



Rotokauri North Proposed Plan Change

Integrated Transportation Assessment Report

30 April 2019





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1 INTRODUCTION

Commute Transportation Specialists has prepared an Integrated Transport Assessment (“ITA”) for a proposed Private Plan Change (“PPC”) to rezone approximately 140 ha of land, located within the existing Rotokauri Structure Plan area, at the north western edge of Hamilton. The PPC area is currently zoned as ‘Future Urban’ in the Hamilton City District Plan (“HCDP”) and the proposal intends to rezone this land to predominantly ‘Medium Density Residential’ zoning to allow for the development of up to 2000 residential dwellings.

A local neighbourhood centre is also being proposed within the site.

A hierarchy of roads are proposed to support the development and will have connections onto Exelby Road, SH39 and Burbush Road respectively.

It is noted that the subject site is located within the existing Rotokauri Structure Plan boundary. As such, the proposed PPC area including associated roading provisions assessed within this report will be complimentary to the development planned within the Structure Plan and is to be known as ‘Rotokauri North’ and will be subject to a new/updated Structure Plan specific to the Rotokauri North area.

A number of documents have been prepared for this PPC and will be referenced throughout this report (and provided as attachments to this report as relevant). These include the following:

- Memorandum prepared by TDG (dated October 2017);
- Rotokauri North – SH39 Access review prepared by Commute Transportation (dated 24th August 2018); and
- Preliminary transportation review prepared by TDG (dated November 2017).

Key transportation considerations for this proposal are:

- the accessibility of the site to the various modes of transport; and
- the ability of the surrounding road network to safely and efficiently support the proposed development; and
- the alignment of the potential residential development with that planned for the PPC area and with the remainder of the Rotokauri Structure Plan area.

These and other transportation issues will be addressed in this report.

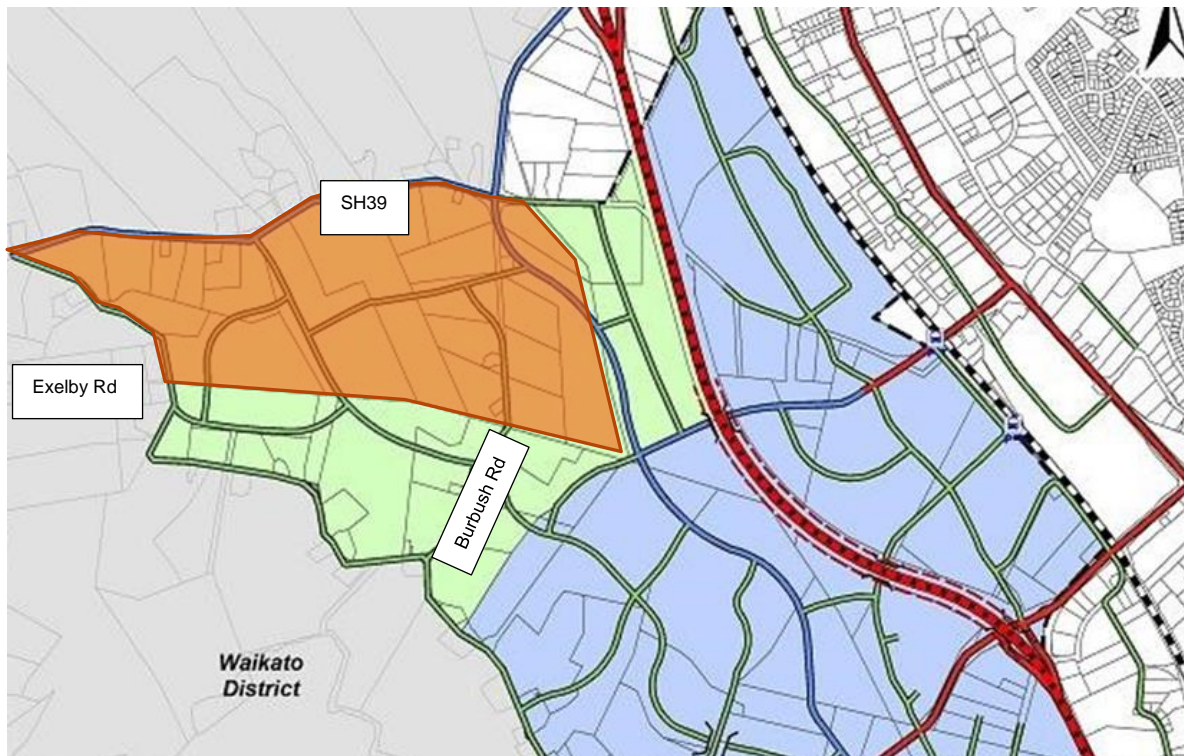
2 EXISTING ENVIRONMENT

2.1 SITE LOCATION

The site is zoned as Future Urban Zone (“FUZ”) under the HCDP and is currently occupied by a small number of residential dwellings and agriculture related activities.

Figure 2-1 shows the location of the site in relation to the Rotokauri Structure Plan.

Figure 2-1: Site location (Hamilton City Council's ("HCC") Partly Operative District Plan)



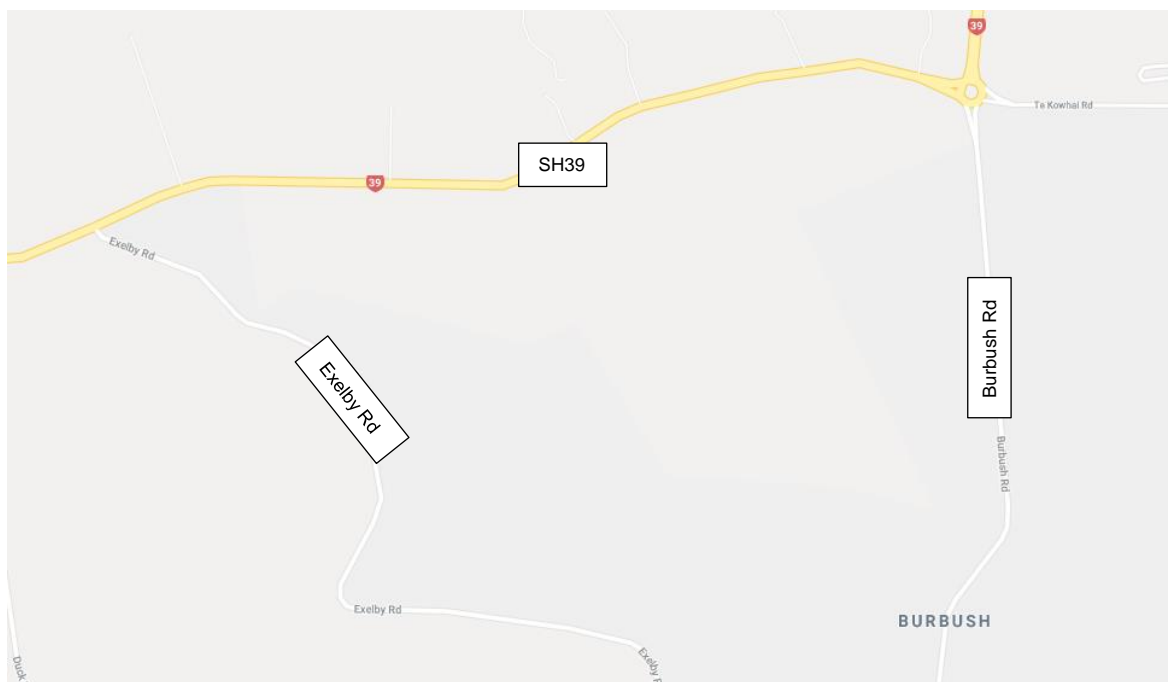
As can be seen above, the PPC area is identified as part of stage 2 of the Rotokauri Structure Plan.

2.2 ROADING NETWORK

2.2.1 GENERAL

Figure 2-2 shows the existing road network near the vicinity of the site.

Figure 2-2: Existing road network



2.3 STATE HIGHWAY 39

State Highway 39 (also known as Te Kowhai Road “SH39”) runs east-west along the north boundary of the site. The posted speed limit on SH39 in the area is 80km/hr.

Near the north-eastern corner of the site, SH39 forms a large single-lane roundabout with Te Kowhai Road / Burbush Road and then continues northwards on Koura Drive to a full grade-separated interchange with State Highway 1 (the Waikato Expressway “SH1”).

SH39 is a two-way, two-lane road with a typical seal width of approximately 11 m and is marked with a centre line and edge lines and is considered to be in excellent condition. This section of SH39 was upgraded in 2014 as part of a project to re-route SH39 as a more direct link to SH1.

Photograph 1: SH39 in the vicinity of the site



2.4 EXELBY ROAD

Exelby Road runs generally north-west/south-east between SH39 and Rotokauri Road and forms the western boundary of the subject site. Rotokauri Road completes the link to the Baverstock and Nawton suburbs. It is currently a local rural road and has a typical seal width of approximately 5.7 m in the vicinity of the site, with a road corridor width of 20 m. Between SH39 and Burbush Road, Exelby Road does not have any painted markings. The topography and horizontal alignment of Exelby Road results in limited forward visibility at many curves.

Photograph 2: Exelby Road in the vicinity of the site



2.5 BURBUSH ROAD

Burbush Road runs approximately north-east/south-west between SH39 and Exelby Road and forms the eastern boundary of the subject site. It is currently a local rural road and has a typical seal width of approximately 5.7 m in the vicinity of the site, within a road corridor of 20 m. Burbush Road is marked with a centre line from SH39 to Exelby Road.

Photograph 3 shows the current layout of Burbush Road in the vicinity of the site.

Photograph 3: Burbush Road in the vicinity of the site



2.6 ACCESSIBILITY

2.6.1 PRIVATE VEHICLES

The site is well located with regard to vehicle connections to and from the wider Hamilton and Auckland regions. SH39 runs along the northern boundary of the site and provides a

connection to the Waikato expressway northbound and southbound ramps via the SH1 Koura Drive interchange. The SH1 Koura Drive Interchange is located approximately 1 – 3 km north from the site via the Te Kowhai Road/ Burbush Road roundabout. SH1 is a nationally significant route that connects Hamilton to the south and Auckland to the north.

2.6.2 PUBLIC TRANSPORT

There are no local bus services operating near the vicinity of the PPC area. The nearest bus stops are located on Rotokauri Road (some 1.9 km southeast of the site) and serve the Frankton service (Route 8) connecting between Rotokauri Road and the Hamilton town centre.

As the area develops, and stages of the minor arterial road are completed, consideration by Council should be given to either extending the existing Frankton service along the planned minor arterial road and within the site, or providing a new service connecting Rotokauri North to the town centre and wider area.

2.6.3 WALKING

The area surrounding the site is still fairly rural in nature with no dedicated pedestrian provisions along Exelby Road or Burbush Road. However, a shared path is provided at each approach to the Te Kowhai Road/ Burbush Road roundabout as shown in Photograph 4 below.

Photograph 4: Existing shared path near Te Kowhai Road/ Burbush Road roundabout



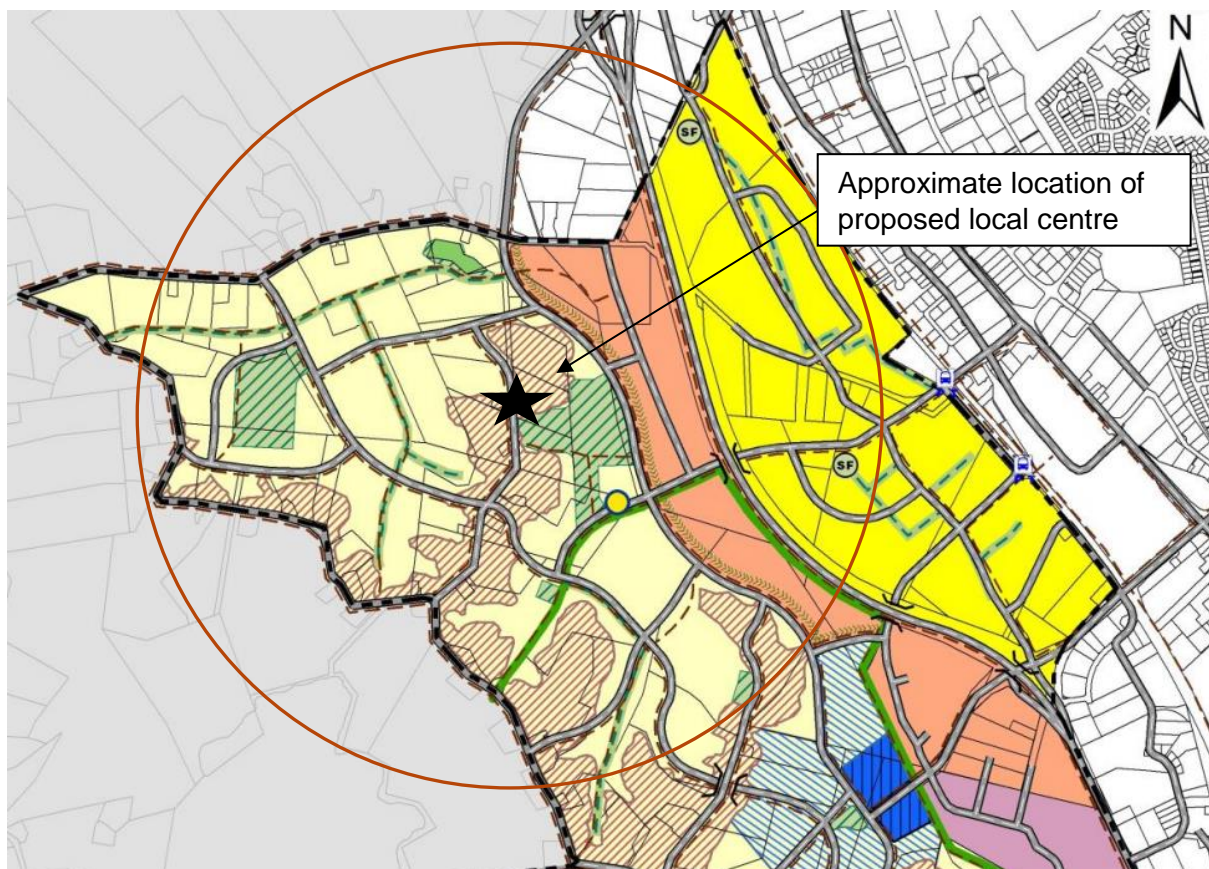
The Austroads Guide to Traffic Engineering Practice Part 13 – Pedestrians indicates that the practical walking distance for non-recreational walking trips is in the order of 1.5km. Using the practical walking distance of 1.5km and the 15th percentile walking speed of a typical fit,

healthy adult of 1.3m/s, gives a journey time of some 20 minutes. This is in line with New Zealand data in the Pedestrian Planning and Design Guide, which states that for walking trips, half are more than 10 minutes and 18% are more than 20 minutes.

The primary catchment area for pedestrians has therefore been based on a 20-minute walking time from the proposed site centres.

As noted, the site is currently rural in nature therefore, there are no existing facilities located near the site within the typical walking catchment area (1.5 km radius). As the area develops in accordance with that planned in the operative Rotokauri Structure Plan and the proposed Rotokauri North Structure Plan the amenity near the vicinity of the will likely be enhanced as shown in Figure 2-3 below.

Figure 2-3: Walking catchment of site (existing operative Rotokauri Structure Plan)



As shown above, a community focal point is planned, southeast of the site, and is located within the walking catchment area. It is noted that the proposal also intends to provide a small neighbourhood centre within the Rotokauri North Structure Plan area, this is also located within the walking catchment area. There are also a number of employment and industrial activity planned by the Rotokauri Structure Plan within the walking catchment area.

In addition, Hamilton City Council have identified as a future Council project, a bridge/underpass, to connect those parts of the Rotokauri Structure Plan located west and east of the Waikato expressway respectively. Once constructed in the future, this will improve access to the wider facilities such as the Base shopping mall.

2.6.4 CYCLING

There are currently no dedicated cycle facilities on Exelby Road, Burbush Road or SH39. This excludes some localised off-road shared path provided at the approaches to the Te Kowhai Road/ Burbush Road roundabout.

2.7 TRAFFIC VOLUMES

Daily traffic volumes have been extracted from the TDG Preliminary transportation review (dated 2017) and NZTA state highway traffic count database for Exelby Road, Burbush Road, SH39 (Te Kowhai Road). The peak hour volume has been estimated to be 10% of the daily volume; this is outlined in Table 2-1 below.

Table 2-1: Existing Traffic Volumes

Road	ADT	AM
Exelby Road	550 vpd	55 vph
Burbush Road	590 vpd	59 vph
SH39 Te Kowhai Road (between Limmer Road and Duck Road)	5813 vpd	581 vph

2.8 ROAD SAFETY RECORD

A search of the road safety record using the NZTA Crash analysis system (CAS) has been made to identify all crashes reported near the vicinity of the site during the five-year period from 2013 to 2017 including all available crashes in 2018. The study area includes the following road sections:

- SH39 (between Exelby Road and SH1);
- Burbush Road (between SH39 and Exelby Road);
- Exelby Road (between SH39 and Burbush Road); and
- Other several local roads including Te Kowhai Road (east of SH39) and Errol Cl.

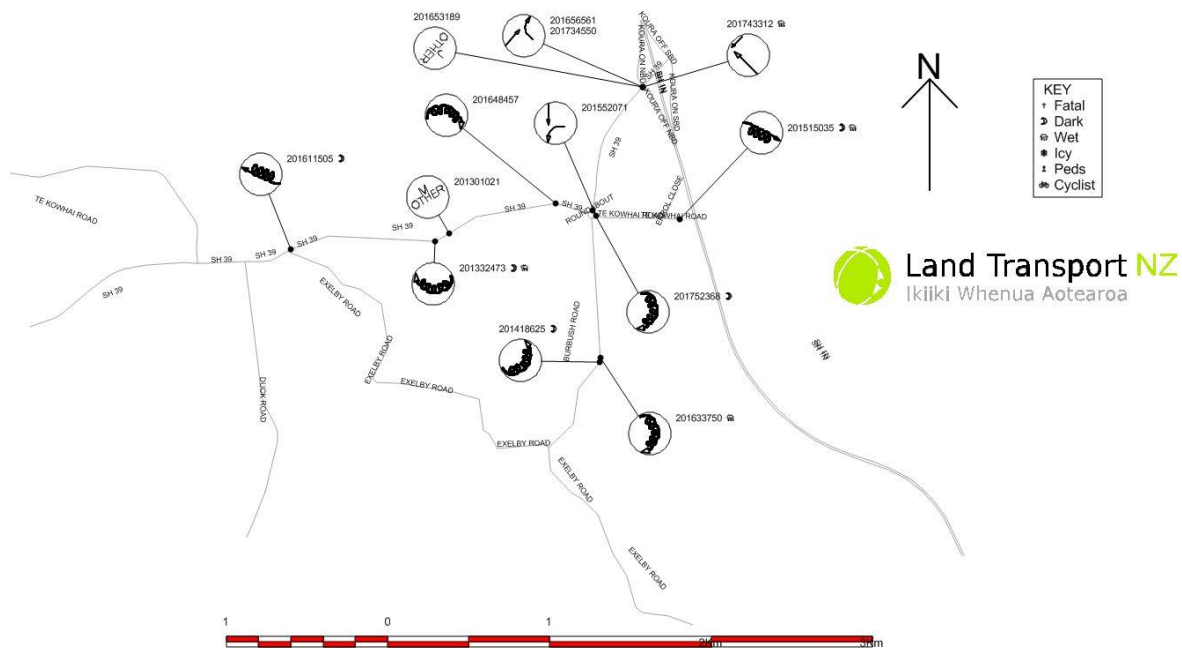
In total, 13 crashes were recorded within the search area over the five-year period. Of these, there was two serious crashes and two minor injury crashes. The remaining crashes had no reported injuries. The following summarises the crashes;

- Two loss of control crashes were reported on Burbush Road. Both crashes involved a vehicle (or motorcycle) losing control when turning left/ right along Burbush Road. One minor injury was reported.
- Four crashes were recorded along SH39 (Te Kowhai Road) including three loss of control crashes. Of the three loss of control crashes reported, two occurred on involved a vehicle losing control when turning right (too far left/ right). The third loss of control crash involved the vehicle going off the road resulting in one serious injury (attempted suicide). The remaining crash resulted in two serious injuries and involved a vehicle eastbound on SH39 hitting another vehicle manoeuvring (manoeuvring vehicle failed to give-way at driveway).
- Four crashes were reported at the intersection between SH39/ Koura road off-ramp (NBD). Of these, two crashes involved a vehicle hitting a vehicle merging from the right (merging vehicle failed to give-way). The remaining two crashes involved a car hitting a van crossing/ turning at the intersection. No injuries were reported.

- Two crashes were recorded at the Te Kowhai Road/ SH39 intersection including one loss of control crash and one merging crash. No injuries were reported.
- one crash was recorded on Te Kowhai Road, some 100 m east of the intersection with Errol Close and involved a vehicle eastbound on Te Kowhai Road losing control (alcohol and lost control under braking were listed as contributing factors).

The CAS diagram is provided in Figure 2-4 below.

Figure 2-4: CAS diagram



As can be seen, a number of loss of control crashes have been reported within the study area. One crash (serious injury) was reported on SH39 involving a vehicle leaving a driveway. In this case, the driver manoeuvring from the property failed to give-way to through traffic. A number of crashes were also recorded at the SH39/ Koura off ramp (NBD), however the majority of these involved vehicles turning/ merging and were all non-injury. As such, provided the new intersections on SH39 and internal intersections are designed appropriately and comply with Austroads sight distance requirements, it is considered that the PPC and potential residential development (including the restriction on private access to SH39) will not exacerbate the existing road safety record.

It is noted that the surrounding road network is currently rural in nature. Following the development of the Rotokauri North Structure Plan, the area will be urbanised. As such, the speed limits are likely to decrease, and the priority control at each intersection will be upgraded accordingly.

3 EXISTING ROTOKAURI STRUCTURE PLAN

The land is identified by Council for Future Urban development and has a current structure plan known as the Rotokauri Structure Plan.

The RCDP describes the area as:

“The Rotokauri growth cell is an area of approximately 1000 Ha on the north west fringe of Hamilton. It was brought into the city during the 1980s to provide for long-term

development and city growth. At present it is primarily in agricultural use, with the majority of the area zoned for future urban development within the District Plan.”

The operative Rotokauri Structure Plan outlines the future zoning and transport network for land located within the structure plan boundary to cater for future urban growth. The HCDP identifies that the development of the Rotokauri Structure Plan has been guided by the following vision:

“The sustainable expansion of the City into Rotokauri, through a coherent integrated and people focused mixed use development based on best practice urban design principles”

Figure 2-9 of the Rotokauri Structure Plan also included a transportation network plan, identifying arterial, key collector and collector roads as shown in Figure 3-1 below.

Figure 3-1: Rotokauri Structure Plan – Staging and Transport Network

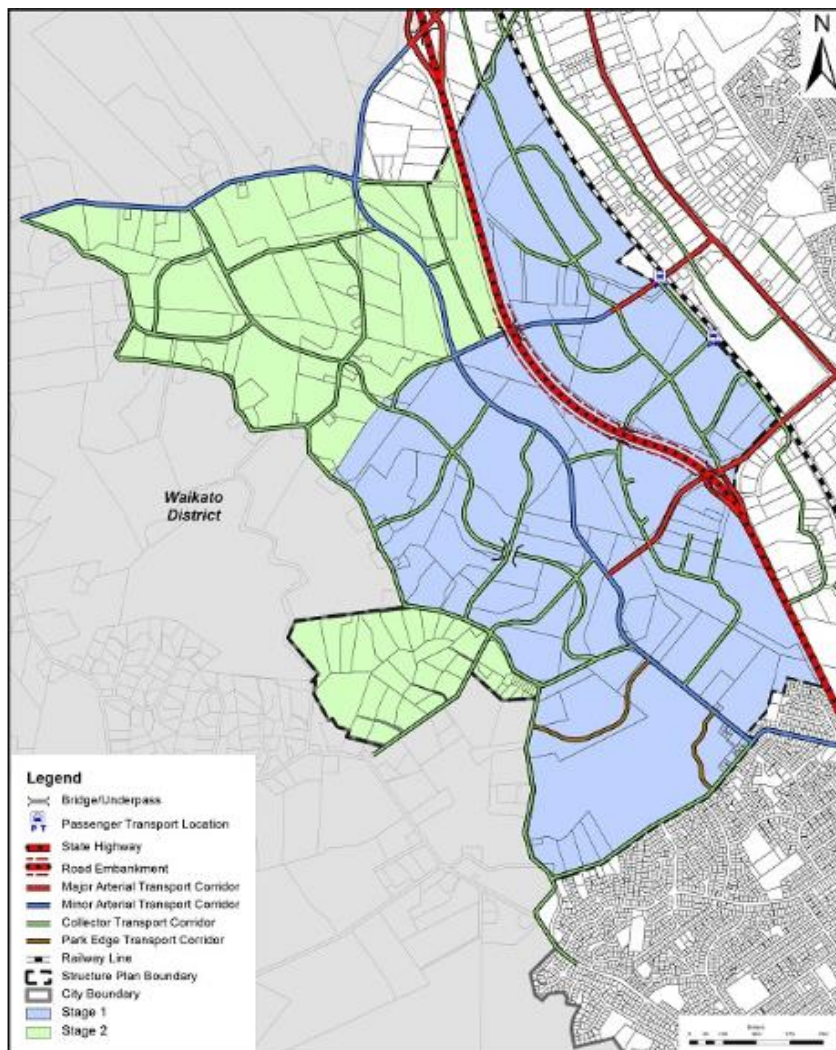
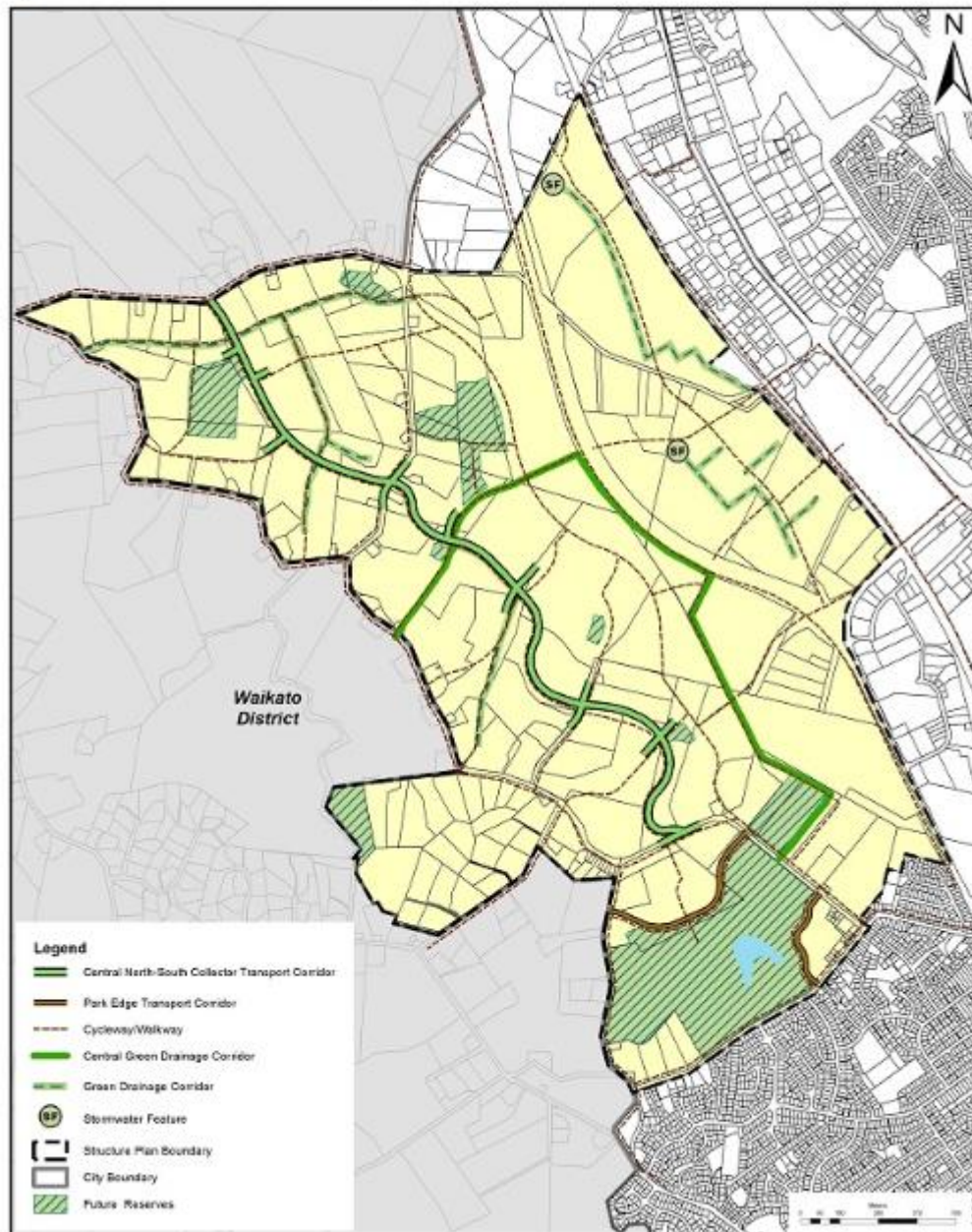


Figure 2-10 of the Rotokauri Structure Plan also includes the main pedestrian and cycle facilities planned as shown in Figure 3-2 below.

Figure 3-2: Rotokauri Structure Plan - Open Space Network

Figure 2-10: Rotokauri Structure Plan – Open Space Network



The Rotokauri Structure Plan outlines the release of land for development in two stages, with the PPC located within the stage 2 area. The Rotokauri Structure Plan indicates that the release of land beyond stage 1A (such as the PPC):

“will be contingent upon the availability of network capacity which may arise as a result of traffic generation being less than anticipated in the traffic growth assessments, or from completion of new infrastructure”.

This report outlines the availability of network capacity and any upgrades to the main network required to give effect to the release of the Rotokauri North area as a separate stage/PPC.

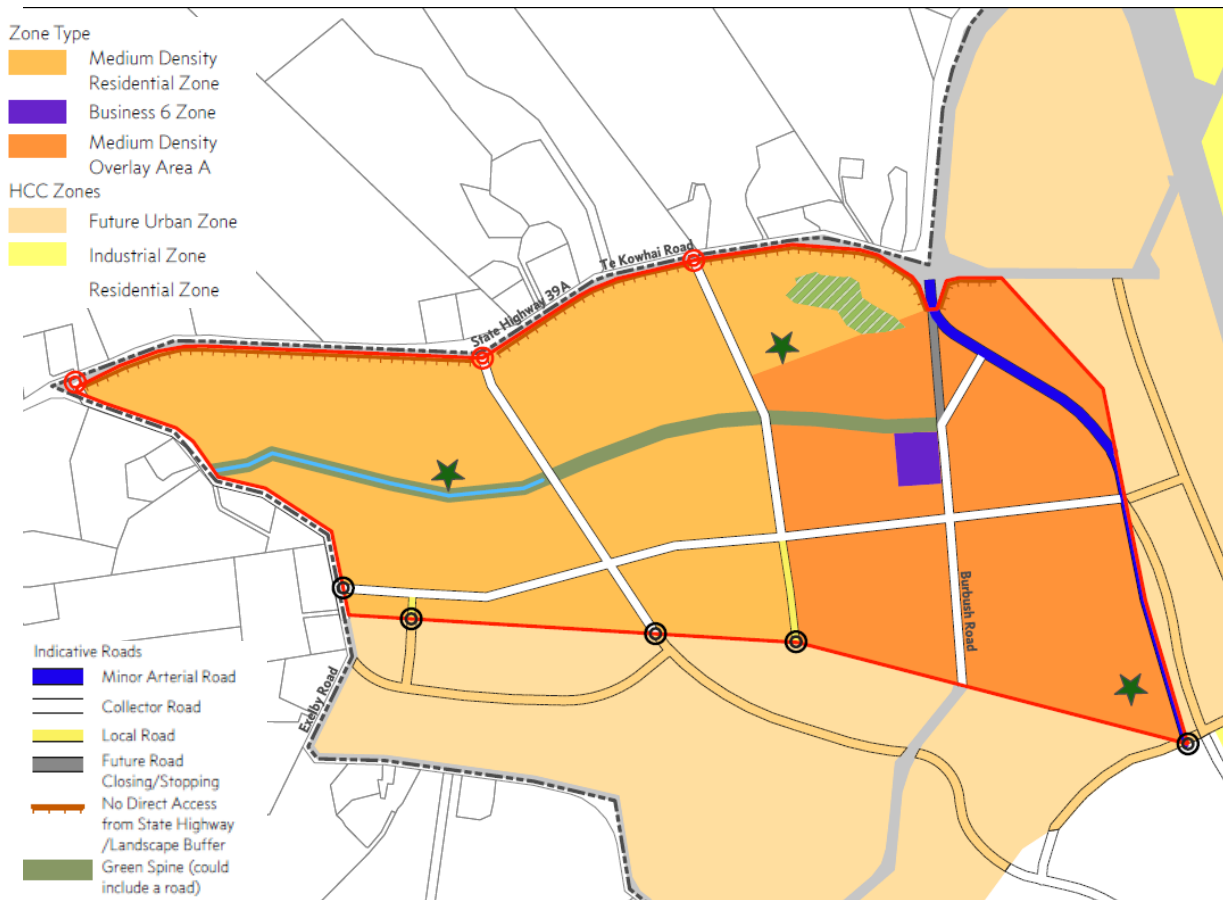
4 PROPOSED DEVELOPMENT

The proposal intends to rezone approximately 140 ha of land located in Rotokauri North. The site is currently zoned as 'Future Urban' in the HCDP and the proposal intends to rezone the land to predominantly 'Medium Density Residential' zoning to allow for the development of approximately 2000 residential dwellings. Of note, a neighbourhood centre is also proposed in the centre of the development.

The site is located at the north western end of the Rotokauri Structure Plan boundary.

Figure 4-1 shows the proposed zoning including the location of a local neighbourhood centre (circled in red).

Figure 4-1: Proposed zoning of Rotokauri North



5 PROPOSED ROAD NETWORK

A hierarchy of road types are proposed and have been designed with the intention of creating a clearly understood movement pattern as well as some variety and character throughout the Rotokauri North area and to maintain key connections with the Rotokauri Structure Plan.

Figure 4-1 above shows the proposed road hierarchy and roading connections.

Following attendance at a Council workshop (August 2018), during which consideration of site constraints and opportunities were discussed, a new structure plan has been developed and is shown in Figure 4-1 above.

5.1 ROTOKAURI NORTH STRUCTURE PLAN: TRANSPORTATION NETWORK

The Rotokauri North Structure Plan anticipates that the proposed road network will have a total of eight key road connections to the existing road network (circled in orange in above), including:

- Two new connections onto SH39;
- One connection on Exelby Road;
- One connection onto Burbush Road.

A minor arterial road is proposed as part of the development and will connect to the Te Kowhai Road/ Burbush Road roundabout at the northern end. As a result of establishing the new minor arterial road, Burbush Road could be realigned at the northern end and is planned to connect to the minor arterial road, rather than the Te Kowhai Road/ Burbush Road roundabout (as existing). The alignment also locates this minor arterial entirely within the PPC area to allow its delivery with this stage rather than it being split between this stage and a future stage (unknown delivery date).

It is noted that both Exelby Road (carriageway and eastern berm) and Burbush Road will be upgraded to collector roads as part of the development. Further key connecting points to the rest of the Rotokauri Structure Plan area will be maintained.

5.1.1 KEY DIFFERENCES – IMPACT ON SH39

The proposal introduces several minor changes to the road network when compared to that planned as part of the Rotokauri Structure Plan. These are outlined in Table 5-1 below (and locations illustrated in Figure 5-1 below). It is noted that, similar to the proposed layout, one east-west link is planned within the Rotokauri Structure Plan.

Figure 5-1: Planned road network for the operative Rotokauri Structure Plan

Figure 2-9: Rotokauri Structure Plan – Staging and Transport Network

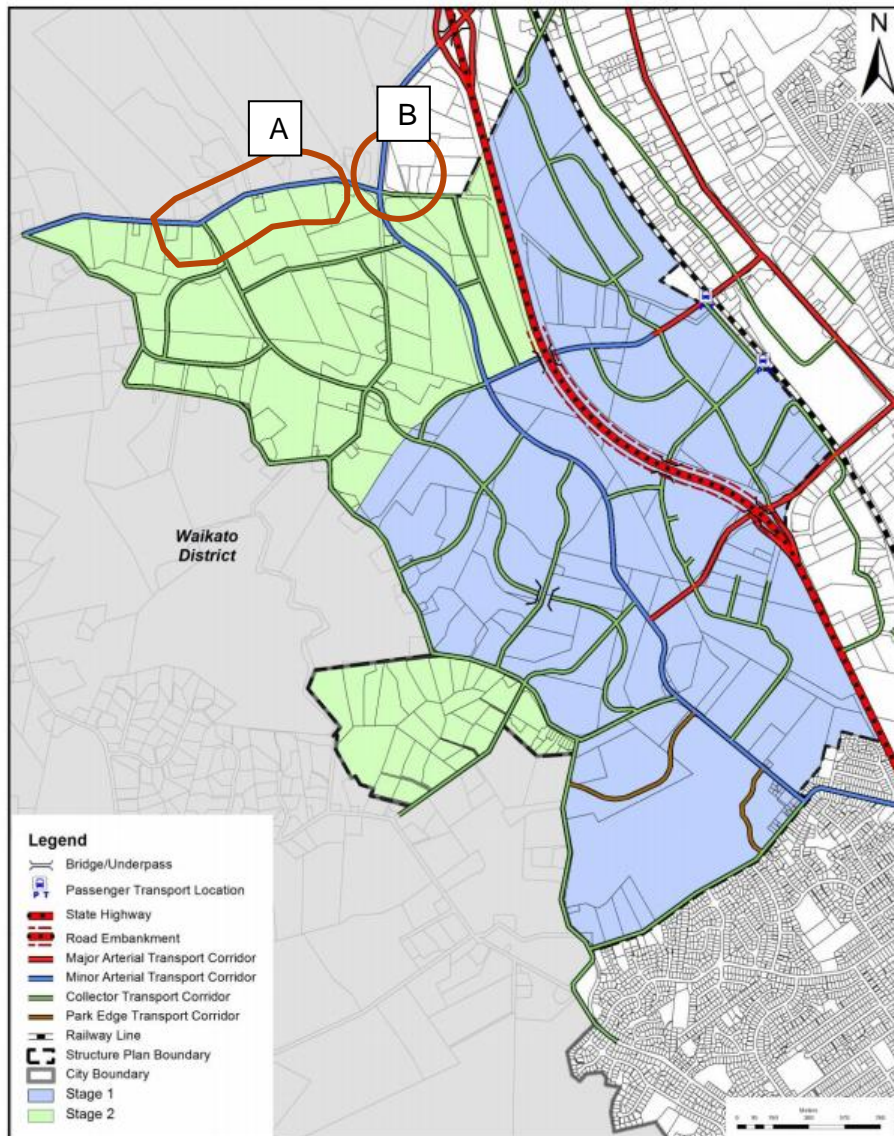


Table 5-1: Comparison of road network planned as part of the operative Rotokauri Structure plan and the proposed Rotokauri North Structure Plan respectively

	Road name	Operative	Proposed	Comment
A	New connections onto SH39	The Rotokauri Structure Plan indicates one new road connection onto SH39	The proposal intends to provide two new road connections onto SH39	Provided these new road connection intersections are designed to comply with Section 9 below and the Austroads Guide requirements, it is considered that by providing an additional link onto the state highway network, this will reduce congestion at the existing and planned intersections once the

				structure plan area is fully developed.
B	Burbush Road	With a new minor arterial road, Burbush Road is planned to connect to the minor arterial road via a new collector or local road.	The proposal identifies the opportunity to realign Burbush Road such that it connects directly to the new minor arterial road. Road stopping is matter to be addressed through the Local Government Act 2002	Provided the intersection between Burbush Road and the new minor arterial road is designed in a safe manner and complies with Austroads guide requirements, it is considered that this alteration is not considered to adversely affect the future road network in any way. It is noted that, consideration must be given to providing dedicating turning bays on the minor arterial road onto Burbush Road to avoid vehicles turning into Burbush Road obstructing through traffic.

Notwithstanding the changes outlined in Table 5-1 above, the proposed road network typically aligns with the planned road network outlined in the Rotokauri Structure Plan.

Through refinement of the area the internal roading layout has changed from that contained in the Rotokauri Structure Plan, however the general principles remain the same with a network of collector roads linking to the arterial network to the north (SH39) and east (new arterial road). The location of the road links to the land to the south of the proposal are generally in the same location as shown in the Rotokauri Structure Plan with the additional of a new collector road link near the middle of the site which directly links to the additional connection to SH39 as noted in item B (Table 5-1) above.

5.2 ROAD CROSS-SECTIONS

Figure 3.6.2(c) -(g) of the Rotokauri Structure Plan sets out the recommended cross-sections for various types of roads.

The following sections outline the proposed cross-section for each road within the PPC area and its alignment with the Rotokauri Structure Plan cross-sections.

5.2.1 MINOR ARTERIAL ROAD

For a minor arterial road, the Rotokauri Structure Plan outlines the following requirements:

- 2 x 3.5 wide traffic lane separated by a 4 m wide solid medium/ return bay;
- 1.8 m wide cycle lane (both sides);
- 2.5 m parallel parking along one side of the carriageway. Adjacent to this side of the carriageway, the following should be provided:
 - 2 m wide front berm;
 - 1.8 m wide footpath;
 - 2 m wide back berm.
- 9.4 m wide recessed 60-degree angle parking (one-side) Adjacent to this side of the carriageway, the following should be provided:

- 1.7 m wide front berm;
- 3 m wide shared path;
- 3 m back berm.

Two cross-sections are proposed for the minor arterial road including one without and with a swale respectively. The cross-section proposed without a swale includes the following:

With swale

- 2 x 3.5 m wide traffic lane separated by a 3.5 m wide solid median;
- 1.2 m wide shoulder (both sides);
- 2.75 m wide berm/ parking bay (both sides);
- 3.0 m wide shared use path (both sides); and
- 1.8 m wide back berm (both sides).

Where the road reserve includes a swale (along one side of the road only) a 1.0 m wide berm separating the parking/ berm and shared use path is provided typically similar to that shown above. The key difference being a swale and 1.0 m wide berm (along one side) separating the parking/ berm and shared use path is provided.

The cross-sections proposed for the minor arterial road are shown in Figure 5-2 and Figure 5-3 below.

Figure 5-2: Minor arterial road cross-section (without swale)

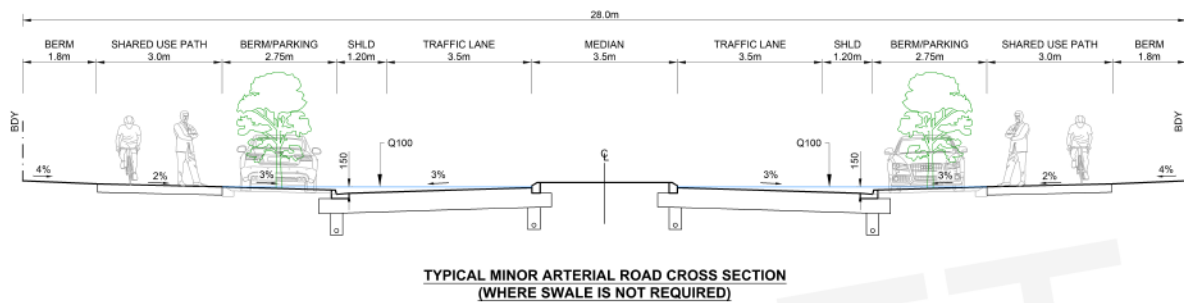
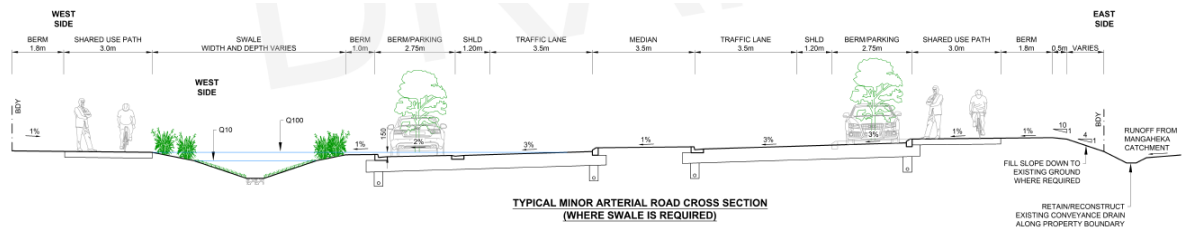


Figure 5-3: Minor arterial road cross-section (with swale)



The key differences between the proposed cross-sections and that outlined in the Rotokauri Structure plan are as follows:

- The width of the centreline median has been reduced to 3.5 m (initially 4.0 m);
- Cycle and pedestrian provisions have been amalgamated as a shared path rather than providing separate facilities;
- Parallel on-street parking is proposed along both sides of the road rather than a mix of parallel and angled parking (structure plan).

While not yet finalised, it is recommended that the speed limit along the minor arterial road be 60 km/hr.

Based on the above, the typical cross-section of the minor arterial road generally aligns with that planned and is considered acceptable. Furthermore, the cross sections in both the operative Rotokauri Structure Plan and the proposed Rotokauri North Structure Plan area are indicative only, and full design to an acceptable standard is captured by existing HCCDP provisions which requires a Restricted Discretionary Activity resource consent for creation of a new road.

5.2.2 COLLECTOR ROAD

Figure 3.6.2(e) of the Rotokauri Structure Plan outlines the following requirements for a collector road:

- 2 x 3.5 wide traffic lane separated by a 3 m wide flush medium;
- 6.2 m wide front berm (both sides);
- 1.8 m wide footpath (both sides);
- 2 m wide back berm (both sides).

A number of collector roads are proposed within the site. Section 15-5 (f) of the HCDP indicates that a “*collector road performs both a movement and property access function and are expected to move goods and people between local destinations or to higher order transport corridors for further travel. Property access is provided with few restrictions. Depending on the land use environment heavy freight and through traffic may be limited on these corridors. Intra-city passenger transport services are likely to use these routes*”.

Similarly, two cross-sections are proposed within the PPC area including one with and without a swale respectively, as follows:

- 2 x 3.0 m wide traffic lane (both directions);
- 0.6m wide shoulder (both sides);
- 1.5 m wide on-road cycle lane (both sides);
- 2.5 m wide berm/ parking bay (both sides);
- 1.8 m wide footpath (both sides); and
- 1.0 back berm (both sides).

Where the road reserve includes a swale (along one side of the road only) a 1.0 m wide berm separating the parking/ berm and footpath is provided typically similar to that shown above. The key difference being a 1.0 m wide berm separating the parking/ berm and shared use path is provided.

Compared with the Structure Plan layout, the proposal intends to provide narrower lanes (3.0 m) and include on-road cycle facilities with 0.6 m wide separation from the traffic lanes. In this regard, the narrower lanes are considered acceptable. In addition, on-street parallel parking spaces are proposed along the collector road (currently not planned as part of the Rotokauri Structure plan). The on-street parking is located adjacent to the cycle lane; it is therefore recommended to provide the 0.6 m wide separation (buffer) between the parking and cycle lane to avoid collisions between drivers opening car doors and cyclists (rather than between the cycle and traffic lane).

While the proposed cross-sections for a collector road vary in some respects to that outlined in the Rotokauri Structure Plan, given that the road will cater for all modes of transport, the proposed layout is an improvement to the previous layout and is therefore considered acceptable.

While not yet finalised, it is recommended that the speed limit along the collector road be 50 km/hr.

The cross-sections proposed for a collector road is shown in Figure 5-4 and Figure 5-5 below.

Figure 5-4: Collector road - proposed cross-section

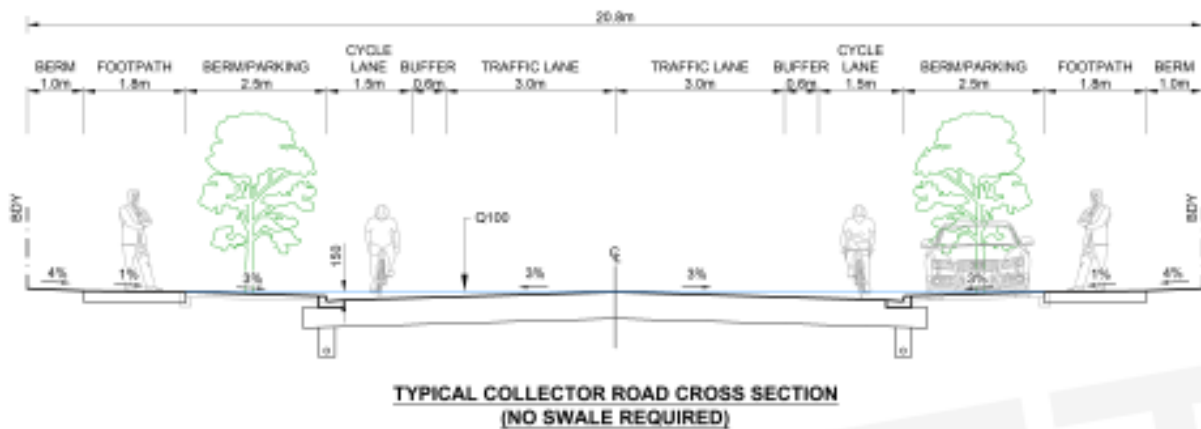
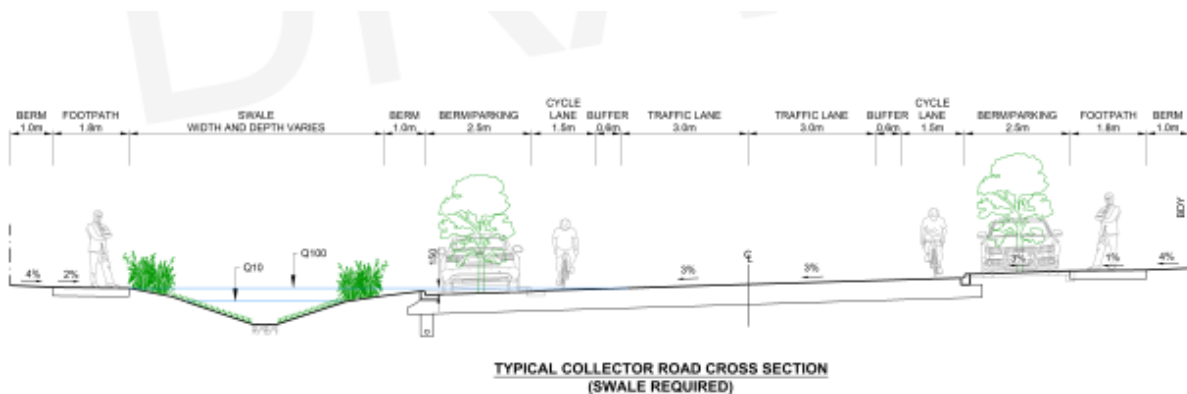


Figure 5-5: Collector road - proposed cross-section (swale)



Overall, the layout proposed for a collector road (on-site) typically aligns with that originally planned and is considered acceptable. Furthermore, the cross sections in both the operative Rotokauri Structure Plan and the proposed Rotokauri North Structure Plan area are indicative only, and full design to an acceptable standard is captured by existing HCCDP provisions which require a Restricted Discretionary Activity resource consent for creation of a new road.

5.2.3 LOCAL ROAD

Figure 3.6.2(f) of the Rotokauri Structure Plan outlines the following requirements for a local road:

- 2 x 3 m wide traffic lane (no separation);
- 6.0 m wide front berm (one-side). Adjacent to this, the following should be provided:
 - 3 m wide footpath;
 - 3 m wide back berm.
- 2 m wide front berm (one side). Adjacent to his, the following should be provided:
 - Drainage reserve (to include some 2.0 m wide footpath).

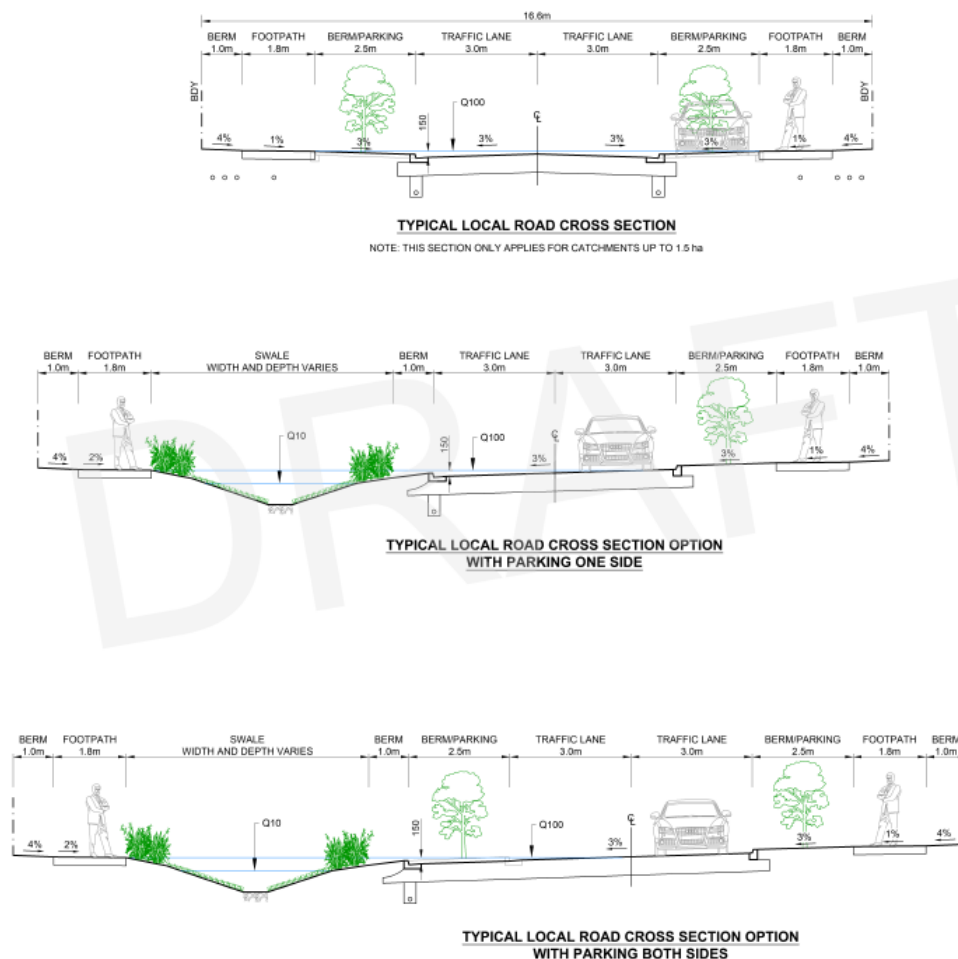
A number of local road types are proposed to provide access to the dwellings. The HCDP outlines the function of a local road is for *property access*. Three cross-sections are proposed within the PPC area and vary in relation to providing on-street parking (one or both sides) or providing a swale.

The typical local road layout includes the following:

- 3.0 m wide lane (both directions);
- 2.5 m wide berm/ parking bay (both sides);
- 1.8 m wide footpath (both sides); and
- 1.0 m wide back berm.

The second cross-section includes the above features with the addition of a swale. The key difference being that the second layout includes a swale along one side of the road (no adjacent parking lane) and the third layout comprises parking on both sides and a swale. Figure 5-5 shows the layout of all three cross-sections.

Figure 5-6: Local road - proposed cross-section



As such, excluding the additional provision of on-street parking along one or both sides of the road (not currently planned for), the proposed cross-sections typically align with that outlined in the Rotokauri Structure Plan for a local road. Further, while no dedicated cycling facilities are provided along local roads, it is recommended that these are designed to a low volume speed limit (40 km/hr) by way of speed humps to encourage lower speeds.

Provided the above recommendations are included in the proposal, including speed management provisions, the above cross-sections are considered acceptable. Furthermore, the cross sections in both the operative Rotokauri Structure Plan and the proposed Rotokauri North Structure Plan area are indicative only, and full design to an acceptable standard is captured by existing HCCDP provisions which require a Restricted Discretionary Activity resource consent for creation of a new road.

5.2.4 REAR LANES

Laneways to access lots from the rear known as “rear lanes” has also been introduced through the PPC. Rear lanes are critical to accessing lots which may front Arterial or Collector Roads, providing an alternative to individual accesses from these higher order roads, and form a key component in maintaining pedestrian and cyclist safety along these routes also. However, it is emphasised that rear lanes are not the same thing as traditional access lot servicing rear lots. These are lanes proposed to serve front lots via a rear access. Three types of rear lanes form part of the PPC packages, the dimensions of these are:

- 7m width for a two-way rear lane;
- 4m width for a one-way lane **where** parking spaces accessed directly off the lane and/or any reverse vehicle manoeuvring into the lane are aligned between 0 degrees (parallel parking) to 45 degrees (angled parking) to the lane; and
- 7m width for a one-way lane **where** parking spaces are accessed directly off the lane and/or any reverse vehicle manoeuvring into the lane are aligned between 46 degree (angled parking) and 90 degree (perpendicular parking).

In this regard, the final detail of vehicle tracking in lanes is a matter to be determined at resource consent stage, based on the final form and length etc of each individual lane. However, subject to the length of the rear lane, in general the widths proposed on a straight block/grid pattern development (as that proposed and anticipated by the PPC) should be suitable.

5.3 PROPOSED INTERSECTION LAYOUTS

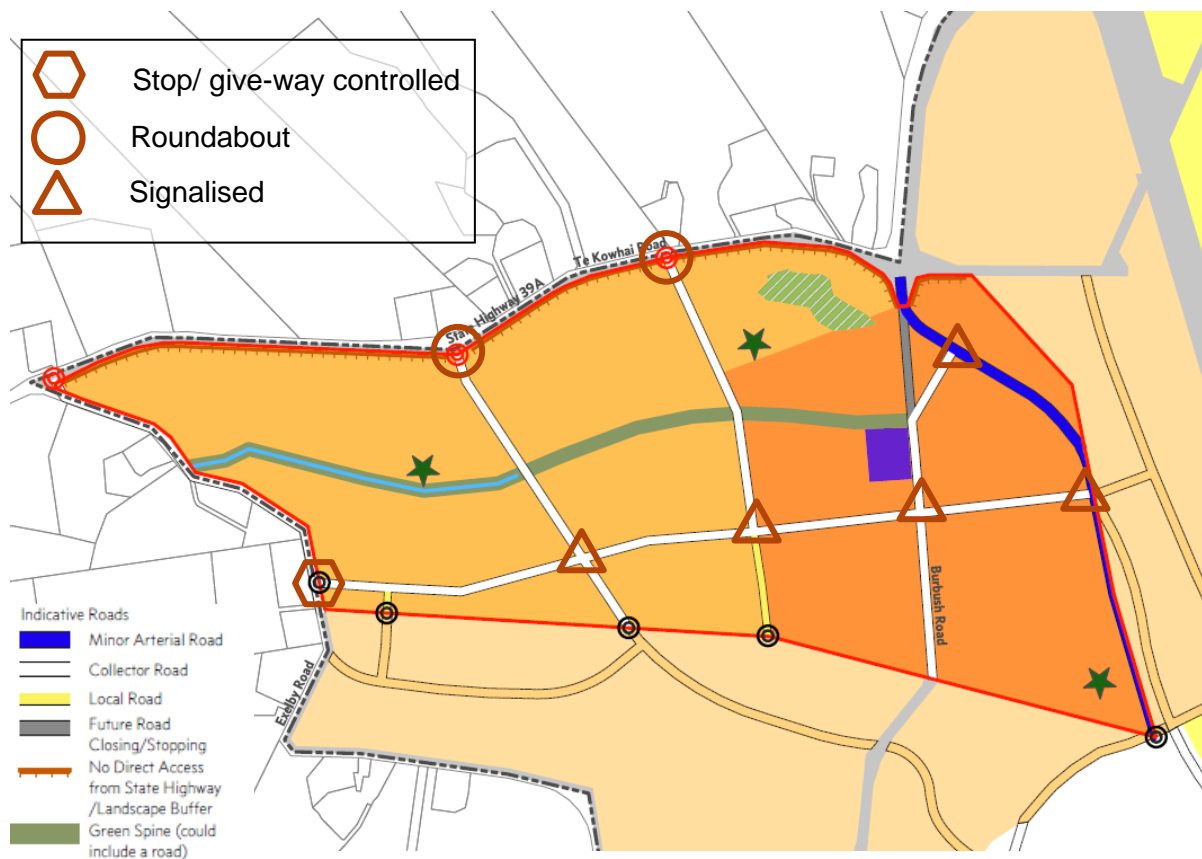
The proposed internal road network is expected to comprise a variety of intersection forms from give-way to signalised intersections. The intersection controls recommended through the site are as follows:

- Arterial / Collector intersections should be roundabout controlled or signalised (unless demand does not warrant);
- Collector/ collector cross-road intersections should be signalised or roundabout (unless demand does not warrant);
- all local road/ local road intersections should be give-way controlled;
- all local road/ collector road intersections should be give-controlled; and
- all collector road/ SH39 intersections should be roundabout controlled (modelling indicates single lane), however Exelby Road unlikely to warrant anything other than standard intersection.

Of note, the above recommendations are only indicative (especially the roundabout vs traffic signals) and are subject to demand analysis at sub-stages (resource consents) of traffic volumes / cyclists and pedestrians at the time of detailed design stage.

Figure 5-7 shows the proposed layout and recommended intersection controls throughout the site.

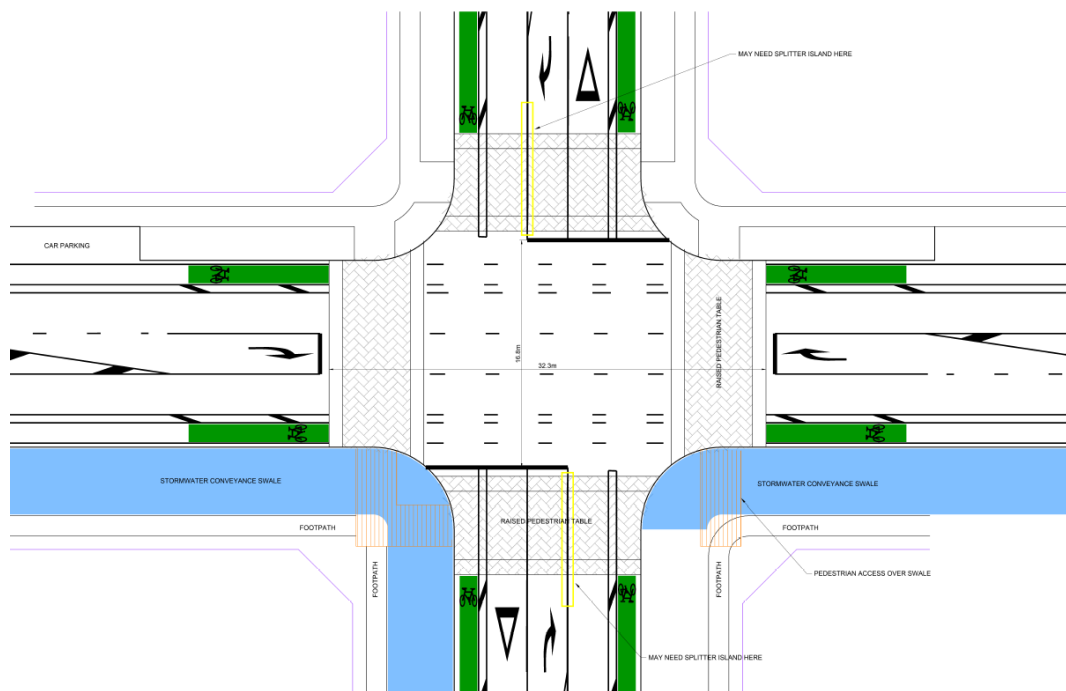
Figure 5-7: Recommended intersection forms through the site



5.3.1 COLLECTOR/COLLECTOR ROAD INTERSECTIONS

A signalised intersection layout (indicative) has been designed for all cross-road (collector road/ collector road) intersections within the site. Figure 5-7 above, shows the recommended location of all signalised intersections and Figure 5-8 shows the proposed collector road cross-section intersection layout.

Figure 5-8: Proposed collector road/ collector road intersection layout



As shown above, each approach includes the following a single through movement/ left turn lane (combined), a dedicated right turn (short lane), on-road cycle lanes (either side) and pedestrian crossings.

5.4 CYCLING PROVISION

A comprehensive cycling network will serve the site. The proposed cycling provisions are to be provided along the new minor arterial road and collector roads and will include the following:

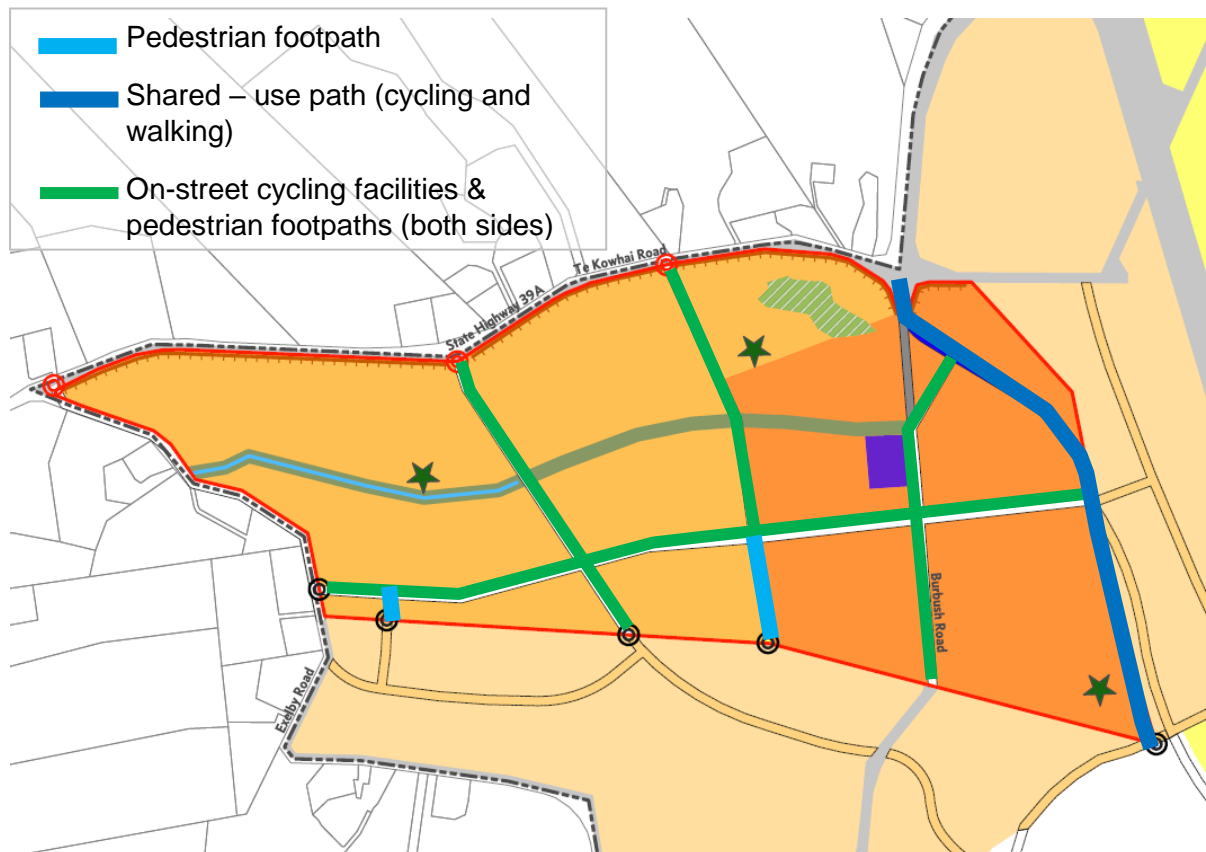
- Minor arterial road: 3.0 m wide shared paths (both sides); and
- Collector roads: 1.5 m wide on-road cycle lanes along both sides of the road and will have a 0.6 m wide separation from the traffic lane.

As noted, a local neighbourhood centre will also be provided and is typically expected to cater for the surrounding residential dwellings. In this regard, it is recommended to provide a low speed environment in the form of traffic calming near the local centre.

Given that the local roads are not expected to provide any dedicated cycling facilities, it is recommended to encourage a low speed environment along these roads by means of traffic calming such as speed tables / road narrowing, ideally at 80 m spacings.

Figure 5-9 shows the proposed cycling and pedestrian network within the PPC area.

Figure 5-9: Proposed cycling provision



6 TRIP GENERATION

6.1 GENERAL

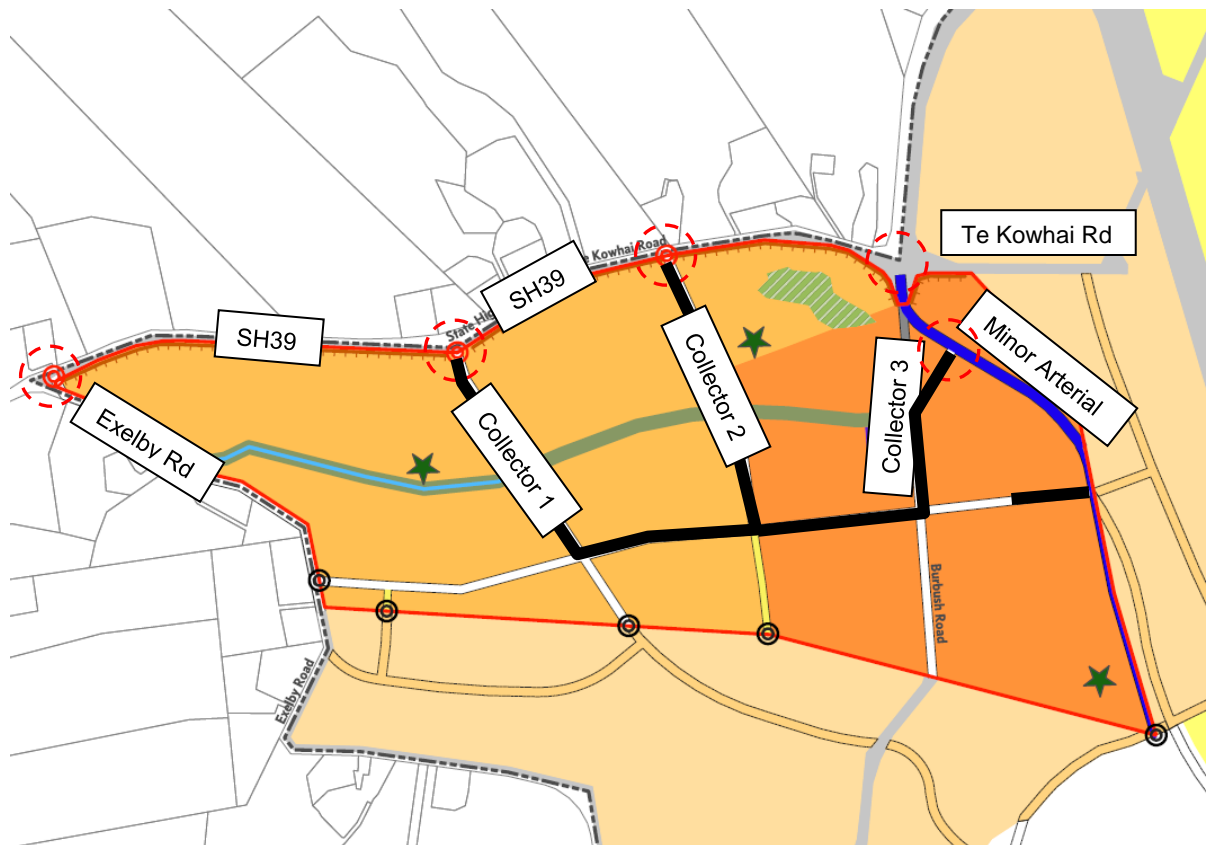
Traffic modelling has been undertaken using the Tracks model (current version) for Hamilton to determine the volumes proposed along the existing roads near the PPC area, as a result of the development associated with the PPC area, for the future years 2021 and 2041. For the purpose of this assessment, the following items were considered in the model:

- the full extent of the development (2000 dwellings) is considered to be established by the year 2021 (worst case);
- the PPC area predominantly comprises of 'Residential' zoning; and
- the major road links proposed within the PPC area have been included in the modelling (as shown in Figure 6-1 below).

Five intersections have been considered within this assessment and are highlighted in Figure 6-1 above. This includes:

1. Exelby Road/ SH39 intersection;
2. Collector 1/ SH39 intersection;
3. Collector 2/ SH39 intersection;
4. SH39/ minor arterial road/ Te Kowhai Road roundabout intersection; and
5. Collector 3/ Minor arterial road intersection.

Figure 6-1: Key roads adopted (within the PPC area) for modelling purposes (outlined in black)



Attachment A provides the volumes proposed along roads within and near the site.

6.2 INTERSECTION PERFORMANCE

6.2.1 GENERAL

The performance of the intersections has been modelled using SIDRA Intersection 6.0 (Sidra), an industry standard tool for assessing the performance characteristics of intersections and road networks.

The results presented in this report include the Degree of Saturation, which is a measure of available capacity and the Level of Service (“LOS”), which is a generalised function of delay. For priority (sign) controlled intersections, a degree of saturation of less than 0.8 is considered to be acceptable. LOS A and B are very good and indicative of free flow conditions; C is good; D is acceptable; and E and F are indicative of congestion and unstable conditions. For a signalised intersection, a degree of saturation less than 0.9 is considered acceptable.

The following sections outline the performance of each intersection for the future years 2021 and 2041 and any upgrades required at these intersections.

6.2.2 EXELBY ROAD/ SH39 INTERSECTION (EXISTING)

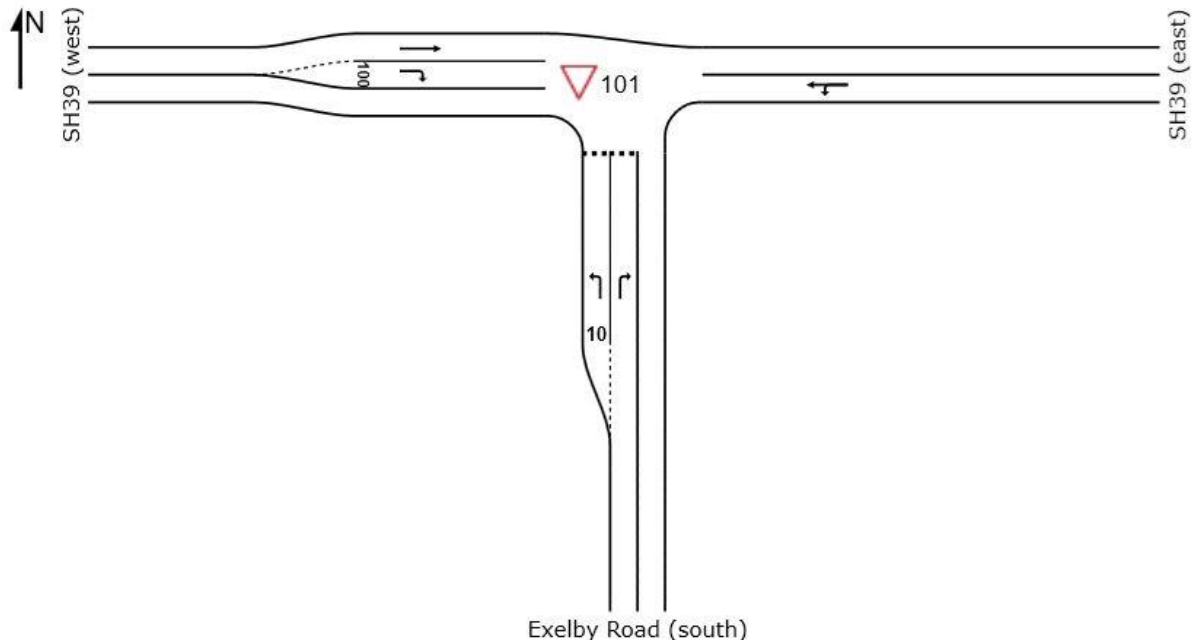
The Exelby Road/ SH39 intersection (existing) is currently give-way controlled with priority afforded to vehicles along SH39. The intersection provides a right turn bay on SH39 to facilitate vehicles turning right into Exelby Road. Figure 6-2 shows the typical layout of this intersection.

Figure 6-2: Exelby Road/ SH39 intersection

SITE LAYOUT

▽ Site: 101 [Exelby Road/ SH39 intersection 2021 AM]

New Site
Giveaway / Yield (Two-Way)



The performance of the intersection for the future year 2021 and 2041 is outlined in Table 6-1 and Table 6-2 below.

Table 6-1: Performance at Exelby Road/ SH39 intersection 2021 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Exelby Road (south)	LT	0.084 (0.127)	6.5 (6.9)	A (A)	2.5 (3.8)
	RT	0.002 (0.002)	10.7 (11.3)	B (A)	0.1 (0.1)
SH39 (east)	LT	0.130 (0.169)	5.6 (5.6)	A (A)	0.0 (0.0)
	TH	0.130 (0.169)	0.0 (0.0)	A (B)	0.0 (0.0)
SH39 (west)	TH	0.157 (0.165)	0.0 (0.0)	A (A)	0.0 (0.0)
	RT	0.102 (0.071)	6.5 (6.8)	A (C)	3.4 (2.3)

Table 6-2: Performance at Exelby Road/ SH39 intersection 2041 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Exelby Road (south)	LT	0.055 (0.020)	7.2 (7.7)	A (A)	1.5 (0.5)
	TH	0.003 (0.004)	14.0 (18.4)	B (C)	0.1 (0.79)
SH39 (east)	TH	0.212 (0.270)	5.6 (5.6)	A (A)	0.0 (0.0)
	RT	0.212 (0.270)	0.0 (0.0)	A (A)	0.0 (0.0)
SH39 (west)	LT	0.240 (0.277)	0.0 (0.0)	A (A)	0.0 (0.0)
	RT	0.019 (0.040)	7.1 (7.7)	A (A)	0.6 (0.51)

As noted, this intersection is priority controlled and no upgrades are proposed as part of the PPC. As shown above, the intersection performs at an acceptable level of service (LOS A – C) during the morning and evening peak hours in 2021 and 2041. The maximum average delay occurs at the right turn movement from Exelby Road is expected to experience the

maximum average delay (11.3 seconds during the evening peak), with a queue length of less than one vehicle. In 2041, the average delay at this movement increases to 18.4 seconds (evening peak). The maximum degree of saturation occurs at the western approach (SH39)

As such, the existing layout of the Exelby Road / SH39 intersection is anticipated to cater for the volumes proposed for the future year 2021 and 2041, including the traffic associated with the PPC. Therefore, no upgrades are required as part of the PPC. It is noted that, a collector road linking from the PPC area to Exelby Road has not been included in the model. It is therefore recommended that an assessment be made at subsequent stages of the development, following the construction of this road connecting to Exelby Road, to determine whether the impact of this road will result in significant increases at the Exelby Road/ SH39 intersection. In relation to the entire road network proposed, several other connections to SH39 are provided therefore it is unlikely that residents will utilise this road when travelling to and from the area west of the PPC area.

6.2.3 COLLECTOR 1/ SH39 INTERSECTION (PROPOSED)

This is a new intersection to be formed as part of the PPC. The layout of this intersection is yet to be confirmed however will likely involve a roundabout control (when required) or give-way.

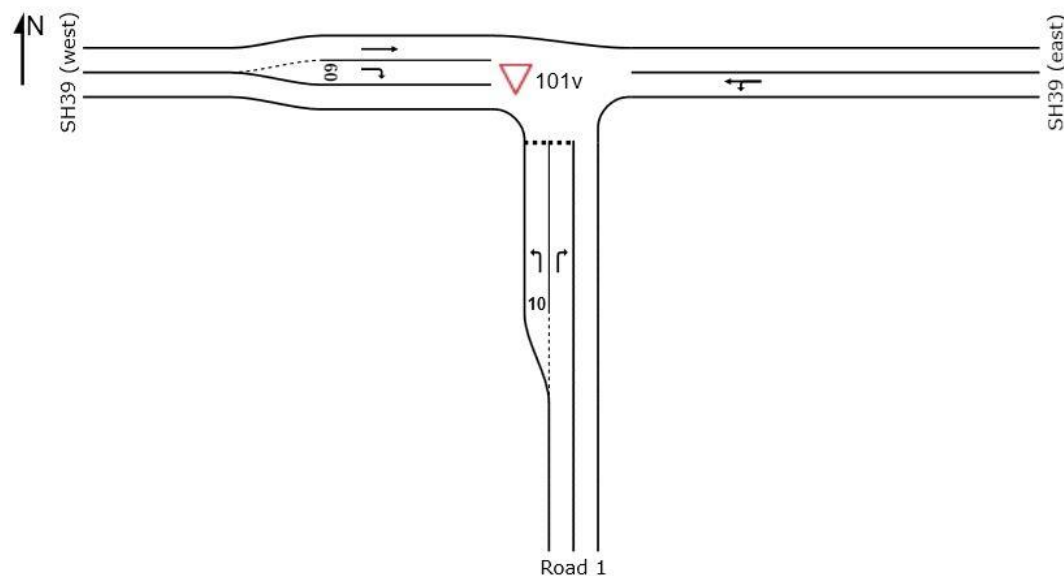
A give-way controlled layout has initially been tested with priority afforded to traffic along SH39. Figure 6-3 shows the potential layout of the intersection (give-way controlled), although it is noted that final form of mitigation is subject to approval and liaison with NZTA at consenting stage.

Figure 6-3: Potential layout of Collector 1/ SH39 intersection

SITE LAYOUT

▽ Site: 101v [Road 1/ SH39 2021 AM]

New Site
 Giveaway / Yield (Two-Way)



The performance of the intersection for the future year 2021 and 2041 is outlined in Table 6-3 and Table 6-4 below.

Table 6-3: Performance at Collector 1/ SH39 intersection 2021 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Collector 1 (south)	LT	0.019 (0.007)	6.3 (6.6)	A (A)	0.5 (0.2)
	RT	0.414 (0.175)	12.1 (13.0)	B (B)	16.7 (4.7)
SH39 (east)	LT	0.148 (0.307)	5.6 (5.6)	A (A)	0.0 (0.0)
	TH	0.148 (0.307)	0.0 (0.0)	A (A)	0.0 (0.0)
SH39 (west)	TH	0.150 (0.155)	0.0 (0.0)	A (A)	0.0 (0.0)
	RT	0.008 (0.021)	6.5 (8.0)	A (A)	0.2 (0.6)

Table 6-4: Performance at Collector 1/ SH39 intersection 2041 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Collector 1 (south)	LT	0.018 (0.007)	7.0 (7.6)	A (A)	0.5 (0.2)
	TH	0.659 (0.368)	23.7 (27.6)	C (D)	29.5 (10.1)
SH39 (east)	TH	0.235 (0.406)	5.6 (5.6)	A (A)	0.0 (0.0)
	RT	0.235 (0.406)	0.0 (0.1)	A (A)	0.0 (0.0)
SH39 (west)	LT	0.236 (0.268)	0.0 (0.0)	A (A)	0.0 (0.0)
	RT	0.008 (0.024)	7.2 (9.6)	A (A)	0.2 (0.7)

As shown above, the lanes are expected to perform at an acceptable level of service (LOS A- C). The right turn on Collector 1 performs at LOS B during the morning and evening peak for the year 2021; the performance of this movement is summarised as follows:

- In 2041, this movement reduces to LOS C (morning peak) and LOS D (evening peak);
- The degree of saturation for this movement is well below 0.8 in 2021 (0.414) and rises to a maximum of 0.659 in 2041 (still below 0.8); and
- A maximum average delay is 13.0 seconds and occurs during the evening peak (2021). This increases to 27.6 seconds in 2041.

Based on the above, the proposed priority intersection layout is considered adequate to accommodate the predicted traffic volumes at this intersection for the future years 2021 and 2041. It is noted that, the performance of this intersection should be reassessed at each subsequent resource consent stages to determine if a roundabout control is warranted.

6.2.4 COLLECTOR 2/ SH39 INTERSECTION

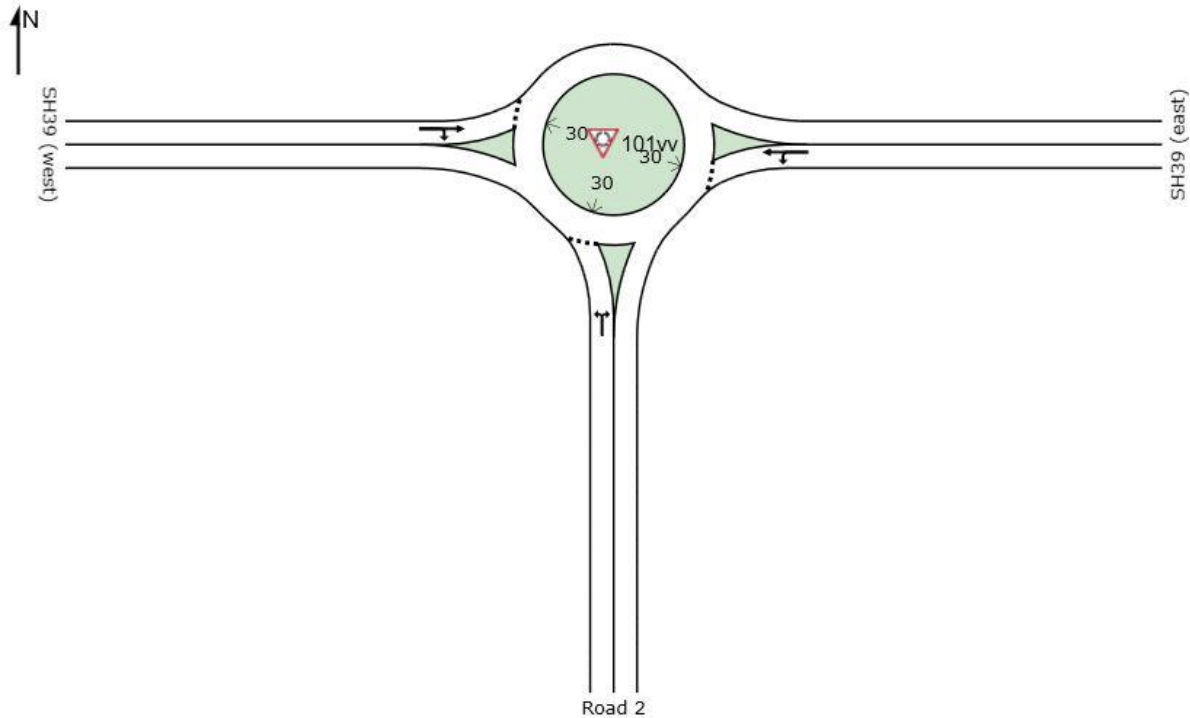
This is a new intersection to be formed as part of the PPC. The modelling indicates that, with the level of volumes proposed for the year 2021 at this intersection, a roundabout control intersection is required, as this link is expected to feed the majority of volumes to and from the site (compared with Collector 1/ SH39 intersection). As such, a single lane roundabout control is recommended as shown in Figure 6-4 below, although it is noted that final form of mitigation is subject to approval and liaison with NZTA at consenting stage.

Figure 6-4: Potential layout of Collector 1/ SH39 intersection

SITE LAYOUT

Site: 101vv [Road 2/ SH39 2021 AM]

New Site
 Roundabout



The performance of the intersection for the future year 2021 and 2041 is outlined in Table 6-1 and Table 6-2 below.

Table 6-5: Performance at Collector 2/ SH39 intersection 2021 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Collector 2 (south)	LT	0.474 (0.206)	5.3 (7.1)	A (A)	27.7 (9.9)
	RT	0.474 (0.206)	11.1 (12.9)	B (B)	27.7 (9.9)
SH39 (east)	LT	0.218 (0.712)	3.5 (3.9)	A (A)	13.0 (79.6)
	TH	0.218 (0.712)	3.6 (4.0)	A (A)	13.0 (79.6)
SH39 (west)	TH	0.617 (0.296)	10.5 (4.5)	B (A)	49.1 (16.5)
	RT	0.617 (0.296)	16.3 (10.3)	B (B)	49.1 (16.5)

Table 6-6: Performance at Collector 2/ SH39 intersection 2041 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Collector 2 (south)	LT	0.444 (0.215)	6.5 (8.9)	A (A)	24.1 (10.9)
	TH	0.444 (0.215)	12.3 (14.6)	B (B)	24.1 (10.9)
SH39 (east)	TH	0.316 (0.749)	3.6 (4.1)	A (A)	21.1 (9.31)
	RT	0.316 (0.749)	3.6 (4.1)	A (A)	21.1 (93.1)
SH39 (west)	LT	0.700 (0.444)	10.2 (4.5)	B (A)	67.3 (30.1)
	RT	0.700 (0.444)	15.9 (10.2)	B (B)	67.3 (30.1)

As shown above, the lanes are expected to perform at a LOS A or B in both 2021 and 2041. For 2021, the maximum degree of saturation occurs at the western approach and is 0.617 during the morning peak hour and 0.296 (evening peak). For this approach, the degree of saturation increases (slightly) to 0.700 (morning peak) and 0.444 (evening peak), however is still well below the threshold before an upgrade is required (0.9). The right turn at the western approach is expected to experience a maximum average delay of 16.3 seconds (2021) and 95%tile back of queue of 49.1 m (6-7 vehicles). In 2041, the delay at this approach increases to 15.9 seconds (2041) with a queue length of 67.3m (9-10 vehicles).

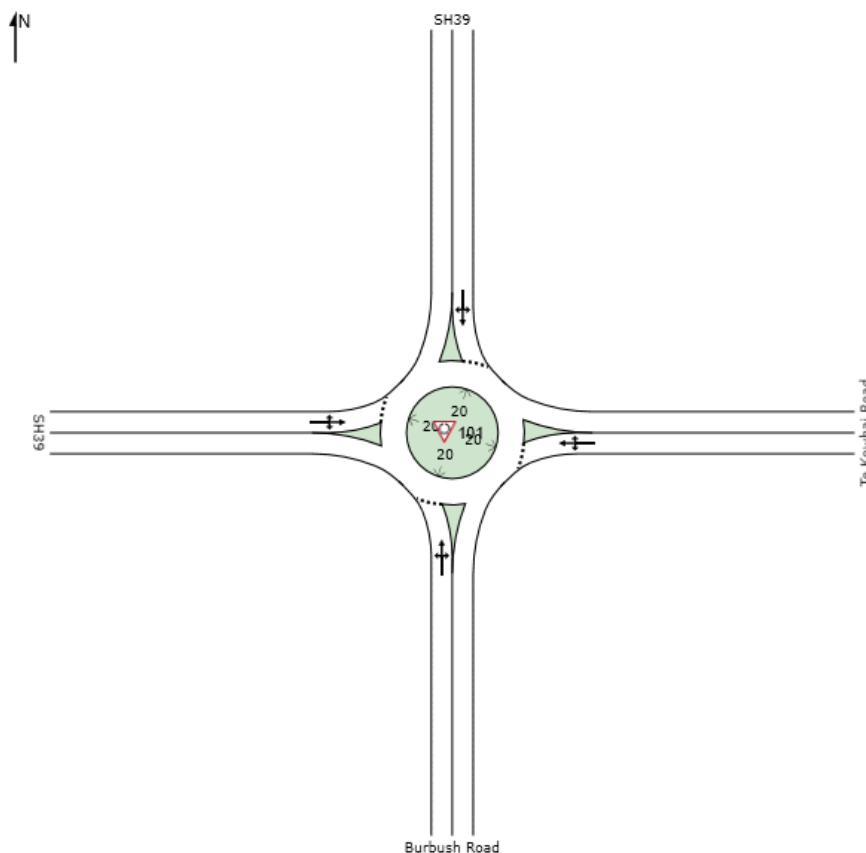
It is also noted that, compared with 2021, the performance of the southern approach (Collector 2 road) reduces in 2041; this is a result of other external roading connections being formed therefore reducing the level of volumes at this intersection.

Overall, the proposed layout is considered adequate to cater for the proposed volumes at this intersection.

6.2.5 TE KOWHAI ROAD/ SH39/ MINOR ARTERIAL (EXISTING) INTERSECTION

The Te Kowhai Road/ SH39 intersection is existing and currently has a connection to Burbush Road to the south. As part of the PPC, Burbush Road is to be realigned to connect to the minor arterial road, and the proposed minor arterial road will form the new southern leg at this intersection (effectively replacing Burbush Road). Figure 6-5 shows the existing layout of the intersection.

Figure 6-5: Te Kowhai Road/ SH39 intersection (existing layout)



The performance of the intersection for the future year 2021 is outlined in Table 6-7 below.

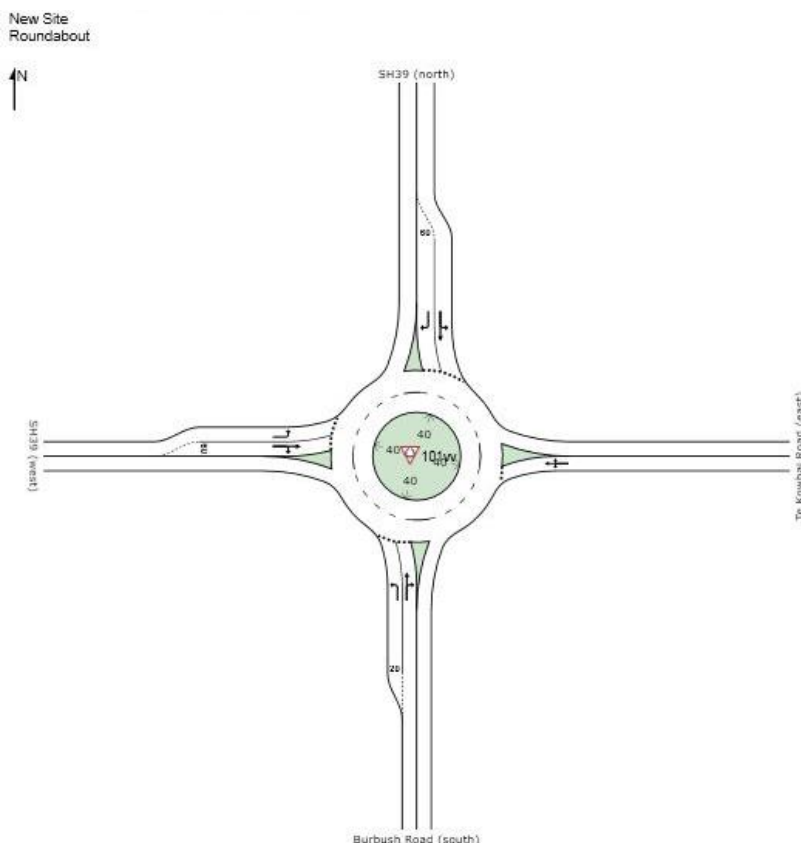
Table 6-7: Performance at Te Kowhai Road/ SH39/ Minor arterial road intersection 2021 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Burbush Road (south)	LT	0.386 (0.672)	5.9 (33.6)	A (C)	20.3 (55.1)
	TH	0.386 (0.672)	6.0 (33.7)	A (C)	20.3 (55.1)
	RT	0.386 (0.672)	11.6 (39.3)	B (D)	20.3 (55.1)
Te Kowhai Road (east)	LT	0.033 (0.593)	6.2 (91.2)	A (F)	1.4 (25.0)
	TH	0.033 (0.593)	6.2 (91.2)	A (F)	1.4 (25.0)
	RT	0.033 (0.593)	11.9 (96.9)	B (F)	1.4 (25.0)
SH39 (north)	LT	0.386 (1.063)	4.2 (65.8)	A (E)	22.7 (1397)
	TH	0.386 (1.063)	4.1 (65.7)	A (E)	22.7 (1397)
	RT	0.386 (1.063)	9.4 (70.9)	A (F)	22.7 (1397)
SH39 (west)	LT	1.031 (0.436)	64.3 (5.3)	E (A)	434.1 (27.2)
	TH	1.031 (0.436)	64.7 (5.7)	E (A)	434.1 (27.2)
	RT	1.031 (0.436)	70.0 (11.0)	E (B)	434.1 (27.2)

As shown above, with the current intersection layout, the volumes proposed for the year 2021 are expected to exacerbate the performance of the intersection with Te Kowhai Road expected to operate at a LOS F (during the evening peak) and a maximum degree saturation of 1.031 (over capacity) occurring at the western approach (SH39). As such, some form of mitigation is required at this intersection prior to full buildout. It is noted that final form of mitigation is subject to approval and liaison with NZTA (and also noting that the existing roundabout is subject to a designation in the HCDP).

Figure 6-6 outlines the recommended (upgraded) layout, which is essentially converted the existing single lane roundabout to a double lane roundabout.

Figure 6-6: Upgraded layout of the Te Kowhai Road/ SH39/ Minor arterial road intersection



Based on the above layout, the performance of the intersection for the future year 2021 and 2041 is outlined in Table 6-8 and Table 6-9 below.

Table 6-8: Performance at Minor Arterial Road/ Te Kowhai Road/ SH39 intersection 2021 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Minor Arterial Road (south)	LT	0.042 (0.038)	5.4 (15.7)	A (B)	1.4 (1.7)
	TH	0.304 (0.354)	4.5 (14.1)	A (B)	13.4 (20.3)
	RT	0.304 (0.354)	11.1 (20.7)	B (C)	13.4 (20.3)
Te Kowhai Road (east)	LT	0.003 (0.093)	4.9 (11.3)	A (B)	1.0 (3.4)
	TH	0.003 (0.093)	4.8 (11.2)	A (B)	1.0 (3.4)
	RT	0.003 (0.093)	11.4 (17.7)	B (B)	1.0 (3.4)
SH39 (north)	LT	0.183 (0.420)	3.4 (3.4)	A (A)	6.1 (20.0)
	TH	0.183 (0.420)	3.1 (3.1)	A (A)	6.1 (20.0)
	RT	0.194 (0.660)	9.6 (9.7)	A (A)	7.1 (48.2)
SH39 (west)	LT	0.848 (0.361)	12.2 (4.4)	B (A)	116.3 (19.4)
	TH	0.052 (0.038)	5.6 (4.5)	A (A)	1.9 (1.4)
	RT	0.052 (0.038)	12.2 (11.1)	B (B)	1.9 (1.4)

Table 6-9: Performance at Minor Arterial Road/ Te Kowhai Road/ SH39 intersection 2041 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Minor Arterial Road (south)	LT	0.144 (0.526)	6.3 (15.4)	A (B)	5.5 (33.1)
	TH	0.464 (0.661)	5.3 (17.0)	A (B)	25.2 (58.9)
	RT	0.464 (0.661)	11.9 (23.6)	B (C)	25.2 (58.9)
Te Kowhai Road (east)	LT	0.054 (0.100)	6.4 (9.2)	A (A)	1.8 (3.5)
	TH	0.054 (0.100)	6.3 (9.1)	A (A)	1.8 (3.5)
	RT	0.054 (0.100)	12.9 (15.7)	B (B)	1.8 (3.5)
SH39 (north)	LT	0.342 (0.507)	4.6 (4.2)	A (A)	15.1 (26.8)
	TH	0.342 (0.507)	4.3 (3.9)	A (A)	15.1 (26.8)
	RT	0.313 (0.622)	10.6 (10.4)	B (B)	14.0 (40.3)
SH39 (west)	LT	0.805 (0.528)	13.5 (6.4)	B (A)	96.2 (34.8)
	TH	0.375 (0.213)	7.3 (6.5)	A (A)	17.6 (9.2)
	RT	0.375 (0.213)	13.9 (13.1)	B (B)	17.6 (9.2)

Based on the upgraded layout, the lanes are expected to perform at a LOS A or B in both 2021 and 2041, with the exception of the right turn lane from the southern approach (Minor Arterial Road) reducing to a LOS C in 2041. The maximum degree of saturation for this movement is 0.661 (evening peak) therefore is well below the limit.

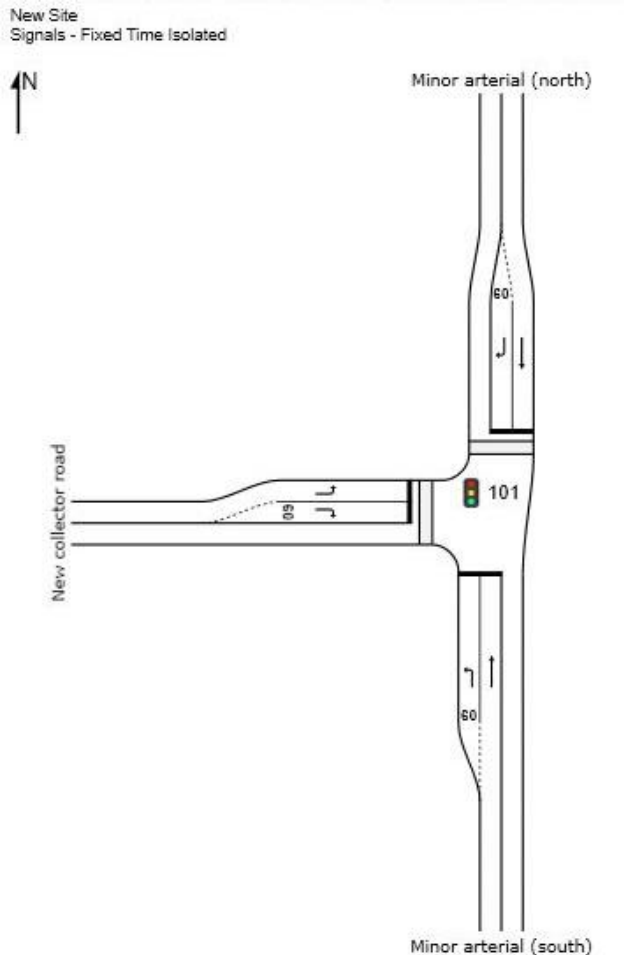
In 2021, the maximum average delay is 12.2 seconds and occurs at the left/ right turn lanes from SH39 (western approach); this increases to 13.9 seconds in 2041 (morning peak). The maximum 95thtile queue is 116.3m (2021) and 96.2m (2041) and occurs at the left turn approach on SH39 (west) during the morning peak hour.

Overall, the recommended layout is considered adequate to cater for the proposed volumes for the future year 2021 and 2041. Based on the above assessment, the existing layout of the intersection warrants an upgrade by the year 2021. As such, an assessment of the intersection should be made at each sub-stage to determine the exact timing of the upgrade.

6.2.6 COLLECTOR 3/ MINOR ARTERIAL INTERSECTION (PROPOSED)

This is a new intersection, to be formed as part of the PPC, and is proposed to be a signal-controlled intersection. Figure 6-7 shows the recommended layout of the intersection.

Figure 6-7: Collector 3 (new road)/ Minor Arterial Road intersection



The performance of the intersection for the future year 2021 and 2041 is outlined in Table 6-10 and Table 6-11 below.

Table 6-10: Performance at Collector 3 (new road)/ Minor Arterial Road intersection 2021 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Minor Arterial Road (south)	LT	0.217 (0.069)	10.6 (11.8)	B (B)	15.9 (4.6)
	RT	0.602 (0.334)	15.4 (17.8)	B (B)	38.5 (13.1)
Minor Arterial Road (north)	TH	0.078 (0.418)	4.6 (6.4)	A (A)	5.5 (36.9)
	RT	0.399 (0.339)	23.6 (20.5)	C (C)	15.1 (17.4)
Collector 3 - new road (west)	LT	0.458 (0.396)	23.9 (22.6)	C (C)	17.5 (17.0)
	RT	0.196 (0.325)	22.9 (22.3)	C (C)	7.1 (13.7)

Table 6-11: Performance at Collector 3 (new road)/ Minor Arterial Road intersection 2041 – AM(PM)

Leg	Movement	Degree of Saturation (v/c)	Average Delay (s)	LOS	95 th %ile Queue (m)
Minor Arterial Road (south)	LT	0.114 (0.649)	9.5 (15.9)	A (B)	10.5 (96.8)
	TH	0.843 (0.871)	33.1 (31.4)	C (C)	65.5 (119.0)

Minor Arterial Road (north)	TH	0.499 (0.285)	14.8 (5.3)	B (A)	61.5 (32.6)
	RT	0.784 (0.897)	37.6 (41.6)	D (D)	44.5 (109.3)
Collector 3 - new road (west)	LT	0.499 (0.863)	20.4 (40.4)	C (D)	58.5 (65.7)
	RT	0.891 (0.655)	36.1 (33.0)	D (C)	156.7 (42.5)

As shown above, the lanes are expected to perform at a LOS A, B or C in 2021 with several movements declining to LOS D in 2041. This includes the right turn movement from SH39 (east) and left turn movement from SH39 (west). The maximum degree of saturation from these movements is 0.891 (right turn movement), occurring during the morning peak hour only, therefore is still below capacity with an average delay of 36.1 seconds. The 95%tile back of queue for this movement is 15.7 m (21-22 vehicles) and is considered acceptable.

Overall, the proposed layout is considered adequate to cater for the proposed volumes at this intersection.

6.2.7 PROPOSED INTERSECTIONS ALONG SH39

As outlined in section 6 above, two new intersections are proposed along SH39 including:

- Collector 2/ SH39 intersection (roundabout); and
- Collector 1/ SH39 intersection. This intersection will initially be developed as a give way-controlled intersection however, this is subject to demand and will be assessed at resource consent for sub-stages to determine if a roundabout control is warranted.

A concept plan has been developed, outlining the indicative boundary of the two intersections in relation to the existing road reserve and is shown in Figure 6-8 and Figure 6-9 below.

Figure 6-8: Collector 1/ SH39 intersection (give-way) – indicative layout



Figure 6-9: Collector 2/ SH39 intersection (roundabout) – indicative layout



As shown above, both intersection layouts are expected to be accommodated within the existing road reserve with any additional land being acquired from the PPC area only. As such, no land is expected to be required from the neighbouring properties.

6.2.8 BURBUSH ROAD (SOUTH)

Based on the TRACKS model, the maximum peak hour traffic volumes expected along Burbush Road, south of the PPC area, is to be in the order of 700 – 900¹ veh/ hr (two-way) equating to some 9000 veh/ day. This is a significant increase in traffic volumes when compared with the existing volumes along Burbush Road (approximately 600 vehicles per day).

It is important to note that the area surrounding Burbush Road is zoned as 'Future Urban' in the HCCDP indicating that this area will be urbanised. With reference to the HCCDP Road Hierarchy maps, the entire length of Burbush Road is proposed to be upgraded to a collector Road. As such, the future function of this road is considered appropriate to cater for the future volumes.

Burbush Road currently provides a single lane in each direction with centre line markings only. As part of this application, Burbush Road will be upgraded to a collector road (within

¹ Volumes extracted from the 2041 TRACKS model

the PPC area) with the remaining length of Burbush Road remaining as existing (until such time as development to the south occurs).

In this regard, Figure 3-1 of Austroads² outlines the level of service of a road based on the average passenger car speed and flow rate. Based on this, with the proposed volumes (maximum of 540 vehicles per lane), Burbush Road is still expected to operate within capacity (LOS B). Further, no apparent crash trends have been identified along Burbush Road (south of the PPC area) as outlined in section 2.8 above.

While Burbush Road to the south of the PPC area is expected to accommodate the anticipated traffic movements, monitoring of the operation to the south of the PPC area is recommended to assess whether the safety or efficiency of this section is compromised in the interim period.

6.3 MITIGATION MEASURES

Based on the above analysis, several mitigation measures are recommended to maintain the safety and efficiency of the surrounding road network. The exact timing of upgrades should be determined at resource consent for each sub-stage, these include:

- The two new connections onto SH39 should be developed during the early stages of the development to disperse traffic within the site and therefore along SH39. Of these, one connection (Collector 2/ SH39 intersection) should be roundabout controlled and the other connection priority controlled respectively;
- Upgrade of the Te Kowhai Road/ SH39/ Minor Arterial Road intersection before full buildout (timing of upgrade to be determined at each sub-stage);
- The following key intersections should be assessed at each sub-stage to determine whether further upgrades are required:
 - Exelby Road/ SH39 intersection;
 - Collector 1/ SH39 intersection;
 - Collector 2/ SH39 intersection; and
 - Te Kowhai Road/ SH39/ Minor Arterial Road intersection.
- Provision of public transport utilising the Collector and arterial road network is considered critical in an overall integrated and multi-model development. This is only likely to be economical after at least 1000 dwellings are occupied and is dependent on Council; and
- Monitor the operation of Burbush Road, to the south of the PPC area, in the interim period (pre-upgrade and urbanisation) to assess whether the safety or efficiency of this section is compromised.

It is also noted that, similar to that planned within the Rotokauri Structure Plan layout, one east-west link is proposed within the PPC area. Based on the above modelling, this is considered acceptable.

² Guide to Traffic Management Part 3: Traffic Studies and Analysis

7 PARKING

7.1 DISTRICT PLAN REQUIREMENTS

From a review of the HCDP, (Table 15-2a) the following minimum parking requirements are considered applicable to the site outlined in Table 7-1 below.

Table 7-1: Unitary Plan parking requirements

Activity	Parking space requirement
Single dwellings and duplex dwelling	2 per household or dwelling
Ancillary residential units and apartment buildings	1 per residential unit

As shown above, a minimum of two spaces should be provided for each dwelling to comply with the HCDP parking requirements. Stacked spaces would be acceptable to reduce the width of vehicle crossings. Where apartment buildings or ancillary residential units are provided within the site, a minimum of 1 car park space should be provided to comply with the HCDP requirements.

The details of parking provisions will be provided in later assessments; however, parking should be provided in accordance with the HCDP requirements (with the recommended amendments above).

Duplex units and/or terraced housing, particularly where associated with affordable housing, are however likely to only have one car park per unit, and it is considered appropriate that provisions be made for this reduction from the standard residential requirements. It is noted that the only deviation from the existing HCDP rules is with respect to a duplex dwelling, as a terraced type product falls under the HCCDP definition of an “apartment building.

In general, a reduction in car parking for duplex dwellings, is likely to encourage other forms of transport (other than private car) however it is recognized that before public transport becomes wide-spread in the area this is likely to result in additional demand for on-street parking. As such in streets with a higher number of these duplex units should have additional provision for on-street parking (e.g. closer to 1 space per 3 units rather than the more typical minimum rate of 1 space per 4 units). Council have the ability under the HCCDP rules to address this type of matter already (as construction of a road is a restricted discretionary activity and the design, layout and wider traffic effects all form part of the matters for discretion). Therefore, no specific new assessment criteria or rule is deemed necessary to address this matter.

Further, it is noted that local roads are proposed to provide on-street parking along one or both sides of the road (not provided for in the Rotokauri Structure Plan cross-sections).

It is considered that a stacked parking space (for example an open space in front of a garage) should be permitted as the second parking space. This provides an efficient and safe way (given both uses will be from the same dwelling) of achieving the second parking space.

7.1.1 CYCLE PARKING

Table 15-2a of the HCDP outlines the requirements for visitor cycle spaces. For a dwelling or duplex building, the HCDP does not require any visitor cycle parking. In this regard, any

requirement for visitor parking associated with any multiple unit development or development of the local neighbourhood centre will be addressed at resource consent stage.

7.1.2 ACCESSIBLE PARKING

Table 15-2d of the HCDP outlines the requirements for accessible parking spaces, for all zones, based on the number of car parking spaces being provided. The following rates apply:

- Minimum of 1 accessible space(s) for every 1-20 car park spaces provided;
- Minimum of 2 accessible space(s) for 21-50 car park spaces provided; and
- One additional accessible space for every additional 50 car parks above 50 car park space

In this regard, each residential property is expected to provide 1-2 car park spaces therefore does not require any accessible spaces. Consideration should be given to providing accessible spaces near the local neighbourhood centre during individual resource consent stages.

7.1.3 LOADING

As per Table 15-2a of the HCDP, no loading spaces are required for residential properties. Consideration should be given to providing loading spaces for the local neighbourhood centre during individual resource consent stages.

8 INTERSECTION LOCATIONS / ACCESS

8.1 GUIDELINES

Measurements have been undertaken both in terms of speeds and visibility on SH39. In terms of SH39 the NZTA Planning Policy Manual (Appendix 5B Accessway standards and guidelines) ("PPM") and Austroads 4A: Unsignalized and signalised intersection are considered appropriate.

In terms of sight distance, the PPM requires a total of 203m for a posted speed limit of 80km/hr (90km/hr operating speed) while Austroads requires 214m Safe Intersection Sight Distance (SISD) for an operating speed of 90km/hr.

In terms of intersection spacing, the PPM notes a desirable spacings between accessways and between intersections and accessways on national state highways carrying over 10,000 vpd of 400m for a Stage Highway with an 80km/hr operating speed.

With these requirements together with limitations in current site boundaries, the following Figure 8-1 (and Appendix A) has been developed showing the constraints on SH39 in relation to intersection locations

Figure 8-1: SH39 constraints

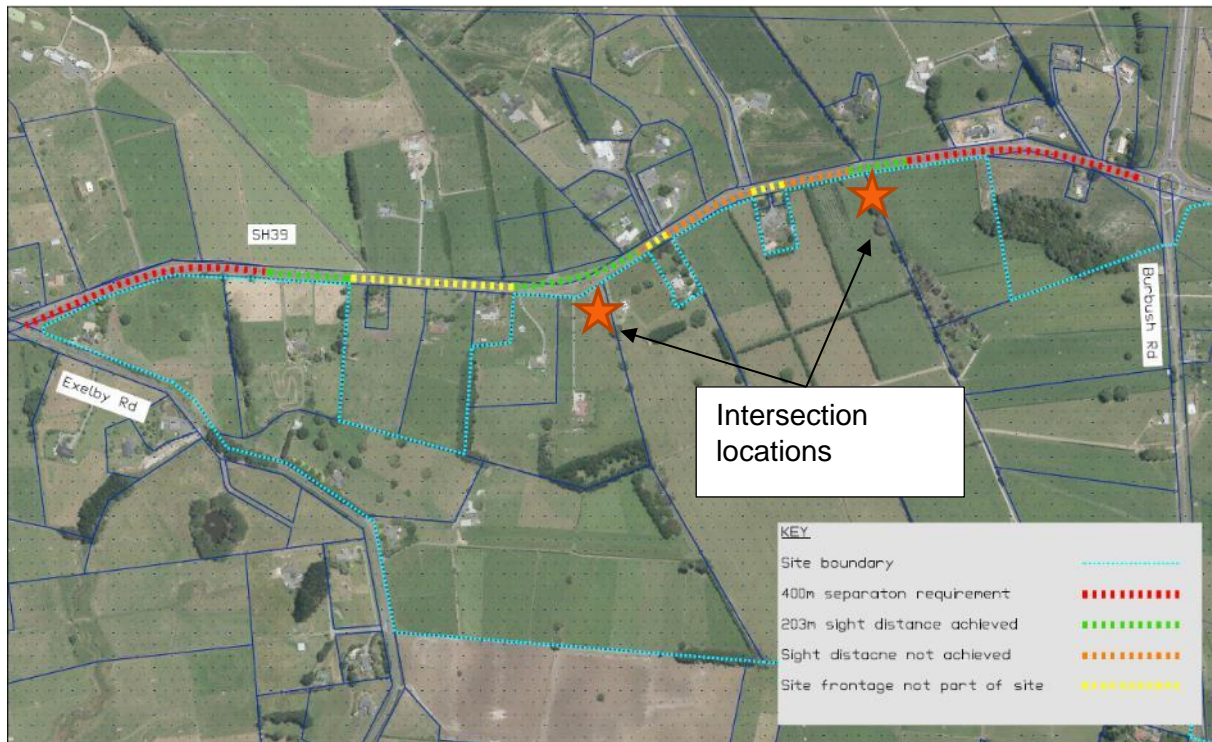


The diagram shows:

- Locations where any proposed intersection would be too close to existing intersection (RED);
- Locations where sight distance is achieved (GREEN);
- Locations where sight distance is not achieved (ORANGE); and
- Locations where locations on SH39 which are not part of the subject site (YELLOW).

The same figure is shown in Figure 8-2 below together with the locations proposed masterplan intersection locations.

Figure 8-2: SH39 constraints



Both locations are considered to be in locations that achieve appropriate separation and sight distance.

9 INTERNAL INTERSECTIONS

The exact formation of individual internal intersections should be considered as part of each detailed development application.

9.1 PROPOSED PROVISIONS

The following transport related rules have been included in the PPC text:

Vehicle Crossings and Internal Vehicle Access

- *new rules to supersede equivalent in Chapter 25/Appendix 15*
- *Minimum widths between vehicle crossings = 2m*
- *Minimum distance for a vehicle crossing from a local road intersection = 10m*

Testing of the current rules, (along with experience with the Auranga development which is another project being undertaken by the applicant for a medium density living development), that modification of the City-wide rules/Appendix 15 rules is required to ensure alignment between transport provisions and the densities possible with the Zone and structure plan provisions.

The local road intersection vehicle crossings locations modification can be managed via designing roads to achieve a lower speed environment (i.e. target of 30km per hour along local roads) to improve the operating characteristics of the road. As the construction of new roads requires resource consent in the first instance (as a restricted discretionary activity) the council has adequate discretion to ensure that the lower speed environment can be achieved.

The modification to widths between crossings is a clarification only as the District Plan is unclear (provides two confliction options). Vehicle crossings will also largely be determined at subdivision design stage so as to not conflict with street furniture/lighting/planting parking bays etc.

Design and Access Widths

- *new rules to supersede equivalent in Chapter 25/Appendix 15*
- *provision for a combined vehicle crossing width of 6m*
- *provision for rear lane standards (equivalent to Rule 23.7.8).*

The current vehicle crossing widths do not take into account pairing opportunities, and these are important in supporting smaller lot sizes with narrower road frontages.

Rear lane standards are repeated so as to avoid any confusion over their intended land use or subdivision status.

Design and Access Widths

Insert vehicle access restrictions (no direct access onto SH39, minor arterial road and collector road with a dedicated cycleway/3m shared path).

Direct vehicle access to SH39 from individual lots is not considered to be appropriate under any circumstances because of the traffic safety and road function implications. Provisions seek to prevent this outcome, which is a matter reflected in the structure plan. Further, a shared use path is proposed along the minor arterial road only therefore no access should be proposed along this road.

The other restrictions address potential safety and amenity conflicts between private vehicles and cyclists (and promote use of rear lanes which in turn supports higher density development) on collector roads. As such, it is appropriate that the rule restrict vehicle accesses over the shared paths or cycle lanes associated with a collector road.

Parking

Insert new standard for parking = 1 carpark per duplex or terraced housing unit.

Justification for this reduction is provided in section 7.1. above.

10 INTEGRATION WITH FUTURE TRANSPORT NETWORK

10.1 GENERAL

The following section provides a review of established policy and plans in relation to the proposed development. The documents reviewed comprise:

- Operative Chapter 25 of the HCDP.
- The Waikato Plan 2017;
- Waikato Regional Land Transport Plan;
- Waikato Regional Public Transport Plan; and
- Regional walking and cycling strategy.

10.2 CHAPTER 25 OF HCDC

Section 25.14 of the HCDP outlines the city-wide objectives, policies and rules relevant to the transport network with the primary objective being “*an integrated multi-modal transport network that meets national, regional and local transport needs and is:*

- *Responsive;*
- *Efficient;*
- *Affordable;*
- *Safe;*
- *Accessible;*
- *Sustainable; and*
- *Integrated with land-use”*

The plan intends to achieve this vision with the following policies:

- The transportation network and related infrastructure is planned, designed, constructed and managed in a manner that:
 - is consistent with and supports the land-use spatial framework for the City (Figure 2.1a in Chapter 2)’
 - Promotes vibrant business centres;
 - Contributes to safe and efficient multi-modal transport corridors serving the Central City, business centres and other key destinations;
 - Contributes to a transportation network;
 - Recognises the need for effective long-term solutions that are affordable and practicable.

The proposal intends to provide a multi-modal road network along the proposed collector and minor arterial road including a 3 m shared path or on-road cycle facilities. The proposal also restricts access of all residential properties to local and collector road, therefore no access is proposed along SH39 or the minor arterial road, to improve safety for vehicles entering/ leaving properties and reduce collisions involving through movements. Based on this, the proposal is considered to support the transport related objectives and policies outlined in the HCDP. The proposal also intends to rezone the PPC area to predominantly residential zoning which aligns with the zoning outlined in Figure 2.1a of Chapter 2 of the HCDP.

10.3 THE WAIKATO PLAN

The Waikato Plan (“the plan) is a comprehensive document that identifies and addresses issues that the region faces and seeks to take advantage of opportunities for the Waikato region. The plan identifies five key priorities with 10 key action plans to address these priorities. The five priorities are as follows:

1. Planning for population change;
2. Connecting communities through targeted investment;
3. Partnering with iwi/ Maori;
4. Addressing water allocation and quality; and
5. Advancing regional economic development.

In order to achieve the second priority (connect communities), four key transport related actions have been identified including;

- Key action 4: advocate on behalf of regional transport priorities;
- Key action 5: Integrate Waikato and Auckland Transport networks;
- Key action 6: encourage development of a nationally significant cycling and walking experience; and
- Key action 7: Establish a freight and logistics action group.

As noted, the proposed residential development, will provide for an additional 2000 dwellings, this will enable and support an increase in population within Rotokauri North and northern Hamilton. It will also provide a roading network which integrates with the existing and Hamilton town centre as well as the wider state highway network and include pedestrian features encouraging the use of alternative modes for local journeys. Based on this, the proposal is considered to support the Waikato Plans priorities.

10.4 WAIKATO REGIONAL LAND TRANSPORT PLAN (RLTP)

The 2018 Update to The Waikato Regional Land Transport Plan (2015-2045) (“RLTP”) sets out the direction for the region’s transport system for the next 30 years. It identifies the land transport objectives and direction for land transport that the region is seeking to achieve to contribute to an effective, efficient and safe land transport system. Four transport objectives are identified in the plan and are summarised below:

- An efficient and resilient land transport system that advances regional economic wellbeing and facilitates freight movement on strategic corridors in the upper North Island;
- A planned transport response that supports future growth areas;
- Land transport in the Waikato region is a Safe System, working towards zero deaths and serious injuries
- A transport system that provides an inclusive range of integrated, quality transport choices for all users to meet their social, economic and cultural needs.

A number of upgrades are planned to the existing land transport infrastructure near the vicinity of the site.

The proposed upgrades to the existing land transport infrastructure surrounding the site will integrate and align with the current road network as well as support the proposed growth in the area, thus contributing to a safe, efficient and effective transport system within Rotokauri North and Hamilton. These upgrades will connect the proposed development with the existing Hamilton town centre community and provide access to multi modal services such as cycling & walking.

As such, the PPC is considered to be supportive of the RLTP objectives.

10.5 WAIKATO REGIONAL PUBLIC TRANSPORT PLAN (RPTP)

The Waikato Regional Public Transport Plan 2018 - 2028 (“RPTP”) outlines the strategic direction for public transport in the Waikato region over the next 10 years. The plan provides a means for councils, transport operators and stakeholders to work together to develop and improve the public transport services and infrastructure in the region, while also enabling public input into the design and operation of the public transport network.

The vision of the RPTP is to “*build a public transport system that enhances the vitality of our communities, strengthens our economy and helps create a healthier environment*”.

The following key policy focus areas are outlined in the RPTP to support this goal:

- Plan for a layered network of public transport services made up of Mass transit, Frequent, Connector, Coverage and Targeted public transport services;
- Consider the needs of the transport disadvantaged when providing for public transport services. The following groups of people are considered transport disadvantaged:
 - People with disabilities;

- People without a driver licence or access to a vehicle
- Children or elderly
- People with low income and/or living in 'high deprivation' neighbourhoods
People living in isolated communities with no easy transport access to essential services.
- Ensure public transport services at least meet the standard service levels set out in table 3.1 for each layer where there is appropriate demand and available funding.

There are currently very limited public transport services available near Rotokauri North area. However, as the remainder of the structure plan area is developed, it is likely that extensions to existing bus services, or new bus services, will be introduced to connect the site with the Hamilton town centre. Establishment of these services by Council would provide the development with improved access to public transport services and has the potential to reduce traffic flows between these areas.

Table 23 of the RLTP indicates that there are plans to extend the existing Frankton service into the Rotokauri development.

In this regard, it is expected that as the public transport services outlined in this ITA are implemented, the proposed development is considered to align well with the objectives of the RPTP.

10.6 ACCESS HAMILTON

Access Hamilton is a high-level integrated transport strategy that has been developed to assist the Hamilton City Council, to achieve its strategic objectives for the city's development and transport infrastructure planning, over the next 30 years. The strategic vision of the plan is to:

- Deliver an affordable, integrated, safe, responsive and sustainable transport system;
- Support economic, social, environmental and cultural well-being;
- Manage incremental change in transport and land-use systems by applying a hierarchy of interventions;
- Position infrastructure and land development to meet the city's long-term needs.

The proposed development intends to provide an integrated transport system integrating all users (including private vehicles, cyclists and pedestrians). Further, as noted a number of upgrades are planned to the existing land transport infrastructure near the vicinity of the site.

The proposed upgrades to the existing land transport infrastructure surrounding the site will integrate and align with the current road network as well as support the proposed growth in the area, thus contributing to a safe, efficient and effective transport system within Rotokauri North and Hamilton.

As such, the PPC is considered to be supportive of the Access Hamilton objectives.

10.7 REGIONAL WALKING AND CYCLING STRATEGY

The 2009 - 2015 Regional Walking and Cycling Strategy outlines the strategy for walking and cycling within the Waikato region in accordance with the RLTP. The vision of the strategy is that: "*Walking and cycling are safe, integrated and accessible activities in the Waikato region*". The strategy intends to achieve this vision with the following three policies and actions:

- Support the construction and maintenance of accessible walking and cycling infrastructure throughout the regions for all user types;
- Promote travel demand management and travel behaviour change initiatives that assist walking and cycling in relieving urban congestion and improving journey time reliability; and
- Recognise the role that walking and cycling can play in the economic development of the region.

The proposed development intends to provide on-road cycle paths and pedestrian footpaths along all collector roads within the development as well as a shared use path along the main minor arterial road. This will provide an easily accessible path for the use of other modes of transport to and from the site and has the potential to reduce the number of vehicles on the road network. Therefore, the proposal is considered to align well with the walking and cycling strategy.

11 CONSTRUCTION TRAFFIC

The proposed development will result in the demolition of the existing facilities followed by the excavation and construction work associated with the new buildings.

Throughout all other construction periods (e.g. fit out, building construction) truck volumes are expected to be typical of a standard construction site and low in comparison with the ultimate traffic generation of the site.

As is typical with a development of this scale, it is proposed that provision be made in the conditions of consent for a Construction Traffic Management Plan to be developed for the works anticipated. It is considered that this Construction Traffic Management Plan should include:

- Construction dates and hours of operation including any specific non-working hours for traffic congestion/noise etc, aligned with normally accepted construction hours in the Hamilton City Region;
- Truck route diagrams both internal to the site and external to the local road network.
- Temporary traffic management signage/details for both pedestrians and vehicles, to manage the interaction of these road users with heavy construction traffic; and
- Details of site access/egress over the entire construction period and any limitations on truck movements. All egress points should be positioned to achieve appropriate site distances.

Based on experience of constructing similar projects and bearing in mind capacity within the existing road network, with the appropriate Construction Traffic Management Plan in place and the above measures implemented, it is considered that construction activities will be managed to ensure an appropriately low level of traffic effects.

Of note, the construction activities are temporary and with appropriate measures in place are able to be managed. Therefore, construction effects can be maintained to a less than minor level.

12 CONSULTATION

The following consultation (attended by Commute) has been undertaken with the Hamilton City Council and NZTA on transport matters relating to the Rotokauri north development. It is the applicants understanding that HCC and NZTA have jointly engaged Mr Alastair Black of Grey Matter to review and provide advice/feedback on behalf of both parties.

- Workshop with Mr Alastair Black of Grey Matter Ltd on 30th July 2018.
- Memo from Commute Consultants dated 24th September 2018, which was emailed to NZTA, Grey Matter and HCC on SH39 access (no feedback received).
- Meeting with Mr Alastair Black and Ms Paula Rolfe (Hamilton City Council) on 26th February 2019 to discuss HCC review of draft ITA dated December 2018.

Several matters were brought to attention during the consultation with NZTA and HCC and as a result of draft feedback from Grey matter and the meeting on 26th February 2018. These matters have been incorporated into this report.

13 IMPLEMENTATION PLAN

Table 13-1 summarises the proposed Rotokauri North Implementation Plan. It sets out local and wider area works that will need to be addressed as part of development of this site.

Table 13-1: Implementation plan

Upgrades/ proposed road provision	Upgrade	Comments	Funder
1 x New collector road/ SH39 intersection	Roundabout controlled intersection (single lane)	Roundabout required for initial development (first sub-stage). This is subject to construction occurring near the northern portion of the site.	Developer
1 x New collector road/ SH39 intersection	Priority control intersection/ roundabout (single lane)	Initial connection developed as priority control intersection. Potential for upgrade to roundabout control as required (assessed at each sub-stage)	Developer
Burbush Road	Upgrade Burbush Road to a collector road	Will be required as part of initial development (using this road)	Developer
	Monitor the operation of Burbush Road, to the south of the PPC area, in the interim period (pre-upgrade and urbanisation) to assess whether the safety or efficiency of this section is compromised	Will be required, in the interim period, pre-upgrade and urbanisation of Burberry Road (south of the PPC area).	Developer
Te Kowhai Road/ SH39 intersection	Upgrade as per the layout in Figure 6-6 (two-lane roundabout)	Will be required prior to full buildout. Intersection to be assessed at each sub-stage) to determine timing of upgrade	Developer
Exelby Road	Upgrade Exelby Road to a collector road	Will be required as part of initial development (using this road)	Developer
Development	Local and Collector roads	As required	Developer
As required	Provision of Public Transport	Provision of a PT network to serve the area recommended	Council

		to occur after 1000 dwellings have been constructed	
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The timing of each of each upgrade/ proposed works is subject to demand and will be determined at resource consent for each sub-stage. It is noted that as part of the existing HCCDP, any road construction is subject to resource consent, and the effects on the wider traffic network (including any upgrades required) falls within the scope of matters than can (and will be) considered. No new framework is required by this PPC to determine the timing of each intersection upgrade.

14 CONCLUSION

The descriptions, analyses and assessments provided in this report have shown that:

- The existing road network will partly provide for accessibility of the site by various transport modes: walking, cycling, bus and private vehicle;
- the extent of development proposed can be accommodated by the surrounding road network while maintaining acceptable levels of safety and performance; and
- the proposed development is consistent with and encourages key regional and district transport policies.

It is recommended that the transport network upgrades described in section 13 of this assessment be provided to enable the proposal to be appropriately supported by the road network. These can be addressed through the relevant resource consent applications.

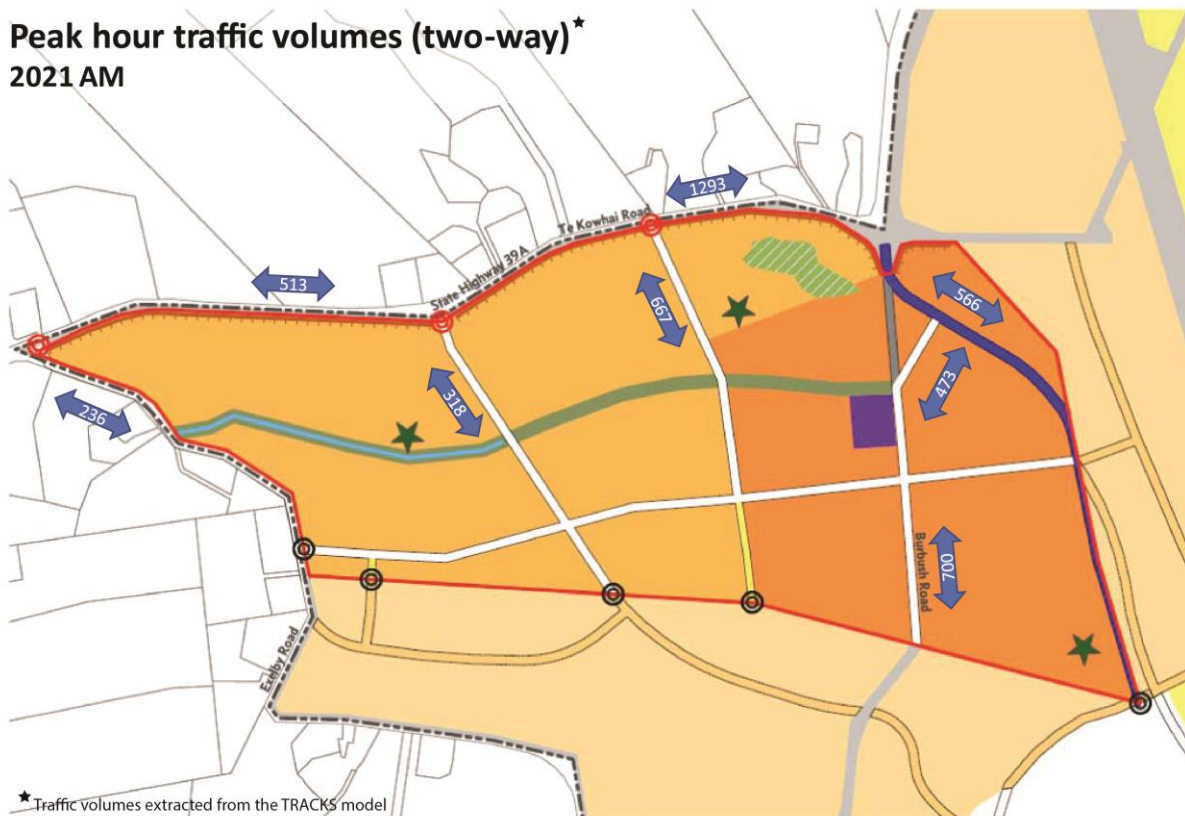
The full extent of development enabled by the proposal will be appropriately supported by the existing road network and upgrades to existing road network (as detailed above) to maintain appropriate levels of safety and efficiency on the surrounding road network.

Accordingly, it is concluded that there is no traffic engineering or transportation planning reason to preclude acceptance of this proposal.

Commute Transportation Consultants

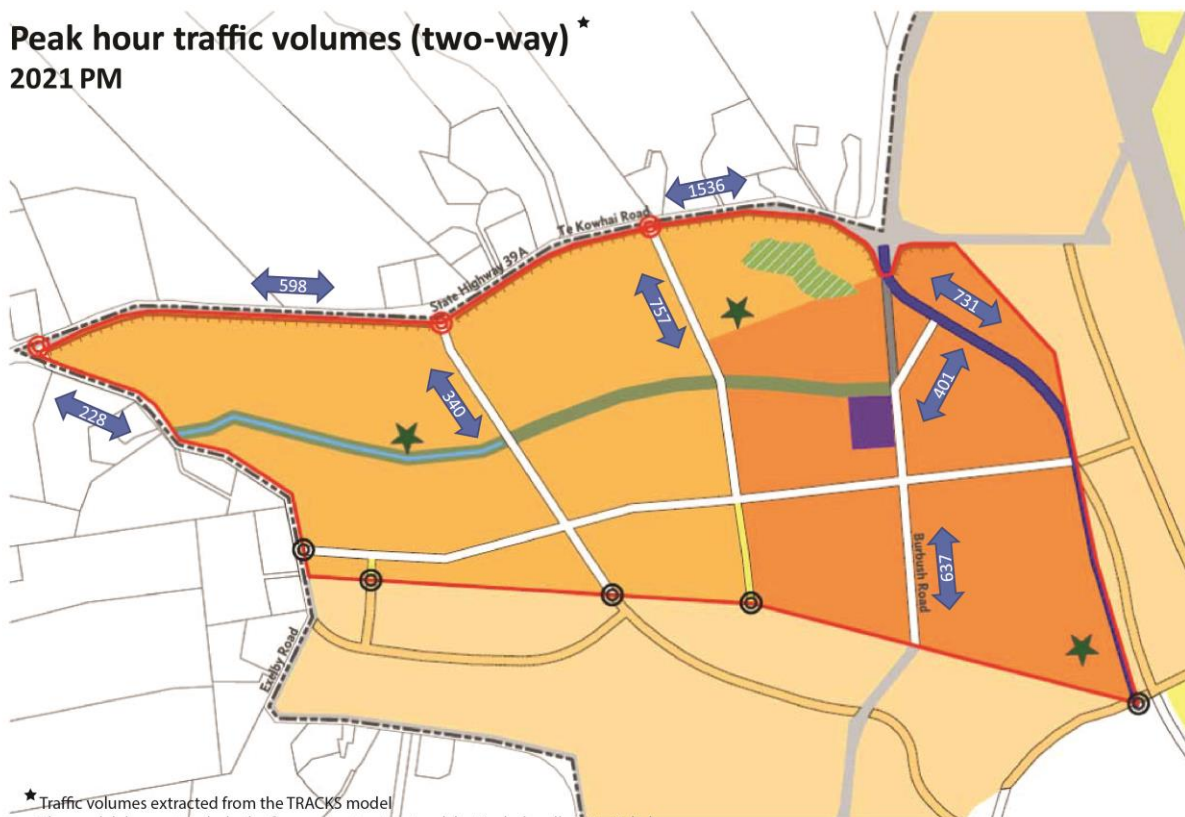
ATTACHMENT A – TRACKS PROPOSED VOLUMES (2021 & 2041)

Peak hour traffic volumes (two-way)*
 2021 AM



*Traffic volumes extracted from the TRACKS model
 The model does not include the finer grain street network but includes all strategic links

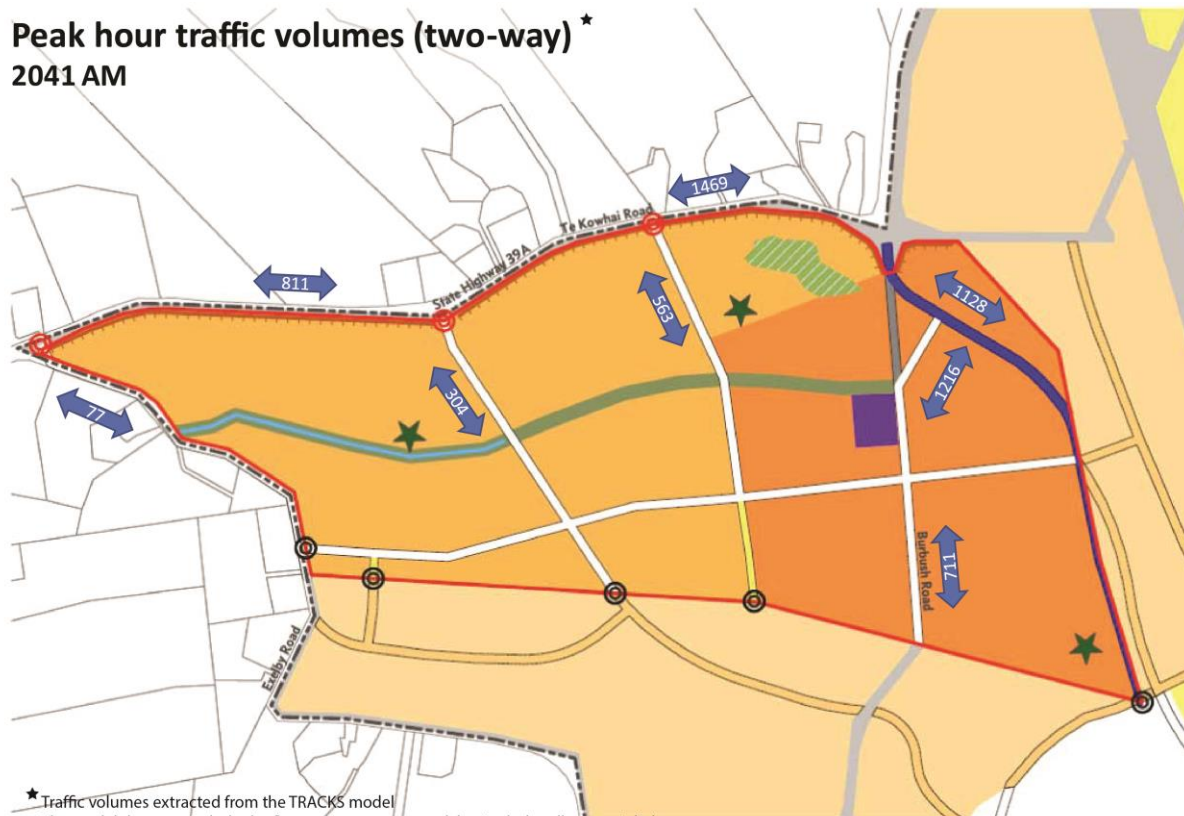
Peak hour traffic volumes (two-way)*
 2021 PM



*Traffic volumes extracted from the TRACKS model
 The model does not include the finer grain street network but includes all strategic links

Peak hour traffic volumes (two-way) *

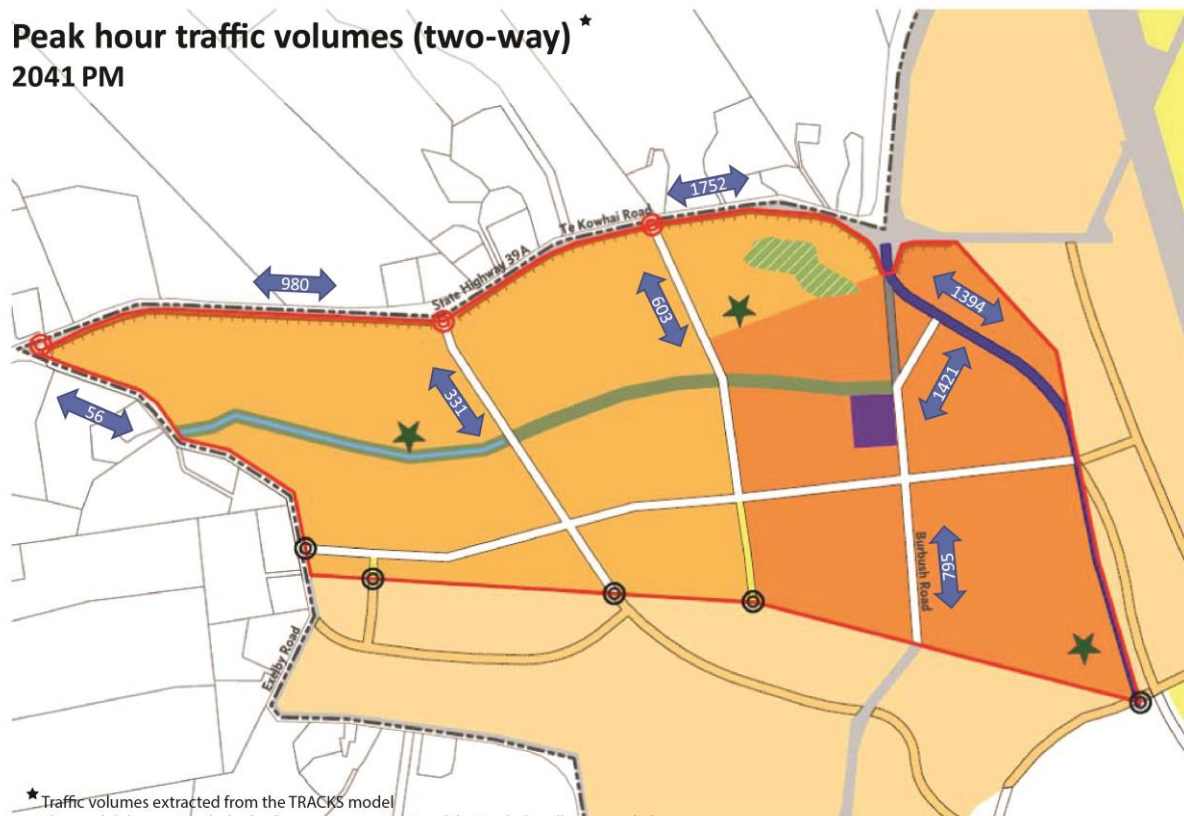
2041 AM



* Traffic volumes extracted from the TRACKS model
The model does not include the finer grain street network but includes all strategic links

Peak hour traffic volumes (two-way) *

2041 PM



* Traffic volumes extracted from the TRACKS model
The model does not include the finer grain street network but includes all strategic links