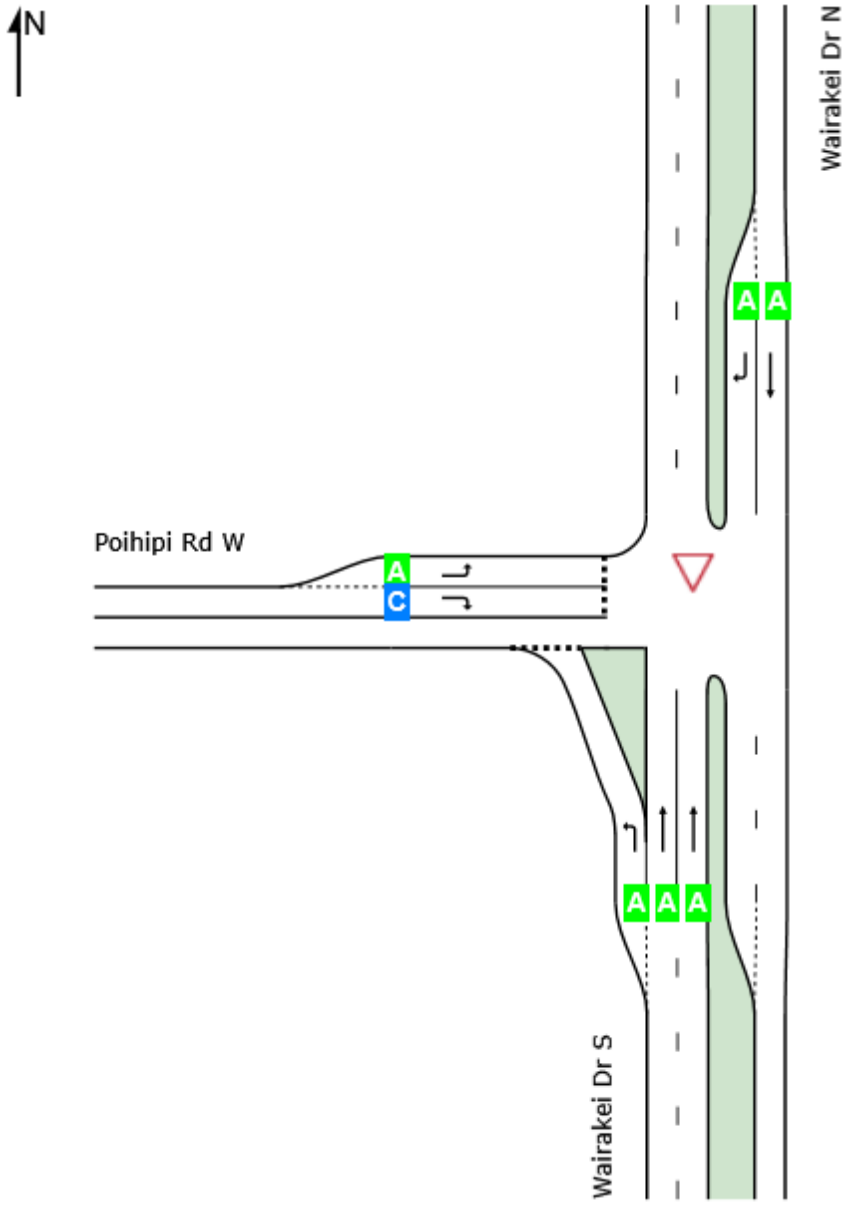


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	311	2.0	0.207	4.8	LOS A	1.0	6.9	0.21	0.48	0.21	46.7
2	T1	229	2.0	0.060	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		540	2.0	0.207	2.8	LOS A	1.0	6.9	0.12	0.28	0.12	48.0
North: Wairakei Dr N												
8	T1	204	2.0	0.107	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
9	R2	91	2.0	0.079	5.5	LOS A	0.3	2.3	0.33	0.56	0.33	45.8
Approach		295	2.0	0.107	1.7	NA	0.3	2.3	0.10	0.17	0.10	48.6
West: Poihipi Rd W												
10	L2	81	2.0	0.068	5.0	LOS A	0.3	1.8	0.21	0.52	0.21	46.1
12	R2	215	2.0	0.505	15.9	LOS C	2.9	20.3	0.76	1.03	1.17	40.8
Approach		296	2.0	0.505	12.9	LOS B	2.9	20.3	0.61	0.89	0.91	42.1
All Vehicles		1131	2.0	0.505	5.2	NA	2.9	20.3	0.24	0.41	0.32	46.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	A	NA	B	NA

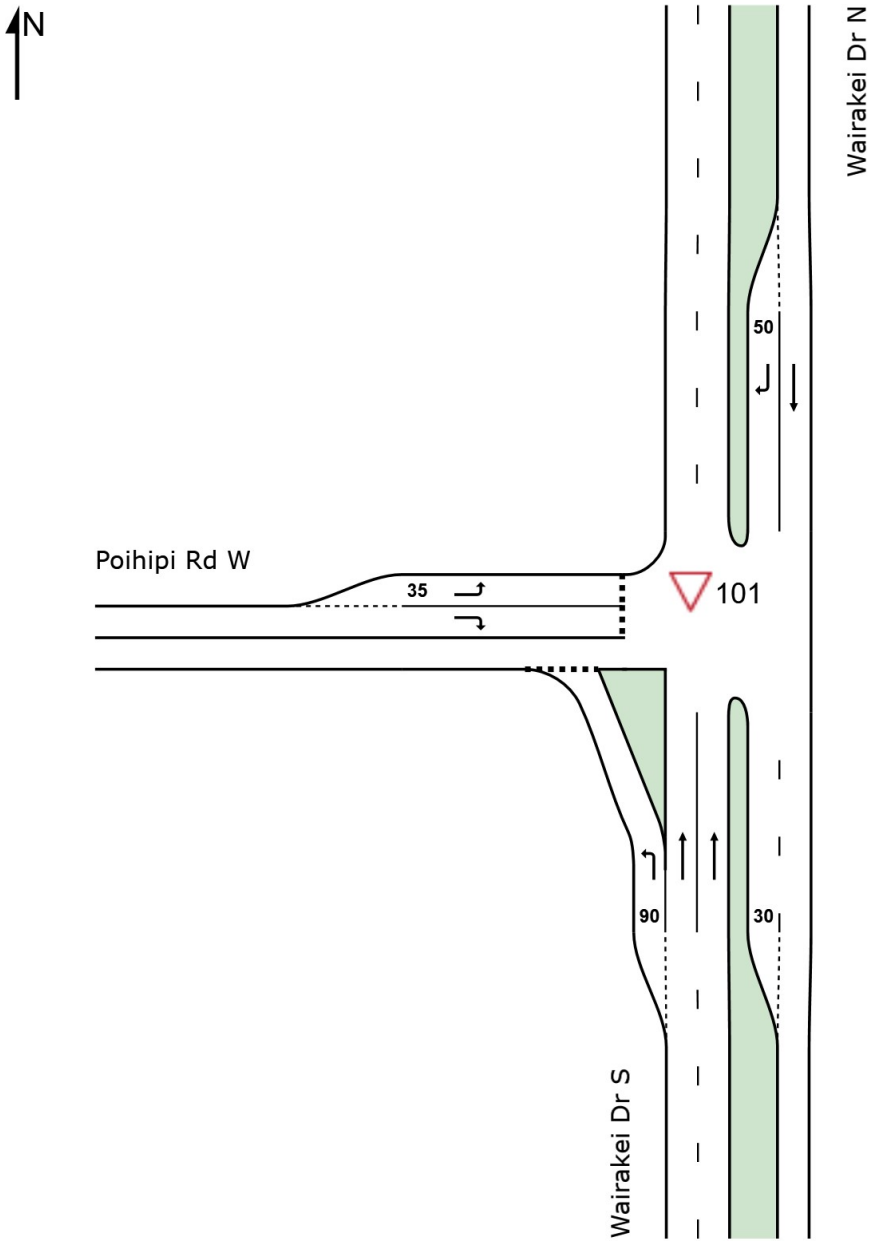


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Poihipi / Wairakei 2041 AM No Dev]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Site Layout

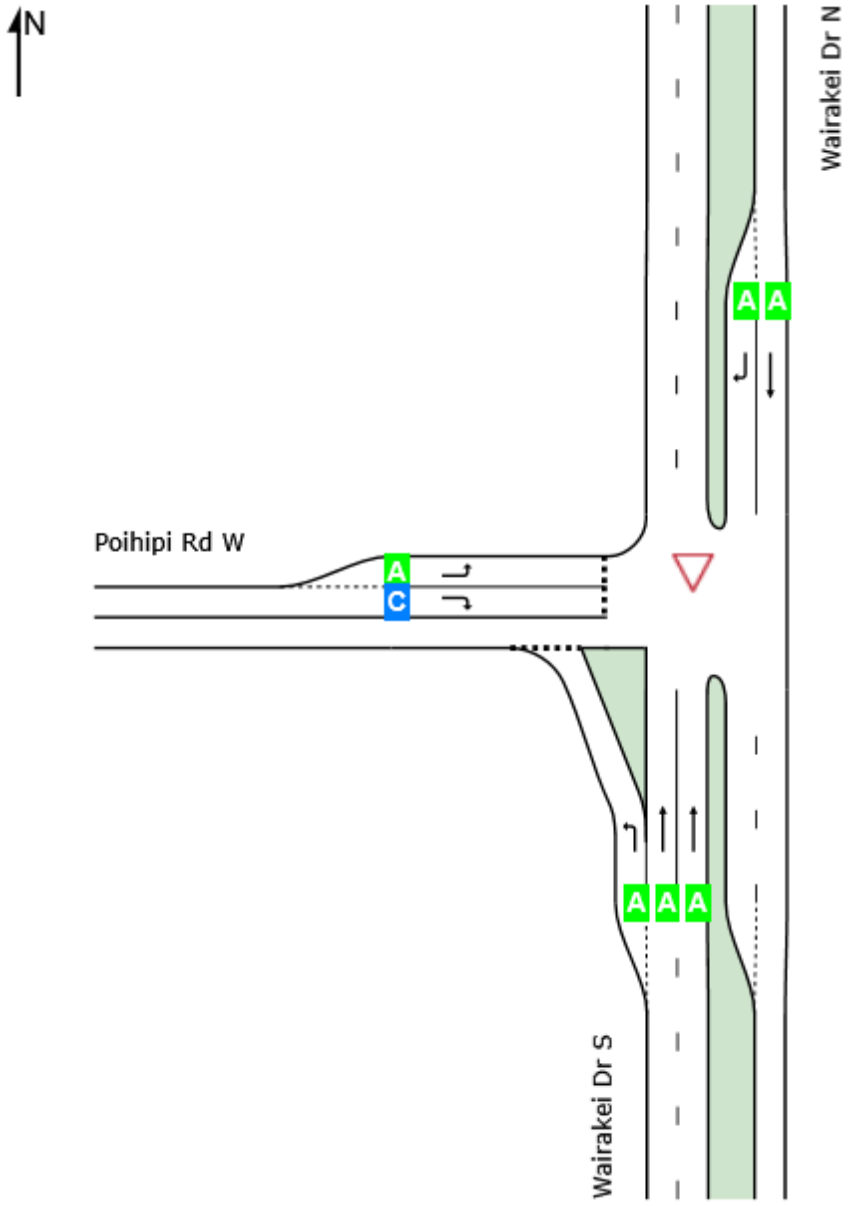


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	124	2.0	0.081	4.7	LOS A	0.3	2.4	0.16	0.47	0.16	46.8
2	T1	179	2.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		303	2.0	0.081	1.9	LOS A	0.3	2.4	0.07	0.19	0.07	48.6
North: Wairakei Dr N												
8	T1	357	2.0	0.187	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
9	R2	72	2.0	0.060	5.3	LOS A	0.2	1.7	0.29	0.53	0.29	45.9
Approach		428	2.0	0.187	0.9	NA	0.2	1.7	0.05	0.09	0.05	49.2
West: Poihipi Rd W												
10	L2	101	2.0	0.083	4.9	LOS A	0.3	2.2	0.19	0.51	0.19	46.2
12	R2	320	2.0	0.769	23.8	LOS C	6.8	48.1	0.87	1.37	2.12	37.5
Approach		421	2.0	0.769	19.3	LOS C	6.8	48.1	0.71	1.17	1.65	39.2
All Vehicles		1153	2.0	0.769	7.9	NA	6.8	48.1	0.29	0.51	0.64	44.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	A	NA	C	NA

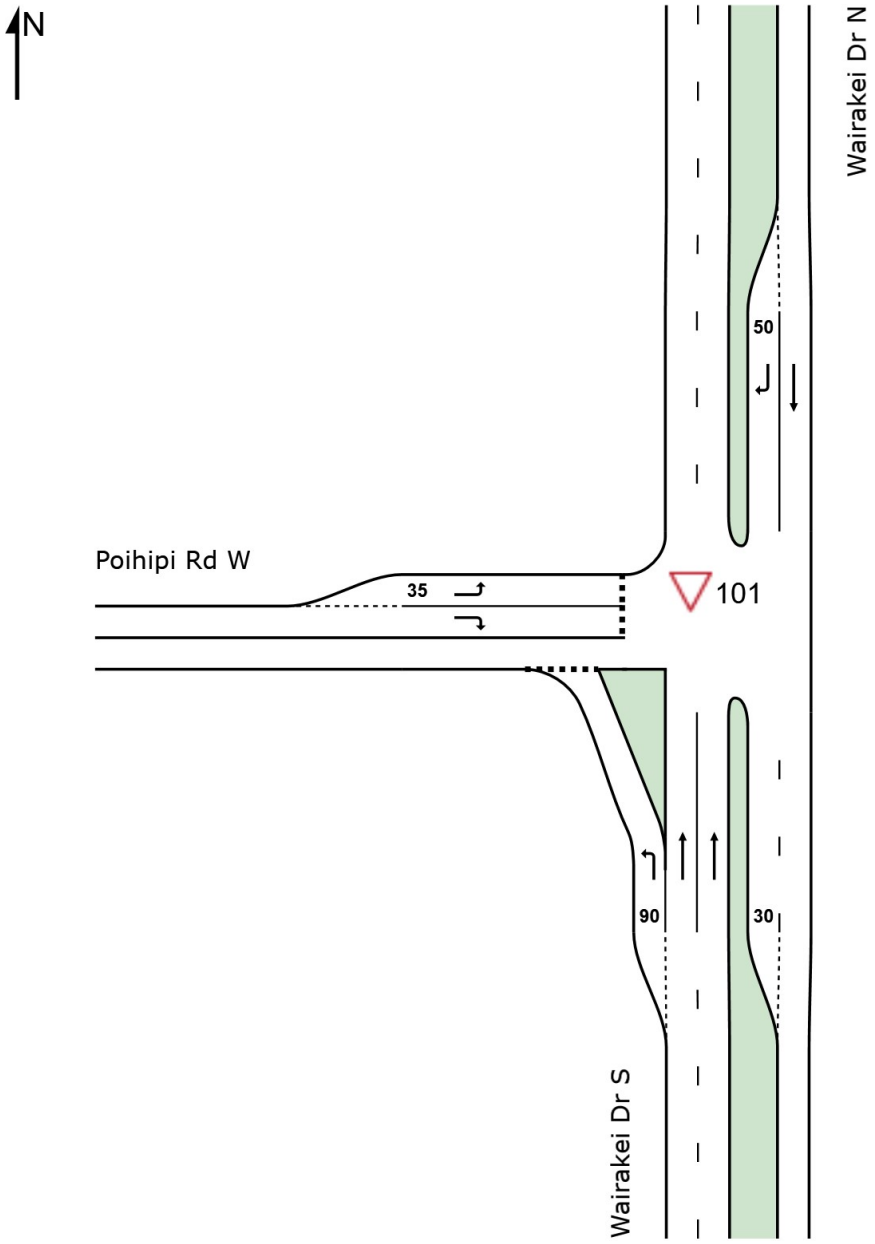


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [Poihipi / Wairakei 2041 PM No Dev]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Site Layout

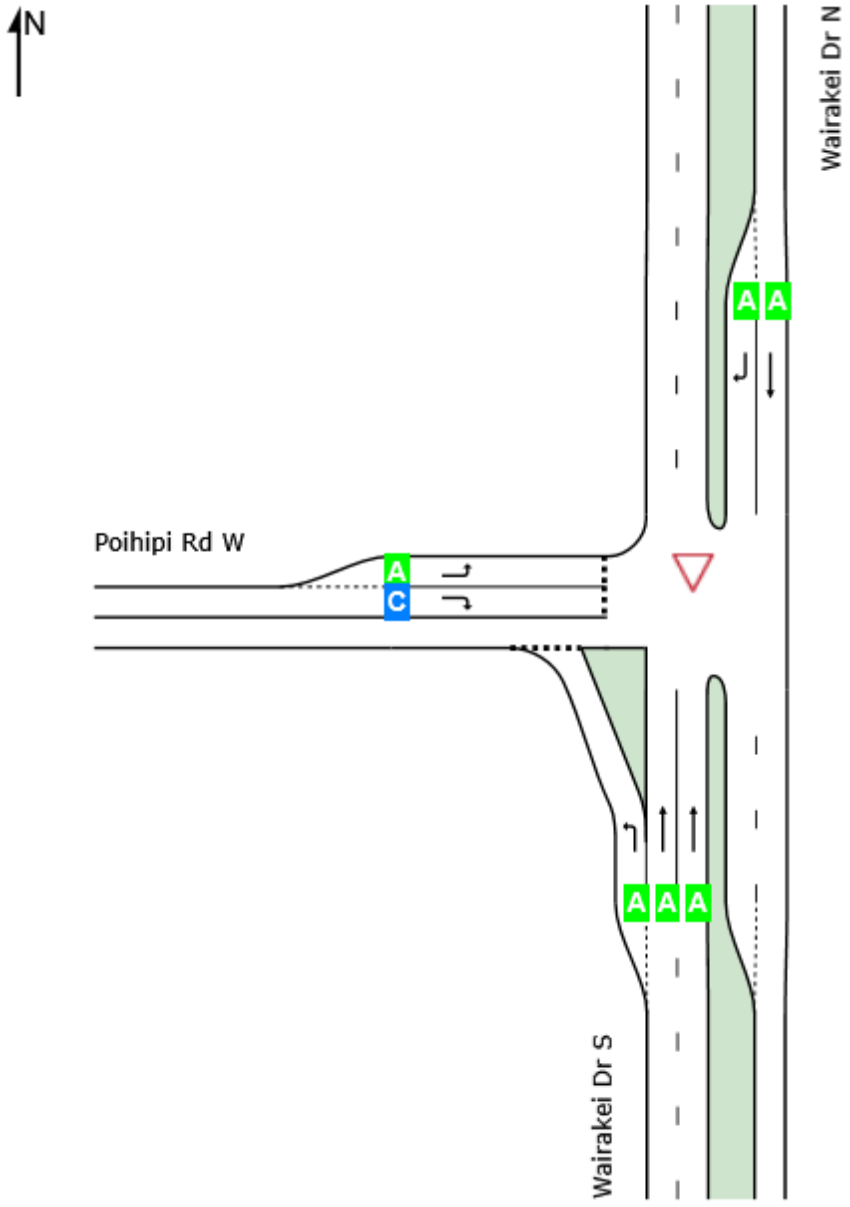


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wairakei Dr S												
1	L2	358	2.0	0.240	4.9	LOS A	1.2	8.2	0.23	0.49	0.23	46.6
2	T1	224	2.0	0.058	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		582	2.0	0.240	3.0	LOS A	1.2	8.2	0.14	0.30	0.14	47.8
North: Wairakei Dr N												
8	T1	208	2.0	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
9	R2	98	2.0	0.085	5.5	LOS A	0.3	2.5	0.33	0.56	0.33	45.8
Approach		306	2.0	0.109	1.8	NA	0.3	2.5	0.11	0.18	0.11	48.6
West: Poihipi Rd W												
10	L2	78	2.0	0.066	5.0	LOS A	0.2	1.7	0.21	0.52	0.21	46.1
12	R2	235	2.0	0.578	18.0	LOS C	3.5	25.2	0.80	1.10	1.36	39.8
Approach		313	2.0	0.578	14.8	LOS B	3.5	25.2	0.65	0.95	1.07	41.2
All Vehicles		1201	2.0	0.578	5.8	NA	3.5	25.2	0.26	0.44	0.37	46.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	A	NA	B	NA



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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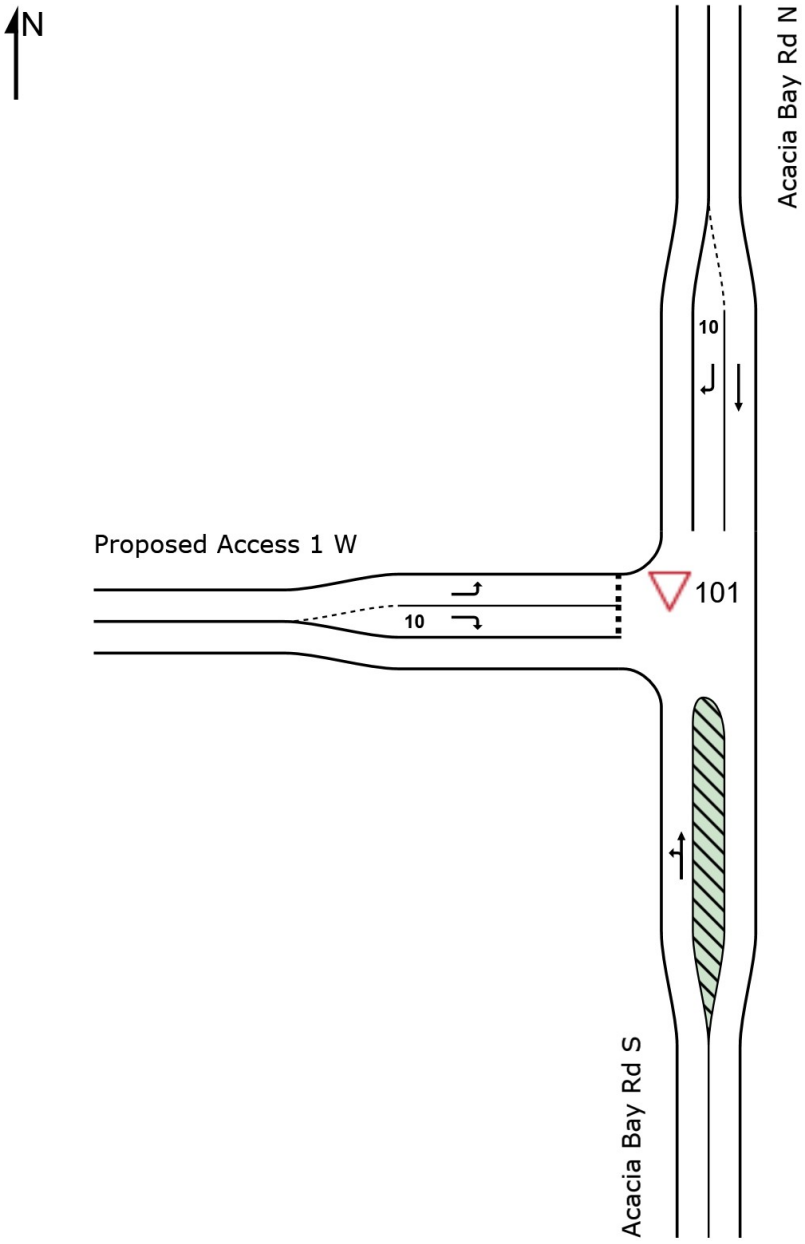
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [New Access 1 2041 AM + Dev]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Site Layout

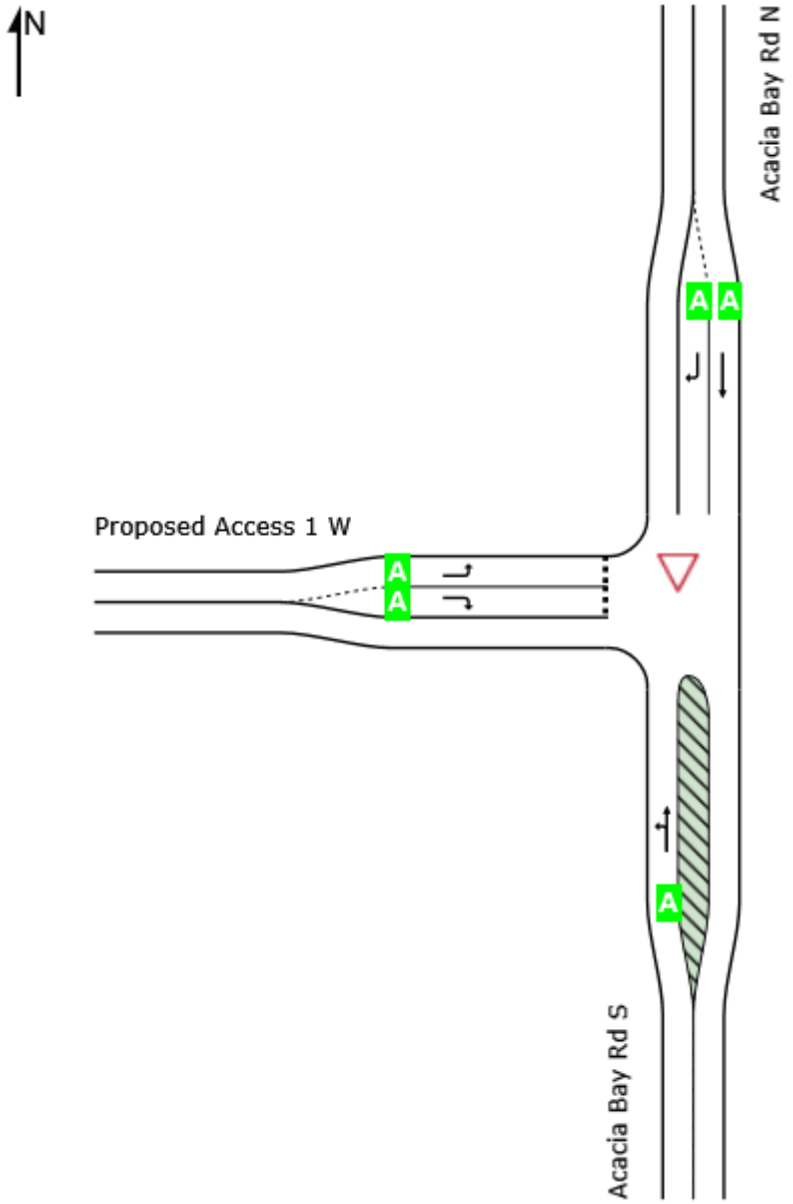


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Acacia Bay Rd S												
10	L2	14	2.0	0.079	4.6	LOS A	0.0	0.0	0.00	0.05	0.00	49.2
11	T1	137	2.0	0.079	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	49.7
Approach		151	2.0	0.079	0.4	NA	0.0	0.0	0.00	0.05	0.00	49.7
North: Acacia Bay Rd N												
5	T1	99	2.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
6	R2	34	2.0	0.022	5.0	LOS A	0.1	0.7	0.26	0.51	0.26	45.8
Approach		133	2.0	0.052	1.3	NA	0.1	0.7	0.07	0.13	0.07	48.9
West: Proposed Access 1 W												
7	L2	52	2.0	0.036	5.0	LOS A	0.1	1.0	0.23	0.51	0.23	46.1
9	R2	49	2.0	0.057	6.2	LOS A	0.2	1.6	0.39	0.60	0.39	45.2
Approach		101	2.0	0.057	5.6	LOS A	0.2	1.6	0.31	0.56	0.31	45.6
All Vehicles		384	2.0	0.079	2.1	NA	0.2	1.6	0.10	0.21	0.10	48.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	NA	NA	A	NA



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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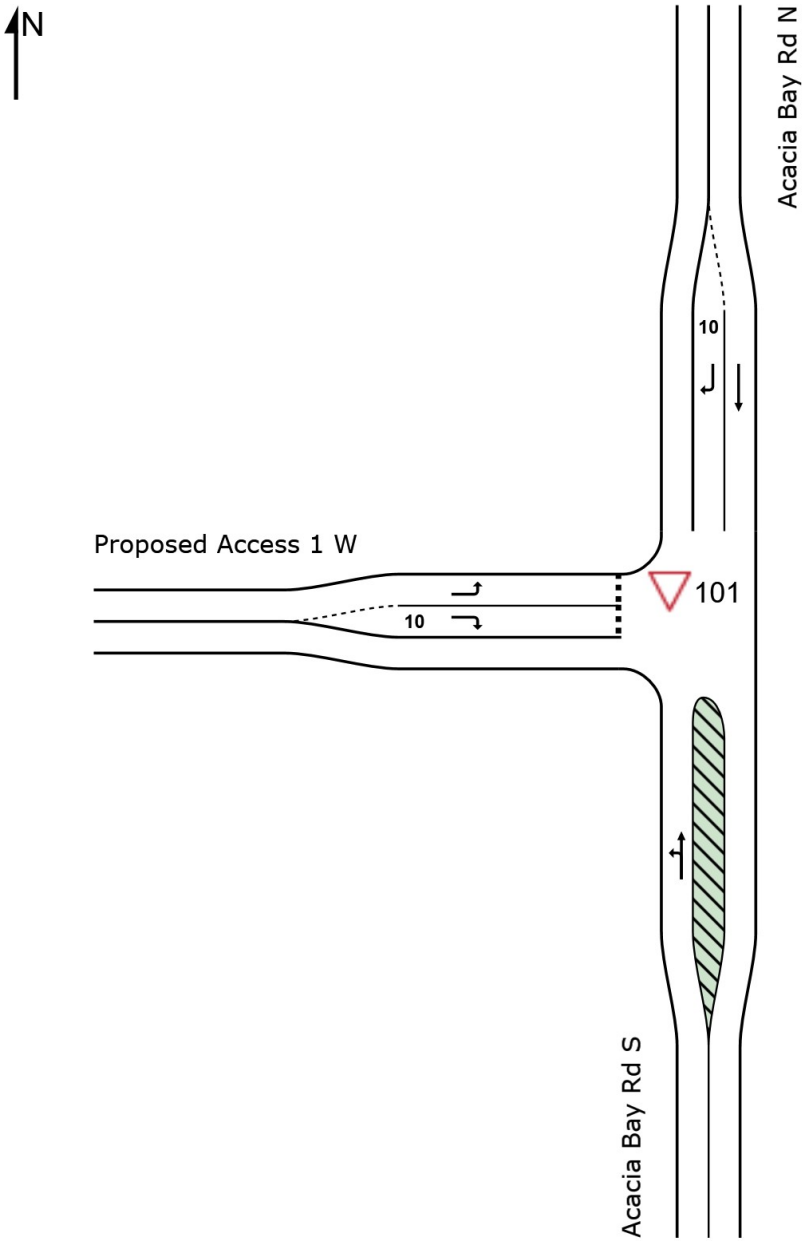
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [New Access 1 2041 PM + Dev]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Site Layout

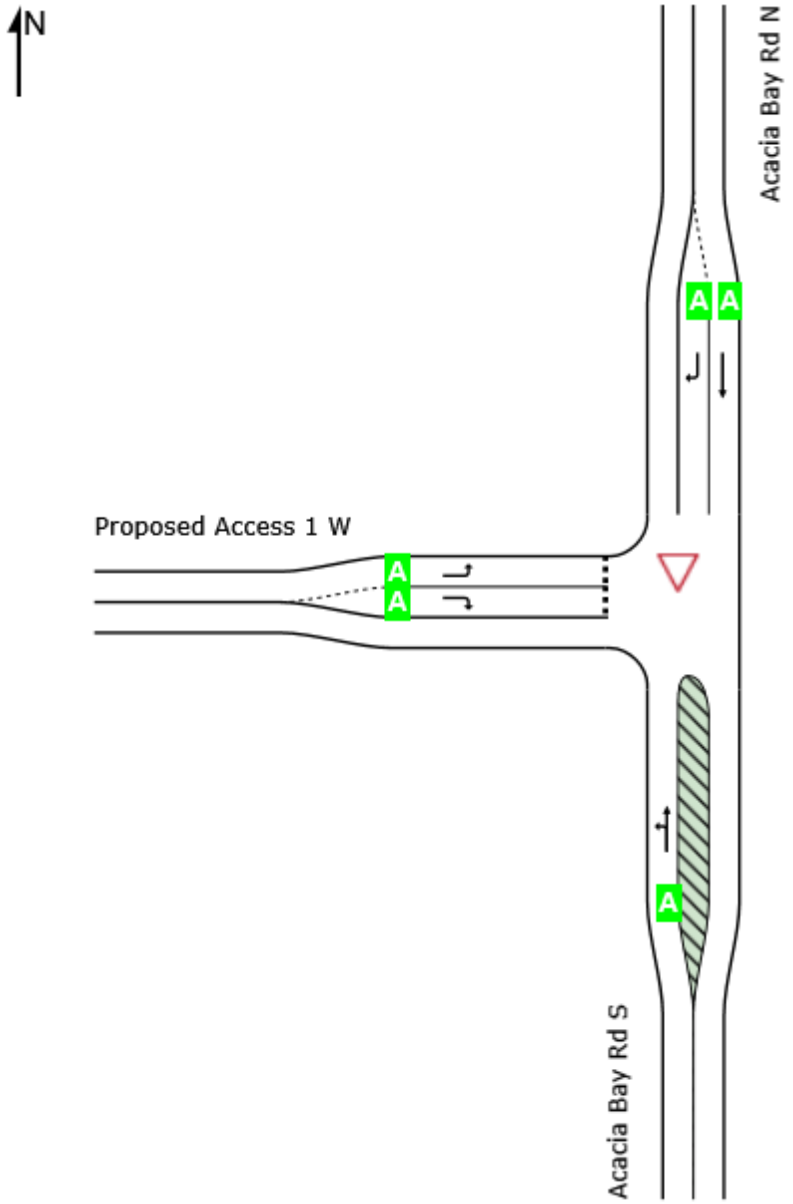


Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Acacia Bay Rd S												
10	L2	55	2.0	0.092	4.6	LOS A	0.0	0.0	0.00	0.17	0.00	48.5
11	T1	120	2.0	0.092	0.0	LOS A	0.0	0.0	0.00	0.17	0.00	49.0
Approach		175	2.0	0.092	1.4	NA	0.0	0.0	0.00	0.17	0.00	48.9
North: Acacia Bay Rd N												
5	T1	123	2.0	0.064	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
6	R2	55	2.0	0.036	5.1	LOS A	0.2	1.1	0.28	0.52	0.28	45.8
Approach		178	2.0	0.064	1.6	NA	0.2	1.1	0.09	0.16	0.09	48.6
West: Proposed Access 1 W												
7	L2	36	2.0	0.024	4.9	LOS A	0.1	0.7	0.21	0.50	0.21	46.1
9	R2	25	2.0	0.031	6.5	LOS A	0.1	0.8	0.42	0.61	0.42	45.1
Approach		61	2.0	0.031	5.6	LOS A	0.1	0.8	0.30	0.55	0.30	45.7
All Vehicles		414	2.0	0.092	2.1	NA	0.2	1.1	0.08	0.22	0.08	48.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	South	North	West	
LOS	NA	NA	A	NA

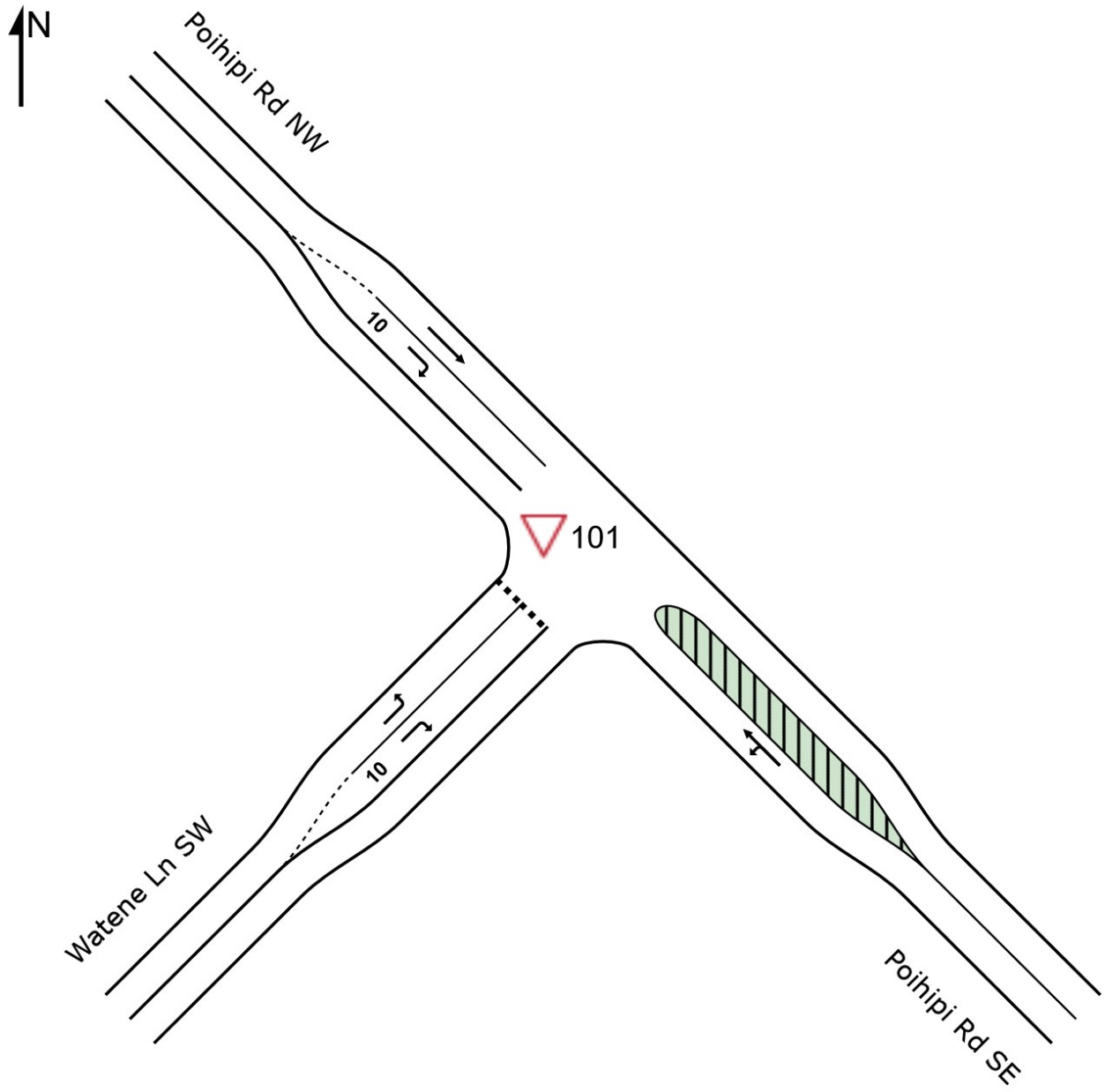


Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [New Access 5 2041 AM + Dev]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Site Layout



Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Poihipi Rd SE												
10	L2	11	2.0	0.066	4.6	LOS A	0.0	0.0	0.00	0.05	0.00	49.2
11	T1	116	2.0	0.066	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	49.7
Approach		126	2.0	0.066	0.4	NA	0.0	0.0	0.00	0.05	0.00	49.7
NorthWest: Poihipi Rd NW												
5	T1	71	2.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
6	R2	299	2.0	0.188	5.0	LOS A	1.0	6.8	0.26	0.53	0.26	45.8
Approach		369	2.0	0.188	4.1	NA	1.0	6.8	0.21	0.43	0.21	46.5
SouthWest: Watene Ln SW												
7	L2	96	2.0	0.065	4.9	LOS A	0.3	1.9	0.21	0.51	0.21	46.1
9	R2	11	2.0	0.016	7.8	LOS A	0.1	0.4	0.51	0.65	0.51	44.3
Approach		106	2.0	0.065	5.2	LOS A	0.3	1.9	0.24	0.52	0.24	45.9
All Vehicles		602	2.0	0.188	3.5	NA	1.0	6.8	0.17	0.36	0.17	47.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
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SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
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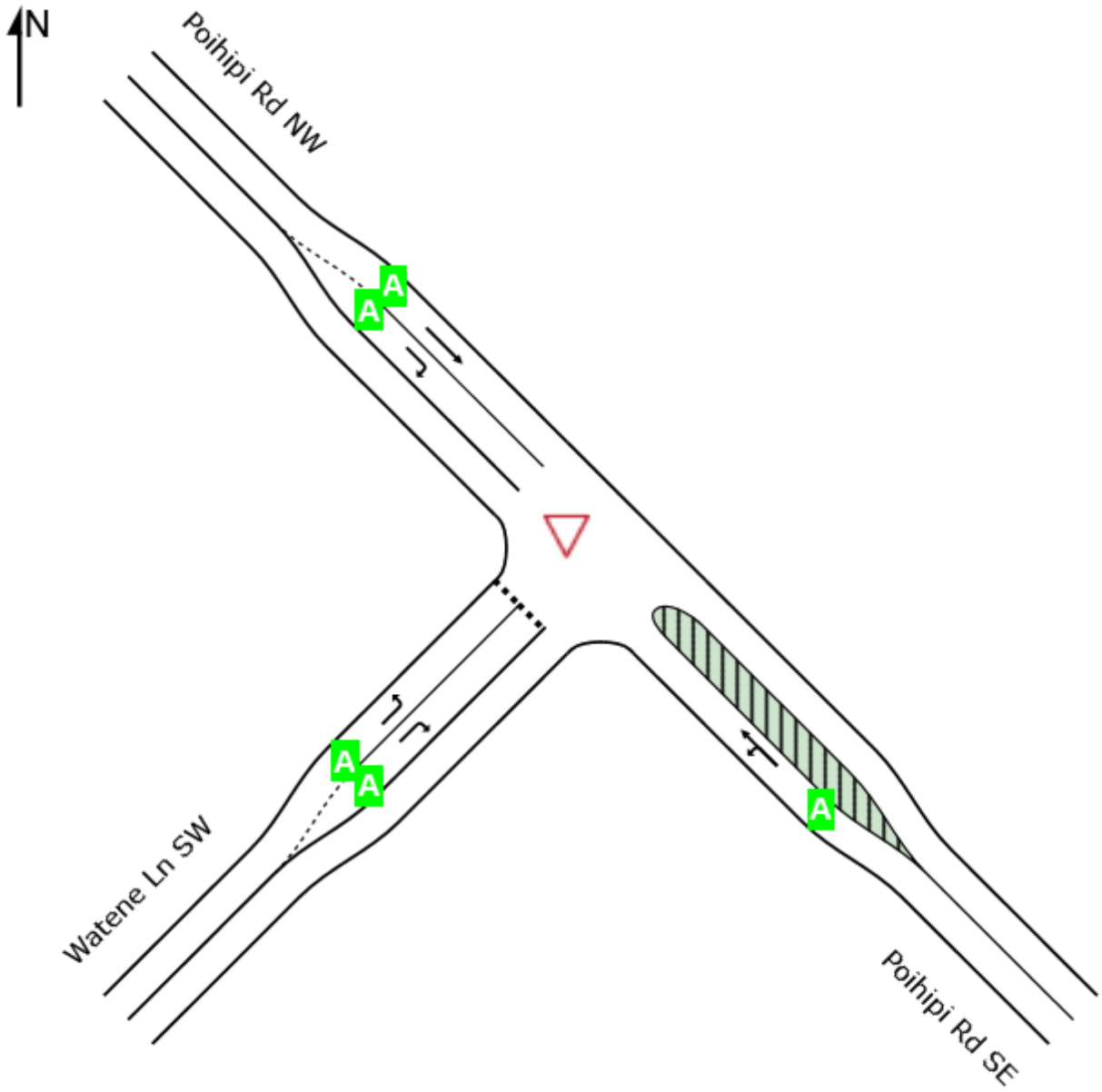
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	Southeast	Northwest	Southwest	
LOS	NA	NA	A	NA



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
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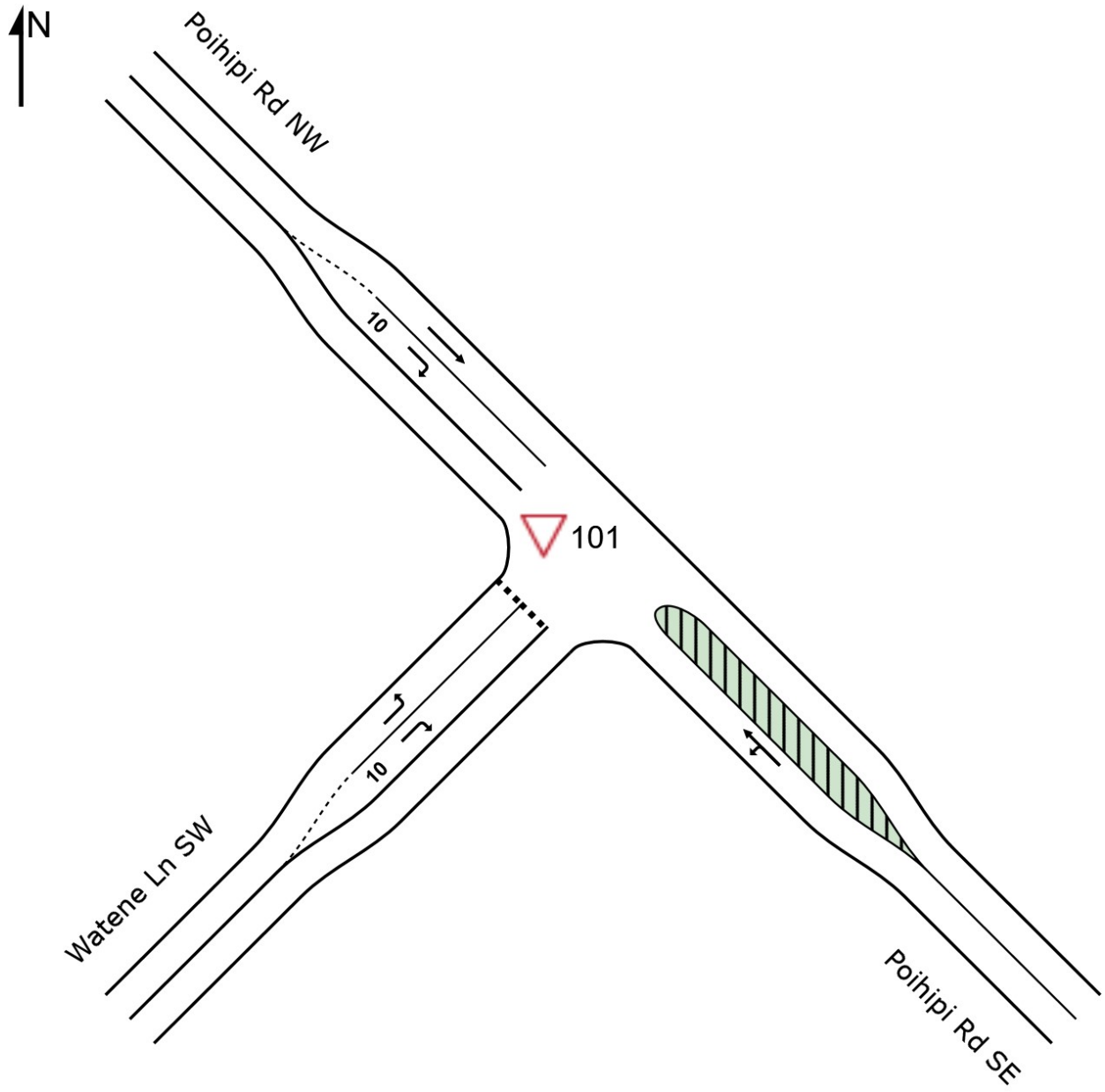
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Site: 101 [New Access 5 2041 AM + Dev]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Site Layout



Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Poihipi Rd SE												
10	L2	11	2.0	0.188	4.6	LOS A	0.0	0.0	0.00	0.02	0.00	49.4
11	T1	351	2.0	0.188	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	49.9
Approach		361	2.0	0.188	0.2	NA	0.0	0.0	0.00	0.02	0.00	49.9
NorthWest: Poihipi Rd NW												
5	T1	99	2.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
6	R2	204	2.0	0.163	6.0	LOS A	0.8	5.4	0.46	0.63	0.46	45.4
Approach		303	2.0	0.163	4.1	NA	0.8	5.4	0.31	0.43	0.31	46.8
SouthWest: Watene Ln SW												
7	L2	88	2.0	0.076	5.9	LOS A	0.3	2.1	0.40	0.60	0.40	45.6
9	R2	11	2.0	0.020	9.6	LOS A	0.1	0.5	0.57	0.72	0.57	43.4
Approach		99	2.0	0.076	6.3	LOS A	0.3	2.1	0.42	0.61	0.42	45.4
All Vehicles		763	2.0	0.188	2.5	NA	0.8	5.4	0.18	0.26	0.18	48.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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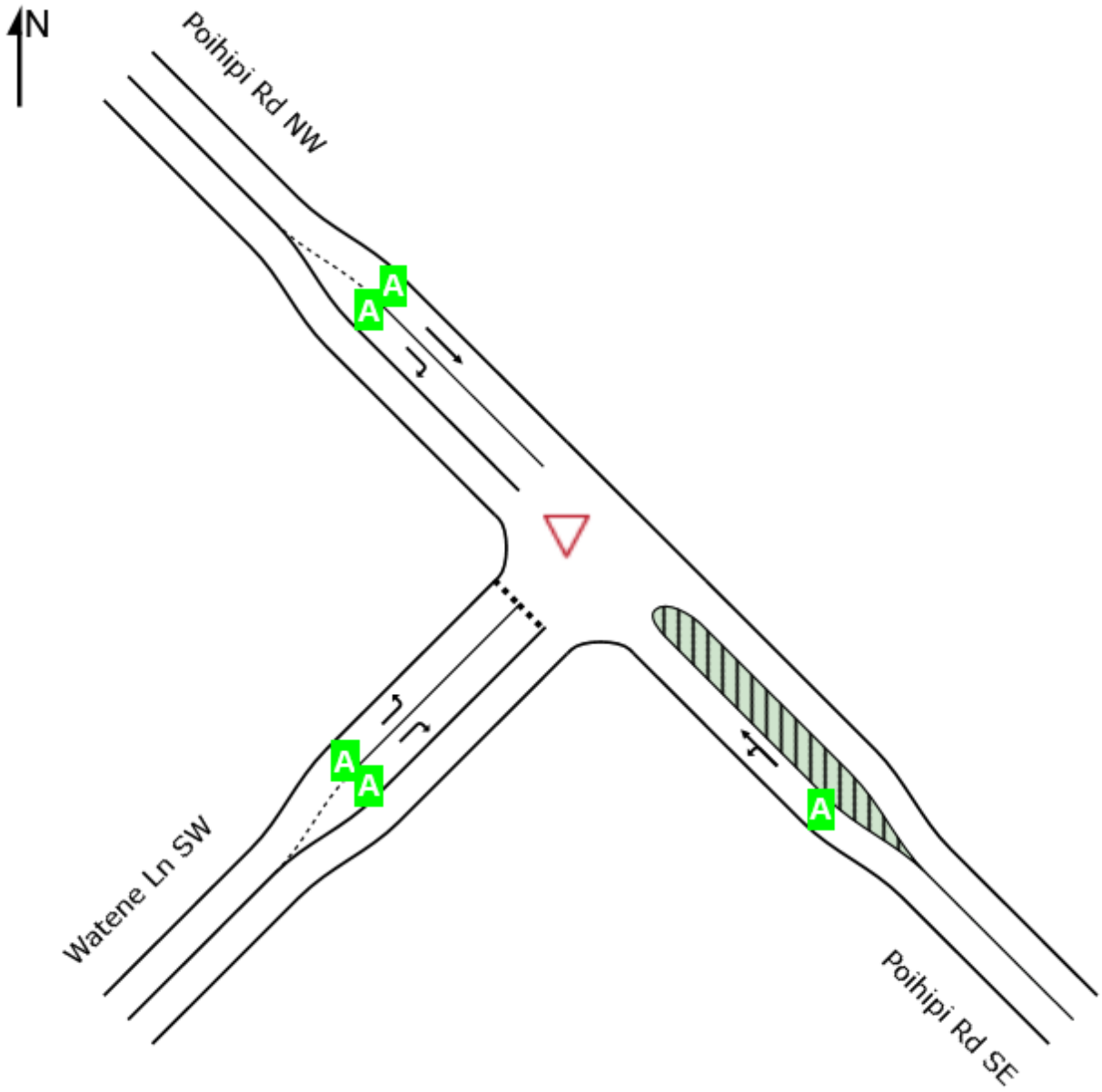
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LOS Summary

	Approaches			Intersection
	Southeast	Northwest	Southwest	
LOS	NA	NA	A	NA



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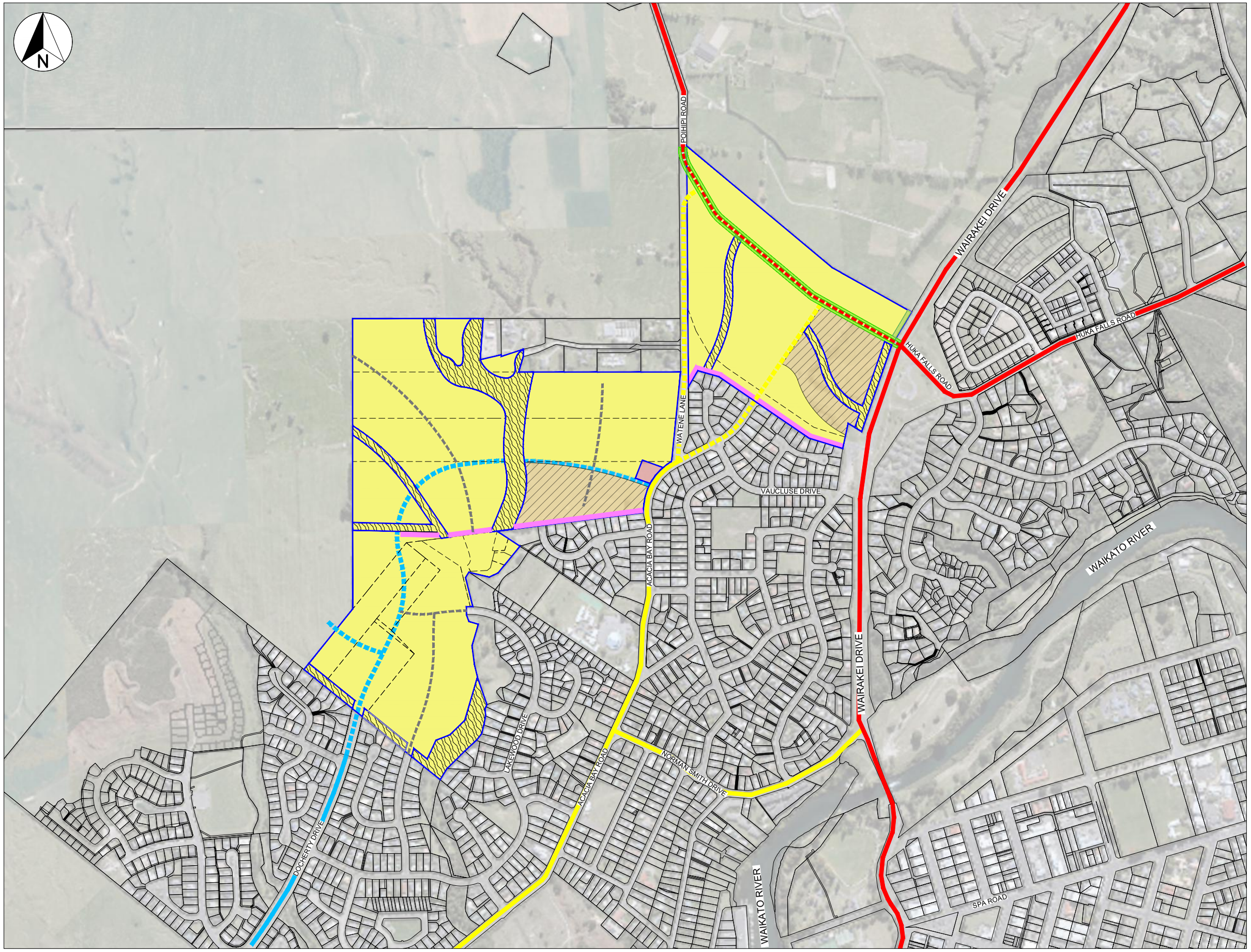
Appendix C
Nukuhau Private Plan Change, Layout Plan



LEGEND

- PROPOSED MEDIUM DENSITY RESIDENTIAL ZONE
- PROPOSED GENERAL RESIDENTIAL ZONE
- PROPOSED NEIGHBOURHOOD SHOPPING CENTRE (SHOPS)

URBAN ROAD HIERARCHY

- ARTERIAL
- PROPOSED ARTERIAL
- PRIMARY COLLECTOR
- PROPOSED PRIMARY ARTERIAL
- SECONDARY COLLECTOR
- PROPOSED SECONDARY COLLECTOR
- PROPOSED ACCESS AND LOW VOLUME

PROPOSED OVERLAYS

- PROPOSED STORMWATER RESERVE WITH PEDESTRIAN ACCESS, CYCLEWAY, AND PLANTING
- RECREATION RESERVE, 10-12m WIDE, WITH PEDESTRIAN ACCESS, CYCLEWAY AND PLANTING
- 3m WIDE LANDSCAPING STRIP - NO DRIVEWAY ACCESS
- 10m WIDE LANDSCAPING STRIP

NOTES

FIXED FEATURES:

1. GENERAL LOCATION OF VARIOUS ZONES.
2. LOCATION OF PROPOSED AND EXISTING ROAD INTERSECTIONS, WITH THE EXCEPTION OF THE PRECISE LOCATION OF THE PROPOSED ARTERIAL ROAD / POIHIPI ROAD INTERSECTION.
3. ROAD CLASS FOR PROPOSED ROADS.
4. POSITION OF LANDSCAPING STRIPS.

ARBITRARY FEATURES:

1. POSITION/ NUMBER OF INTERNAL ROADS.
2. LOCATION OF PROPOSED ARTERIAL ROAD / POIHIPI ROAD INTERSECTION .
3. PRECISE LOCATION AND SIZE OF VARIOUS ZONES.
4. PRECISE LOCATION AND SIZE OF STORMWATER RESERVES.
5. PRECISE LOCATION OF WHERE PROPOSED ROADS WILL INTERSECT WITH NEIGHBOURING LAND.
6. WIDTHS OF LANDSCAPING STRIPS.

FOR CONCEPT

Revision	Amendment	Approved	Revision Date
I	SW RESERVE, CENTRE ZONE, LEGEND	HC	22/11/2019
J	REPLACED RECREATION WITH SW RESERVE	HC	27/11/2019
K	OVERLAYS AND SW RESERVE HATCH REVISED	T.R.	31/07/2020
L	PROPOSED LOCAL CENTRE ZONE REVISED	T.R.	10/08/2020
M	SHOPPING CENTRE RESIZED, NOTES ADDED	H.C.	27/10/2020
F	AMENDED PEDESTRIAN AND CYCLEWAYS	HC	01/10/2019
G	EXISTING & PROPOSED SW GULLYIES ADDED	HC	18/11/2019
H	ROADS REVISED	HC	19/11/2019

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Designed	Approved	Approved Date
H. CRAWFORD	T. RUNNING	27/10/2020
Drawn	Scales	
P. FIEREK	1:5,000 @ A1, 1:10,000 @ A3	

Project: TAUPO DISTRICT PLAN

Sheet: PRIVATE PLAN CHANGE
NUKUHAU PROJECT

Project No.	Sheet. No.	Revision
2-37400.00	L001	M

1:5000 @ A1
1:10000 @ A3
0 50 100 150 200 250 300 350 400 450 500 m

300 mm 200 100 50 10 mm 0

Original Sheet Size A1 [841x594] Plot Date 2020-10-27 at 5:19:40 PM Path \\corp.pbwan.net\anz\Projects\NZ23\2-37400.00 nukuhau structure plan\home\Drawings\(L) Landscaping & Urban Design\+Civil3D\2-37400.00 Nukuhau Project V14.dwg L001(M)

wsp.com/nz