TRAFFIC PLANNING CONSULTANTS LTD

PROPOSED PRIVATE PLAN CHANGE
TRANSPORT ASSESSMENT

FRECKLINGTON FARM
MANGAWHAI

Project Information:

Client	Mangawhai Hills Limited
Job Number	220560
Title	Proposed Private Plan Change, Frecklington Farm, Mangawhai
Prepared By	Peter Kelly and Douglass Blankson
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Auckland Office:
PO Box 60-255, Titirangi, Auckland 0642
Level 1, 400 Titirangi Road, Titirangi Village
Tel: (09) 817 2500
Fax: (09) 817 2504
www.trafficplanning.co.nz

1.0 INTRODUCTION

The following is a transport assessment for the proposed Private Plan Change (PPC) of the historical Frecklington Farm area, hereby referred to as Mangawhai Hills, in Mangawhai. The subject site is currently zoned Rural and is proposed to be changed to Residential to enable higher density living. Approximately 218 hectares of land is seeking a plan change to facilitate the development of approximately 400-600 dwellings, within an area of approximately 106 hectares (with large areas of land within the PPC area given as green space). **Figure 1** displays area subject to the PPC.

Figure 1: Site Location
Image Source: Kaipara District GIS

2.0 EXISTING TRANSPORT ENVIRONMENT

2.1 Road Network

2.1.1 Moir Street

Moir Street is a two-lane road which runs in a general east-west direction and has a posted speed limit of 50 km/h. It forms an intersection with Tara Road at its western end (continues as and Kaiwaka Mangawhai Road) and terminates in the east. Under the Kaipara District Council, it is classified as a primary arterial road, but it continues as access road past its intersection with Molesworth Drive towards the west. Moir Street has a carriageway width of approximately 6.5-7.0 metres, providing one traffic lane in each direction and on-street parking on both sides of the carriageway except where broken yellow lines are provided. Intermittently, dedicated on-street parking lanes are also provided either on one side or both sides of the carriageway where Moir Street is serving residential/commercial development clusters. Footpaths measuring approximately 1.5 metre in width are provided either along the northern or southern side of the carriageway where Moir Street is serving residential or commercial developments. Information from Mobile Road[1] shows that in June 2020 Moir Street had an ADT between 4,299 and 8,074 vehicles per day along its different sections.

2.1.2 Tara Road

Tara Road is classified as secondary collector road under the Kaipara District Council which runs in a general north-south direction. It forms an intersection with Browns Road at its northern end and with Kaiwaka Mangawhai Road/ Moir Street at its southern end. It has a carriageway width of some 6.5 metres providing one traffic lane in each direction. On-street parking is technically permitted along both sides of the carriageway, where possible, but unsealed shoulders and drainage ditches discourage on-street parking. It has a posted speed limit of 50 km/h at its southern end, transitioning to 80 km/h approximately 100 metres north of Darmah Lane. A footpath measuring approximately 1.5 metres in width is provided along the western side of the carriageway terminating after 1.0 km from Kaiwaka Mangawhai Road/Tara Road/ Moir Street intersection. Information from Mobile Road shows that in June 2020, Tara Road had a maximum ADT of 897 vehicles per day.

2.1.3 Urlich Drive

Urlich Drive is a local road which runs in a general north-south direction having an approximate length of 300 metres and forming an intersection with Moir Street at its southern end. It has a carriageway width of some 6.0 metres providing one traffic lane in each direction and on-street parking on both sides except where broken yellow lines are marked. A footpath measuring 1.5 metres in width is provided along the western side of the carriageway. It has a speed limit of 50 km/hr. There is no traffic count data available on Urlich Drive.

2.1.4 Cove Road

Cove road runs in a general north-south direction and forms an intersection with Tara Road at its south-western end and continues as The Centre in the north. Under the Kaipara District Council, Cove Road is classified as primary collector road from Nova Scotia Drive/ South Road/ The Centre intersection to Mangawhai Heads Road/ Cove Road intersection and continues as secondary collector road past its intersection with Mangawhai Heads Road towards the south. It has a carriageway width of approximately 6.5 metres providing one traffic lane in each direction.

[1] Traffic Flow Estimation – www.mobileroad.org

Footpaths are not provided along either side of carriageway near the subject site. It has a posted speed limit of 80 km/h. Information from Mobile Road suggests that in June 2020, Cove Road had a maximum ADT of 1,749 vehicles per day along its section between Mangawhai Heads Road/Cove Road intersection till Cove Road/Tara Road intersection.

2.1.5 Old Waipu Road

Old Waipu Road is classified as an access road which runs in a general north-south direction. It forms an intersection with Molesworth Drive at its southern end and it terminates in the north. It has a carriageway width of some 7.0 metres providing one traffic lane in each direction. A footpath measuring approximately 1.5 metre in width is provided along the western side of the carriageway terminating 50 metres north of Wharuka Glade (private). It has a posted speed limit of 40 km/h. Information from Mobile Road suggest that in June 2020, Old Waipu Road had a maximum ADT of 829 vehicles per day.

2.1.6 Old Waipu Road North

Old Waipu Road North is an unmetalled gravel road and is classified as low volume road which runs in a general north-south direction. It forms an intersection with Cove Road at its northern end and terminates towards the south having a total carriageway length of some 300 metres. It has a carriageway width of approximately 6.0 metres which can accommodate two-way vehicle movement. No footpaths or road markings are provided along Old Waipu Road North. Information from Mobile Road suggest that in June 2020, Old Waipu Road North had an ADT of 65 vehicles per day.

2.2 Traffic Volumes

Turning movement count data was collected in November 2022 for the intersections of:

- Moir Street and Insley Street (peak hour control intersection);
- Moir Street and Tara Road;
- Tara Road and Garbolino Road;
- Tara Road and Cove Road; and
- Old Waipu Road and Molesworth Drive.

Intersection turning movement counts were collected from 08:00 – 18:00 at the intersection of Moir Street and Insley Street in order to determine the peak hours for the morning and afternoon periods, and proportional changes in volumes in 15-minute intervals.

Intersection turning movement counts were then collected at other intersections for at least 30 minutes to determine turning movement distributions, and then had their volumes adjusted by a corresponding factor to the peak hour, as identified at the Moir Street and Insley Street control intersection. For example, at the intersection of Moir Street and Tara Road, during the morning, this intersection was counted between 08:00-08:30. Utilising the control intersection, it was determined that 08:00-08:30 represents 43% of the peak hour total volume. The collected volumes at Moir Street and Tara Road were then increased by a factor of 2.34 to represent the full peak hour.

These peak hour volumes were then compared to average daily traffic (ADT) volumes provided by Northland Transport Alliance (NTA), as well as volumes within MobileRoad.org for area roads as a verification.

For Saturday peak hour traffic volumes, the AM peak hour (busier of the two identified peaks), was factored by 1.25 to account for increased traffic as a result of Mangawhai having many holiday homes and increased weekend activity on the roads. Turning movement splits were compared against the AM and PM peaks, with the higher of the two taken and applied in both directions. As such, the Saturday peak represents the busiest scenario of the three peaks.

Figure 2 displays the AM peak hour traffic volumes within the study area, Figure 3 the PM peak hour traffic volumes and Figure 4 the Saturday peak hour traffic volumes. Volumes in these figures are best viewed digitally, allowing for increased legibility utilising zoom functions.

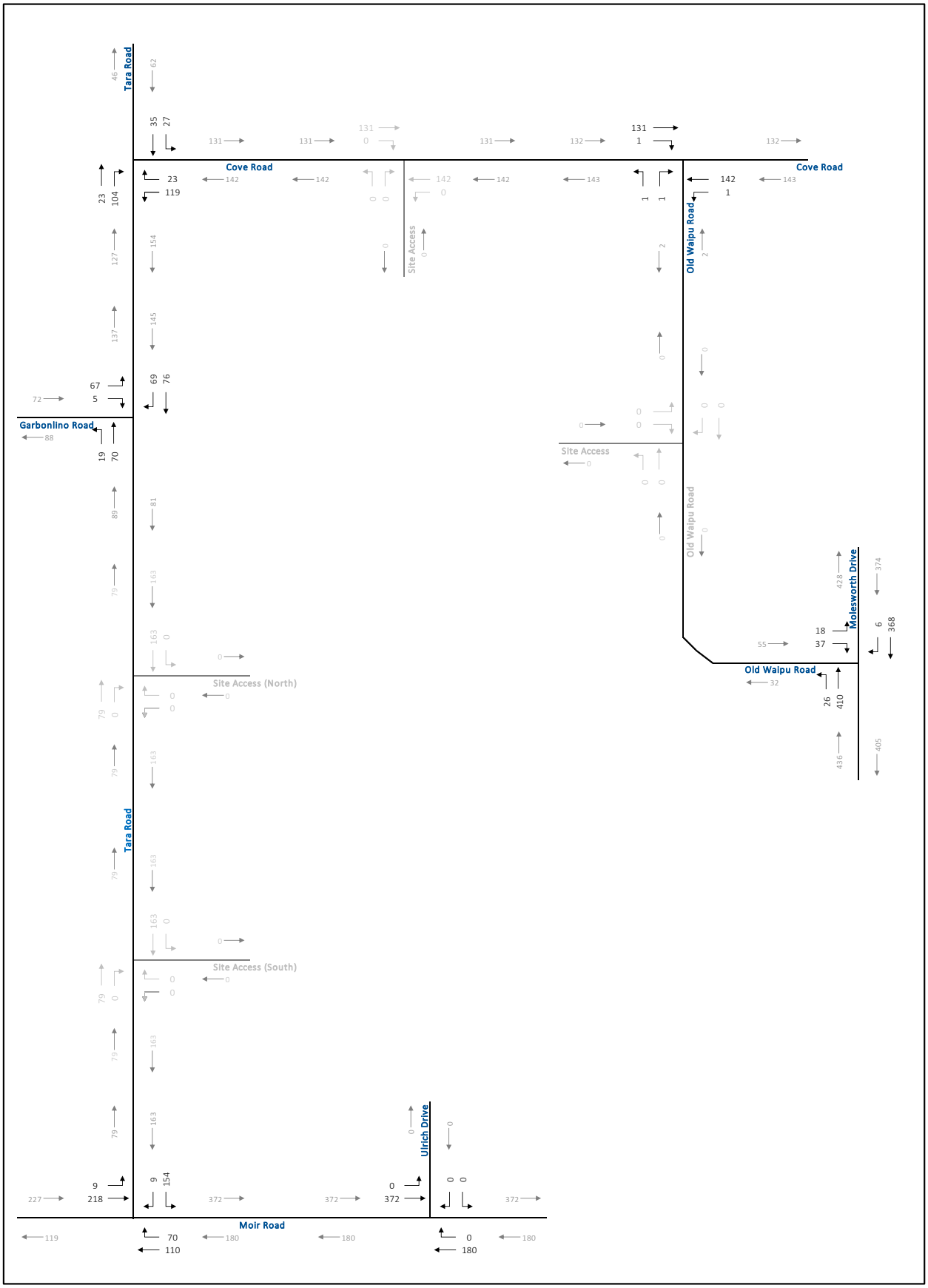

Figure 2: Study Area AM Peak Hour Existing Traffic Volumes

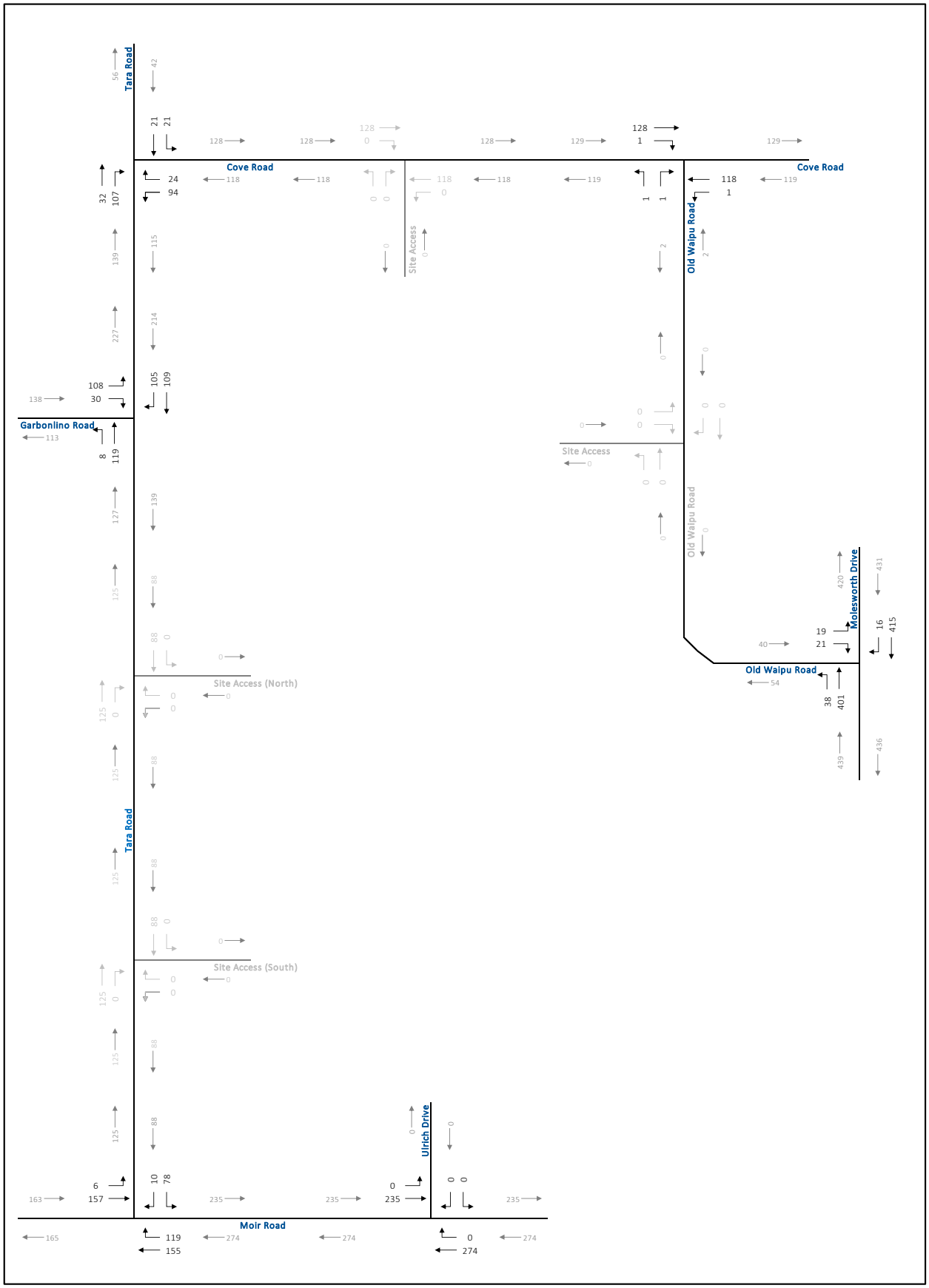

Figure 3: Study Area PM Peak Hour Existing Traffic Volumes

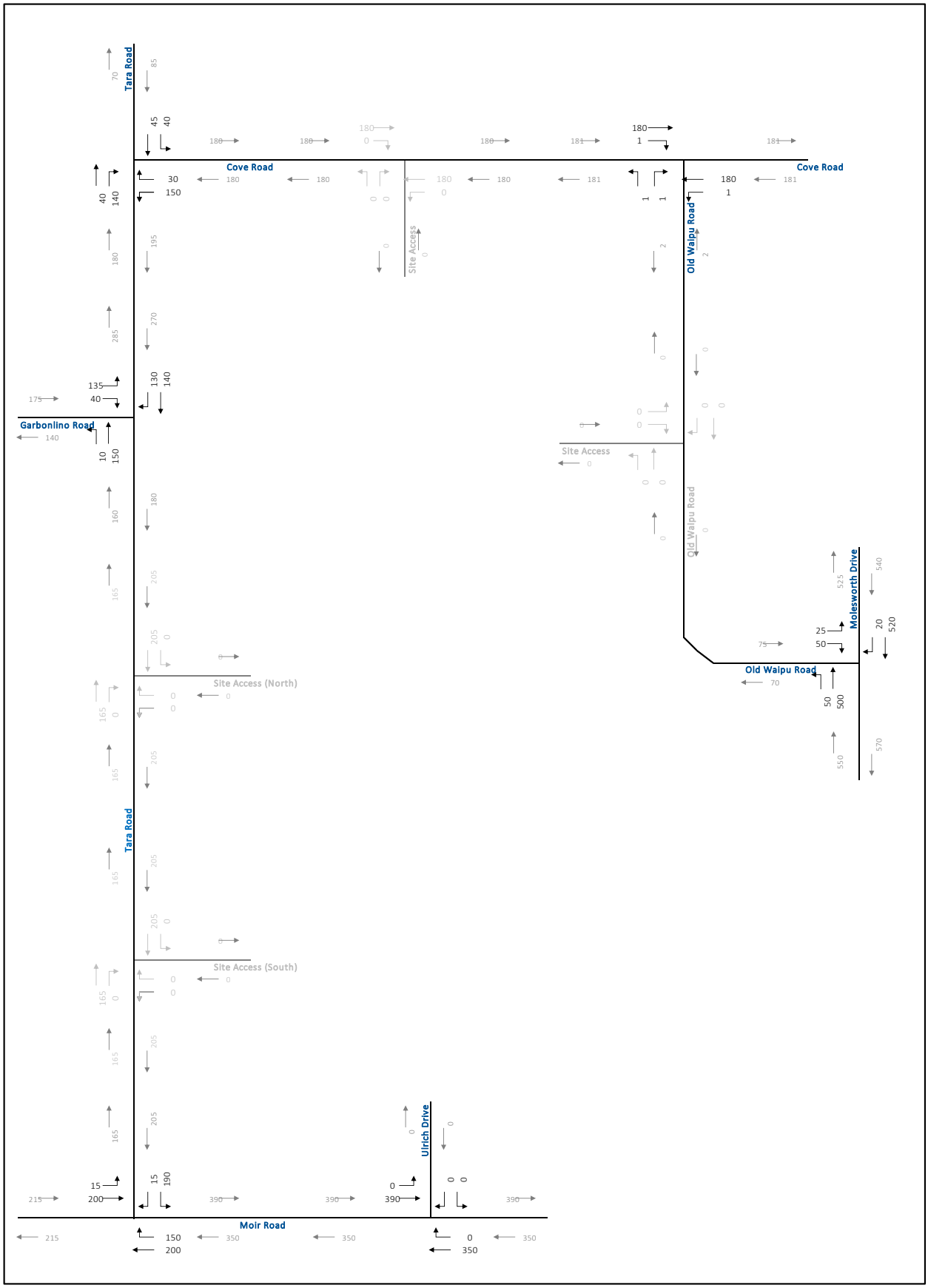

Figure 4: Study Area Saturday Peak Hour Existing Traffic Volumes

2.3 Crash History

Information from the New Zealand Transport Agency's "Crash Analysis System" for the ten-year period, from July 2012 to June 2022, indicates that 27 crashes have been reported within the study area (**Figure 5**). The reported crashes are summarised in **Table 1** below.

Table 1: Study Area Crash History

Location	Reported Crashes			Key Factors
	Total	Injury	Non-Injury	
Midblock: Cove Road, between Tara Road and Old Waipu Road North	2	1 minor 1 serious	-	2 – Loss of control, one due to excess speed, one due driver falling asleep
Intersection: Molesworth Drive / Old Waipu Road	1	1 minor	-	1 – Left-turn side swipe
Midblock: Tara Road, between Cove Road and Moir Street	7	5 minor	2	5 – Loss of control, three of which involved alcohol consumption 1 – Car turning left from a residential property into Tara Road northbound into the path of an oncoming vehicle 1 – Left-turning vehicle rear-ended in the southbound direction whilst turning into residential property
Intersection: Tara Road / Moir Street / Kaiwaka Mangawhai Road	7	4 minor	3	2 – Right-turning vehicle into Kaiwaka Mangawhai Road 1 – Disobeyed Intersection STOP control, suspected alcohol influence 1 – Right-turning vehicle on Moir Street rear-ended 1 – Loss of control turning left into Tara Road 1 – Motorcycle Loss of Control turning, taking right turn into Kaiwaka Mangawhai Road too wide 1 – Loss of control on through movement towards Moir Street, to avoid a cat in the road
Midblock: Moir Street, between Tara Road and Molesworth Drive	8	-	8	1 – Rear end 1 – Collision with parked vehicle 1 – Car overtaking a truck 1 – Reverse manoeuvre out of residential driveway 1 – Left-turning vehicle rear-ended 1 – Exited petrol station into path of oncoming vehicle on Moir Street 1 – Changing lanes on approach to roundabout with Insley Street 1 – Loss of control due to suspected medical event
Intersection: Moir Street / Molesworth Drive	2	1 minor	1	1 – Pedestrian crash resulting from an argument between two drivers 1 – Loss of control turning right into Molesworth Drive at speed
TOTAL	27	1 serious 12 minor	14	

Overall, the crash history would not suggest the occurrence of any recurring crash problems, in terms of common crash types recurring at any one specific location.

A few general observations are summarised below in relation to locations with the larger numbers of crashes:

Tara Road (Seven Crashes)

While five of the seven crashes involved vehicles losing control, these were all at different locations and attributed to different factors, with three noted to have involved intoxicated drivers.

The remaining two crashes related to vehicles accessing local residential properties.

Intersection Tara Road / Moir Street / Kaiwaka Mangawhai Road (Seven Crashes)

The seven recorded crashes are all noted to relate to different vehicle manoeuvres at the intersection, with the exception of the right turn into Kaiwaka Mangawhai Road, which was noted to be common to two of the crashes. Overall, the crash record does not suggest a pre-existing safety issue at this intersection.

Moir Street (Eight Crashes)

The eight crashes which occurred over the 10-year period are noted to relate to different vehicle manoeuvres and locations, which would not suggest a common pre-existing safety issue.

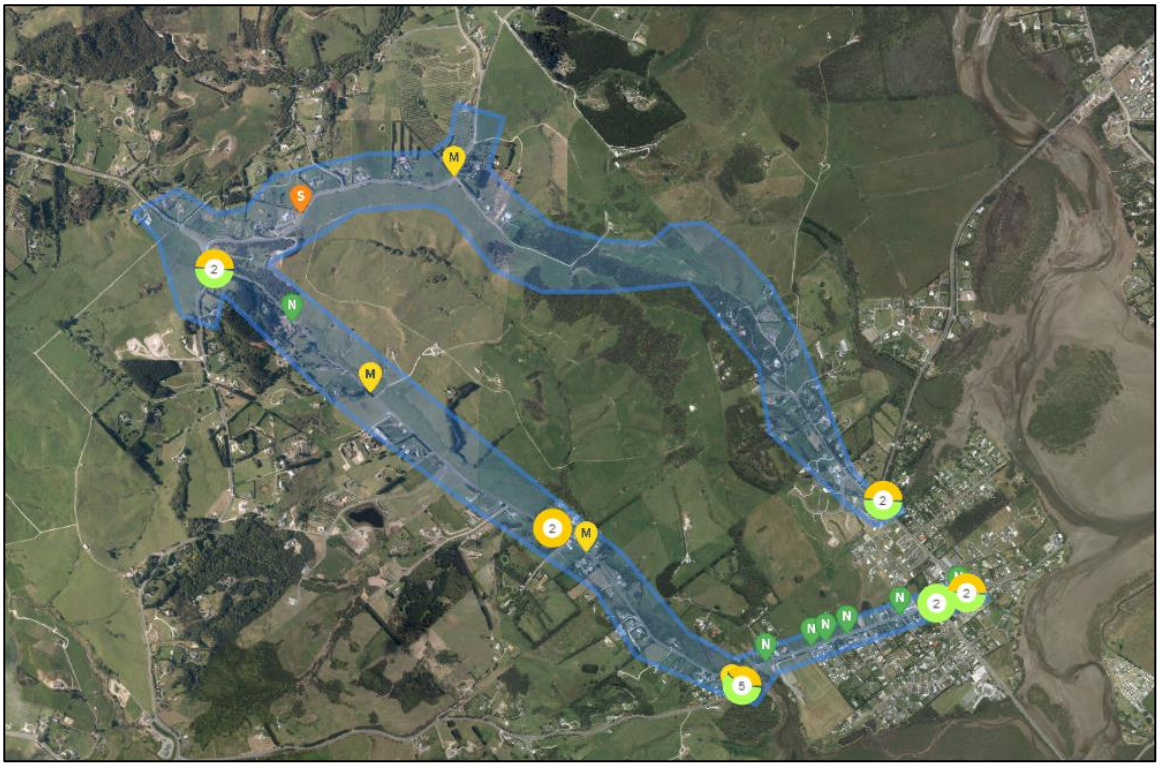

Figure 5: Study Area 10 Year Crash History

Image Source: NZTA Crash Analysis System

3.0 THE PROPOSAL

The proposal consists of rezoning approximately 218 hectares of Rural zoning to Residential zoning. Based on the site area and the existing environmental consideration, it is estimated that approximately 106 hectares of land within the area will be made available for residential use. Of this 40-60% of the land will be made directly available for residential development, with the balance being applied to roading, open space, and other site supporting infrastructure needs. From a minimum lot size of 1,000 m^2, this yields approximately 425-640 lots available to be created. However, given the topographical constraints within the plan change area, it is expected that many lots will result is land areas greater than 1,000 m^2, as such, approximately 400-600 lots will be created as a result of the plan change. This assessment has been based off of a presumed 600 lots, as part of a conservative approach and to allow for greater flexibility within the planning of the proposed Plan Change. An indicative number of lots throughout the site is indicated within Figure 6. It is noted that the indicative number of lots sum to 570, as some areas are likely to have more or less lots developed following more detailed design work at subdivision stage.

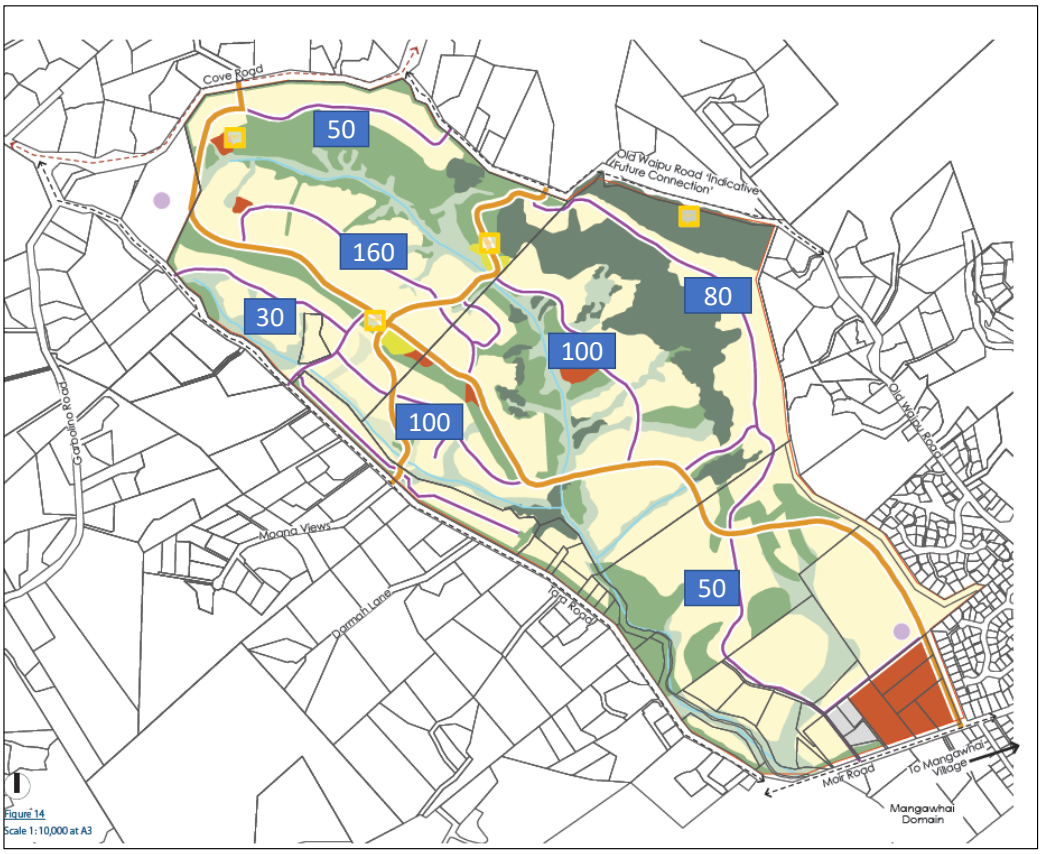

Figure 6: Indicative Lot Yield (Subject to Change)
Image Source: Mangawhai Hills Limited

As part of any subsequent subdivision and development, new public roads will be formed and vested to council. While these roads are strictly indicative at this point, no detailed assessment has been carried out; as their locations are not confirmed and doing so would result in likely inaccurate findings. As such, this assessment focusses solely on the existing road network and looks to identify any potential remedial measures to facilitate the plan change. As part of the PPC provisions, any subsequent subdivision involving the formation of a new public road will require an Integrated Transport Assessment to be completed as part of the application, thereby ensuring that suitable assessment is carried out at each stage of development, as greater detail is known.

3.1 Trip Generation

Residential trip generation data taken from the NZ Transport Agency publication "Trips and Parking Related to Land-Use", provides trip generation estimates for outer suburban dwellings. The publication indicates an 85th percentile rate of 0.9 peak hour trips and 8.2 daily trips. The 85th percentile rates have been utilised due to no local public transportation infrastructure and higher reliance on personal vehicles for travel within this area. Further, utilising the higher rate, represents a more conservative approach within the following assessment, as it is not likely that each future dwelling in this area will have the 85th percentile trip generation rate in practice.

Overall, the site is estimated to generate 4,920 daily trips and 540 peak hour trips. As residential trips are typically tidal, with vehicles leaving in the AM and returning in the PM, an 80-20 and 20-80 inbound-outbound split has been estimated for the AM and PM peak hours, respectively; for the Saturday peak hour a 50-50 inbound-outbound split has been utilised.

3.2 Trip Distribution

Trips to and from the subject lands have been distributed to the wider road network based on trip attractors within the area, census data, and engineering judgement and experience based on likely travel routes factoring in road quality and travel time. From this, Table 2 summarises the trip distribution which was applied to the site generated traffic volumes. It is noted that this distribution is based on the full build out of the subject lands and internal road network. As the development of the land is likely to be staged and road connections through the site will be completed in due course, it is important that further Transport Assessments are completed at subsequent subdivision stages when the internal roading network is known to best determine traffic volumes and potential impacts. The need for further Transport Assessments is set out within the Precinct Plan Provisions, whenever a new public road is proposed. As such, future subdivision applications will require a more focussed assessment which will suitably account for the existing and proposed road network, allowing for more accurate findings.

Table 2: Mangawhai Hills Trip Distribution Estimates

Route	Trip Distribution
North via Cove Road	15%
West via Garbolino Road	10%
West via Kaiwaka Mangawhai Road	5%
East via Moir Street	35%
East via Mangawhai Central Future Connection	35%

The following provides additional information regarding the estimated trip distribution:

- North via Cove Road: Provides connection to northern Mangawhai, Lang's Beach, Waipu, and is approximately 10 kilometres and 5-10 minutes shorter of a drive to reach Whangarei.
- West via Garbolino Road: provides connection to Kaiwaka and State Highway 1, allowing for connections to Whangarei and Wellsford. Higher proportion assigned due to more future lots within the plan change area being located in the north of the subject lands.
- West via Kaiwaka Mangawhai Road: provides connection to Kaiwaka and State Highway 1, allowing for connections to Whangarei and Wellsford. Lower proportion assigned due to fewer future lots within the plan change area being located in the south of the subject lands.

- East via Moir Street: provides connection to Mangawhai Village, as well as provides an alternate route to State Highway 1 via Mangawhai Road.
- East via Mangawhai Central Future Connection: provides connection to the Mangawhai Central commercial area as well as other developed areas of Mangawhai. While this connection is contingent on other land owners and NTA, the expectation is that parts of the subject land will not progress with development until said connection is established. Should future plans deviate from this, a Transport Assessment is required to be provided, which would suitably assess potential effects at that time. Additionally, discussions with Northland Transport Alliance, have indicated that as part of establishing a heavy vehicle route into Mangawhai Central, via Cove Road and Old Waipu Road, the existing section of Old Waipu Road (south) will terminate near No. 110.

It is noted that these distributions are strictly estimates and are based upon the full development of the subject site. During the staging of the development are, interim trip distributions are likely to be used and will be reported on accordingly within the respective Transportation Assessment as part of the subdivision stage.

3.3 Site Access to Public Road Network

The subject site is provided with road frontage onto Tara Road, Cove Road, and Old Waipu Road, as well as has the potential for a road connection with Urlich Drive. Considering this and master planning for the Mangawhai Hills area, the site is likely to have road connections to the wider existing public road network as shown in **Figure 7**.

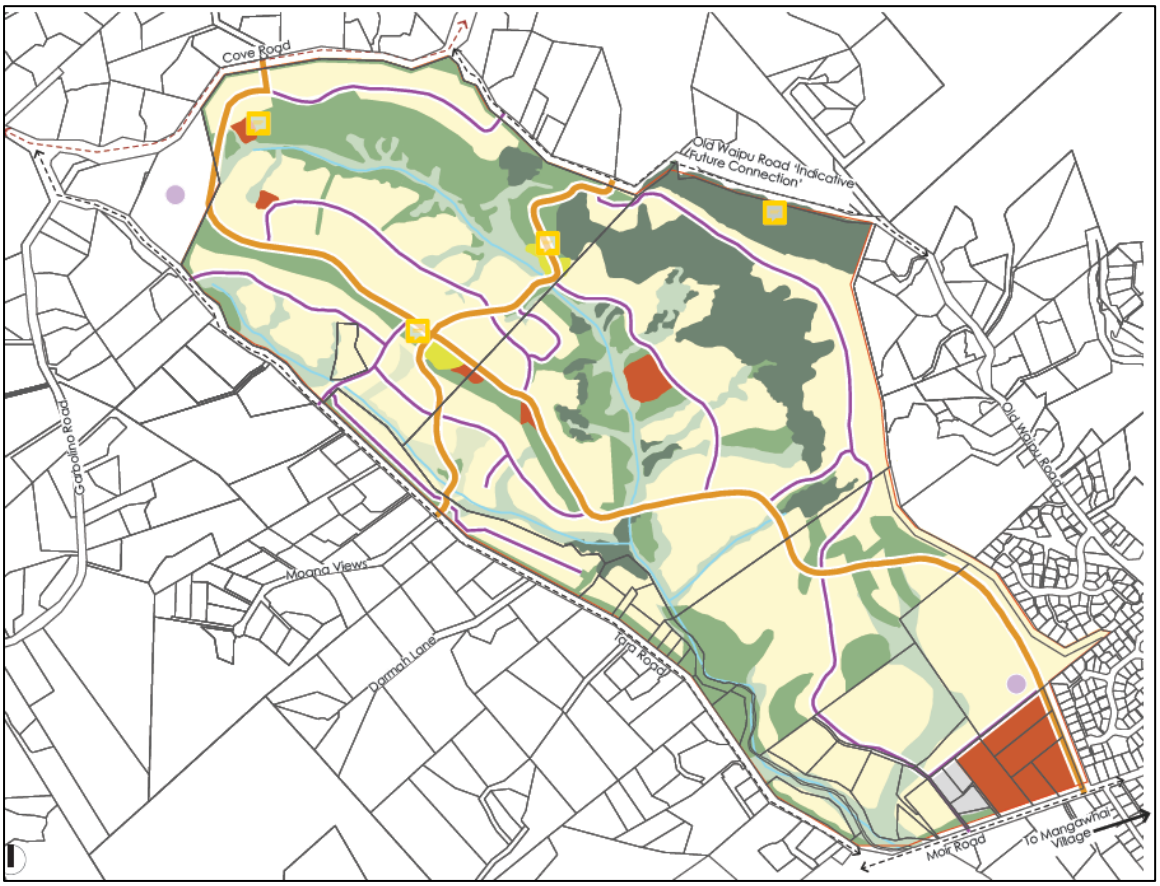

Figure 7: Conceptual Structure Plan

**Internal road network and road connection locations subject to change following detailed design*

3.4 Site Generated Traffic Volumes

Applying the estimated trip generation for the site, the estimated trip generation to the surrounding road network, and the indicative internal site road layout, traffic volumes at area intersections can be estimated following the full build-out of the subject site. These site generated traffic volumes are included in Figure 8 for the AM peak hour, Figure 9 for the PM peak hour, and Figure 10 for the Saturday peak hour.

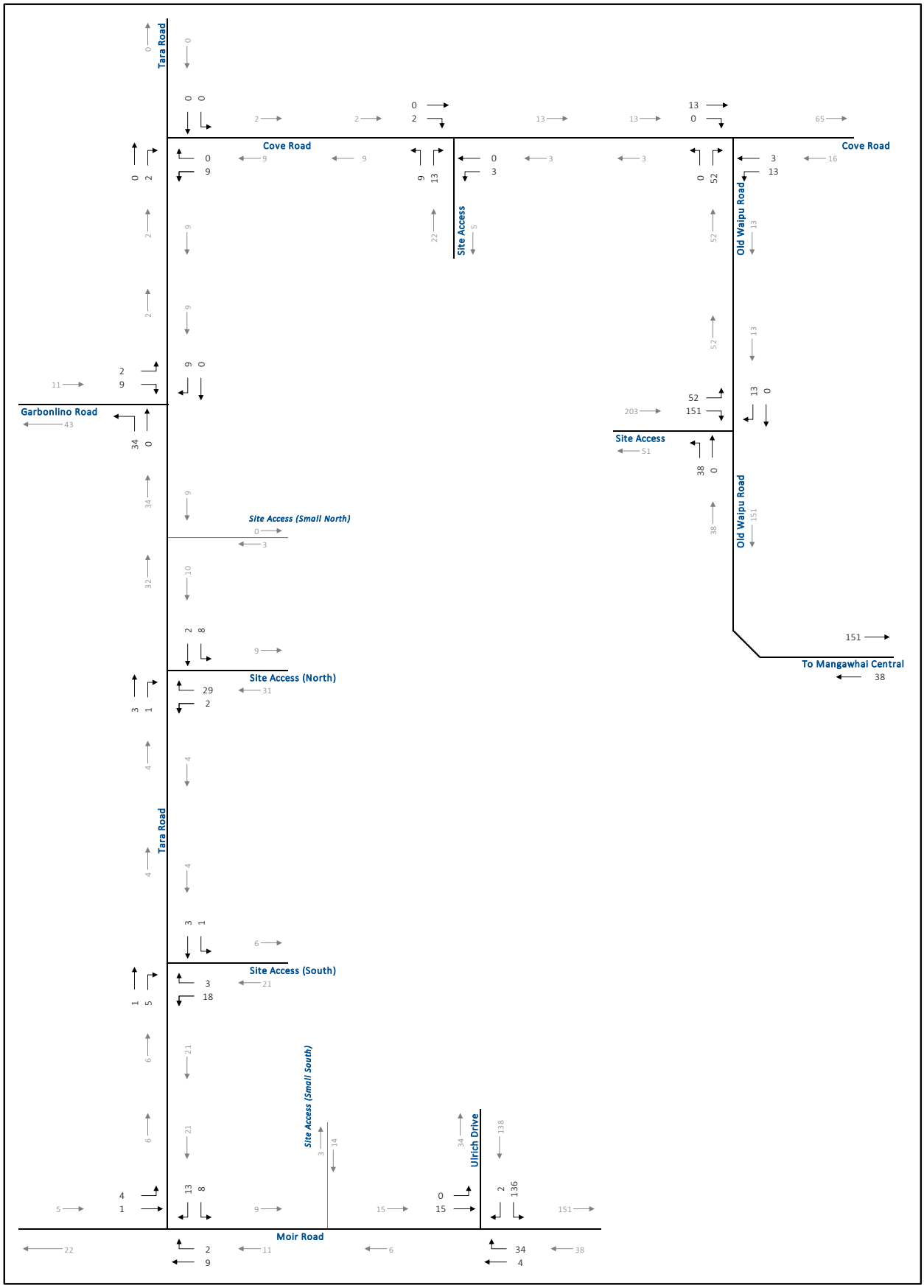

Figure 8: AM Peak Hour Site Generated Traffic Volume Estimates

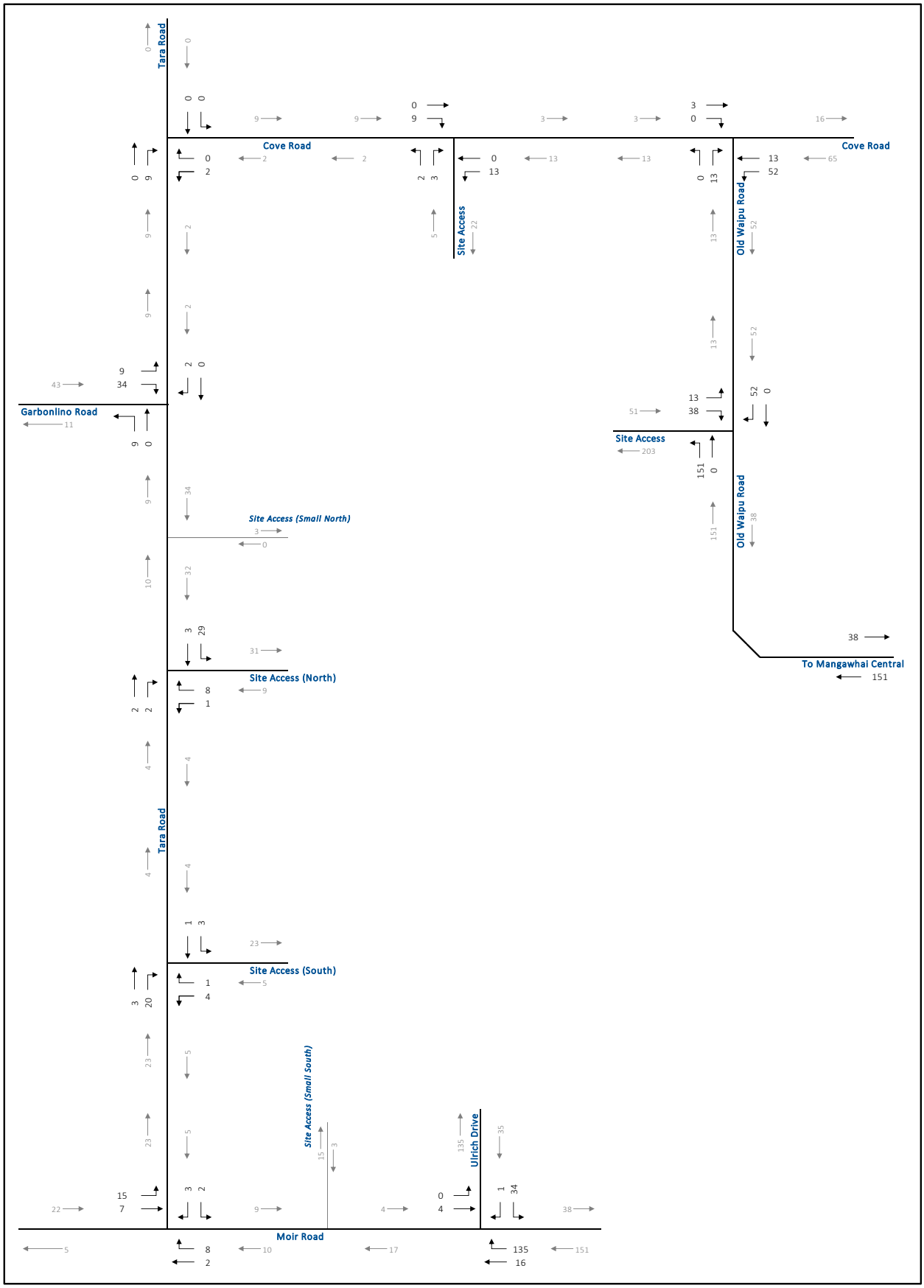

Figure 9: PM Peak Hour Site Generated Traffic Volume Estimates

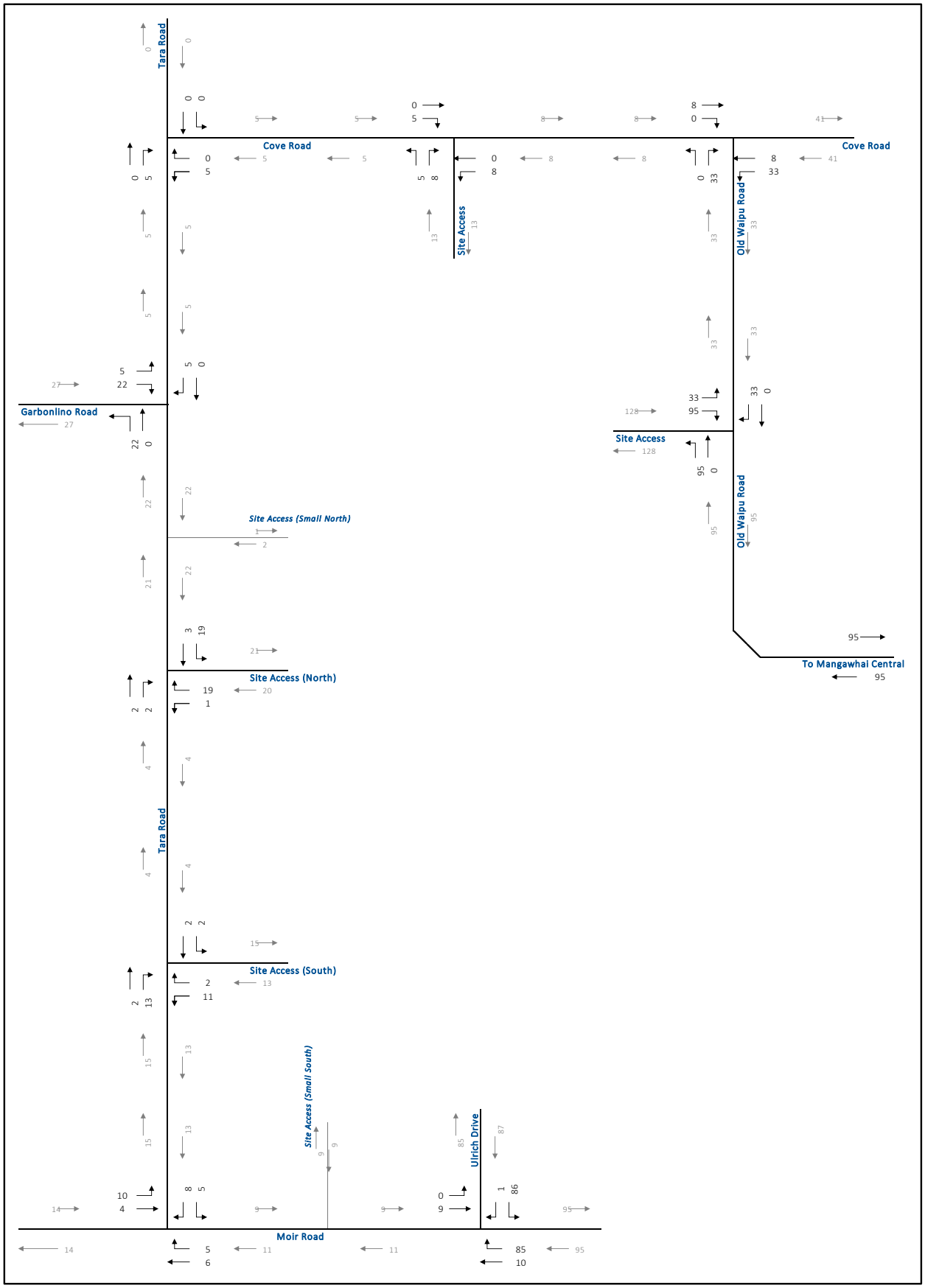

Figure 10: Saturday Peak Hour Site Generated Traffic Volume Estimates

4.0 TRAFFIC OPERATIONS

Intersection level of service (LOS) is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles desiring to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on a number of criteria related to the opposing traffic flows and intersection geometry.

The highest possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 50 seconds for unsignalized intersections or when the volume to capacity ratio is greater than 1.0, the movement is classed as LOS F and remedial measures are usually implemented, if they are feasible. LOS E is usually used as a guideline for the determination of road improvement needs on through lanes, while LOS F may be acceptable for right-turn movements at peak times, depending on delays.

The operations of intersections in the study area were evaluated with the existing turning movement volumes using Sidra.

The intersection analysis considered three measures of performance:

- The degree of saturation (volume to capacity ratio) for each intersection.
- The LOS for each turning movement (LOS is based on the average delay per vehicle).
- The 85th percentile queue length.

4.1 Studied Intersections

The following intersections were modelled with existing, background and total traffic volumes (described later within this report):

- Tara Road and Moir Road
- Tara Road and Garbolino Road
- Tara Road and Cove Road
- Cove Road and Old Waipu Road (North)
- Moir Drive and Ulrich Drive

The following intersections were not assessed with the rationale for their exclusion provided:

- Moir Drive and Insley Street *and* Moir Drive and Molesworth Drive:
    - These intersections have been recently upgraded to single lane roundabouts, and utilised traffic growth forecasts for the wider Mangawhai area; as confirmed by NTA. As such, the design of these roundabouts would include additional traffic volumes travelling through them as a result of the proposed plan change area to an extent. The proposal is anticipated to increase volumes within the roundabouts by approximately 189 vehicle movements during peak hours. While the delays experienced at the roundabout may increase, it is unlikely that any further safety improvements would be required (noting the recent upgrade) and that the volumes and the available land-area would be unlikely to require/accommodate a multi-lane roundabout in this area.

- Molesworth Drive and Old Waipu Road:
    - Through discussions with NTA regarding the establishment of a heavy vehicle route into the Mangawhai Central area via Garbolino Road, Tara Road, Cove Road and Old Waipu Road, it was identified that the existing section of Old Waipu Road (south), would intentionally not be connected to this new road; so to avoid additional traffic loading along what is currently a relatively quiet residential cul-de-sac area. As such, vehicle movements associated from the site would not likely travel through this intersection, as more direct routes between the subject lands and trip attractors would be available as part of the ultimate designed build out.
- New intersections created onto either Tara Road, Moir Road, Cove Road, Old Waipu Road:
    - New intersections likely to be created as part of the plan change were not assessed as the specifics of those intersection designs, locations, and turning movement volumes are unknown at this point due to more detail being available at subsequent subdivision stages of development.

Lastly it is reiterated that, as part of the precinct plan provisions, a Transport Assessment is required to be completed as part of any subsequent subdivision activity which creates a new public road. With this in place, more accurate analysis can be completed to identify potential localised impacts, along with remedial measures to mitigate said impacts (if any).

4.2 Existing Operations

Using the above methodology, the existing intersection operations were assessed within Sidra and are summarized in **Table 3**, indicating the existing levels of service (LOS), volume to capacity ratios (V/C) experienced within the study area, for the Saturday peak hour. As the Saturday peak hour has the highest overall traffic volumes, it was the only scenario assessed in detail, as it will ultimately determine any required improvements (along with findings from the Safe System Assessment included later within this report). **Attachment 1** contains the detailed Sidra reports.

Table 3: Existing Saturday Intersection Operations

Intersection	Approach Leg Level of Service				Overall Degree of Saturation	Highest 85th Queue Length
	North	South	East	West		
Tara Road and Moir Road	A	-	A	A	0.222	8 metres
Tara Road and Garbolino Road	A	A	A	-	0.169	6 metres
Tara Road and Cove Road	A	A	-	A	0.133	4 metres
Cove Road and Old Waipu Road	-	A	A	A	0.100	1 metre
Moir Road and Urlich Drive	A	-	A	A	0.216	1 metre

From the analysis of the existing Saturday peak hour volume estimates, it was determined that the existing intersections all operate at a suitable levels. As volumes are less during the AM and PM peak hours, it can be deduced that these periods also operate at suitable levels.

4.3 Future Background Traffic Operations

The assessment of future traffic conditions contained in this section includes estimates of future background and total traffic and analysis for the 2033 horizon (10 years from present). The future traffic volumes in the vicinity of the development will likely consist of increased non-site traffic volumes (background traffic), traffic generated by other developments, and the traffic forecast to be generated by the proposed development.

The non-site traffic increase is the generalized traffic growth in Mangawhai. The generalized traffic growth will follow the average increase in population within the area. Background growth was taken as 1% per annum compounded. This percentage was utilised as the development consists of a large quantum of housing and therefore represents a significant portion of the growth that may occur within the Mangawhai Area, with 600 households, equalling approximately 1,500 – 2,100 people (2.5-3.5 people per household). Combining the background 1% growth with the site generated traffic volumes, over the approximate 10-year development horizon, yields a net average growth rate of 2.5%.

Population in Mangawhai area (census districts Mangawhai Rural, Mangawhai Heads and Mangawhai) is estimated to currently be ~7,000 people. Information made available in the latest Infometrics Kaipara District population projections report (Feb 2023), estimates between 2022-2034, the population will grow by approximately 2.4% per annum. As such, the utilised growth rates utilised within this assessment closely align with the forecast growth identified within the Infometrics report.

Additionally, within the Background scenario, the establishment of the Mangawhai Heavy Vehicle Route was accounted for, with peak hour vehicle movements estimated at 250 inbound vehicles, and 250 outbound vehicles. While these volumes are strictly estimates at this point, it is anticipated that further work on the modelling of this route will be completed in conjunction with future subdivision of the subject lands in close cooperation with NTA.

Based on the forecast 2033 background traffic volumes, LOS analyses have been conducted using Sidra to determine the Saturday peak hour conditions for the intersections within the study area and are summarised in Table 4. Attachment 2 contains the detailed Sidra reports.

Table 4: Background 2033 Intersection Operations

Intersection	Approach Leg Level of Service				Overall Degree of Saturation	Highest 85th Queue Length
	North	South	East	West		
Tara Road and Moir Road	B	-	A	A	0.25	9 metres
Tara Road and Garbolino Road	A	A	-	B	0.39	16 metres
Tara Road and Cove Road	A	A	A	-	0.33	12 metres
Cove Road and Old Waipu Road	-	A	A	A	0.29	12 metres
Moir Road and Urlich Drive	A	-	A	A	0.24	1 metre

From the analysis of the Background Saturday peak hour volume estimates, it was determined intersection will operate at good levels with saturation and queue lengths remaining within acceptable levels. As volumes are less during the AM and PM peak hours, it can be deduced that these periods also operate at similar levels.

4.4 Future Total Traffic Operations

Figure 12 displays the total trips expected in 2033, which is the addition of the development traffic (***Figure 10***) to the background traffic (***Figure 11***). Based on the forecast 2033 total traffic volumes, LOS analyses have been conducted using Sidra to determine the Saturday peak hour conditions for the intersections within the study area and are summarised in Table 5. Attachment 3 contains the detailed Sidra reports.

Table 4: Total 2033 Intersection Operations

Intersection	Approach Leg Level of Service				Overall Degree of Saturation	Highest 85th Queue Length
	North	South	East	West		
Tara Road and Moir Road	B	-	A	A	0.26	9 metres
Tara Road and Garbolino Road	A	A	-	B	0.44	20 metres
Tara Road and Cove Road	A	A	A	-	0.34	13 metres
Cove Road and Old Waipu Road	-	A	A	A	0.30	12 metres
Moir Road and Urlich Drive	B	-	A	A	0.31	9 metres

From the analysis of the Total Saturday peak hour volume estimates, it was determined intersection will operate at good levels with saturation and queue lengths remaining within acceptable levels. As volumes are less during the AM and PM peak hours, it can be deduced that these periods also operate at similar levels.

As with any development proposal of this scale further analysis will be carried out at subsequent stages; with a focus on identifying potential improvements to mitigate effects and improve overall safety. While the operational assessment has preliminarily indicated that the operations of the surrounding road will not be significantly impacted (mainly due to low existing traffic volumes and trips being distributed throughout the road network), there may still be some improvements required to help ensure the safety of the wider road network. This is assessed within Section 5 of this report.

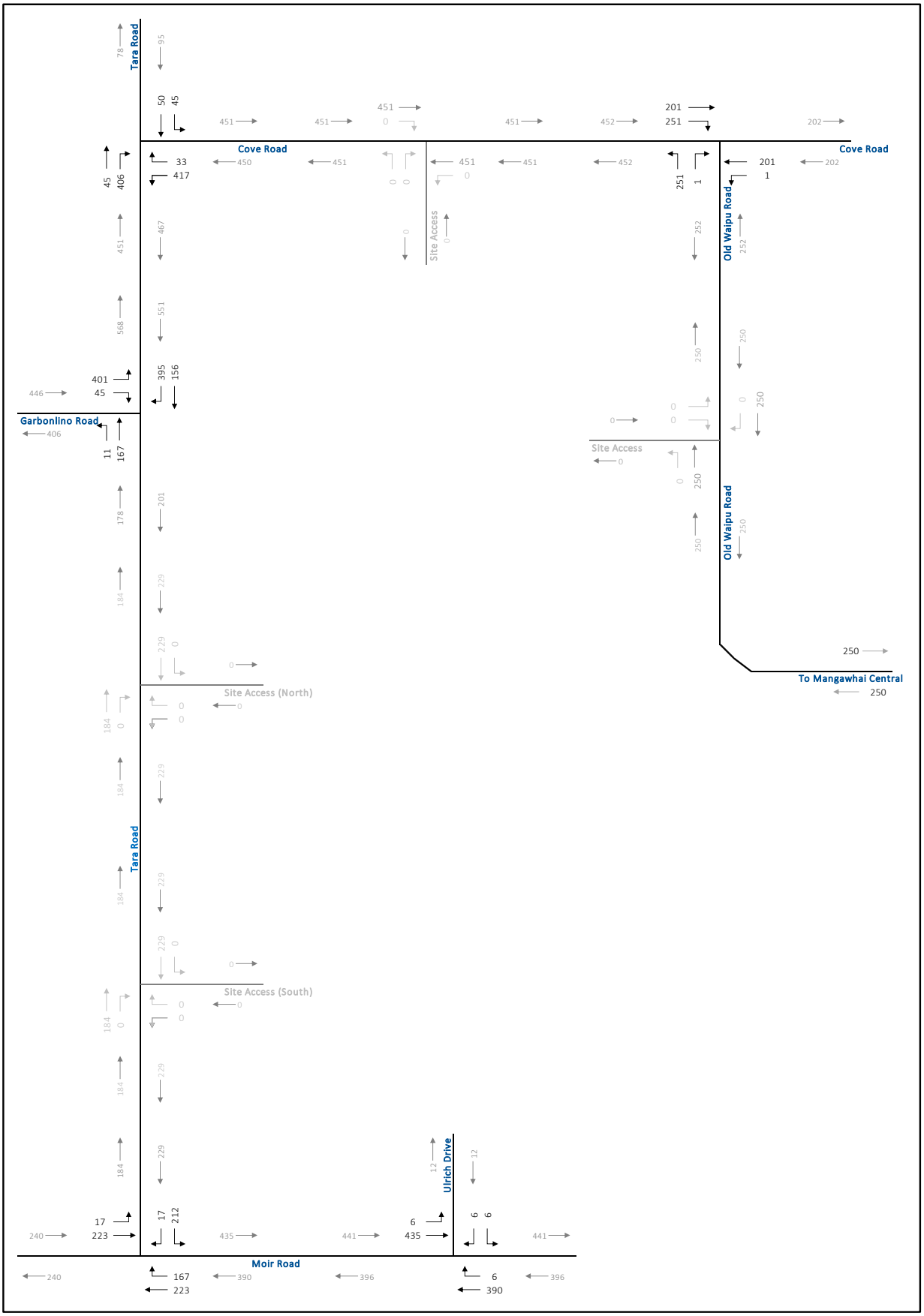

Figure 11: Estimated 2033 Background Saturday Peak Hour Traffic Volumes

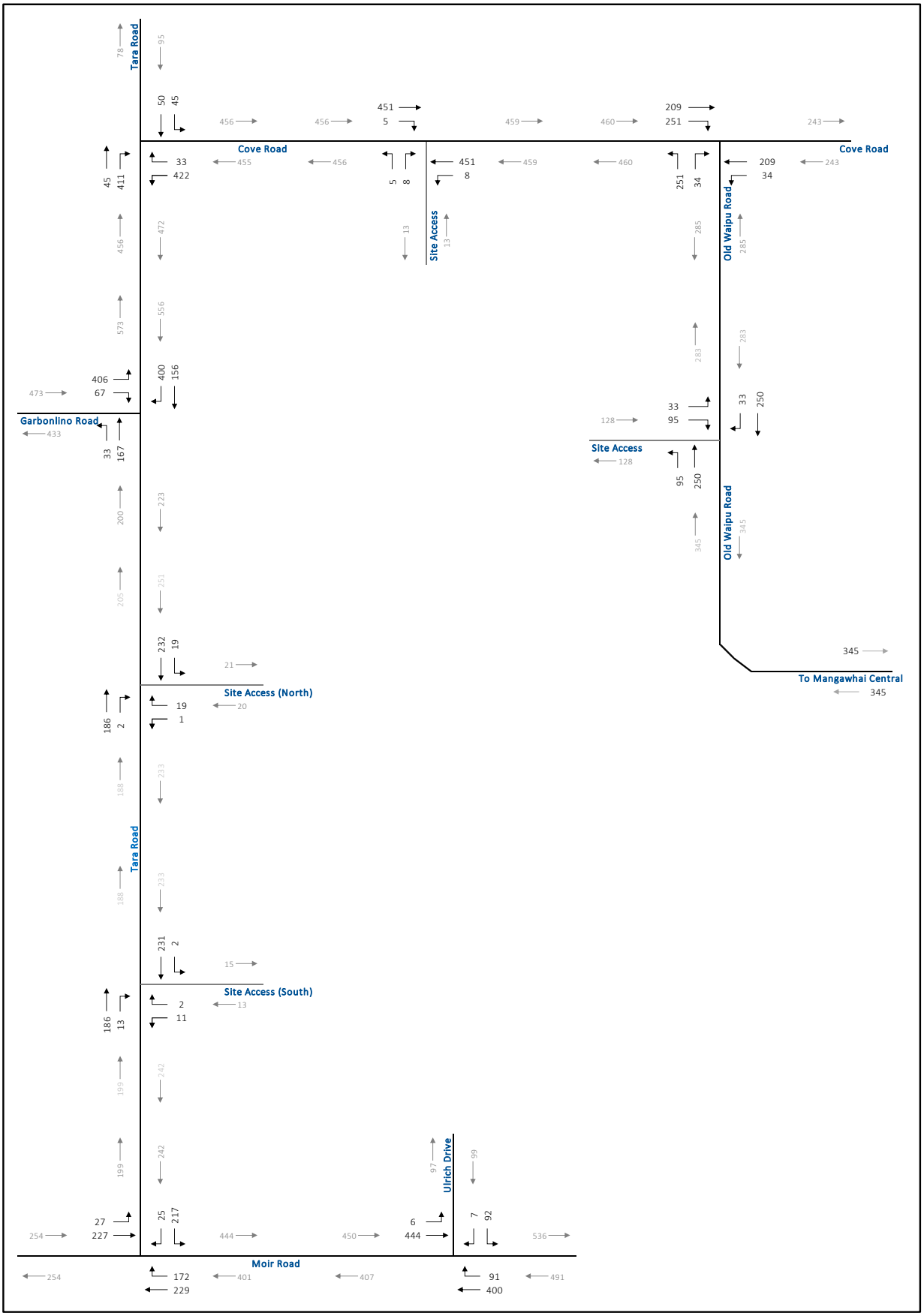

Figure 12: Estimated 2033 Total Saturday Peak Hour Traffic Volumes

5.0 PRELIMINARY SAFE SYSTEM ASSESSMENT

A Safe System Assessment Framework (SSAF) has been requested by Kaipara District Council (KDC) as part of pre-application meetings and correspondence. This following is an assessment of the six (6) locations of concern that KDC highlighted in their correspondence, as identified in Figure 13.

Figure 13: SSAF Study Area

Image Source: Kaipara District Council's GIS maps

5.1 Site Visit Observations

The site visit for the SSAF was carried out on Monday 28th November 2022 between 08:45 – 14:30. 30-minute traffic counts (at minimum) were undertaken to help inform the SSAF of the road user movements at the sites. The weather was fine, sunny, and dry during the site visit.

5.1.1 Tara Road Intersection with Garbolino Road

This intersection forms part of a staggered intersection with Cove Road. During the site visit it was observed that there was a dominant 'dog-leg' movement from Garbolino Road (left turn) into Cove Road (right turn) and vice versa. There was noticeably less left turning traffic into Garbolino Road and right turn movements out of Garbolino Road. To the south of the intersection is a curve and also a downward incline. A vehicle travelling northbound currently has limited forward visibility when viewing the right movement into Garbolino Road which is likely to result in conflicts occurring. It is understood that Tara Road will potentially form part of a heavy commercial vehicle (HCV) route and is identified for a route upgrade. The intersection is on a curve and there is adequate visibility to observe oncoming traffic from both directions although looking south, when along Tara Road, visibility is reduced due to the road geometry. To the northern side of the intersection there is a steep drop off on the western side and an embankment on the eastern side. Currently right turning vehicles are passed by southbound traffic using the shoulder. There have been no reported crashes at the intersection for the latest available 10 year period (from NZTA' CAS database).

Figure 14: Tara Road and Garbolino Road Intersection

Image Source: Kaipara District Council's GIS maps

5.1.2 Tara Road Intersection with Cove Road

This intersection forms part of a staggered intersection with Garbolino Road. During the site visit it was observed that there was a dominant 'dog-leg' movement from Cove Road (left turn) into Garbolino Road (right turn) and vice versa. There was noticeably less left turning traffic into Cove Road and right turn movements out of Cove Road. Opposite the Cove Road intersection is a steep drop off. The intersection has good visibility to observe oncoming traffic. There has been a treatment at the intersection to reduce the width of the intersection mouth by installing a curved 'sight rail timber wooden fence'. There are no reported crashes at this intersection for the latest available 10-year period (from NZTA' CAS database).

Figure 15: Tara Road and Cove Road Intersection
Image Source: Kaipara District Council's GIS maps

5.1.3 Cove Road Intersection with Old Waipu Road (North-End)

The intersection is on a compound curve and to the north of the intersection there is another compound curve which was seen to temporarily mask an approaching vehicle. Old Waipu Road (N) is an unsealed road. During the site visit no vehicles were seen turning into or out of the side road indicating the low level of traffic volumes. Due to the proximity of the fence line on the northern side of the intersection, there is limited opportunity to widen the intersection at that location to install a right turn bay, however, on the southern side the property fence line indicates that there is scope to widen the road along this side. There are no reported crashes at this intersection for the latest available 10-year period (from NZTA' CAS database).

Figure 16: Cove Road and Old Waipu Road (N) Intersection

Image Source: Kaipara District Council's GIS maps

5.1.4 Moir Street Intersection with Tara Road

This is a stop-controlled priority intersection with a curve and upward incline on the western approach to the intersection which limits visibility for vehicles at the intersection on Tara Road. The dominant traffic turning movements at the intersection are the left turn out of Tara Road and the right turn into Tara Road. The current layout does not include a right turn bay in Moir Street. There is a slight drop off in gradient opposite Tara Road and a footpath starts at this intersection on the northern side and continues eastbound over the stream towards the tennis courts. There have been three reported crashes for the latest available 10-year period (from NZTA' CAS database). All three occurred in 2015 and no further crashes have been reported since that time. All three involved turning movements at the intersection.

Figure 17: Tara Road and Moir Road Intersection
Image Source: Kaipara District Council's GIS maps

5.1.5 Moir Street Intersection with Urlich Drive

This is a priority intersection with a give way control with a left turn taper into the side road and a parking layby opposite the intersection. There is a pram ramp on the north-western side of the intersection but none on the opposite side of the road. There is berm on the north-eastern side of the intersection and a footpath on the southern side. The 30km/h speed limit transition along Moir Street is located approximately 160 metres east from the intersection and Kagan Avenue is located approximately 35m to the east of the intersection and can be considered a staggered intersection. Urlich Drive is currently a no exit road and no traffic was seen using the side road at the time of the site visit. There are no reported crashes at this intersection for the latest available 10-year period (from NZTA' CAS database).

Figure 18: Moir Road and Urlich Ave Intersection
Image Source: Google Maps

5.2 Baseline

The objective of this assessment is to identify how well the current intersections within the study area align with Safe System objectives and to allow comparison with the proposal / development. This is the assessment of five locations, looking at a specific road design and operational issues.

The various intersection (baselines) are shown in purple to distinguish them against the proposed treatment / development effects in red.

5.3 Site Safe System Assessment Matrixes

Additional Safe System Components	Prompts	Comments
Road User	Are road users likely to be alert and compliant, or are there factors that might influence this? What are the expected compliance and enforcement levels (alcohol/drugs, speed, road rules, and driving hours) and what is the likelihood of driver fatigue? Are there special road uses (e.g. entertainment precincts, elderly, children, on-road activities), distraction by environmental factors (e.g. commerce, tourism), or risk-taking behaviours?	• Local drivers and tourists – good reaction times, good level of control • Adequate sight distances • Moderate speed environment (40 & 50 km/hr) • High speed environment (80 km/hr)
Vehicle	What level of alignment is there with the ideal of safer vehicles? Are there factors which might attract large numbers of unsafe vehicles? Is the percentage of heavy vehicles too high for the proposed/existing road design? Are there enforcement resources in the area to detect non-roadworthy, overloaded or unregistered vehicles and thus remove them from the network?	• No vehicle enforcement • Low to Moderate to volume • Heavy vehicles – 2% summer peak, 3.5% off peak.
Post-crash care	Are there issues that might influence safe and efficient post-crash care in the event of a severe injury? Do emergency and medical services operate as efficiently and rapidly as possible? Are other road users and emergency response teams protected during a crash event? Are drivers provided the correct information to address travelling speeds on the approach and adjacent to the incident? Is there provision for e-safety (i.e. safety systems based on modern information and communication technologies, C-ITS)?	• Road shoulders may be used for emergency stops • The roadside space and land beside the road can be used by emergency services • Closeness to emergency facilities (Whangarei Hospital - 60 km)

Moir Road (ADT 4300) / Urlich Drive (ADT 50) Intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer	2/4 summer	2/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers y Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed x	Delineation x Well surfaced y Straight road x	
	2/4	2/4	3/4	1/4	1/4	1/4	2/4	
Severity	High speed n No barriers y Steep grade x Drains y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	2/4	2/4	2/4	1/4	2/4	2/4	2/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*2*2=8/64 SP 1*2*2=4/64 OP	**46 (38) /448 SP (OP)**

Moir Road (ADT 4300) / Urlich Drive (ADT 2000) Intersection – Proposed Treatments include, right turn bay / localised widening, improved street lighting with improved markings and signs through the staggered intersection and pedestrian refuge.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer	2/4 summer	2/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	1/4	1/4	1/4	
Severity	High speed n No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	2/4	2/4	1/4	1/4	2/4	2/4	2/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*2*1=4/64 SP 2*2*1=2/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	**34 (26) /448 SP (OP)**

Moir Rd (ADT 4300) / Tara Rd (ADT 900) / KMR intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer	2/4 summer	2/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers y Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed x	Delineation x Well surfaced y Straight road x	
	2/4	2/4	3/4	1/4	1/4	1/4	2/4	
Severity	High speed n No barriers y Steep grade x Drains y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	2/4	2/4	2/4	1/4	2/4	2/4	2/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*2*2=8/64 SP 1*2*2=4/64 OP	**46 (38) /448 SP (OP)**

Moir Rd (ADT 4300) / Tara Rd (ADT 1200) / KMR Intersection – Proposed Treatments include, right turn bay / localised widening, improved street lighting with double centreline markings (and signs) through the intersection.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer	2/4 summer	2/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	1/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	1/4	1/4	1/4	
Severity	High speed n No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles x Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities x	High speed n	High speed n Some roadside hazards y	
	2/4	2/4	1/4	1/4	2/4	2/4	2/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*2*1=4/64 SP 2*2*1=4/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	2*1*2=4/64 SP 1*1*2=2/64 OP	**34 (28) /448 SP (OP)**

Cove Rd (ADT 1000) / Old Waipu Rd (N) (ADT 10) intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers y Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed x	Delineation x Well surfaced y Straight road x	
	3/4	3/4	2/4	1/4	0/4	1/4	2/4	
Severity	High speed y No barriers y Steep grade x Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	3/4	3/4	2/4	1/4	4/4	4/4	4/4	
Product	2*3*2=12/64 summer 2*3*2=12/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*4=0/64 SP 0*0*4=0/64 OP	1*1*4=4/64 SP 1*1*4=4/64 OP	1*2*4=8/64 SP 1*2*4=8/64 OP	46 (46) /448 SP (OP)

Cove Rd (ADT 3000) / Old Waipu Rd (N) (ADT 2000) intersection – Proposed Treatments include, right turn bay / localised widening, speed reduction to 70/60km/h, street lighting with double centreline markings through the intersection. It is understood that the Council has plans to make this a heavy vehicle route.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	0/4	1/4	1/4	
Severity	High speed y No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	2/4	2/4	1/4	1/4	3/4	3/4	3/4	
Product	2*2*2=8/64 summer 2*2*2=8/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*2*1=4/64 SP 2*2*1=4/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*3=0/64 SP 0*0*3=0/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	**28 (28) /448 SP (OP)**

Tara Rd (ADT 1500) / Cove Rd (ADT 1000) intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers y Guidance and delineation x Flush medians x Curve road x	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed x	Delineation x Well surfaced y Straight road x	
	3/4	2/4	3/4	1/4	0/4	1/4	2/4	
Severity	High speed y No barriers y Steep grade x Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	2/4	2/4	2/4	1/4	4/4	4/4	4/4	
Product	2*3*2=12/64 summer 2*3*2=12/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*4=0/64 SP 0*0*4=0/64 OP	1*1*4=4/64 SP 1*1*4=4/64 OP	1*2*4=8/64 SP 1*2*4=8/64 OP	**42 (26) /448 SP (OP)**

Tara Rd (ADT 3500) / Cove Rd (ADT 3000) intersection – Proposed Treatments include, right turn bay (localised widening), speed reduction to 70/60 km/h & barrier plus street lighting with double centreline markings through the intersection. It is understood that the Council has plans to make this a heavy vehicle route.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road y	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	0/4	1/4	1/4	
Severity	High speed y No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	1/4	2/4	1/4	1/4	3/4	3/4	3/4	
Product	2*2*1=4/64 summer 2*2*1=4/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	2*2*1=4/64 SP 2*2*1=4/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*3=0/64 SP 0*0*3=0/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	**23 (15) /448 SP (OP)**

Tara Rd (ADT 1500) / Garbolino Rd (ADT 600) intersection – Existing Situation

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	2/4 summer peak	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road x	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	3/4	3/4	3/4	1/4	0/4	1/4	2/4	
Severity	High speed y No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	2/4	2/4	2/4	1/4	4/4	4/4	4/4	
Product	2*3*2=12/64 summer 2*3*2=12/64 off peak	2*3*2=12/64 SP 2*3*2=12/64 OP	2*3*2=12/64 SP 2*3*2=12/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*4=0/64 SP 0*0*4=0/64 OP	1*1*4=4/64 SP 1*1*4=4/64 OP	1*2*4=8/64 SP 1*2*4=8/64 OP	**46 (34) /448 SP (OP)**

Tara Rd (ADT 1500) / Garbolino Rd (ADT 2600) intersection – Proposed Treatments include, right turn bay (localised widening), speed reduction to 70/60km/h and barrier plus street lighting with double centreline markings through the intersection. It is understood that the Council has plans to make this a heavy vehicle route.

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume x	High volume x	High vol. x	High volume x	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	2/4 summer peak	2/4 summer peak	**2/4 summer peak**	2/4 summer peak	0/4 summer	1/4 summer	1/4 summer	
	2/4 off peak	2/4 off peak	24 off peak	2/4 off peak	0/4 off peak	1/4 off peak	1/4 off peak	
Likelihood	Steep grade x & y Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation x Flush medians x Curve road x	Divided, wide/flush median x Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points x High speed y Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign x Buses stopping x	Separate facilities n Crossing facilities at intersection x Less lanes to cross y High speed y	Separate facilities x Crossing facilities at intersection x Road shoulders x High speed y	Delineation x Well surfaced y Straight road x	
	2/4	2/4	2/4	1/4	0/4	1/4	1/4	
Severity	High speed y No barriers x Steep grade x & y Drains y Poles and trees to hit y	High speed y	High speed y Reduced conflict angles x Good sight distance y	High speed y Visible intersection y Surfaced y	High speed y No crossing facilities x	High speed y	High speed y Some roadside hazards y	
	1/4	2/4	1/4	1/4	3/4	3/4	34	
Product	2*2*1=4/64 summer 2*2*1=4/64 off peak	2*2*2=8/64 SP 2*2*2=8/64 OP	**2*2*1=4/64 SP** 2*2*1=4/64 OP	2*1*1=2/64 SP 2*1*1=2/64 OP	0*0*3=0/64 SP 0*0*3=0/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	1*1*3=3/64 SP 1*1*3=3/64 OP	**21 (15) /448 SP (OP)**

5.4 Safe System Assessment Findings

It should be noted that given the low-moderate traffic (road user) volumes on the arterials and local roads minor changes in metrics do not, typically, translate into changes in scoring.

5.4.1 Moir Road and Urlich Drive

Scenario	Score (Off Peak score)
Existing	46 (38) /448 SP (OP)
Proposed Development with treatment	34 (26) /448 SP (OP)

The score remains quite low at this site it should be noted that the figures for vulnerable road users are very low (including the side road traffic volumes). Installing a right turn bay will not require significant new infrastructure as the parking layby can be converted to accommodate the traffic movement.

5.4.2 Moir Road and Tara Road

Scenario	Score (Off Peak score)
Existing	46 (38) /448 SP (OP)
Proposed Development with treatment	34 (28) /448 SP (OP)

Although the scoring is improved slightly with the proposed installation of a right turn bay, it is clear that such a treatment will have a traffic calming affect at this location. It will improve amenity for right turning traffic.

5.4.3 Cove Road and Old Waipu Road (North)

Scenario	Score (Off Peak score)
Existing	46 (46) /448 SP (OP)
Proposed Development with treatment	28 (28) /448 SP (OP)

Although the scoring is the same in both the summer and off-peak times it is considered that the changes in volumes would not require a change in the scoring. There are no pedestrian or cyclist movements expected, or when they occur it is expected to be in very low numbers. The right turn bay and the reduction in speed limit will improve the safety risk at this location.

5.4.4 Tara Road and Cove Road

Scenario	Score (Off Peak score)
Existing	42 (26) /448 SP (OP)
Proposed Development with treatment	23 (15) /448 SP (OP)

There are no pedestrian or cyclist movements expected, or when they occur it is expected to be in very low numbers. The right turn bay and the reduction in speed limit will improve the safety risk at this location.

5.4.5 Tara Road and Garbolino Road

Scenario	Score (Off Peak score)
Existing	46 (34) /448 SP (OP)
Proposed Development with treatment	21 (15) /448 SP (OP)

There are no pedestrian or cyclist movements expected, or when they occur it is expected to be in very low numbers. The right turn bay and the reduction in speed limit will improve the safety risk at this location.

6.0 IDENTIFIED NETWORK IMPROVEMENTS

Following the completion of the operations assessment (**Section 4**) and the Safe System Assessment (**Section 5**), the following network improvements are likely to be required (subject to more detailed assessment and engineering design at subsequent subdivision stages, where more detail is known, along with coordination with NTA with respect to the implementation of the Heavy Vehicle Route):

- Tara Road and Moir Road:
  - Install a right turn bay / localised widening.
  - Improved street lighting.
  - Install double centreline markings (and signs) through the intersection.
  - Remove vegetation/cut-back berm west of Tara Road to increase visibility to the west.
- Tara Road and Garbolino Road (remedial measures attributed to existing concerns, not significantly exacerbated by proposal):
  - Install right turn bay / localised widening.
  - Speed reduction to 70 or 60km/h.
  - Barriers to protect unrecoverable slopes.
  - Improved street lighting.
  - Install double centreline markings through the intersection.
- Tara Road and Cove Road (remedial measures attributed to existing concerns, not significantly exacerbated by proposal):
  - Install right turn bay / localised widening,
  - Speed reduction to 70 or 60km/h.
  - Barriers to protect unrecoverable slopes.
  - Improved street lighting.
  - Install double centreline markings through the intersection.
- Cove Road and Old Waipu Road:
  - Install right turn bay / localised widening.
  - Speed reduction to 70 or 60km/h.
  - Improved street lighting.
  - Install double centreline markings through the intersection.
- Moir Road and Urlich Drive:
  - Install right turn bay / localised widening.
  - Install pedestrian crossing facilities.
  - Improved street lighting.
  - Install improved road markings and signs through the staggered intersection.
- Area footpaths:
  - Extend existing footpath along Tara Road to connect to future internal site footpath/trail network and new road connections. See **Figure 19**.

Through the implementation of these improvements, the existing transport network can continue to operate at a suitable operational level, as well as have its overall safety improved. It is noted that these identified improvements are preliminary as specific details of the ultimate development are unknown. To ensure that future development of the plan change area is assessed in greater detail at later stages, the Precinct Provisions have specified that any subsequence subdivision which requires establishment of a new public road, shall require an Integrated Transport Assessment and Safe System Assessment to be provided. This approach will allow for appropriately scaled improvements and road upgrades to occur, relative to the scale of the proposed development, as compared to potentially requiring all road network improvements to occur from Day 1 or providing development thresholds; which may not be accurate dependent upon the area of land being developed and established road connections.

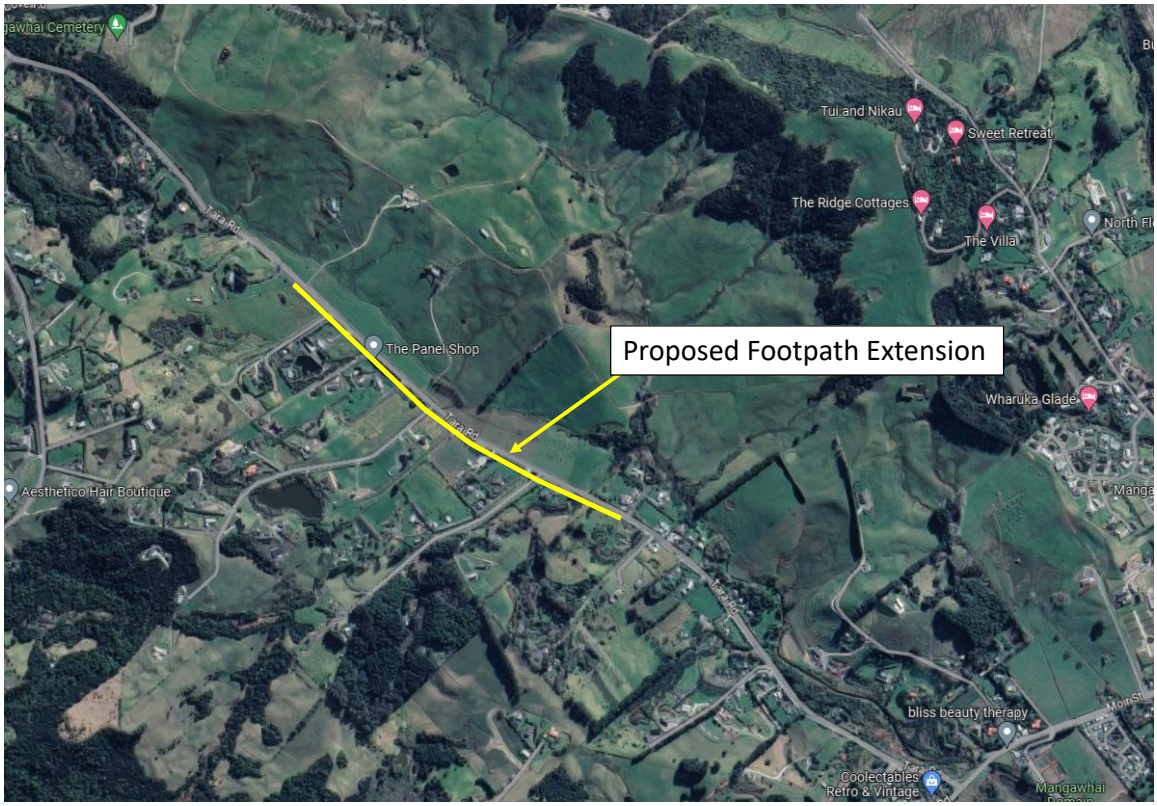

Figure 19: Tara Road Footpath Extension

7.0 CONCLUSION

Based on the investigations carried out as part of this assessment the following is concluded:

- The proposed plan change for approximately 218 hectares of rural land, enabling the creation of approximately 400-600 residential lots, will generate approximately 4,920 daily trips and 540 peak hour trips.
    - Trip generation has been calculated based on the 85th percentile trip generation rate for each of the 600 dwellings; thereby representing a conservative approach to effect determination.
- A review of the area crash history did not suggest any inherent road safety issues, which would likely result in serious injury or death.
- When these trips are assigned to the wider road network, there are were no noticeable effects onto the studied intersections, as the continue to operate at acceptable levels.
- Area roads (intersections) where accommodating turning movements associated with the Plan Change Area, should be provided with auxiliary right turn bays to increase the general safety of vehicle movements, along with increased lighting and safety barriers (where appropriate).
- Tara Road shall have its footpath extended to connect to the proposed Plan Change Area's public footpath/trail network.
- Subsequent subdivision applications involving public roads to be vested shall provide an Integrated Transport Assessment and Safe System Assessment to ensure more detailed assessment is carried out with respect to the proposal.

Prepared by,

Peter Kelly
Senior Transportation Engineer

Douglass Blankson
Senior Associate

ATTACHMENT 1:

EXISTING TRAFFIC INTERSECTION OPERATIONS

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Moir Street - Tara Road)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Moir Street													
Lane 1	368	2.4	1659	0.222	100	2.7	LOS A	1.1	7.7	Full	500	0.0	0.0
Approach	368	2.4		0.222		2.7	NA	1.1	7.7				
North: Tara Road													
Lane 1	216	0.5	1085	0.199	100	8.7	LOS A	0.8	6.0	Full	500	0.0	0.0
Approach	216	0.5		0.199		8.7	LOS A	0.8	6.0				
West: Kaiwaka Mangawhai Road													
Lane 1	226	1.9	1920	0.118	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	226	1.9		0.118		0.4	NA	0.0	0.0				
Intersection	811	1.8		0.222		3.6	NA	1.1	7.7				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Moir Street

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	211	158	368	2.4	1659	0.222	100	NA	NA
Approach	211	158	368	2.4		0.222			

North: Tara Road

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	200	16	216	0.5	1085	0.199	100	NA	NA
Approach	200	16	216	0.5		0.199			

West: Kaiwaka Mangawhai Road

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	16	211	226	1.9	1920	0.118	100	NA	NA
Approach	16	211	226	1.9		0.118			

	Total	%HV	Deg.Satn (v/c)

Intersection	811	1.8	0.222

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Kaiwaka Mangawhai Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Garbolino - Tara Road)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tara Road													
Lane 1	168	3.0	1907	0.088	100	0.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	168	3.0		0.088		0.3	NA	0.0	0.0				
North: Tara Road													
Lane 1	284	3.0	1682	0.169	100	2.7	LOS A	0.8	5.8	Full	500	0.0	0.0
Approach	284	3.0		0.169		2.7	NA	0.8	5.8				
West: Garbolino Road													
Lane 1	184	3.0	1209	0.152	100	5.5	LOS A	0.6	4.4	Full	500	0.0	0.0
Approach	184	3.0		0.152		5.5	LOS A	0.6	4.4				
Intersection	637	3.0		0.169		2.9	NA	0.8	5.8				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Tara Road

Mov. From S To Exit:	L2 W	T1 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	11	158	168	3.0	1907	0.088	100	NA	NA
Approach	11	158	168	3.0		0.088			

North: Tara Road

Mov. From N To Exit:	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	147	137	284	3.0	1682	0.169	100	NA	NA
Approach	147	137	284	3.0		0.169			

West: Garbolino Road

Mov. From W To Exit:	L2 N	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	142	42	184	3.0	1209	0.152	100	NA	NA
Approach	142	42	184	3.0		0.152			

	Total	%HV	Deg.Satn (v/c)

Intersection	637	3.0	0.169

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Garbolino Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Tara - Cove)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tara Road													
Lane 1	189	3.0	1679	0.113	100	3.9	LOS A	0.6	4.0	Full	500	0.0	0.0
Approach	189	3.0		0.113		3.9	NA	0.6	4.0				
East: Cove Road													
Lane 1	189	3.0	1420	0.133	100	4.9	LOS A	0.6	4.0	Full	500	0.0	0.0
Approach	189	3.0		0.133		4.9	LOS A	0.6	4.0				
North: Tara Road													
Lane 1	89	3.0	1867	0.048	100	2.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	89	3.0		0.048		2.2	NA	0.0	0.0				
Intersection	468	3.0		0.133		4.0	NA	0.6	4.0				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Tara Road

Mov. From S To Exit:	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	42	147	189	3.0	1679	0.113	100	NA	NA
Approach	42	147	189	3.0		0.113			

East: Cove Road

Mov. From E To Exit:	L2 S	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	158	32	189	3.0	1420	0.133	100	NA	NA
Approach	158	32	189	3.0		0.133			

North: Tara Road

Mov. From N To Exit:	L2 E	T1 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	42	47	89	3.0	1867	0.048	100	NA	NA
Approach	42	47	89	3.0		0.048			

	Total	%HV	Deg.Satn (v/c)

Intersection	468	3.0	0.133

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Tara Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Cove - Old Waipu)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Old Waipu Road													
Lane 1	2	0.0	1098	0.002	100	5.5	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	2	0.0		0.002		5.5	LOS A	0.0	0.0				
East: Cove Road													
Lane 1	191	3.0	1912	0.100	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	191	3.0		0.100		0.1	NA	0.0	0.0				
West: Cove Road													
Lane 1	191	3.0	1910	0.100	100	0.0	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	191	3.0		0.100		0.0	NA	0.0	0.1				
Intersection	383	3.0		0.100		0.1	NA	0.0	0.1				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

South: Old Waipu Road

Mov. From S To Exit:	L2 W	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	1	2	0.0	1098	0.002	100	NA	NA
Approach	1	1	2	0.0		0.002			

East: Cove Road

Mov. From E To Exit:	L2 S	T1 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	189	191	3.0	1912	0.100	100	NA	NA
Approach	1	189	191	3.0		0.100			

West: Cove Road

Mov. From W To Exit:	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	189	1	191	3.0	1910	0.100	100	NA	NA
Approach	189	1	191	3.0		0.100			

	Total	%HV	Deg.Satn (v/c)

Intersection	383	3.0	0.100

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Old Waipu Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Cove Road Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 101 [EX_SAT Peak (Site Folder: Moir - Urlich)]

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

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Moir Street													
Lane 1	374	2.0	1906	0.196	100	0.1	LOS A	0.1	0.4	Full	500	0.0	0.0
Approach	374	2.0		0.196		0.1	NA	0.1	0.4				
North: Ulrich Drive													
Lane 1	11	2.0	742	0.014	100	7.4	LOS A	0.0	0.3	Full	500	0.0	0.0
Approach	11	2.0		0.014		7.4	LOS A	0.0	0.3				
West: Moir Street													
Lane 1	416	2.0	1924	0.216	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	416	2.0		0.216		0.1	NA	0.0	0.0				
Intersection	800	2.0		0.216		0.2	NA	0.1	0.4				

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Approach Lane Flows (veh/h)

East: Moir Street

Mov. From E To Exit:	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	368	5	374	2.0	1906	0.196	100	NA	NA
Approach	368	5	374	2.0		0.196			

North: Ulrich Drive

Mov. From N To Exit:	L2 E	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	5	11	2.0	742	0.014	100	NA	NA
Approach	5	5	11	2.0		0.014			

West: Moir Street

Mov. From W To Exit:	L2 N	T1 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	411	416	2.0	1924	0.216	100	NA	NA
Approach	5	411	416	2.0		0.216			

	Total	%HV	Deg.Satn (v/c)

Intersection	800	2.0	0.216

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length m	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
East Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Ulrich Drive Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: Moir Street Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

ATTACHMENT 2:

2033 BACKGROUND TRAFFIC INTERSECTION OPERATIONS

MOVEMENT SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Moir Street - Tara Road)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Moir Street														
5	T1	223	2.0	235	2.0	0.251	0.7	LOS A	1.3	9.0	0.34	0.26	0.34	47.9
6	R2	167	3.0	176	3.0	0.251	5.7	LOS A	1.3	9.0	0.34	0.26	0.34	46.9
Approach		390	2.4	411	2.4	0.251	2.9	NA	1.3	9.0	0.34	0.26	0.34	47.4
North: Tara Road														
7	L2	212	0.0	223	0.0	0.231	8.6	LOS A	1.0	7.0	0.39	0.89	0.39	44.6
9	R2	17	7.0	18	7.0	0.231	12.8	LOS B	1.0	7.0	0.39	0.89	0.39	44.1
Approach		229	0.5	241	0.5	0.231	8.9	LOS A	1.0	7.0	0.39	0.89	0.39	44.6
West: Kaiwaka Mangawhai Road														
10	L2	17	0.0	18	0.0	0.132	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	49.2
11	T1	223	2.0	235	2.0	0.132	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	49.7
Approach		240	1.9	253	1.9	0.132	0.4	NA	0.0	0.0	0.00	0.04	0.00	49.7
All Vehicles		859	1.8	904	1.8	0.251	3.8	NA	1.3	9.0	0.26	0.37	0.26	47.2

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Garbolino - Tara Road)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tara Road														
21	L2	11	3.0	12	3.0	0.098	4.6	LOS A	0.0	0.0	0.00	0.03	0.00	49.2
22	T1	167	3.0	176	3.0	0.098	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	49.8
Approach		178	3.0	187	3.0	0.098	0.3	NA	0.0	0.0	0.00	0.03	0.00	49.7
North: Tara Road														
28	T1	156	3.0	164	3.0	0.368	0.9	LOS A	2.3	16.4	0.39	0.42	0.39	47.0
29	R2	395	3.0	416	3.0	0.368	5.5	LOS A	2.3	16.4	0.39	0.42	0.39	46.0
Approach		551	3.0	580	3.0	0.368	4.2	NA	2.3	16.4	0.39	0.42	0.39	46.3
West: Garbolino Road														
30	L2	401	3.0	422	3.0	0.392	5.4	LOS A	2.0	14.2	0.35	0.58	0.36	45.7
32	R2	45	3.0	47	3.0	0.392	11.3	LOS B	2.0	14.2	0.35	0.58	0.36	45.3
Approach		446	3.0	469	3.0	0.392	6.0	LOS A	2.0	14.2	0.35	0.58	0.36	45.7
All Vehicles		1175	3.0	1237	3.0	0.392	4.3	NA	2.3	16.4	0.32	0.42	0.32	46.6

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Tara - Cove)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tara Road														
2	T1	45	3.0	47	3.0	0.289	0.4	LOS A	1.7	12.0	0.26	0.48	0.26	46.8
3	R2	406	3.0	427	3.0	0.289	5.0	LOS A	1.7	12.0	0.26	0.48	0.26	45.9
Approach		451	3.0	475	3.0	0.289	4.5	NA	1.7	12.0	0.26	0.48	0.26	45.9
East: Cove Road														
4	L2	417	3.0	439	3.0	0.333	4.8	LOS A	1.7	12.3	0.15	0.51	0.15	46.2
6	R2	33	3.0	35	3.0	0.333	8.6	LOS A	1.7	12.3	0.15	0.51	0.15	45.8
Approach		450	3.0	474	3.0	0.333	5.1	LOS A	1.7	12.3	0.15	0.51	0.15	46.2
North: Tara Road														
7	L2	45	3.0	47	3.0	0.054	4.6	LOS A	0.0	0.0	0.00	0.26	0.00	48.0
8	T1	50	3.0	53	3.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.26	0.00	48.5
Approach		95	3.0	100	3.0	0.054	2.2	NA	0.0	0.0	0.00	0.26	0.00	48.3
All Vehicles		996	3.0	1048	3.0	0.333	4.6	NA	1.7	12.3	0.18	0.48	0.18	46.3

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Cove - Old Waipu)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Old Waipu Road														
1	L2	252	0.0	265	0.0	0.197	5.4	LOS A	0.9	6.1	0.33	0.56	0.33	45.8
3	R2	1	0.0	1	0.0	0.197	8.9	LOS A	0.9	6.1	0.33	0.56	0.33	45.4
Approach		253	0.0	266	0.0	0.197	5.4	LOS A	0.9	6.1	0.33	0.56	0.33	45.8
East: Cove Road														
4	L2	1	0.0	1	0.0	0.111	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	49.5
5	T1	201	3.0	212	3.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		202	3.0	213	3.0	0.111	0.1	NA	0.0	0.0	0.00	0.00	0.00	49.9
West: Cove Road														
11	T1	201	3.0	212	3.0	0.291	0.7	LOS A	1.6	11.5	0.36	0.33	0.36	47.4
12	R2	251	0.0	264	0.0	0.291	5.5	LOS A	1.6	11.5	0.36	0.33	0.36	46.6
Approach		452	1.3	476	1.3	0.291	3.4	NA	1.6	11.5	0.36	0.33	0.36	46.9
All Vehicles		907	1.3	955	1.3	0.291	3.2	NA	1.6	11.5	0.27	0.32	0.27	47.3

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [BG_SAT Peak (Site Folder: Moir - Urlich)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Moir Street														
5	T1	390	2.0	411	2.0	0.218	0.1	LOS A	0.1	0.4	0.02	0.01	0.02	49.9
6	R2	5	2.0	5	2.0	0.218	6.9	LOS A	0.1	0.4	0.02	0.01	0.02	48.9
Approach		395	2.0	416	2.0	0.218	0.1	NA	0.1	0.4	0.02	0.01	0.02	49.9
North: Ulrich Drive														
7	L2	5	2.0	5	2.0	0.016	6.2	LOS A	0.1	0.4	0.51	0.66	0.51	44.7
9	R2	5	2.0	5	2.0	0.016	9.6	LOS A	0.1	0.4	0.51	0.66	0.51	44.3
Approach		10	2.0	11	2.0	0.016	7.9	LOS A	0.1	0.4	0.51	0.66	0.51	44.5
West: Moir Street														
10	L2	5	2.0	5	2.0	0.241	4.6	LOS A	0.0	0.0	0.00	0.01	0.00	49.3
11	T1	435	2.0	458	2.0	0.241	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	49.9
Approach		440	2.0	463	2.0	0.241	0.1	NA	0.0	0.0	0.00	0.01	0.00	49.9
All Vehicles		845	2.0	889	2.0	0.241	0.2	NA	0.1	0.4	0.02	0.01	0.02	49.8

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

ATTACHMENT 3:

2033 TOTAL TRAFFIC INTERSECTION OPERATIONS

MOVEMENT SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Moir Street - Tara Road)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Moir Street														
5	T1	229	2.0	241	2.0	0.260	0.8	LOS A	1.3	9.4	0.35	0.26	0.35	47.8
6	R2	172	3.0	181	3.0	0.260	5.8	LOS A	1.3	9.4	0.35	0.26	0.35	46.9
Approach		401	2.4	422	2.4	0.260	2.9	NA	1.3	9.4	0.35	0.26	0.35	47.4
North: Tara Road														
7	L2	217	0.0	228	0.0	0.254	8.6	LOS A	1.1	7.7	0.40	0.90	0.40	44.5
9	R2	25	7.0	26	7.0	0.254	13.2	LOS B	1.1	7.7	0.40	0.90	0.40	44.0
Approach		242	0.7	255	0.7	0.254	9.1	LOS A	1.1	7.7	0.40	0.90	0.40	44.5
West: Kaiwaka Mangawhai Road														
10	L2	27	0.0	28	0.0	0.139	4.6	LOS A	0.0	0.0	0.00	0.06	0.00	49.1
11	T1	227	2.0	239	2.0	0.139	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	49.6
Approach		254	1.8	267	1.8	0.139	0.5	NA	0.0	0.0	0.00	0.06	0.00	49.6
All Vehicles		897	1.8	944	1.8	0.260	3.9	NA	1.3	9.4	0.27	0.37	0.27	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.
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Garbolino - Tara Road)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tara Road														
21	L2	33	3.0	35	3.0	0.111	4.6	LOS A	0.0	0.0	0.00	0.09	0.00	48.9
22	T1	167	3.0	176	3.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	49.4
Approach		200	3.0	211	3.0	0.111	0.8	NA	0.0	0.0	0.00	0.09	0.00	49.4
North: Tara Road														
28	T1	156	3.0	164	3.0	0.378	1.0	LOS A	2.4	17.0	0.42	0.43	0.42	46.9
29	R2	400	3.0	421	3.0	0.378	5.6	LOS A	2.4	17.0	0.42	0.43	0.42	46.0
Approach		556	3.0	585	3.0	0.378	4.3	NA	2.4	17.0	0.42	0.43	0.42	46.2
West: Garbolino Road														
30	L2	406	3.0	427	3.0	0.441	5.8	LOS A	2.7	19.7	0.37	0.61	0.42	45.4
32	R2	67	3.0	71	3.0	0.441	12.1	LOS B	2.7	19.7	0.37	0.61	0.42	45.0
Approach		473	3.0	498	3.0	0.441	6.7	LOS A	2.7	19.7	0.37	0.61	0.42	45.3
All Vehicles		1229	3.0	1294	3.0	0.441	4.7	NA	2.7	19.7	0.33	0.45	0.35	46.3

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Tara - Cove)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tara Road														
2	T1	45	3.0	47	3.0	0.293	0.4	LOS A	1.7	12.2	0.26	0.48	0.26	46.8
3	R2	411	3.0	433	3.0	0.293	5.0	LOS A	1.7	12.2	0.26	0.48	0.26	45.9
Approach		456	3.0	480	3.0	0.293	4.6	NA	1.7	12.2	0.26	0.48	0.26	45.9
East: Cove Road														
4	L2	422	3.0	444	3.0	0.337	4.8	LOS A	1.7	12.5	0.15	0.51	0.15	46.2
6	R2	33	3.0	35	3.0	0.337	8.7	LOS A	1.7	12.5	0.15	0.51	0.15	45.8
Approach		455	3.0	479	3.0	0.337	5.1	LOS A	1.7	12.5	0.15	0.51	0.15	46.2
North: Tara Road														
7	L2	45	3.0	47	3.0	0.054	4.6	LOS A	0.0	0.0	0.00	0.26	0.00	48.0
8	T1	50	3.0	53	3.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.26	0.00	48.5
Approach		95	3.0	100	3.0	0.054	2.2	NA	0.0	0.0	0.00	0.26	0.00	48.3
All Vehicles		1006	3.0	1059	3.0	0.337	4.6	NA	1.7	12.5	0.18	0.48	0.18	46.3

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Cove - Old Waipu)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Old Waipu Road														
1	L2	251	0.0	264	0.0	0.255	5.4	LOS A	1.1	7.8	0.36	0.59	0.36	45.8
3	R2	34	0.0	36	0.0	0.255	9.4	LOS A	1.1	7.8	0.36	0.59	0.36	45.4
Approach		285	0.0	300	0.0	0.255	5.9	LOS A	1.1	7.8	0.36	0.59	0.36	45.7
East: Cove Road														
4	L2	34	0.0	36	0.0	0.134	4.6	LOS A	0.0	0.0	0.00	0.08	0.00	49.0
5	T1	209	3.0	220	3.0	0.134	0.0	LOS A	0.0	0.0	0.00	0.08	0.00	49.5
Approach		243	2.6	256	2.6	0.134	0.7	NA	0.0	0.0	0.00	0.08	0.00	49.4
West: Cove Road														
11	T1	209	3.0	220	3.0	0.303	0.9	LOS A	1.7	12.1	0.40	0.34	0.40	47.4
12	R2	251	0.0	264	0.0	0.303	5.7	LOS A	1.7	12.1	0.40	0.34	0.40	46.5
Approach		460	1.4	484	1.4	0.303	3.5	NA	1.7	12.1	0.40	0.34	0.40	46.9
All Vehicles		988	1.3	1040	1.3	0.303	3.5	NA	1.7	12.1	0.29	0.35	0.29	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.
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [TOT_SAT Peak (Site Folder: Moir - Urlich)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Moir Street														
5	T1	400	2.0	421	2.0	0.308	0.9	LOS A	1.2	8.5	0.28	0.12	0.29	48.6
6	R2	91	2.0	96	2.0	0.308	7.3	LOS A	1.2	8.5	0.28	0.12	0.29	47.7
Approach		491	2.0	517	2.0	0.308	2.1	NA	1.2	8.5	0.28	0.12	0.29	48.4
North: Ulrich Drive														
7	L2	92	2.0	97	2.0	0.112	6.5	LOS A	0.4	3.0	0.49	0.68	0.49	45.3
9	R2	7	2.0	7	2.0	0.112	11.6	LOS B	0.4	3.0	0.49	0.68	0.49	44.9
Approach		99	2.0	104	2.0	0.112	6.9	LOS A	0.4	3.0	0.49	0.68	0.49	45.3
West: Moir Street														
10	L2	6	2.0	6	2.0	0.246	4.6	LOS A	0.0	0.0	0.00	0.01	0.00	49.3
11	T1	444	2.0	467	2.0	0.246	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	49.9
Approach		450	2.0	474	2.0	0.246	0.1	NA	0.0	0.0	0.00	0.01	0.00	49.8
All Vehicles		1040	2.0	1095	2.0	0.308	1.7	NA	1.2	8.5	0.18	0.13	0.19	48.7

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.