Project Number: 5-P1492.00

Roxburgh Crescent Plan Change

Transport Assessment

01/03/2024

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Document Details:

Date: 1 March 2024
Reference: 5-P1492.00
Status: Final

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Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
1	23/08/2022	M Evis	G Randall	A Harris	Draft
2	01/03/2024	M Evis	G Randall	A Harris	Final

Revision Details

Revision	Details
1	Draft report for client comment
2	Updated information on existing network conditions, updated structure plan and roading cross sections.

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Disclaimer

This report ('Report') has been prepared by WSP exclusively for Palmerston North City Council ('Client') in relation to developing a Transport Assessment ('Purpose') and in accordance with the Short Form Agreement with the Client dated 28th June 2022. The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

1 Introduction

WSP has been commissioned by Palmerston North City Council (PNCC) to undertake a Transport Assessment (TA) of the proposed Plan Change to rezone existing industrial land at 20-34 Roxburgh Crescent to a medium-density residential zoning. The proposed rezoning of the site could result in the development of approximately 104 new residential dwellings on the site. An accompanying Structure Plan has been developed for the proposed Plan Change area outlining the indicative transport network and site arrangements (discussed further in Section 3). The proposed site area for inclusion within the proposed Plan Change is shown within Figure 1-1 below.

Figure 1-1: Area Included within the Roxburgh Crescent Proposed Plan Change

1.1 Report Purpose

The existing site is currently zoned "industrial" within the PNCC District Plan. The primary purpose of this TA is to provide a high-level assessment of the transport related effects of the potential rezoning of the site from "industrial" to "medium-density residential". The TA also reviews the suitability of the accompanying Structure Plan from a transportation perspective.

The following traffic related items have been considered:

- The expected trip generation and site operations,
- The impacts of the proposed development on the local road network,
- The suitability and safety of the proposed site accesses and internal site arrangements, and

- Connectivity of the site for both active modes (walking and cycling) and public transport.

1.2 Site Location

The proposed Plan Change area is located at the south-eastern extent of the Palmerston North urban area and is located approximately 3.5km east of the Palmerston North Central Business District (CBD). The proposed Plan Change area is approximately 2.5 hectares (ha) and located within a small industrial precinct. The area immediately to the south and west is currently zoned residential, whilst to the east the site is bounded by the Manawatu River as shown in Figure 1-2 below.

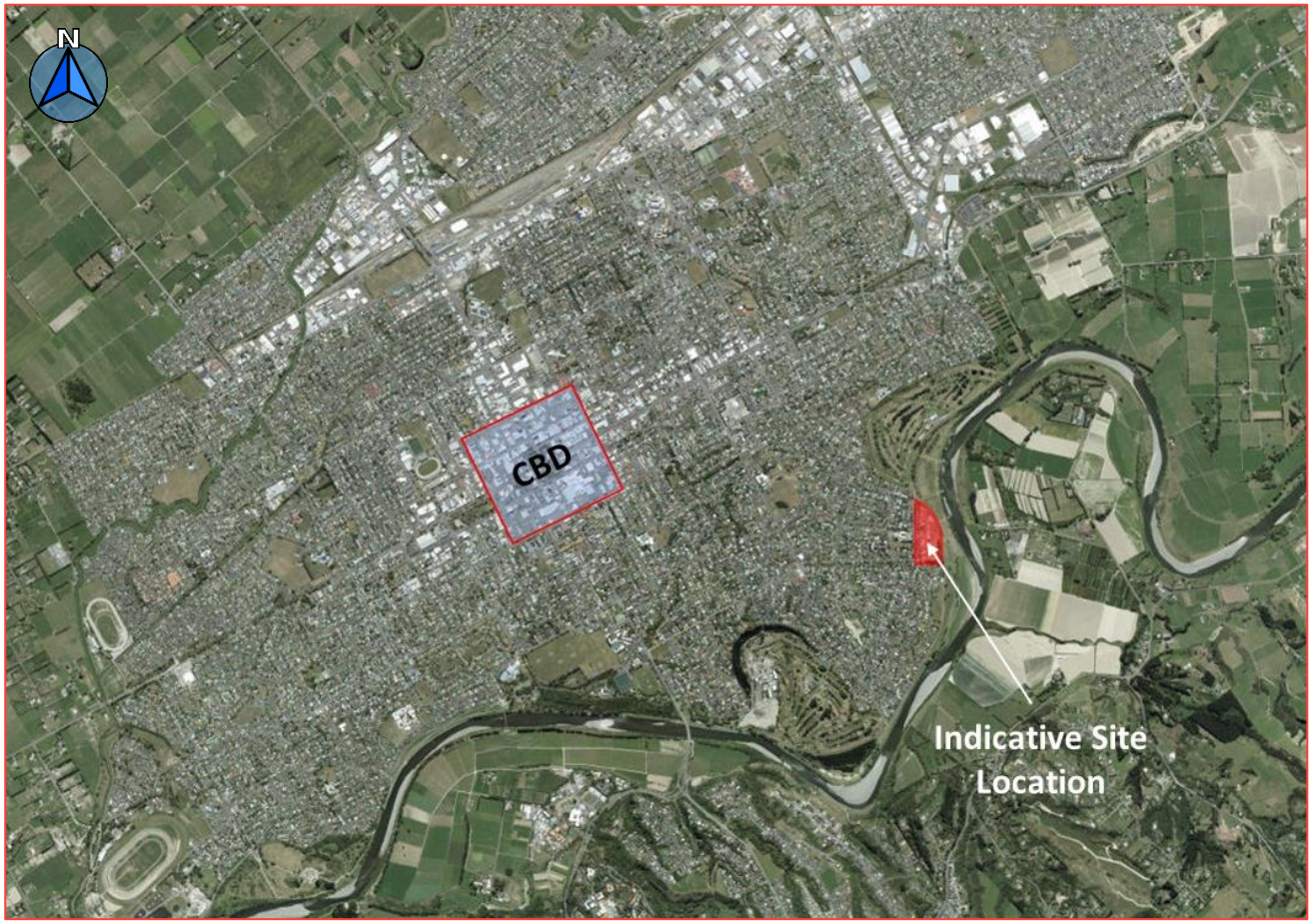


Figure 1-2: Site Context (Source: PNCC GIS Maps)

1.3 Report Structure

The remainder of the report has been structured as outlined below:

- **Section 2:** Provides an outline of the existing transport network within the vicinity of the site;
- **Section 3**: Provides details of the transport aspects of the proposed Plan Change, including the site layout arrangements outlined within the Structure Plan and general on-site provisions;
- **Section 4:** Provides an outline of the assessment of effects including the ability of the network to support traffic generated by the proposed Plan Change, the suitability of the proposed on-site transport arrangements outlined in the Structure Plan and the connectivity of the proposed Plan Change area for non-car based modes of transport; and
- **Section 5:** Summarises the key findings and recommendations of the transport assessment.

1.4 Relevant Information

In developing this Transport Assessment, the following sources of information have been used and appropriately referenced throughout the report:

- MobileRoad (www.mobileroad.org)

- PNCC District Plan – Section 20: Land Transport
- PNCC ATLYST Traffic Count Data
- PNCC Engineering Standards for Land Development (2021)
- Palmerston North Urban Cycling Network Masterplan, PNCC (2019)
- Trip Generation Manual, 9th Edition – Institute of Highway Engineers (ITE)
- Guide to Traffic Generating Developments (2002) – Road and Traffic Authority, NSW
- New Zealand Trips and Parking Database (2017)
- Trips and Parking Related to Land Use – Research Report 453, Waka Kotahi, 2011

2 Existing Transport Environment

This section of the report provides a description of the existing transport network and safety record within the vicinity of the proposed Plan Change area. The assessment focuses on the principal roads of interest within the study area, these being:

- Roxburgh Crescent;
- Ruahine Street;
- Pahiatua Street;
- Albert Street; and
- Te Awe Awe Street.

2.1 Transport Network

The roading hierarchy differentiates between roads by function. Roads at the top of the hierarchy are generally arterial routes that cater for through traffic and often have high traffic volumes. Roads at the lower end of the hierarchy (collector and local roads) generally have lower traffic volumes and provide an access function. The existing road hierarchy as defined within the PNCC District Plan is shown in Figure 2-1, with a definition of each road classification provided within Table 2-1.

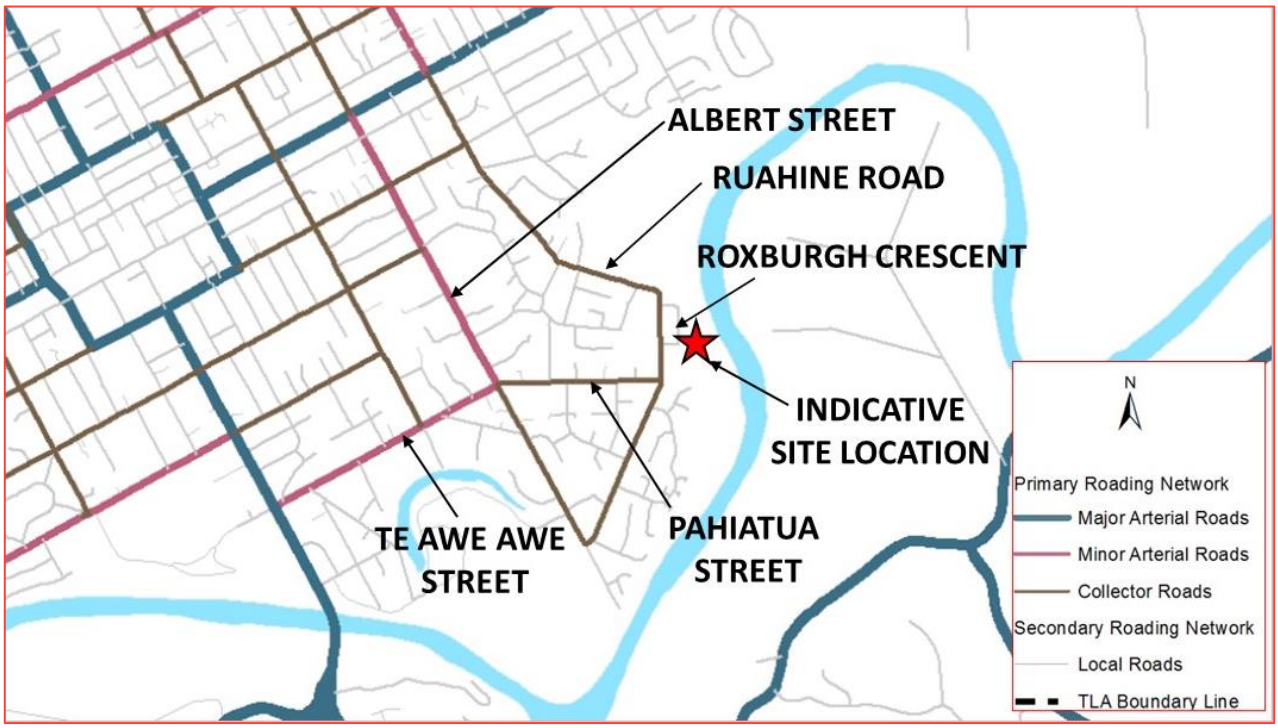


Figure 2-1: Excerpt from Road Hierarchy – Palmerston North (District Plan Figure 20A.2)

Table 2-1: PNCC Road Hierarchy Classification Description

CLASSIFICATION	DESCRIPTION	RELEVANT ROADS
Minor Arterial Road	Minor Arterial Roads provide access between Collector and Major Arterial Roads. These roads have a dominant through vehicular movement and carry the major public transport routes. Access to property may be restricted and rear servicing facilities may be required. Urban traffic volumes are typically 8,000 vehicles per day to 20,000 vehicles per day and rural from 1,000 to 5,000 vehicles per day with a higher proportion of heavy vehicles. Typical urban operating speeds are 40 to 60 km/h and rural 80 to 100 km/h.	Te Awe Awe Street Albert Street
Collector Road	Collector Roads provide circulation in local areas and links to arterial roads, while balancing these needs with pedestrian and local amenity values. These roads provide access for all modes of transport including public transport. Typical traffic flows are between 3,000 and 10,000 vehicles per day.	Ruahine Road Pahiatua Street
Local Road	Local Roads provide access and connectivity within a local area. Low vehicle speeds, pedestrian and local amenity values predominate. Such roads typically carry up to 3,000 vehicles per day and their two lanes provide for on-street parking, property access and pedestrian needs.	Roxburgh Crescent

Albert Street, Ruahine Road, Pahiatua Street and Te Awe Awe Street form part of the Primary Road network. Albert Street (north of Pahiatua Street) and Te Awe Awe Street are identified as minor arterial roads, whilst Ruahine Street and Pahiatua Street are identified as collector roads in the District Plan. Ruahine Street forms the primary route for north/south traffic, whilst Pahiatua Street (located to the south of Roxburgh Crescent) provides the primary route for east/west traffic within the vicinity of the proposed Plan Change area.

A summary of the road network characteristics of key routes in the vicinity of the proposed Plan Change area is summarised within Table 2-2. All roads within the surrounding area are within the urban speed limit boundary, which has a posted speed limit of 50km/hr.

Table 2-2: Summary of Roading Characteristics[1]

ROAD NAME	ROAD HIERARCHY	ROAD WIDTH	AVERAGE WEEKDAY TRAFFIC VOLUMES			OPERATING SPEED (85TH %TILE)
			ALL DAY	AM PEAK	PM PEAK	
Roxburgh Crescent (northern link)	Local Road	11.0m	730 (24.2%)	60	70	35.8 km/hr
Roxburgh Crescent (southern link)	Local Road	11.0m	660 (15.2%)	70	70	29.1 km/hr
Ruahine St (east of Newcastle St)	Collector	11.0m	3,220 (7.1%)	346	292	48.4 km/hr
Ruahine St (west of Windsor St)	Collector	12.0m	6,700 (4.9%)	749	574	54.4 km/hr
Pahiatua St (west of Ascot St)	Collector	11.0m	4,540 (4.9%)	460	450	53.4 km/hr
Albert St (north of Elmira St)	Minor Arterial	13.0m	14,300 (6.0%)	1,210	1,262	47.8 km/hr
Te Awe Awe St (west of Ihaka St)	Minor Arterial	13.0m	14,235 (5.3%)	1,360	1,258	46.4 km/hr

[1] Speeds and traffic volumes have been determined from PNCC's ATLYST database. Data for Roxburgh Crescent includes traffic generated by the Higgins construction yard prior to its relocation.

2.2 Road Description

2.2.1 Roxburgh Crescent

Roxburgh Crescent is classified as a "local" road within the District Plan and currently provides access to the existing industrial buildings along its length. Roxburgh Crescent will continue to operate as the primary connection to the surrounding road network from the proposed Plan Change area.

Roxburgh Crescent is a loop road which is approximately 350m in length, intersecting with Ruahine Street on both its northern and southern end. There are no formal controls provided on the northern intersection at present. The southern intersection is controlled through a "Stop" priority with Roxburgh forming the minor approach.

Weekday traffic volumes on both extents of Roxburgh Crescent are estimated to be between 650-750 vehicles per day (vpd) of which between 15% to 25% is estimated to be heavy vehicles[2]. During weekends, traffic volumes are significantly lower than recorded weekday traffic volumes (approx. 170-180 vpd). This is largely driven by weekday industrial activities related to the Higgins construction yard; however, there are several residential properties present on the western extents of Roxburgh Crescent which also generate trips during the weekend period.

Roxburgh Crescent has a road reserve width of 13.0m, with a carriageway width of approximately 11.0m. It is formed of two general traffic lanes with parking restrictions provided on one-side of the road. A footpath (ranging between 1.5 to 2.0m wide) is provided on one side of Roxburgh Crescent along the majority of the road alignment.

2.2.2 Ruahine Street

Ruahine Street is a collector road which carries between 3,200 vpd on its southern extent (near Roxburgh Crescent) to 12,000 vpd between Church Street and Main Street. The large volume of traffic on the northern section of the route is attributed to the regional connectivity that Ruahine Street provides onto Main Street (State Highway 3) and the northern section of Ruahine Street as these roads are both arterial roads, which facilitate movement and access throughout the day.

Ruahine Street provides connections between the suburbs of Hokowhitu and Terrace End enabling local and regional connectivity to the primary road network. Within the vicinity of Roxburgh Crescent, the road carriageway is approximately 11.0m wide and is formed of two general traffic lanes with on-street parking permitted on both sides. The road currently has a posted speed limit of 50km/h[3].

2.2.3 Pahiatua Street

Pahiatua Street is identified as a Collector Road within the District Plan, providing east-west connectivity between Ruahine Street as well as other regionally significant routes on the primary roading network including Albert Street and Te Awe Awe Street. Pahiatua Street has a road carriageway width of approximately 11.0m and is formed of two general traffic lanes with on-street parking permitted on both sides of the road. Pedestrian footpaths are also provided on both sides of the road. The road has an estimated ADT of approximately 4,500 vpd with heavy vehicles comprising approximately 5% of traffic. The road currently has a posted speed limit of 50km/h[4].

2.3 Public Transport Network

Horizons Regional Council are currently implementing a new public transport operating model ("Connect") that will provide more direct and frequent bus services across Palmerston North. The new network will be operational from March 2024.

Bus services within the new network that will operate within the vicinity of the proposed Plan Change area include the Cloverlea-Hokowhitu (Route 103/104) and City East to Massey (Route 121)

[2] **Note**: this is based on data from 2019 recorded within PNCC's ATLYST traffic count database. Existing weekday traffic flows are expected to have reduced during weekdays as a result of Higgins' relocation from the site in 2023.
[3] https://speedlimits.nzta.govt.nz/
[4] https://speedlimits.nzta.govt.nz/

(see Figure 2-2). The frequencies of services are shown in Table 2-3. The Cloverlea-Hokowhitu (Route 103) route provides access to the city centre (Main Street bus terminal) where connections can be made to numerous other services including both regional and national bus routes.

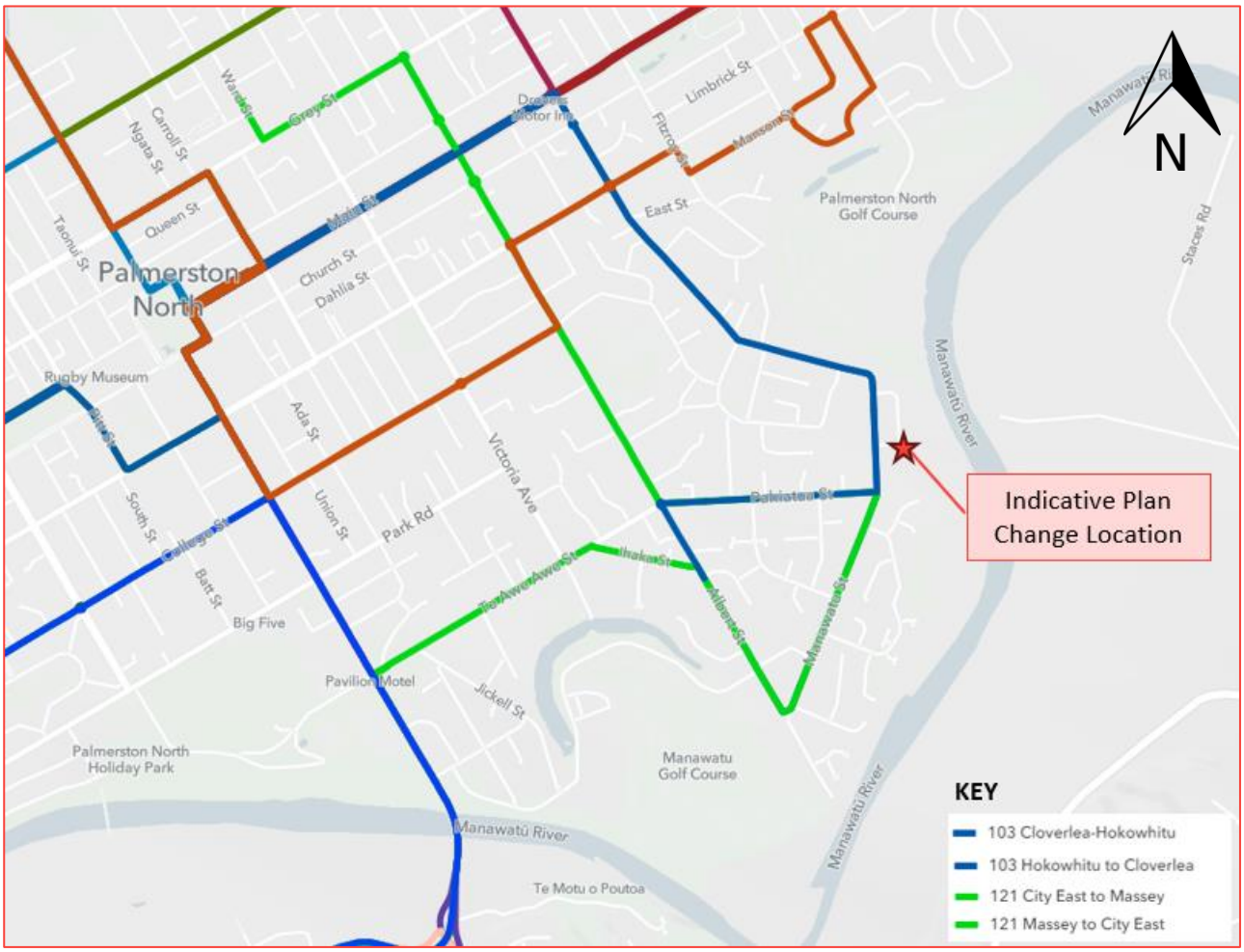


Figure 2-2: Proposed New Network ("Connect") for Palmerston North (Hokowhitu Excerpt)

Table 2-3: Existing Public Transport Services Operating Near the Proposed Plan Change Site

ROUTE	DESCRIPTION	WEEKDAY FREQUENCY	NEAREST STOP
Route 103	Cloverlea to Hokowhitu	Every 15 mins during peak, Every 30 mins off-peak	541 Ruahine Street
Route 103	Hokowhitu to Cloverlea	Every 15 mins during peak, Every 30 mins off-peak	550 Ruahine Street
Route 121	City East to Massey	Every 60 mins (07:20 to 12:30 hrs)	114 Pahiatua Street
Route 121	Massey to City East	Every 84 mins (13:10 to 20:10 hrs)	121 Pahiatua Street

Several bus stops are located within a 400m walking distance of the proposed Plan Change area (as shown in Figure 2-3)[5]. Pedestrian connectivity between local bus stops on Ruahine Street is facilitated through an existing zebra crossing positioned adjacent to Winchester School. As such, the proposed Plan Change area expected to continue to be well serviced by public transport under the New Network.

[5] A 400m radius equates to an approximate 5 minute walking time and is considered an acceptable catchment for bus stops in urban areas within best practice guidelines (link).

Figure 2-3: Bus Stops within an Indicative 400m Radius of Roxburgh Crescent[6]

2.4 Pedestrian and Cycling Connectivity

The existing footpaths on Roxburgh Crescent are largely limited to a single side of the street; however there are short sections on the northern end of Roxburgh Crescent where no formal footpaths are provided resulting in a poor connectivity and accessibility for pedestrians to the wider network (see Figure 2-4 and Figure 2-5). During the site visit it was observed that in some locations the effective width of the existing footpath is restricted by signage and utilities. There are currently no direct connections between the proposed Plan Change area and the Manawatu River Shared pathway.

[6] Bus stop locations shown within the figure include the new pair of bus stops adjacent to 552 Ruahine Street that are being implemented to support the new bus network.

Figure 2-4: Roxburgh Crescent (Southern End)

Figure 2-5: Roxburgh Crescent (Northern End)

Beyond Roxburgh Crescent, the existing roading network provides pedestrian connections to local key destinations including Winchester School, the Manawatu River Shared Path and local convenience stores. An existing pedestrian/kea crossing is provided on Ruahine Street (between the two Roxburgh Crescent connections) which provides direct connections to Winchester Primary School (see Figure 2-6). A zebra crossing exists across Pahiatua Street near the intersection with Ruahine Street.

Figure 2-6: Pedestrian Crossing on Ruahine Street

The location of the proposed Plan Change area in relation to the current and proposed Palmerston North urban cycle network is shown within Figure 2-7. Te Awe Awe Street is located approximately 1km away from Roxburgh Crescent which has on road painted cycle lanes. These bicycle lanes connect to the wider cycle network, providing connections to the CBD, the Esplanade, the Research Institute and Massey University.

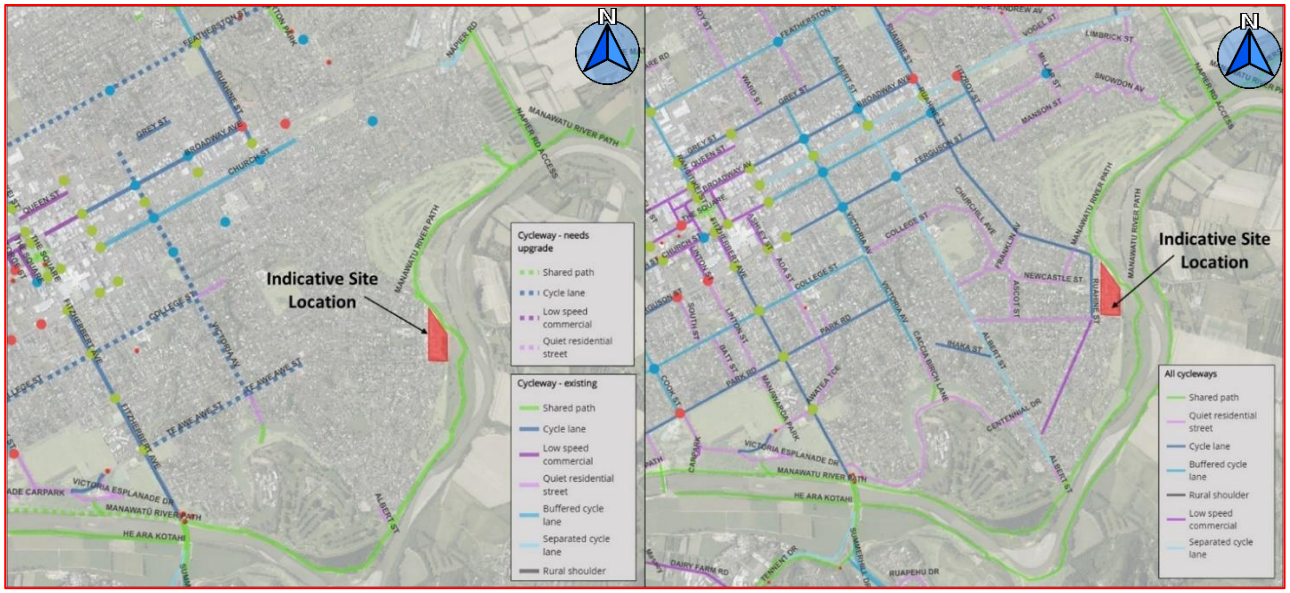


Figure 2-7: Existing Palmerston North Cycle Network (Left) and Proposed Regional Cycle Network (Right) (Source: Urban Cycling Network Masterplan, PNCC)

The proposed Plan Change area is located adjacent to the Manawatu River Shared Path which connects with various parks along the river including the Esplanade, Memorial Park, Paneiri Park, as well as providing cycling connections to the CBD and Massey University via Fitzherbert Avenue or the He Ara Kotahi Bridge. Presently, the closest access to the shared path from the proposed Plan Change area is 200m north of the access of Roxburgh Crescent (via the entry at 523 Ruahine Street – see *Figure 2-8*).

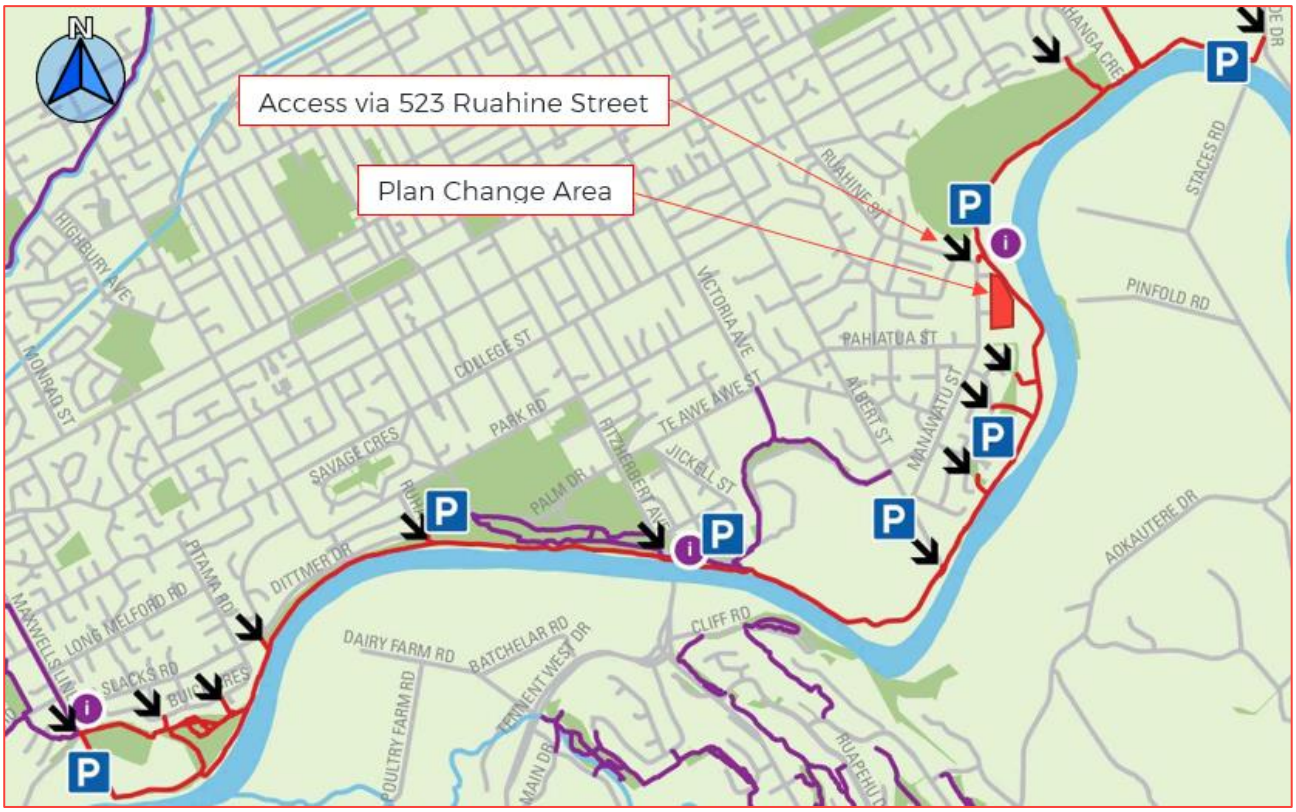


Figure 2-8: Existing Walking and Cycling Connections to the Manawatu Shared Path

2.5 Safety Record

A review of the Waka Kotahi Crash Analysis System (CAS) database has been undertaken to identify all reported crashes in the vicinity of the proposed Plan Change area over a ten-year period from 2013 to 2022. The search also extracted available data from 2023.

A total of 16 crashes have been recorded over this period, of which four resulted in minor injury crashes and 12 non-injury crashes. The location and severity of recorded crashes within the vicinity of the proposed Plan Change area is shown within Figure 2-9[7]. It is noted that none of the recorded crashes involved vulnerable road users (pedestrians or cyclists).

The majority of recorded crashes involved collisions with parked vehicles or loss of control negotiating bends. Alcohol, incorrect lane positioning and travel speeds were noted as the primary influencing crash factors. Whilst a small number of crashes have occurred near the site, there is no history of crashes relating to vehicle movements into or from the Roxburgh Crescent intersections and most crashes resulted from poor driver behaviour. As such, the crash history does not indicate any significant safety concerns in respect to traffic generated by the proposed Plan Change area.

[7] The orange circles denote the location of recorded "minor injury" crashes, whilst the green circles denote the location of recorded "non injury" crashes.

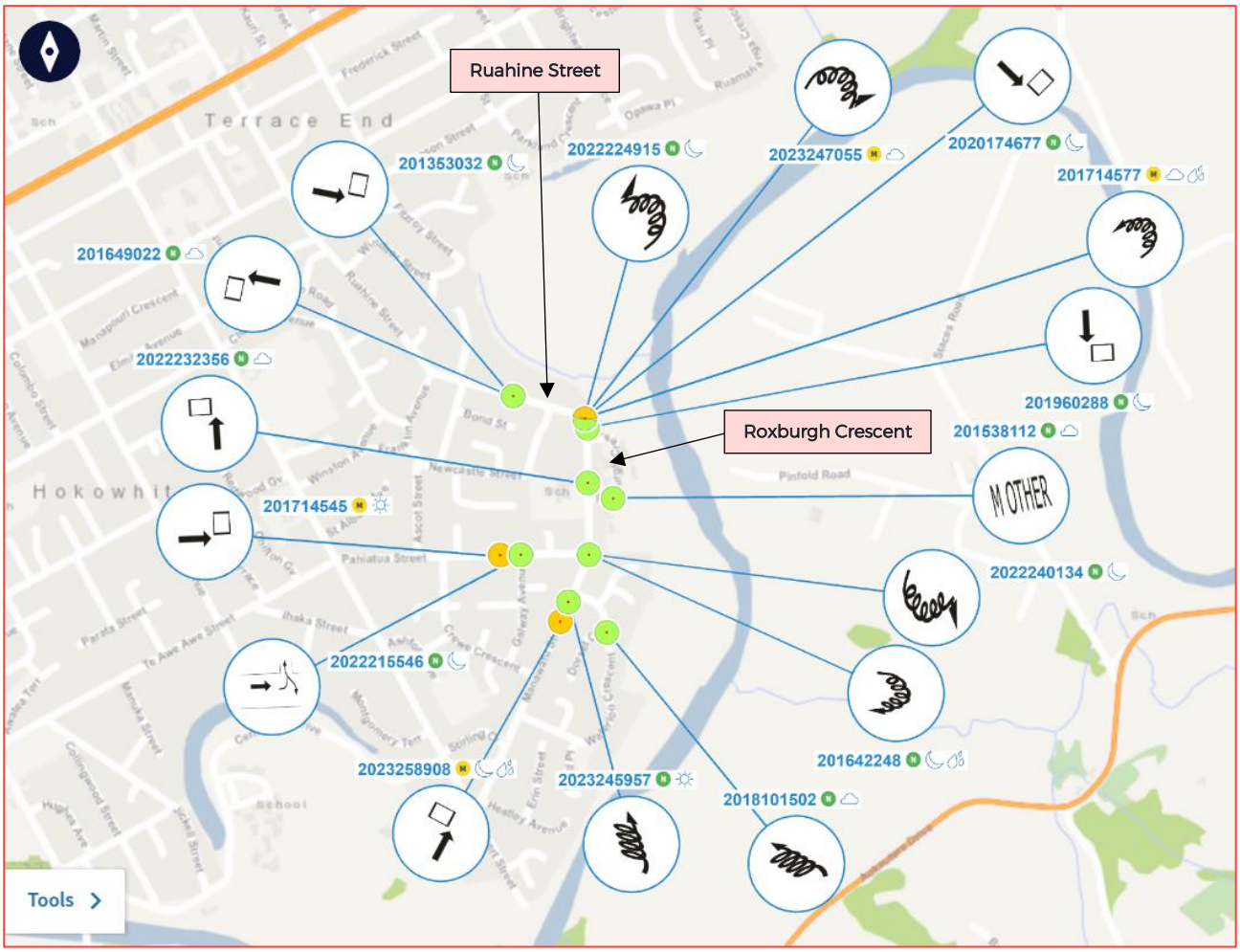


Figure 2-9: Crash Map – Crash Analysis System, 2013-2022[8] (Source: Waka Kotahi)

[8] Includes recorded crashes from 2023

3 The Proposal

A Structure Plan has been developed for the proposed Plan Change area based on minimum lot size of 250m^2. The Structure Plan has been used as a basis for the assessment of effects within this Transport Assessment (outlined in Section 4). The anticipated site yield based on these lot size scenarios is approximately 104 households.

Access for all modes of transport from the proposed Plan Change area would be provided through existing Roxburgh Crescent connections to Ruahine Street (see Figure 3-1). The proposed road network within the Structure Plan has developed around an eastbound extension of Roxburgh Crescent (south) and a southbound extension to the existing Roxburgh Crescent alignment which currently fronts along the western edge of the existing Higgins Site.

The Structure Plan also indicates the use of two existing vehicle crossings from the proposed Plan Change area onto Ruahine Street; both of which currently service activities within the Higgins construction yard. The proposal would also provide access for pedestrians and cyclists onto the Manawatu River Shared Path from the internal road network (denoted by Area C within the Structure Plan).

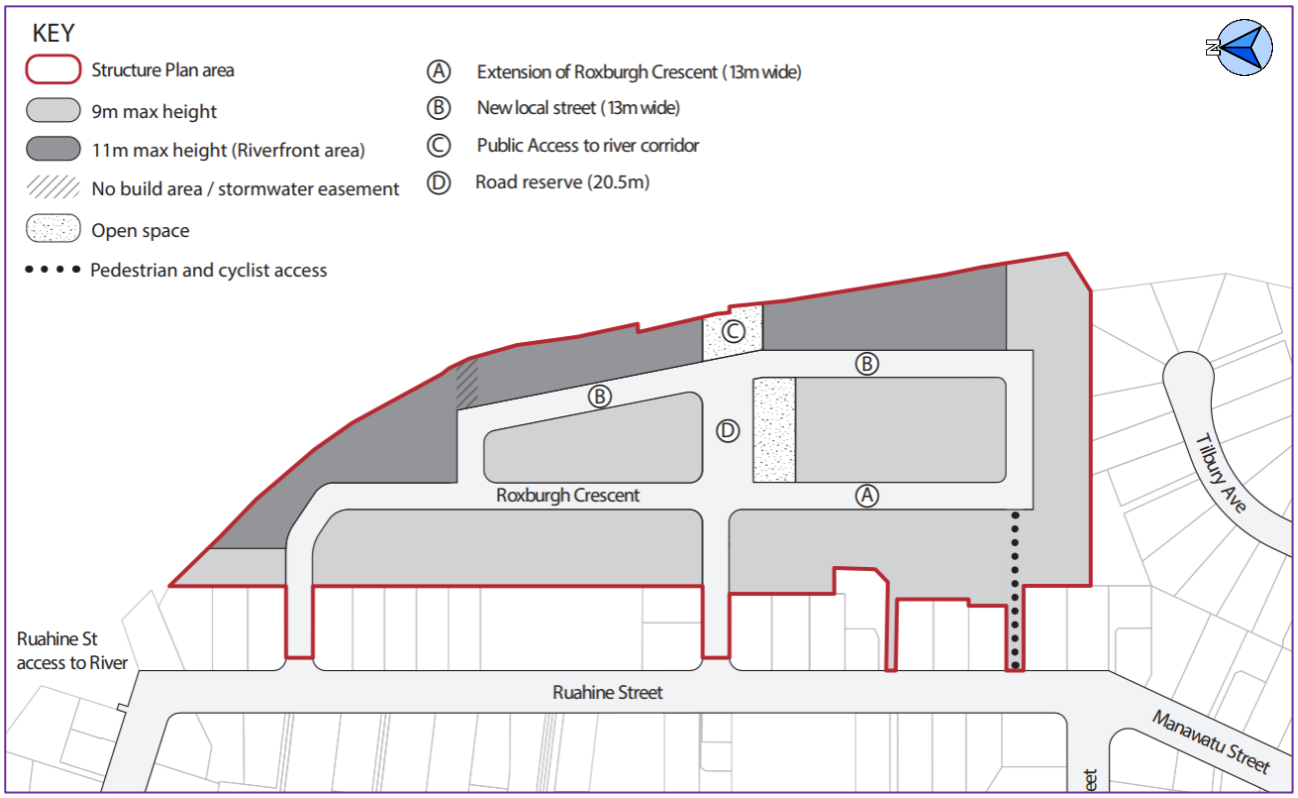


Figure 3-1: Structure Plan Layout for 250m^2 Minimum Lot Size

4 Assessment of Effects

This section of the report provides a detailed assessment of the transportation impacts of the proposed Plan Change on the surrounding road network. It also provides an outline of the suitability of the proposed access locations, internal roading provisions for the development and wider connectivity of the site for non-car based modes of transport.

4.1 Trip Generation

The proposed Plan Change seeks to enable medium density residential development to occur, which would replace existing industrial activities on Roxburgh Crescent. Analysis of the most recent traffic count data on Roxburgh Crescent (March 2019) indicates that during a typical weekday approximately 1,400 all day and 120 peak hour traffic movements were generated by existing industrial land use activities[9].

As previously noted, approximately 104 medium density residential lots could be developed within the proposed Plan Change area, based on a minimum lot size of 250m^2. The following industry recognised standards have been used to establish the anticipated trip generation rates that could be expected from medium density housing within the proposed Plan Change area:

- Guide to Traffic Generating Developments (RMS Guide) – (New South Wales Roads and Maritime Services)[10]; and
- NZ Transport Agency Research Report 453 – Trips and Parking Related to Land Use (2011) which utilises outputs from the New Zealand Trips Database (NZTDB).

The relevant peak hour and all-day trip generation rates for this residential type referenced within these trip generation guides are shown within Table 4-1.

Table 4-1: Trip Generation Rates for Medium Density Residential Development

Guidance	Dwelling Type	Peak Hour Trips (vph)	All Day Trip Generation (vpd)
RMS Trip Generation Guide	Two or Less Bedrooms	0.4-0.5 per household	4 to 5 per household
	Three Bedrooms or More	0.65 per household	5 to 6.5 per household
NZ Research Report 453[11]	N/A	0.8 per household	6.8 per household

The peak hour trip generation and all-day trip generation rates outlined within the NZTA Research Report 453 are higher than those provided within the RMS Trip Generation Guide. To ensure a robust assessment of trip generation, the rates outlined within the NZTA Research Report 453 have been used to conservatively estimate traffic generated by the proposed Plan Change area.

Utilising these rates, Table 4-2 shows that upon full development of the site to medium-density residential, the proposed Plan Change area could generate a daily trip generation of approximately 707 trips and 83 trips during the peak hours (in the higher density scenario).

Table 4-2: Estimated Site Trip Generation Rates

Lot Density Scenario	Indicative Household Yield	Peak Hour Trips	All Day Trips
Minimum Lot Size - 250m^2	104 Households	83	707

Table 4-3 compares the forecast traffic that could be generated by the development of medium-density residential development compared with existing traffic flows generated by current on-site industrial activity. This indicates that converting existing industrial land to medium-density

[9] Established from PNCC Traffic Count Data from ATALYST (2019). It is noted that these traffic volumes include traffic generated by industrial activities from the Higgins construction yard prior to its relocation from the Roxburgh Crescent site in 2023.

[10] Roads and Traffic Authority of NSW, Guide to Traffic Generating Developments, Version 2.2, October 2002

[11] Based on 85th percentile trip generation rates

residential would result in a net reduction in total traffic volumes generated by the site on the local road network, during both the peak periods (~45 vehicle per hour) and across the day (~680 vehicles per day).

Table 4-3: Existing and Forecast Traffic Volumes on Roxburgh Crescent (Northern and Southern Ends Combined)

PERIOD	EXISTING INDUSTRIAL LAND USE	FORECAST RESIDENTIAL LAND USE	NET CHANGE
AM Peak Flows	127 vph	83 vph	-44 vph
PM Peak Flows	117 vph	83 vph	-34 vph
Daily Trips	1,390 vph	707 vpd	-683 vpd

Traffic surveys indicate approximately 20% of traffic generated by existing industrial activities are heavy vehicles which travel through existing residential areas to access the wider transport network. Heavy vehicle traffic generated by residential developments are typically limited to servicing activities (such as refuse collection); therefore, once the site is converted from industrial to medium-density residential, the volume of heavy vehicle traffic on Roxburgh Crescent and the primary road network is also expected to reduce.

4.2 Forecast Traffic Flows on Key Routes

Ruahine Street and Pahiatua Street provides connections between the proposed Plan Change area and key destinations to the north and west respectively. Both roads are identified as collector roads within the road hierarchy and can be expected to support between 3,000 to 10,000 vehicles per day (or up to 1,000 two-way peak hour movements based on typical peak hour demands).

Existing traffic volumes on Pahiatua Street (4,540 vpd) and Ruahine Road (3,640 vpd) fall within the lower end of these ranges. There are no other known high trip generating land-use developments or proposals that would likely increase traffic demands on these roads within the vicinity of the site.

To assess the impacts of the proposed Plan Change area on local network capacity, the forecast peak hour and all-day traffic volumes have been assigned to the external road network based on existing commuter travel patterns within the "Hokowhitu East" census block using available 2018 New Zealand Census data[12] (see **Appendix C**). On this basis, the following traffic splits have assumed:

- 70% will travel to and from the north (via Ruahine Street); and
- 30% will travel to and from the west (via Pahiatua Street).

All day and peak hour trips generated by the proposed Plan Change have been assigned to Ruahine Street and Pahiatua Street based on these distribution assumptions as shown in Table 4-4. The traffic flow forecasts are considered conservative as no reduction in traffic generated by existing industrial activities have been accounted for within these volumes.

Table 4-4: Forecast Traffic Volumes on the Primary Road Network

STREET	PERIOD	EXISTING TRAFFIC FLOWS (TWO-WAY)	FORECAST NEW TRIPS (TWO-WAY)	TOTAL FORECAST TRAFFIC FLOWS (TWO-WAY)
Ruahine Street (North of Roxburgh Crescent)	All Day	3,220 vpd	+495 vpd	3,715 vpd
	AM Peak Hour	346 vph	+58 vph	404 vph
	PM Peak Hour	292 vph	+58 vph	350 vph
Pahiatua Street	All Day	4,540 vpd	+212 vpd	4,752 vpd
	AM Peak Hour	460 vph	+25 vph	485 vph
	PM Peak Hour	450 vph	+25 vph	475 vph

[12] https://commuter.waka.app/

This assessment indicates the forecast traffic volumes on the primary road network (Ruahine Street and Pahiatua Street) will remain within the expected bounds of their relative classification and are considered to have sufficient capacity to accommodate the daily and peak hour traffic volumes generated by the proposed Plan Change area.

4.3 Access Strategy

The proposed strategy outlined within Structure Plan includes the use of Roxburgh Crescent to connect with Ruahine Street as well as the use of existing driveways that currently provide access to the Higgins construction yard.

4.3.1 Roxburgh Crescent Connections

The Roxburgh Crescent (South) intersection is "stop" controlled, with clear sightlines provided in both directions along Ruahine Street. Parking restrictions are present on the eastern side of Ruahine Street which reinforce clear sightlines in both directions (see Figure 4-1).

Figure 4-1: Sightlines to the North (left) and South (right) at the Southern Roxburgh Crescent Connection

There are no "formal" controls at the northern Roxburgh Crescent (north) connection onto Ruahine Street. This intersection has restricted sightlines to the north due to the curvature of the road and on-street parking being permitted within the vicinity of the intersection (see Figure 4-2). Crash history indicates restricted visibility has not resulted in any crashes at the intersection; however, given restricted sight visibility to the north implementing a stop control at this intersection would be beneficial.

Figure 4-2: Sightlines to the North (left) and South (right) at the Northern Roxburgh Crescent Connection

A change in land-use within the proposed Plan Change area is expected to reduce the volume of heavy vehicle traffic generated by the site, providing the ability to modify the geometry of the existing intersections. Potential improvements that could be considered include:

- Kerb build outs to reduce pedestrian crossing distances and improve visibility of pedestrians for vehicles approaching the intersection from Roxburgh Crescent; and
- Parking restrictions within the vicinity of the northern access intersection to reinforce sightlines, particularly to the north.

At present there are no turning bays provided to support access into Roxburgh Crescent from Ruahine Street. As outlined within Figure 4-3, right-turning demands into Roxburgh Crescent are expected to be highest during the PM peak hour (20 vph). Austroads Guide to Traffic Management: Part 6 (2020) provides guidance on the warrant process for turning bays at intersections based on traffic volumes and posted speeds. Warrants have been checked in accordance with Figure 2.25 of the Austroads guidelines based on existing traffic flows on Ruahine Street (see Figure 4-3), which indicates neither access would trigger the needs for a right turn bay[13].

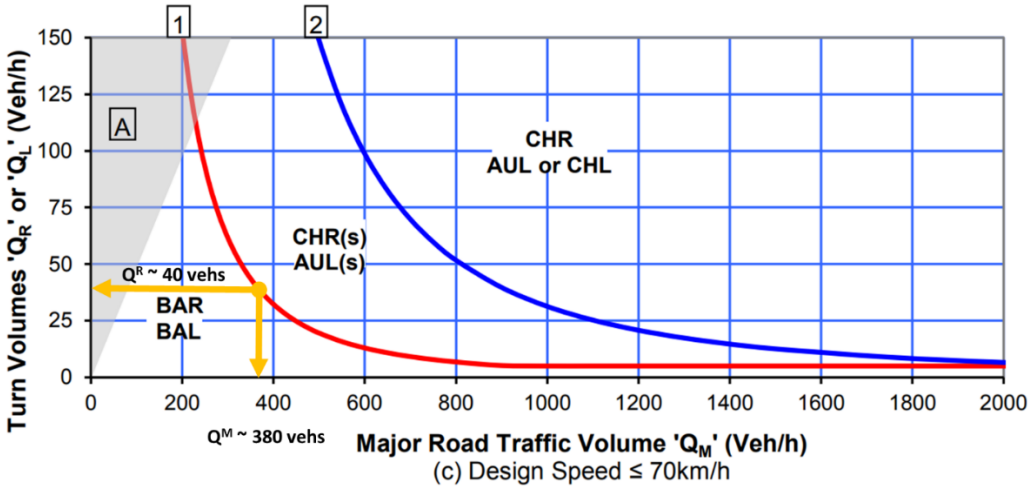


Figure 4-3: Warrants for Turning Treatments at Unsignalised Intersections (Austroads Part 6 – Figure 2.25)

4.3.2 Vehicle Crossings

There are two existing vehicle crossings onto Ruahine Street from the Higgins construction yard that are included within the proposed Plan Change area (see Figure 4-4). Consideration of the future function of these accesses in relation to the proposed Plan Change area are outlined below.

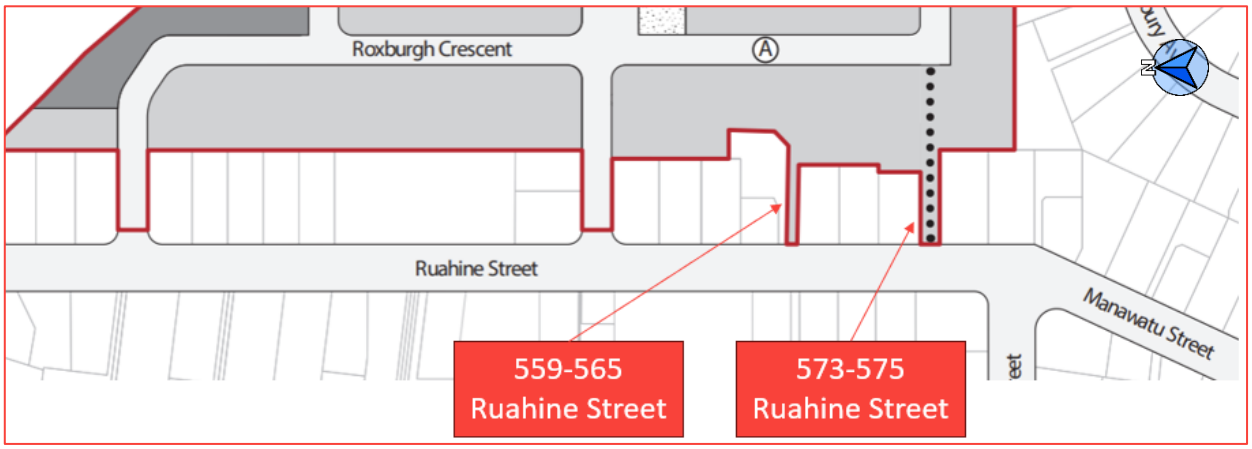


Figure 4-4: Existing Vehicle Crossings included within the Plan Change Structure Plan

[13] Based on the existing traffic flows and forecast traffic volumes, right-turn bays from Ruahine Street would be warranted if turning volumes exceeded approximately 40 vehicles per hour as demonstrated in the diagram.

Access to 573/575 Ruahine Street

The existing vehicle driveway is identified within the Structure Plan as part of the proposed Plan Change which could potentially be used as a secondary vehicle access to the site. The existing vehicle crossing provides access to Higgins commercial activities in 573/575 Ruahine Street as well as residential properties (571 Ruahine Street) and the rear access to the Winchester Store (see Figure 4-5). The existing vehicle crossing is 8.2m wide at the property boundary and is approximately 40m in length.

Given the relatively low volume of traffic expected to be generated by the proposed Plan Change area, additional vehicle access beyond those provided by the Roxburgh Crescent intersections are not required to support site activity from a network capacity perspective. Furthermore, for properties located to the south of the proposed Plan Change area this would provide a more direct connection to Ruahine Street encouraging greater traffic movements than intended for a driveway.

It is recommended that as part of the development process, vehicle access from the proposed Plan Change area to Ruahine Street via the driveway is restricted, whilst retaining access for existing residential or commercial land-uses located outside of the proposed Plan Change area. It would be desirable for pedestrian or cyclist access to be maintained to enhance connectivity and permeability from the proposed Plan Change area for these modes.

Figure 4-5: Existing Vehicle Crossing Adjacent to Winchester Store

Vehicle Access to 559-565 Ruahine Street

This vehicle crossing provides a secondary access to ancillary buildings within the Higgins construction yard (559-565 Ruahine Street). The existing vehicle crossing is approximately 4.5m wide at the property boundary and approximately 40m in length (see Figure 4-6). The crossing complies with the general requirements of the performance standards in terms of spacing and sightline distances for residential vehicle crossings outlined within the District Plan.

Based on the existing vehicle crossing width and the direction provided within the District Plan's performance standards, the vehicle crossing could be used to provide access for up to three residential lots. Although the formed width is less than 5.0m, the driveway is straight and provides good forward sightlines therefore passing provisions are not expected to be required.

If multiple residential lots are proposed to be serviced by the driveway, on-site manoeuvring should be provided such that vehicles are not required to reverse onto or from Ruahine Street.

Figure 4-6: Existing Vehicle Crossing to 559-565 Ruahine Street

4.4 Internal Road Arrangements

This section of the report provides an outline of the proposed internal roading layout identified within the Structure Plan for the proposed Plan Change.

4.4.1 Road Layout

The internal road arrangements are expected to operate as "local roads" servicing access demands to the proposed Plan Change area, with low traffic volumes and low operating speeds. The proposed network would form a circulatory route that connects with the existing Roxburgh Crescent road alignment, removing the need for cul-de-sacs or specific turn around areas to be provided. This also supports connectivity, permeability and resilience as access to the proposed Plan Change area is not dependent on a single access point.

The form of intersections within the proposed Structure Plan are expected to be priority controlled, which are deemed sufficient for the anticipated traffic demands within the internal road network. These could be supported through engineering measures such as raised platforms to support a low-speed environment. The specific design of internal road intersections will be determined during the subdivision stage; however, the proposed road arrangements outlined within the Structure Plan adhere with the principles for intersection design outlined within PNCC's Engineering Standards for Land Development.

4.4.2 Suitability of Cross Sections

The PNCC Engineering Standards for Land Development (2023) outlines the minimum road reserve, carriageway and berm widths for roads serving defined number of residential dwellings (Table 3-1, Page 39)[14]. The standards outline the minimum requirements for 15.5m wide carriageways for local residential roads servicing up to 200 dwelling units (see Appendix D).

The intention of the minimum requirements is to provide sufficient network capacity to support local road activities where development is proposed on both sides of the corridor. This includes the provision of two trafficable lanes, footpaths on both sides of the road and sufficient space for on-street parking on one side of the road. NZS4404 (Land Development and Subdivision Infrastructure standards) states road widths shall be selected to ensure that adequate movement lanes, footpaths,

[14] engineering-standards-for-land-development-30-may-2023.pdf (pncc.govt.nz)

berms can be provided to retain amenity values (including landscaping) and enable utility services to be provided safely and in economically accessible locations.

The proposed road network outlined within the Structure Plan consists of 13.0m wide road corridor, providing consistency with the road boundary widths on existing sections of Roxburgh Crescent. Although the proposed roading arrangements do not comply with PNCC's Engineering Standards, a 13.0m wide cross section could provide for two traffic lanes (5.5-5.7m), footpaths on both sides of the road (min. 1.8m) with the remaining corridor space allocated to berm/planting space with on-street parking limited to a single side of the road (see Figure 4-7). The cross section would be similar in principle to those recently developed within Hokowhitu Lagoon (see Figure 4-8).

Figure 4-7: Indicative Cross Section Arrangement for a 13m Roading Corridor

Figure 4-8: Example of a 13m Roading Corridor – Hokowhitu Lagoon Development

The proposed cross section arrangement outlined above would be largely consistent with the desired arrangements of the local road cross sections as outlined within the PNCC Engineering Standards for Land Development; however, the reduced cross section widths will require careful design at the subdivision stage to ensure the safe and efficient use of the road including:

- The geometry of the internal road network would need to be designed to sufficiently accommodate the access needs of large vehicles (such as emergency vehicles or refuse trucks) particularly at curves or intersections;
- Medium density housing would result in higher frequency of vehicle crossings along property frontages, potentially reducing the space available for on-street parking provisions and increasing the number of potential conflict points with pedestrian users. Options that could be considered through the design process include:
    - Pairing of driveways servicing adjacent (back-to-back) to maximise available space for on-street parking and other street design elements within the berms;
    - Fence height restrictions on property frontages and minimum setbacks for parking garages[15] would assist in supporting safety/visibility for vehicles accessing driveways and maximise visibility of pedestrians or oncoming traffic; and
    - Providing on-site shared parking areas located away from the road frontage to minimise the number of vehicle crossings over footpaths, enabling additional on-street parking to be provided and reducing the number of potential conflict points with users of the footpaths.
- Typically, utilities are located within berms for ease of access. With reduced berm space there is a likelihood that these would be positioned in less desirable locations (i.e. under the footpath or carriageway) which may create future maintenance or operational challenges.

4.4.3 Open Space

As part of the proposed Plan Change, the structure plan has identified new open spaces and a public entrance to the Manawatū River from Roxburgh Crescent as part of a reserve exchange (denoted as the open space within the Structure Plan)[16]. This would establish a new reserve central to the proposed Plan Change area, located along the southern side of the Roxburgh Road (South) extension road (see Figure 4-9).

Also denoted within the Structure Plan, a wider road reserve (20.5m) is proposed adjacent to the open space within the centre of the reserve (see Figure 4-10). The wider road reserve would enable additional on-street parking to be provided along the southern side of the Roxburgh Crescent (south) extension road adjacent to the open space, formed with a 90-degree parking arrangement. The parking facilities are expected to be designed to conform with minimum design standards outlined within the District Plan[17].

It is recommended that raised pedestrian platforms are provided at the western and eastern extent of the proposed Roxburgh Crescent extension to reinforce lower vehicle operating speeds and support pedestrian access to the proposed open space. Lower operating speeds would also assist in minimise potential conflicts with vehicles accessing or egressing the proposed parking facilities.

[15] A minimum setback distance of 6.0m from the property boundary would provide sufficient space to accommodate the stacking length of an 85th percentile car on the driveway, and minimise the potential for parked cars encroaching on the adjacent footpath.

[16] There is currently a small area of reserve acting as a "buffer" between Roxburgh Crescent's industrial activities and housing at the southern end of the proposed plan change area. This "buffer" would not be needed if the area is zoned residential, therefore the reserve is proposed to be relocated central to the proposed Plan Change area.

[17] As denoted within Section 20 of PNCC District Plan - section-20-land-transportv10.pdf (pncc.govt.nz)

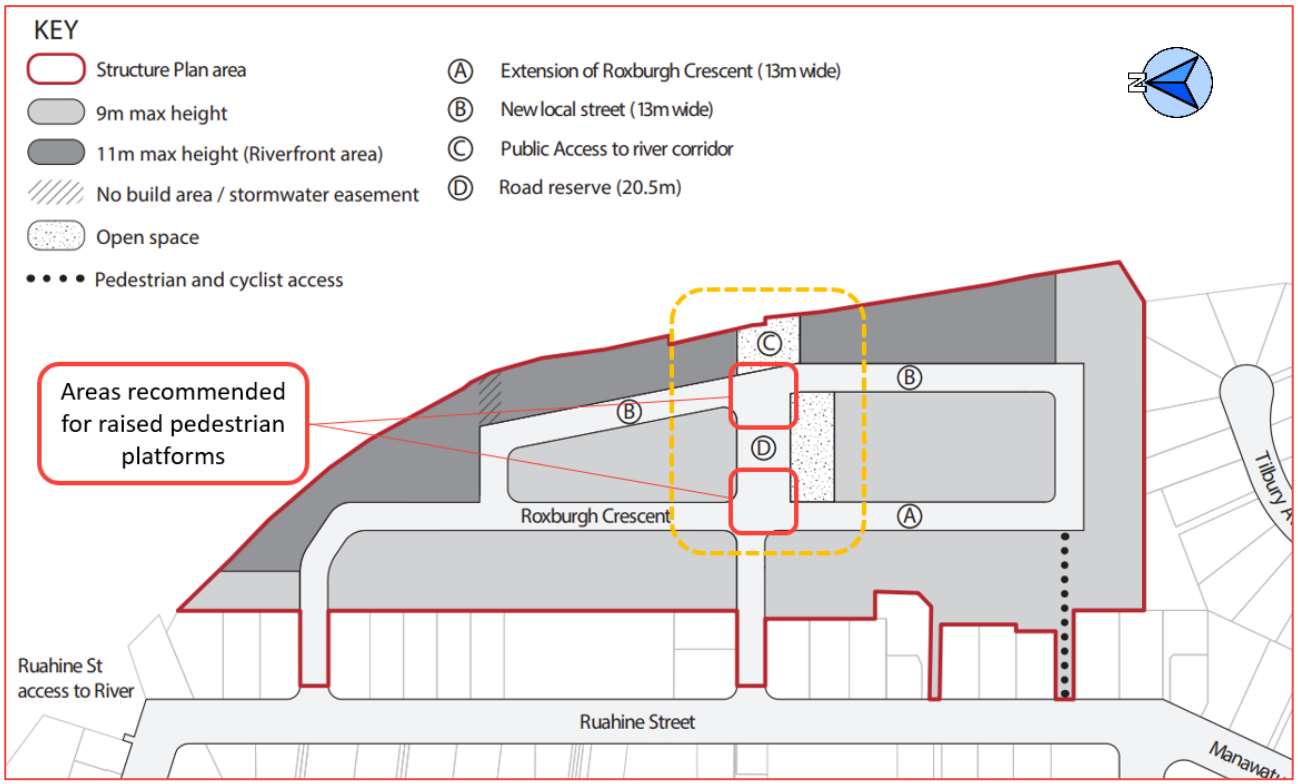


Figure 4-9: Proposed Open Space within the Roxburgh Crescent Plan Change

Figure 4-10: Indicative 20.5m Wide Cross Section Adjacent to Proposed Reserve (Road Type D)

4.4.4 *Existing Form of Roxburgh Crescent*

The existing road environment on Roxburgh Crescent reflects its current function for supporting access to local industrial activities (see Figure 4-11). The function of Roxburgh Crescent is expected to change as residential development occurs, including a reduction in heavy vehicle demands and increasing use by active modes. This would provide opportunities to upgrade the streetscape environment on Roxburgh Crescent to reflect the residential form of the proposed Plan Change area.

Figure 4-11: Existing Form of Roxburgh Crescent Adjacent to Higgins Yard

Ultimately, it would be desirable for the existing road environment to be upgraded to be consistent with the proposed residential cross sections within the Plan Change area. This may include reducing road carriageway widths to support a lower speed environment and the provision of connected and continuous footpaths on both sides of the road.

The timing of any upgrades to the existing Roxburgh Crescent environment would need to consider servicing demands associated with remaining industrial lots (i.e. should sections of the proposed Plan Change area develop before others) and would likely need to be staged as development occurs.

4.5 Connectivity to the Public Transport Network

The proposed Plan Change area is well connected to the public transport, with existing bus stops located on Ruahine Street adjacent to northern and southern Roxburgh Crescent entrances. As noted within Section 2.3, existing bus stops are expected to be retained within the new public transport network for Palmerston North. These bus stops are located within a 400m walking distance of the development and are considered accessible within a 5-minute walk of the proposed development area. Providing a comprehensive walking network within the internal road network would support accessibility to the public transport network.

The proposed new public transport network for Palmerston North will result in an increase in the frequency of bus services in proximity to the proposed Plan Change area. These services will provide connectivity between the proposed Plan Change area and key employment zones including Palmerston North city centre (Main Street bus station), and the outer business zone, as well as access to key services (such as New World/Countdown).

4.6 Provisions for Walking and Cycling

4.6.1 Internal Provisions

The internal road arrangements are expected to operate as "local roads" servicing access demands to the proposed Plan Change area, with low traffic volumes and low operating speeds. On this basis, local roads within the proposed Plan Change area are not expected to require dedicated cycling facilities (consistent with the Subdivision Engineering standards). It is expected that pedestrian footpaths would be provided on both sides of the internal road network to be consistent with cross section expectations of the Subdivision Engineering Standards.

4.6.2 External Connections

A zebra crossing is currently provided on Ruahine Street between the northern and southern Roxburgh Crescent accesses, providing good connections to local walkable destinations including local bus stops and Winchester School. The pedestrian crossing is unlikely to be significantly affected by traffic from the proposed residential development as traffic to and from the development will be split across the two intersections so not all traffic will pass through the pedestrian crossing.

Ruahine Street (between Pahiatua Street and State Highway 3) has been identified as a proposed route for cycle lanes within the urban cycle network. Once these connections are developed, these would provide connections from the proposed Plan Change area to multiple city centre destinations including the CBD and outer business zones.

The proposed Structure Plan also proposes to provide a new access for active modes onto the Manawatu Shared River Path at the eastern extent of the Roxburgh Crescent (South) extension. The provision of a walking and cycling link to the Manawatu Shared Pathway would provide direct access from the proposed Plan Change area onto the existing regional cycle network. The connection would also provide local residents and communities with access to recreational opportunities and support accessibility by non-car based modes to key employment or educational destinations, particularly to the south of Palmerston North (such as Massey and Linton Army base).

To ensure safe connectivity and access to the Manawatu River Shared Pathway it is recommended a shared path connection through the reserve area (C) is provided with a minimum width of 3m, providing continuation from the local road network through to the boundary of the site. Physical restrictions (such as bollards or planting) may be required along the property boundary to reduce likelihood of non-authorised vehicles accessing the Manawatu River from proposed Plan Change area.

4.7 Impacts of Construction Traffic

Additional heavy vehicle movements will be expected to access the site during the construction phase of the development which may have the potential to impact on the local road network and wider network surroundings. It is unlikely that the proposed area for rezoning will be developed in a single stage, given there are several different landowners within the existing industrial zone.

Considerations would need to be given to the impacts of development on other landowners, including the ability of businesses to operate safely/efficiently whilst various stages of construction are occurring.

To reduce the impact of construction traffic on the local road and parking network, it is recommended that a Construction Traffic Management Plan (CTMP) is developed and approved for each stage of the development prior to commencing work on the site.

5 Conclusions

This Transport Assessment has considered the transportation related effects of the proposed rezoning of 2.5 hectares of industrial land on Roxburgh Crescent (in Hokowhitu) to medium-density residential. The proposed area included within the Plan Change has the potential to accommodate up to 104 lots (based on a 250m^2 minimum lot size).

On full development of the proposed Plan Change area, the medium-density residential housing is expected to result in approximately 83 peak period trips and 707 daily trips over a typical weekday. This would result in a net reduction in peak hour and all-day traffic demands compared to existing industrial land-use activities within the proposed Plan Change area. There is sufficient capacity available to support traffic generated by the proposed Plan Change area without having a detrimental impact on the safe and efficient operation of the network.

The proposed Plan Change area is well connected to the public transport network with several bus stops located within a 400m walking catchment of the site. The proposed new public transport network for Palmerston North will increase the frequency of services within the vicinity of the proposed Plan Change area, providing connections to key local destinations within Palmerston North, including the city centre and inner business zones. The proposed Plan Change area is also well sited to provide access to the existing and proposed strategic cycle network, including new connections to the Manawatu River Shared Pathway which provides regional connections to key employment and recreational opportunities.

The internal roading network as outlined within the supporting Structure Plan would provide permeability and connectivity between the proposed Plan Change area and the strategic roading network. It is anticipated that development will occur in phases, and that the internal roading network serving the proposed Plan Change area will be developed incrementally as development occurs.

It is noted that the proposed widths for local roads identified within the Structure Plan are narrower than the minimum desired widths defined within PNCC's Engineering Standards for Land Development; however, as demonstrated within this transport assessment, the proposed road network can be developed to adhere with the intended principles of these standards. It is recommended that the following planning provisions and design principles are adopted to support safe and efficient access on the road:

- Provide minimum garage setbacks and fence height limits where properties are serviced from the street to support visibility for vehicles egressing properties;
- Pair driveways servicing adjacent properties (back-to-back) to maximise available space for on-street parking and other street design elements within the berms; and
- Where possible, provide on-site shared parking areas away from the road frontage to minimise the number of vehicle crossings (and hence conflict points) on footpaths passing along residential frontages.

The function of Roxburgh Crescent is expected to change as residential development occurs, including reduced heavy vehicle demands and increasing use by active modes. The timing of any future upgrades to the existing Roxburgh Crescent environment would need to consider the servicing needs of remaining industrial activities within the proposed Plan Change area; however, to reflect its changing function it is recommended that:

- The existing intersection between the Roxburgh Crescent (northern access) and Ruahine Street is upgraded to a "stop" control and parking restrictions are applied to re-enforce sightlines (particularly to the north);
- Kerb build outs are provided at intersections between Roxburgh Crescent and Ruahine Street to reduce crossing distances and improve driver visibility of pedestrians; and
- Continuous footpaths are provided on both sides of Roxburgh Crescent along its full extent.

Appendix A: Trip Generation Rates

Comparison of Trip Generation Rate Literature

Medium Density Residential

To identify the trip generation rates for residential developments, reference has been made to available data within the following industry recognised guidelines:

- The New Zealand Trips and Parking Database (NZTPD);
- New South Wales and Traffic Authority publication - "Guide to Traffic Generating Developments" (RTA); and

The trip generation rates for medium density residential use residential dwellings are shown within Table A1. The trip generation rates are based on a "per dwelling housing" rates.

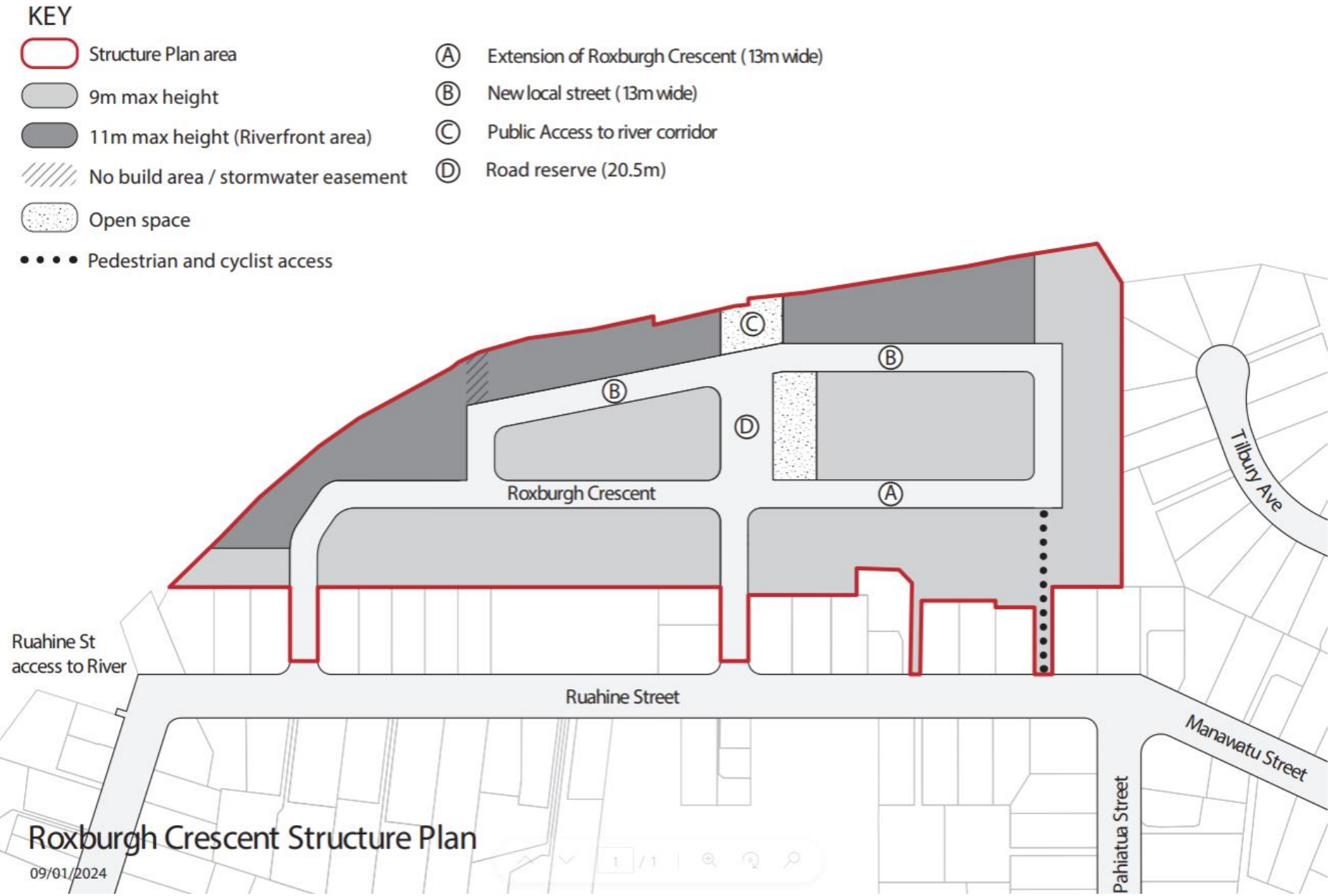
Table A1: Average Trip Generation Rates for Medium Density Residential Dwellings (Various Sources as Named)

SOURCE	RATE	PEAK TRIPS	ALL DAY TRIPS
RTA – Guide to Traffic Generating Developments (Average)	Up to 2 bedrooms	0.4-0.5 / dwelling	4-5 / dwelling
	3 Bedrooms or more	0.5-0.65 / dwelling	5-6.5 / dwelling
New Zealand Trips Data Base (NZTDB)	Per Dwelling (85th Percentile)	0.8 / dwelling	6.8 / dwelling
Adopted Rate		**0.8 / dwelling**	**6.8 / dwelling**

Analysis of trip generation rates indicate that the peak period trip generation rates outlined within the NZTDB are generally higher than those within the RTA Guide to Traffic Generating Developments. The RTA is also based on the number of bedrooms provided within each dwelling (with the view that more bedrooms generate higher travel demands).

To provide a conservative estimate of trips generated by the proposed rezoning, it is recommended that the higher trip generation rates (NZTDB) are used within the assessment.

Appendix B: Proposed Structure Plan Layout


KEY
Structure Plan area
9m max height
11m max height (Riverfront area)
No build area / stormwater easement
Open space
Pedestrian and cyclist access
Ⓐ Extension of Roxburgh Crescent (13m wide)
Ⓑ New local street (13m wide)
Ⓒ Public Access to river corridor
Ⓓ Road reserve (20.5m)
Roxburgh Crescent
Tilbury Ave
Ruahine St
access to River
Ruahine Street
Manawatu Street
Pahiatua Street
Roxburgh Crescent Structure Plan
09/01/2024

Appendix C: Trip Distribution Assumptions

Trip Distribution Assumptions

Step 1

Departures - Hokowhitu East				
Area Unit Name	**Trips (2018)**	**Direction**	**Nortbound**	**Westbound**
Aokautere Rural	9	West (Pahiatua St)		1%
Awapuni North	6	West (Pahiatua St)		1%
Awapuni South	9	West (Pahiatua St)		1%
Esplanade	15	West (Pahiatua St)		1%
Feilding Central	9	North (via Ruahine St)	1%	
Highbury East	6	North (via Ruahine St)	1%	
Hokowhitu Central	6	West (Pahiatua St)		1%
Linton Camp	30	West (Pahiatua St)		3%
Milson South	6	North (via Ruahine St)	1%	
Milverton	12	West (Pahiatua St)		1%
Newbury	9	North (via Ruahine St)	1%	
Ohakea / Sanson	9	North (via Ruahine St)	1%	
Palmerston North Airport	9	North (via Ruahine St)	1%	
Palmerston North Central	339	North (via Ruahine St)	33%	
Palmerston North Hospital	69	North (via Ruahine St)	7%	
Papaioea North	33	North (via Ruahine St)	3%	
Papaioea South	27	North (via Ruahine St)	3%	
Pihauatua	12	West (Pahiatua St)		1%
Poutoa	15	West (Pahiatua St)		1%
Roslyn	27	North (via Ruahine St)	3%	
Ruahine	24	West (Pahiatua St)		2%
Ruamahanga	9	North (via Ruahine St)	1%	
Takaro North	21	North (via Ruahine St)	2%	
Takaro South	6	North (via Ruahine St)	1%	
Tremaine	138	North (via Ruahine St)	13%	
Turitea	150	West (Pahiatua St)		15%
West End	12	West (Pahiatua St)		1%
Whakarongo	6	North (via Ruahine St)	1%	
	1,023.00		**71%**	**29%**

Step 2 **Trip Distribution (Final)**

	Northbound	Westbound
Census Directional Split	71%	29%
Assumed Directional Split	70%	30%
Routing	Via Ruahine Street	Via Ruahine Street / Pahiatua Street

Appendix D: Local and National Design Guidelines

DESIGN COMPONENT	PNCC ENGINEERING STANDARDS FOR LAND DEVELOPMENT (2023)	PNCC STREET DESIGN MANUAL (2013)	NZS4404:2010
	Local Road	Residential Local	Local Road (1 to 200 Dwellings)
Typical Daily Traffic Volumes (VPD)	0-3,000	0-3,000	Up to 2,000
Min. Road Reserve Width (m)	15.5	14.5	15
Footpaths (m)	2 x 1.8	2 x 2.5-3.0	2 x 1.5
Grass Berms (m)	2 x 1.9	2 x 1.2	-
Cycle Lanes (m)	Shared with Traffic	Shared with Traffic	Shared with Traffic
Traffic Lanes (m)	2 x 3.0	2 x 2.75-3.25	5.5-5.7
Parking Lanes (m)	1 x 2.1	2 x 2.0	Shared in traffic lane up to 100du, separate parking with over 100 du
Min. Carriageway Width (m)	-	9.5 including parking bays	5.5-5.7

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