



# OHARA PLAN CHANGE, CONSTABLE ROAD WAIUKU

INTEGRATED TRANSPORTATION ASSESSMENT  
10 March 2022

Prepared for the Gardon Trust

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## TABLE OF CONTENTS

1.	SUMMARY .....	5
2.	INTRODUCTION AND SCOPE .....	6
2.1	Subject Site.....	7
3.	LAND USE AND TRANSPORT ENVIRONMENT .....	7
3.1	Auckland Unitary Plan Controls .....	7
3.2	Existing Roads.....	8
3.3	Public Transport.....	10
3.4	Waiuku College Traffic Generation .....	11
3.5	Walking and Cycling .....	12
3.6	Road Safety Record.....	13
3.7	Future Land Use Activities in the Area .....	15
3.8	Future Traffic Growth.....	16
4.	THE PROPOSAL .....	17
4.1	Plan Change and Precinct Plan.....	17
4.2	Intersection Location .....	19
4.3	Possible Intersection Form .....	21
4.4	Access Restriction .....	22
4.5	Internal Intersections.....	23
4.6	Parking .....	23
4.7	No Stopping Restrictions .....	23
4.8	Walking and Cycling .....	23

4.9	Other Connections .....	24
5.	TRIP GENERATION AND EXPECTED MODE SHARE .....	24
5.1	Trip Generation .....	24
5.2	Mode Share .....	25
5.3	Vehicle Trips .....	27
6.	REGIONAL POLICY ISSUES .....	29
7.	ASSESSMENT OF EFFECTS .....	30
7.1	Tier 1 or Regional Assessment .....	30
7.2	District Level Assessment (Tier 2) .....	32
7.2.1	Morning Peak Hour Assessment .....	33
7.2.2	Afternoon School Peak .....	35
7.2.3	Evening Peak Assessment.....	38
7.2.4	Future Traffic Growth.....	41
7.2.5	Tier 2 Summary .....	42
7.3	Tier 3 Assessment – Local Traffic Issues.....	42
8.	OTHER TRAFFIC AND TRANSPORTATION ISSUES .....	45
8.1	Waiuku College.....	45
8.2	Traffic Flows to Karioitahi Beach.....	46
9.	CONSULTATION SUMMARY AND IMPLEMENTATION PLAN .....	46
9.1	Consultation .....	46
9.2	Mitigation Works Likely at Subdivision Stage .....	47
10.	CONCLUSION .....	48
11.	ATTACHMENT 1 CRASH LISTING 2017 TO 2021 .....	48

12.	ATTACHMENT 2 MEANS OF JOURNEY TO WORK DATA 2018 CENSUS (STATISTICS NZ) .....	50
13.	ATTACHMENT 3 SIDRA MODEL RESULTS (AS PER CLAUSE 23 REQUEST) .....	52
13.1	Constable Road King Street Roundabout Layout.....	52
13.2	Constable Road King Street Roundabout Morning Peak Base Model .....	53
13.3	Constable Road King Street Roundabout Morning Peak Development Model.....	54
13.4	Constable Road King Street Roundabout Morning Peak 10 Year Growth Model.....	55
13.5	Constable Road King Street Roundabout 3pm Base Model .....	56
13.6	Constable Road King Street Roundabout 3PM Development Model .....	57
13.7	Constable Road King Street Roundabout 3PM Growth Model.....	58
13.8	Constable Road King Street Roundabout Evening Peak Base Model .....	59
13.9	Constable Road King Street Roundabout Evening Peak Development Model.....	60
13.10	Constable Road King Street Roundabout Evening Peak Growth Model.....	61
13.11	King Street Queen Street Roundabout Layout .....	62
13.12	King Street Queen Street Roundabout Morning Peak Base Model.....	63
13.13	King Street Queen Street Roundabout Morning Peak Development Model .....	64
13.14	King Street Queen Street Roundabout Morning Peak Growth Model .....	64
13.15	King Street Queen Street Roundabout 3PM Base Model.....	66
13.16	King Street Queen Street Roundabout 3PM Development Model .....	67
13.17	King Street Queen Street Roundabout 3PM Growth Model .....	68
13.18	King Street Queen Street Roundabout Evening Peak Base Model.....	69
13.19	King Street Queen Street Roundabout Evening Peak Development Model .....	70
13.20	King Street Queen Street Roundabout Evening Peak Growth Model .....	71
13.21	Assessment of Future Growth .....	71

## 1. SUMMARY

This Integrated Transportation Assessment (ITA) report is required by the Auckland Unitary Plan. It sets out current and future transportation issues and effects in the rural town of Waiuku in support of a proposed residential housing plan change that provides vital housing for up to 910 additional dwellings built off Constable Road within the Waiuku town active transport area.

Waiuku is located at the southwestern corner of the Auckland Council area but has very different travel patterns to the rest of Auckland. Waiuku is a small town that services its surrounding rural catchment and the various employment industries of this area as well as providing housing for people who work in the nearby heavy industrial area at Glenbrook, in local tourism or in food production.

There are some limited public transport services provided by Auckland Transport to Pukehohe and Papakura which allow interchanges with the Auckland rail system. However, most workers and students in the Waiuku area actually have travel destinations within their own local area making the town generally self-sufficient. The Franklin area of the Auckland region as it grows is developing its own identity and housing growth is essential to enable the area's travel self-sufficiency to continue.

The proposed rezoning as a concept fits well into the planned growth for the Franklin area. It would be accessed from a new intersection with Constable Road that would be built by the developer (an indicative intersection layout has been included in this report to assist in assessing the plan change. Approval of the intersection form is not required at this stage. That will occur when a detailed design is developed as part of a future subdivision consent application). A residential housing development under this plan change would allow greater connectivity and better walking and cycling connections to the existing Waiuku College, the Rugby Club, the extensive undeveloped council recreational reserve land as well as the township and areas significant coastal reserve walkways and cycleways.

The plan change would additionally integrate with surrounding land uses through creating potential internal links that could be continued by neighbouring landowners should they wish. These potential connections include a road that would terminate at the Council's recreation fields behind Waiuku College and another road which would join at the rear of a residential development on the neighbouring property at 45 Constable Road.

Transportation effects of the proposed plan change have been assessed at the Regional, District and local level. There are not expected to be any regional transportation effects as Waiuku is located a long distance from the areas of Auckland where congestion commonly occurs. The proposed residential houses are unlikely to become homes for long distance commuters as the town is too far away from the major regional destinations that encourage commuting.

Key intersections in the area have been modelled to ensure that the proposed houses will not lead to peak hour traffic congestion. No changes are required to the local road network beyond the new intersections that will be built by the developer as part of a future subdivision consent. The ITA has shown that the proposed plan change will enable an increase in housing stock in Waiuku in a manner that will encourage the use of alternative modes of travel without requiring dependency on the private car while ensuring that any adverse effects are avoided, remedied or mitigated.

## **2. INTRODUCTION AND SCOPE**

This ITA has been prepared in support of a proposed plan change that would allow for the development of up to 910 additional houses in Waiuku within healthy walking and cycling proximity to Waiuku College, Sandspit Beach, the harbour and the Waiuku town centre. The land is currently used for grazing livestock and borders the existing built-up area located beside the local secondary school, Waiuku College.

The need for an ITA is set out in both the Auckland Unitary Plan (AUP) and the ITA guidelines through thresholds for development. The AUP requires an ITA when a development is applied for outside of existing centres that will provide more than 100 houses. The AT guideline requires an ITA when the development exceeds 120 houses. The development is likely to provide a maximum of 910.

A scoping meeting was not held with Auckland Council or Auckland Transport (AT) to determine specific matters that could be covered by this ITA. This was not necessary as the ITA has been prepared in accordance with the Guidelines published by AT and addresses the matters normally contained in both a Tier 1 and Tier 2 assessment.

This report has been structured to follow the AT Guidelines and specifically addresses the matters required for plan changes and structure plans as defined in that document.

## 2.1 Subject Site

The site is located on the southwestern side of Waiuku just outside the existing town, on the north-western side of Constable Road. Currently, the land is used for farming activities. The location is shown in Figure 1 below.

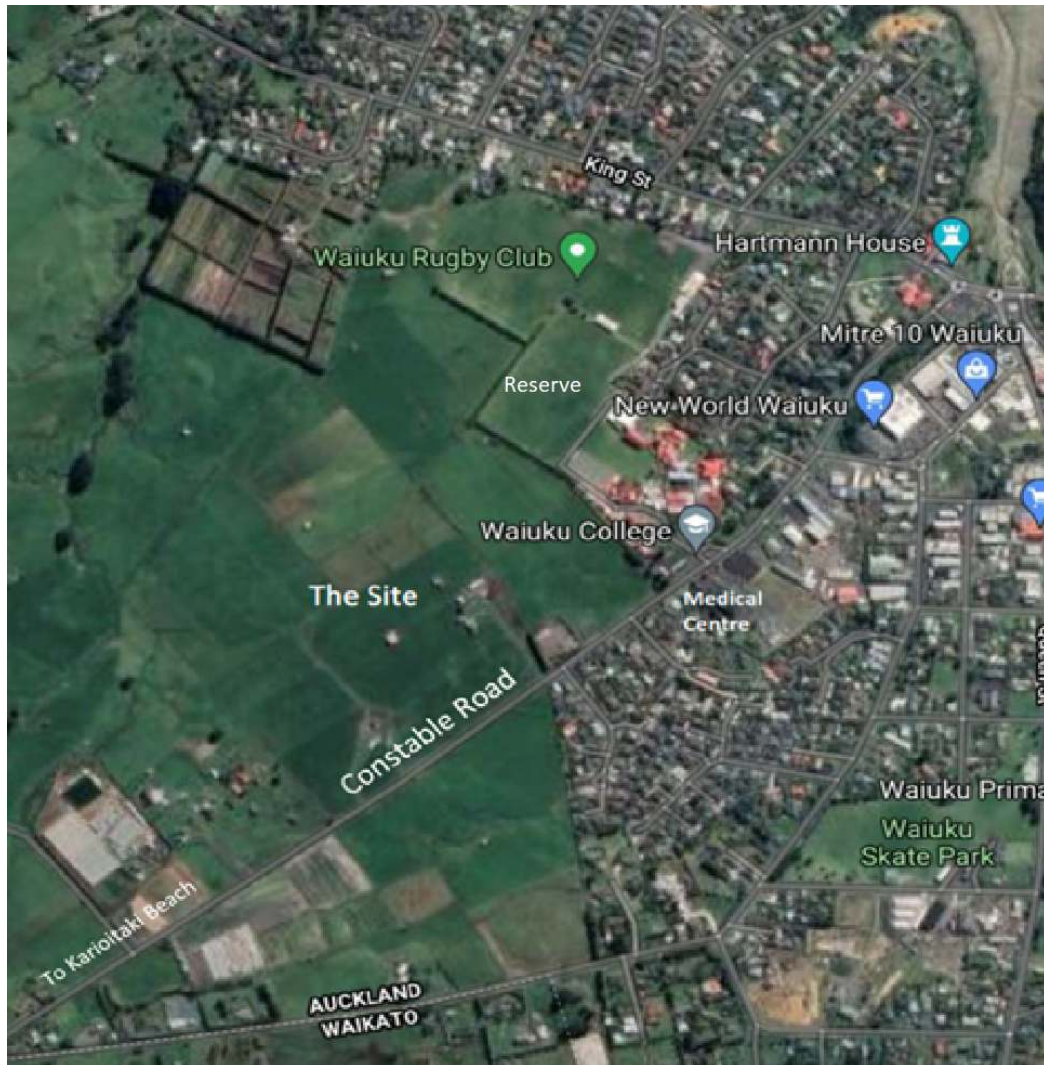


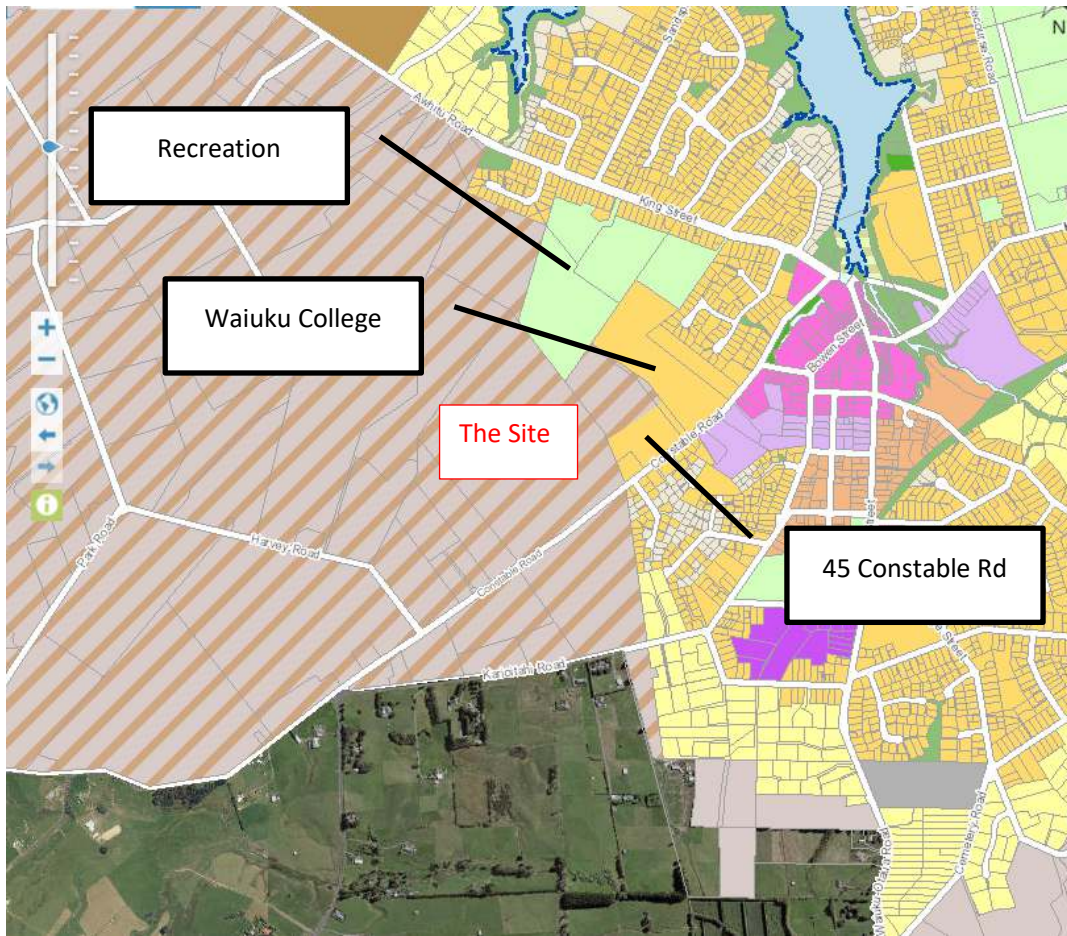
Figure 1: Locality Plan.

## 3. LAND USE AND TRANSPORT ENVIRONMENT

### 3.1 Auckland Unitary Plan Controls

The entire site is currently zoned as Mixed Rural Zone. The adjoining area has a mix of zones ranging from Business- Local Centre zone in the middle of Waiuku, a mixed-use zone on the edge of the commercial centre and a range of residential zones closer to the site. These include a

combination of Mixed Housing - Suburban , Single House zone and some large lot zones. The current zoning map is shown in Figure 2 below.



**Figure 2: Auckland Unitary Plan**

The AUP shows that neither Constable Road nor King Street are designated as arterial roads. There are no other precinct controls or overlays that are relevant from a transportation perspective.

### 3.2 Existing Roads

The road network within Waiuku is not classified by AT in their ATCOP documents. The entirety of Waiuku was left out of the classification diagram as shown in Figure 3 below. It is however classified by NZTA as part of their One Network system. NZTA shows Constable Road as a secondary collector and King Street as an arterial. Under the Auckland Unitary Plan neither Constable Road nor King Street are arterials, so they are local roads. Inspections of the area have shown that these roads do function as collector roads.



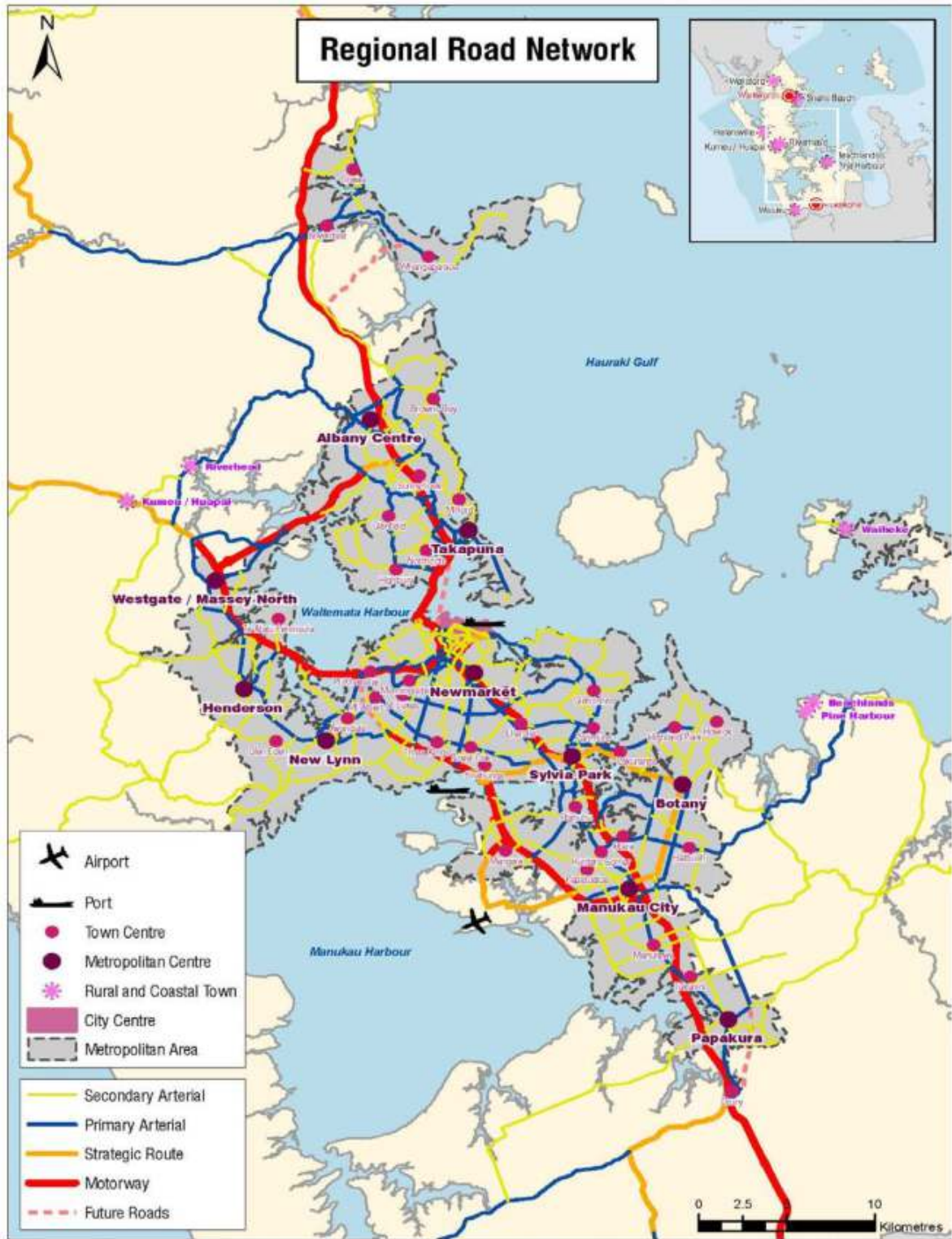


Figure 9: Map of Arterial Roads in the Auckland Region

### Figure 3: ATCOP Road Classification

Current traffic flows on roads in the Waiuku area have been obtained from the regular Auckland Transport count programme. These flows are shown in Table 1 below.

Constable Rd	Northbound	Southbound	Bothways
Weekday	3126	3765	6891
7-day average	2939	3571	6510
Saturday	2606	3276	5882
Sunday	2337	2894	5231
morning peak	340	279	619
evening peak	368	396	764
King Street	Eastbound	Westbound	Bothways
Weekday	4757	4722	9479
7-day average	4459	4452	8911
Saturday	3963	3930	7893
Sunday	3462	3623	7085
morning peak	338	538	876
evening peak	588	399	987
Sandspit Road	Northbound	Southbound	Bothways
Weekday	1711	1627	3338
7-day average	1606	1540	3146
Saturday	1380	1361	2741
Sunday	1305	1285	2590
morning peak	179	210	389
evening peak	226	178	404

**Table 1 - Traffic Flows February 2020**

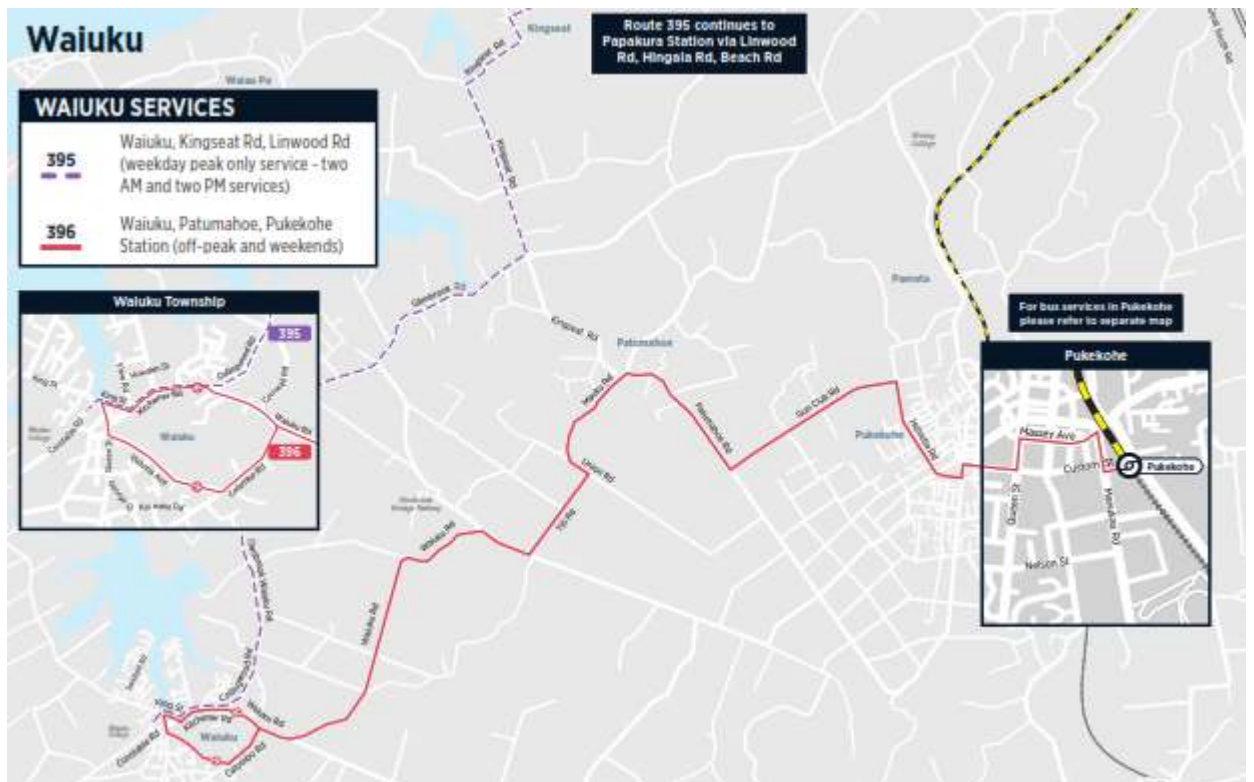
All of these roads are operating well below their carrying capacity.

Detailed turning movement counts were carried out at key intersections as part of this project to allow models to be built. These counts were carried out on Tuesday 23 March 2021 at Covid Alert Level 1.

### 3.3 Public Transport

Currently these are the public buses serving Waiuku:

- the 395 service is a commuter service connecting Waiuku with the Papakura Station via Glenbrook and Kingseat. (Leaving 2 Constable Road at ten minutes to six and again at ten minutes to seven on weekdays). Returning services leave Papakura Station at 17:33pm and 18:33pm. The trip takes approximately 38 minutes.
- The 396 service connects Waiuku with trains at Pukekohe Station. The service operates on weekdays every two hours with reduced services on Saturdays, Sundays and public holidays. The 396 service provides a loop through Waiuku as shown in Figure 4 below.



**Figure 4: Public Transport Services**

School buses also serve the Waiuku area however the proposed plan change area would not need these services as the proposed residential sites are within a short walk of all local schools.

### 3.4 Waiuku College Traffic Generation

Waiuku College is a significant traffic generator within Constable Road. The college generates 8 school buses during the start and finish of school hours. The Waiuku Medical Centre situated opposite the college in conjunction with the Waiuku College Board are currently providing a temporary vehicle drop off and pick up facility on the opposite side of the road to the college which requires students to cross Constable Road. There is currently a zebra pedestrian facility located across Constable Road near Leonard Street.

The proposed plan change could enable the college with the Council to create a vehicle drive in and drop off facility (for their respective land use activities), for the college and council reserve to accommodate parking as well as provide future bus bay facilities for recreational activities, school buses and school trips that is separated from the current Constable Road vehicle traffic peak flows. This would eliminate the potential for the growing college traffic to cause a community safety risk

as the college roll grows into the future. None of this is part of the current plan change which simply seeks a rezoning. However, the plan change is clearly an opportunity that could enable both the College and Council to sustainably and economically enhance their respective land use activities through transportation integration.

### 3.5 Walking and Cycling

No specific walking or cycling facilities are currently available on the exiting site frontage at the moment as the area is used for grazing land for livestock.

There is currently a footpath on the opposite side of Constable Road that starts 30 metres southeast of Breaker Grove. This extends along the length of Constable Road to King Street. There is not a continuous footpath on the western side of Constable Road. We understand a footpath will be built in front of 45 Constable Road as part of that development. There is no footpath on the western side in frontage to Waiuku College.

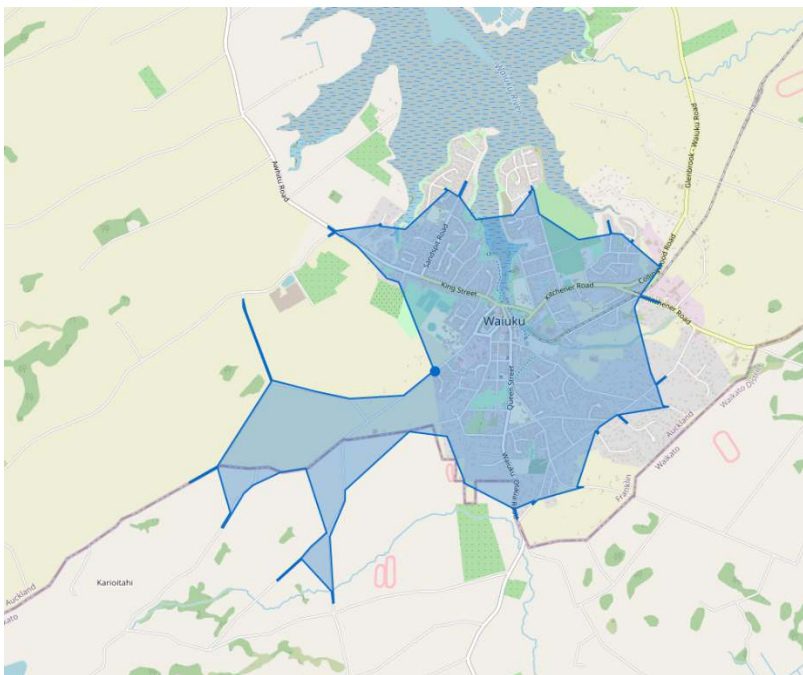
Walking times from the site access on Constable Road have been recorded to key destinations in Waiuku. These have all been measured from the proposed access location rather than within the site because the internal roads do not yet exist, and the form of those roads will not be known until a future subdivision is consented. This means that the measured walk times do not include walking within the plan change area itself.

Destination	Distance (Measured from Constable Road)	Walk Time
Waiuku College	400m	5mins
Waiuku Health Centre	400m	5mins
New World	850m	10mins
NZ Post	1000m	12mins
Bus stop	1.0km	12mins
War Memorial Hall	1.1km	13mins
Waiuku Library	1.1km	14mins
Waiuku School	1.4km	18mins

**Table 2: Existing Walk Distances (From Constable Road)**

This shows the compact nature of Waiuku, and it demonstrates that the land is very close to Waiuku College which is the major pedestrian destination in the town.

Similarly, the area that can be reached by a 10-minute bike ride has been plotted in isochrone form in Figure 5. The isochrone has been plotted from the location of the proposed access on Constable Road as we do not yet know the form of internal roads (and the plotting software only works on existing roads). The area includes practically all of Waiuku being reachable in 15-minutes. In some ways this makes Waiuku an ideal area to locate further residents as a way of improving transport efficiency, reducing impacts on climate change and meeting the needs of public health and wellbeing. Please note the area within the proposed rezoning area has not been included as these internal roads and the link to Sandspit Road do not yet exist.



**Figure 5: Existing 10-Minute Cycling Catchment**

The proposed establishment of walkways and cycleways within the proposed plan change area would enhance the wider community amenity through improving accessibility to Waiuku College, the west coast, the harbour, Sandspit Beach and also by providing multimodal choice within an accessible, sustainable and connected Waiuku township.

### 3.6 Road Safety Record

A search of the NZTA database of reported crashes for the five-year period 2017 to 2021 (see Attachment 1) shows there were no crashes on Constable Road near the site. Seven crashes have occurred further to the northeast on Constable Road some distance from the site boundaries. Of

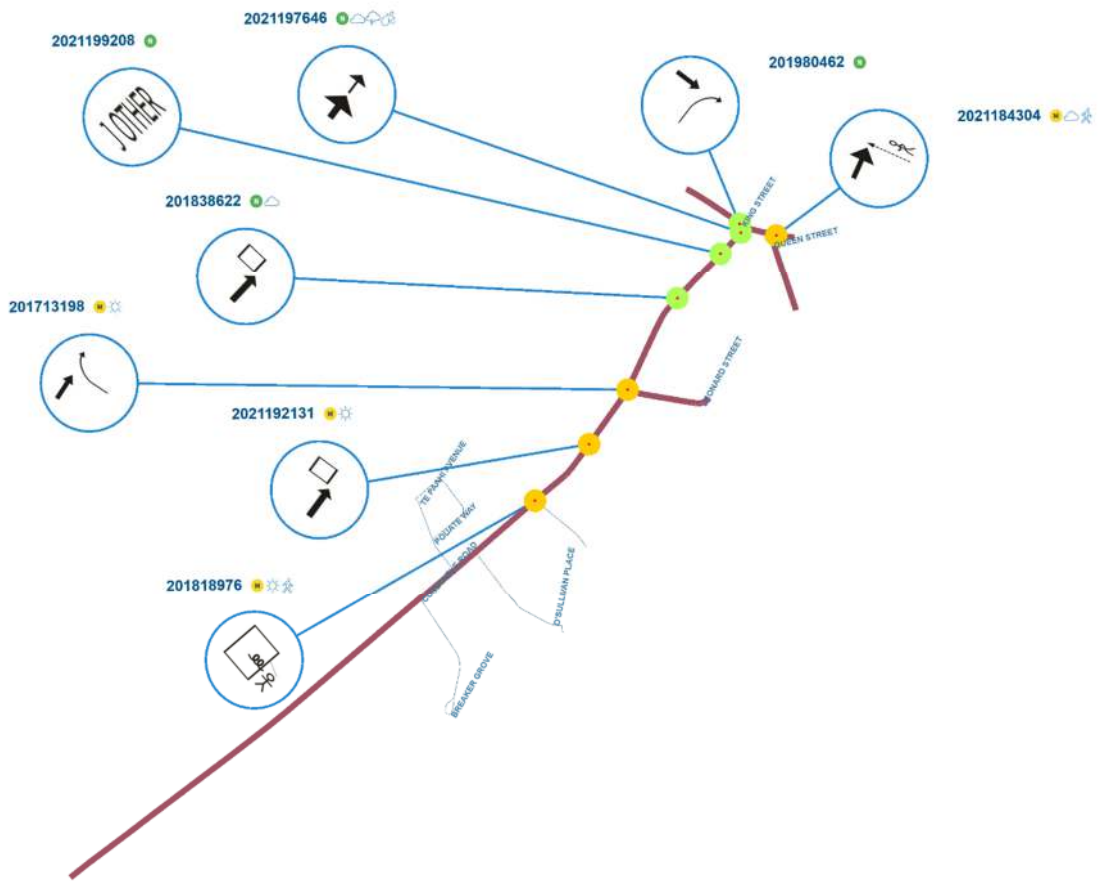
these crashes three resulted in minor injuries and four resulted in no injuries. One crash occurred at the King Street intersection with Queen Street.

Starting in the south and moving northeast on Constable Road the reported crashes occurred at the following locations:

- One crash occurred outside Waiuku College where a passenger fell whilst boarding a vehicle.
- A northbound SUV collided with a parked truck between the high school and Leonard Street
- One crash occurred at the Leonard Street intersection where a driver failed to give way while turning right out of Leonard Street.
- One crash occurred when a vehicle entering Constable Road from a driveway failed to give way to a car northbound on Constable Road.
- Two crashes occurred at the King Street roundabout. One of these was the result of a car hitting the rear of a vehicle stopping at the roundabout. The other crash occurred when a car eastbound on King Street that failed to give way to a car turning right out of Constable Road.
- The crash diagram below also shows an eighth crash that did not occur on Constable Road but involved a car hitting a child at the Queen Street roundabout. This crash resulted in minor injuries.

The crash pattern does not indicate any safety issues along the long site frontage and does not suggest any issues that need to be mitigated as part of the proposed plan change.

There is no common pattern to the crashes further northeast on Constable Road or at the roundabouts.



**Figure 6: Reported Crashes 2017 to 2021 .**

None of the crashes reported in the last five years are coded as having resulted in serious injuries or death.

### 3.7 Future Land Use Activities in the Area

The land in and around Waiuku is expected to develop in keeping with the Auckland Unitary Plan vision. The Fernleigh Business Park (80 ha) on Cornwall Rd in Waiuku is currently being developed. The industrial/commercial lots are expected to create interest for businesses throughout Auckland as a place to relocate to. It should be noted that this is over and above the planned future growth in the local New Zealand Steel precinct.

The workers attracted to this rapidly expanding business park will need homes and it is preferable that these homes be located within the local area and in close proximity to education, sport,

recreation, shopping and open spaces to avoid the need for vehicle commuting to employment in Waiuku.

The neighbouring site at 45 Constable Road has a consent to allow up to 48 houses to be built in several stages. This development has been included in the baseline for this ITA as follows:

	Houses	Trip Rate Veh/h/hh	Trips Vehicle/Hour	In		Out	
				% Entering	In flow	%Leaving	Out Flow
Morning Peak	48	0.75	36	0.25	9	0.75	27
Afternoon School Peak	48	0.5	44	0.5	12	0.5	12
Evening	48	0.75	36	0.75	27	0.25	9

**Table 3: 45 Constable Road Traffic Assumptions**

### 3.8 Future Traffic Growth

Assessment of historic traffic data on King Street in Waiuku has shown a ten-year growth from 7545 vehicles per day to 8304 vehicles per day or a growth of 10% in ten years (1% arithmetic or straight-line per year). The available data is shown in Table 4 below.

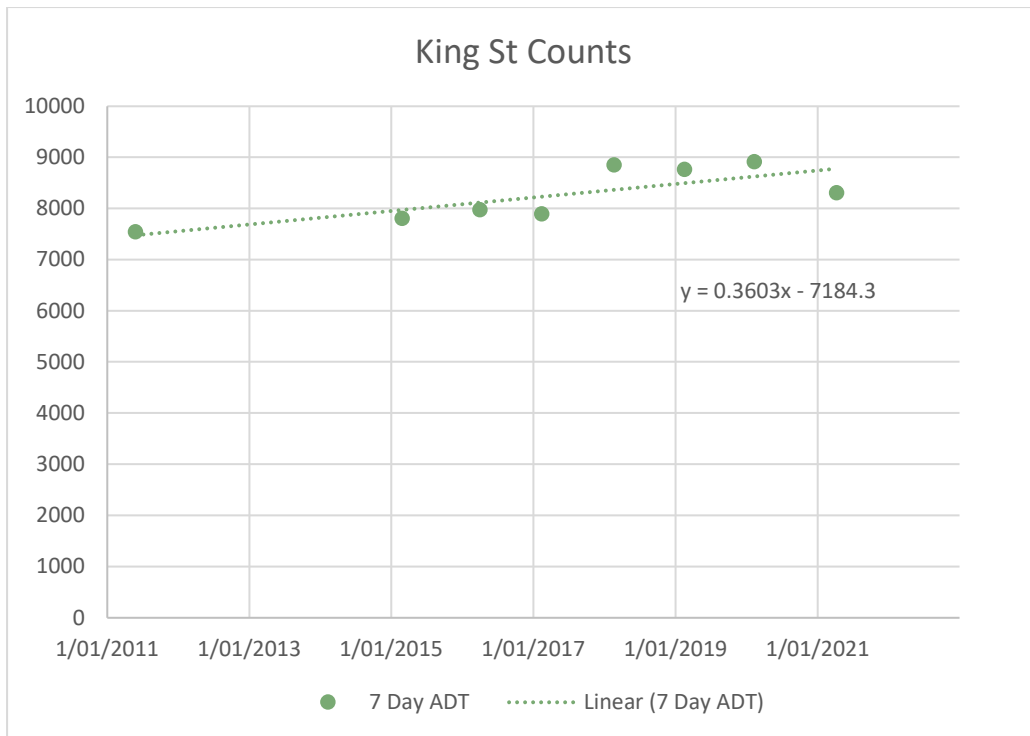
Road Name	Count Start Date	7 Day ADT
KING ST (WAIUKU)	25/05/2011	7545
KING ST (WAIUKU)	25/02/2015	7804
KING ST (WAIUKU)	30/03/2016	7973
KING ST (WAIUKU)	12/02/2017	7892
KING ST (WAIUKU)	18/02/2018	8848
KING ST (WAIUKU)	15/02/2019	8764
KING ST (WAIUKU)	10/02/2020	8911
KING ST (WAIUKU)	8/04/2021	8304

**Table 4: Traffic Counts on King Street near Sandspit Road**

A more accurate growth can be determined by plotting the data and fitting a straight line to the graph which shows traffic has grown at 1.8% per year arithmetic<sup>1</sup> over the ten-year period.

<sup>1</sup> Straight-line growth calculated using linear regression as per LTNZ 2006 method.





**Figure 7: Traffic Growth**

## 4. THE PROPOSAL

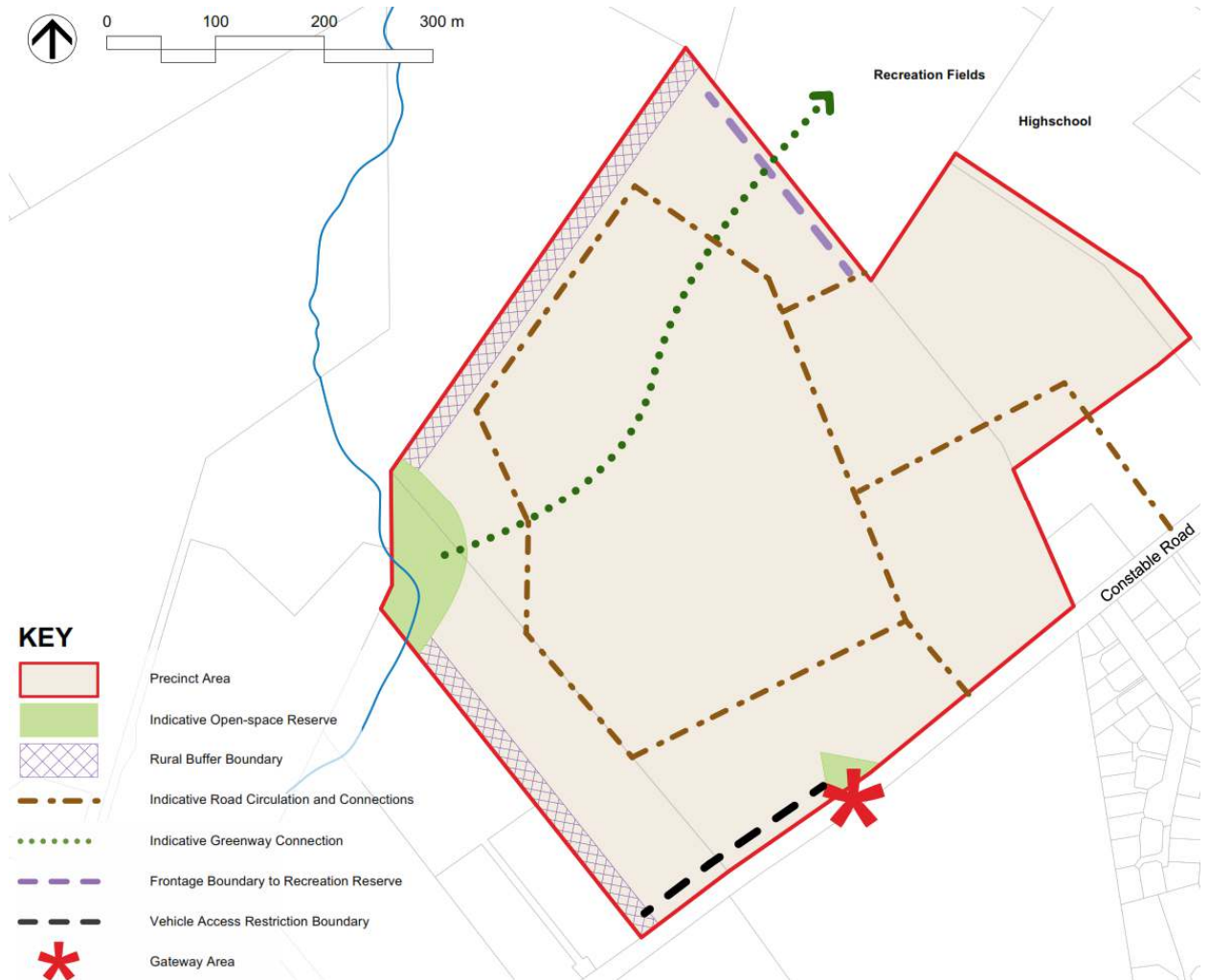
### 4.1 Plan Change and Precinct Plan

The land area covered by this report is shown in the Precinct Plan in Figure 8 below. The plan shows how the development would have frontage onto Constable Road and shares boundaries with the High School, the Council owned reserve land, and farmland to the south and west.

The Precinct Plan shows the indicative location of the intersection that would be required on Constable Road, and indicative key internal roads, which would all be local roads. Two key points to note are that the internal roads have been set out to ensure a future subdivision of the land would provide a connection to the roads being built through the neighbouring site at 45 Constable Road. Similarly, the internal roads would also allow for a future connection through the Council owned recreational reserve if or when that is required by the Auckland Council. (The Plan Change does not have a requirement for that future Council link road, but it does allow it to occur if the Council or the College wish to pursue accessibility improvements).

The Precinct Plan also shows an access restriction onto Constable Road along the southern-most frontage. This access restriction would ensure that no access is provided where visibility could be restricted by a crest in the existing road, and it ensures there will be no access outside of the area

demarcated by a Gateway Area. That Gateway Area would mark the boundary between the rural section of Constable Road and the urban section. This would be a good location for a future extension by Auckland Transport to the 50km/h speed restriction should that be approved in conjunction with a future subdivision and intersection.



**Figure 8: Precinct Plan by Common Ground Studio**

The proposed plan will create approximately 910 residential lots. This ITA and associated traffic assessment is based on 910 houses.

It should be noted that this Private Plan Change seeks a rezoning of the land, and it seeks to incorporate the Precinct Plan as a control in the Unitary Plan. The Plan Change is not seeking approval for the intersection or internal roads because that would all naturally occur as part of a future subdivision consent application. No further detail is available as part of the Plan Change.

The matters set out below simply seek to determine whether an intersection could be formed at the proposed location.

#### 4.2 Intersection Location

The Proposed Plan Change would include a Precinct Plan that would note the location of a future intersection, but it does not attempt to define the form of that intersection. The following analysis simply seeks to show that a suitable intersection control could be designed at that location. Any specific future development proposal would need to be accompanied by a design that would need to meet whatever design codes are in force at that time and would need consent approvals from Auckland Council and Auckland Transport.

The future subdivision would be accessed from a new intersection on Constable Road approximately 140 metres southwest of the existing intersection with Breaker Grove.



**Figure 9: Location of Main Constable Road Access**

At this location Constable Road currently operates as a 100km/h rural road with a transition to the existing 50km/h speed limit approximately 50m to the west of the proposed intersection.

Constable Road rises as it approaches the current town boundary and is straight with very good visibility in either direction.

Visibility to the proposed Intersection from the northeast is excellent, having in excess of 400 metres of sight distance, most of which is road travelled at 50km/h.

Visibility from the southwest is limited by a crest as shown in the distance in Figure 9 above. The visibility from just beyond the crest to the proposed intersection location is 190 metres. That is suitable for an approach speed of 80km/h<sup>2</sup>.

Visibility across the crest itself has been measured at closer to 120 metres. From that we can conclude two things:

- There should be no direct access to Constable Road in the vicinity of the crest.
- The crest is unsafe at speeds of more than 80km/h as above that speed the Stopping Sight Distance Criterion cannot be achieved<sup>3</sup>.

While the posted speed limit on Constable Road near the crest is 100km/h, it is actually not safe to travel at that speed and hence the operating speed is closer to 80km/h. Reducing speed in the future on Constable Road to at least 70 km/h is desirable and should be a requirement of the design of any future development. Ideally, in a safe system, the speed limit would be 50km/h until well out of the township.

An intersection at the proposed indicative location would not meet safe system requirements for a 100km/h road because that would require at least 234m of sight distance. If for some reason the speed limit was not reduced, and to be quite clear under the safe system approach it should be reduced, then to comply the intersection would need to be moved further towards Waiuku. However, I do not expect that situation to occur at subdivision consent stage. The safe and appropriate speed limits setting by Auckland Transport for vehicle speed limits has tended to allow for a 50km/h speed limit in urban areas and a maximum of 70km/h in urban fringe areas. I consider that it would be inappropriate of Auckland Transport to persist with a 100km/h speed limit on Constable Road if the area develops as proposed.

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<sup>2</sup> Austroads Guide to Road Design Part 4A, Safe Intersection Sight Distance 80km/h  $R_T=1.5$ sec is 170m &  $R_T=2.0$ sec is 181m.

<sup>3</sup> Austroads Guide to Road Design Part 3 Table 5.5 requires 114m visibility for 80km/h with a reaction time of 2 seconds and 126m for 2.5 seconds.

### 4.3 Possible Intersection Form

A simple Tee intersection controlled by a Giveaway control is the most likely future intersection form. A footpath would be required on the residential side of the road while a shoulder would be maintained on the opposite undeveloped side of Constable Road.

A right turn pocket can be installed at this location with 3.0m through lanes and a 2.8m right turn lane. Figure 10 below shows how the indicative intersection could be formed with some local pavement widening on the development side of the road. The taper has been designed for a 70km/h approach speed. That would be shortened if the 50km/h limit is extended. The widening is approximately 1.7m from the existing edge of seal. No changes are required to the opposite side of Constable Road.

Other intersections on Constable Road and high traffic generators such as Waiuku College do not have right turn pockets.

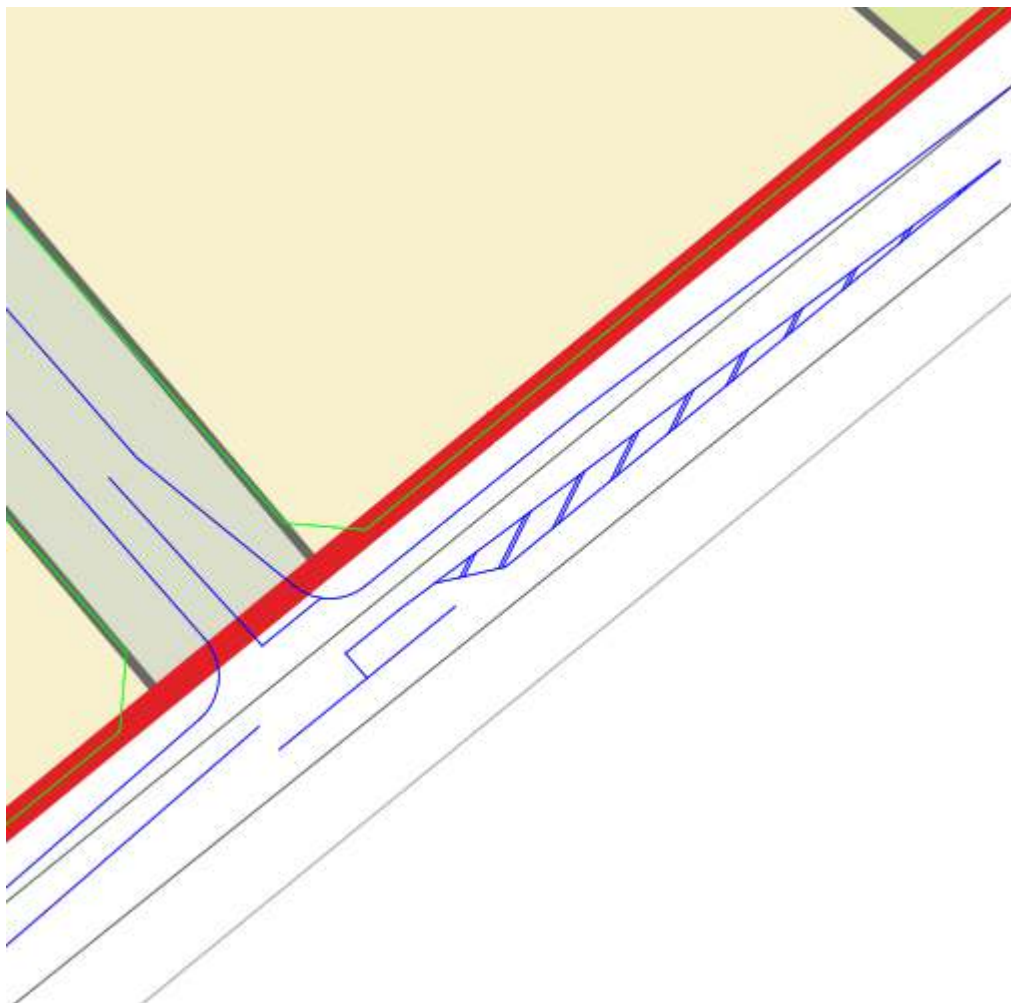


Figure 10: Probable Constable Road Intersection

Kerb and channel and a footpath would be installed on the Constable Road site frontage on the development side. The other side would be left as it currently is as there are no current Council approvals to develop the land opposite the site.

Corner splays of 5 metres by 5 metres would be required on the sites nearest the intersection to ensure visibility standards are achieved.

None of these details can be confirmed at the Plan Change stage and no approval is sought for any of these design details at this time. They have been included only to provide an indication of the likely form of intersection that would accompany a subdivision application in the future.

All of the details can easily be altered to increase or decrease the design speed of the intersection.

#### 4.4 Access Restriction

At the southern end of the site Constable Road has a crest within a cutting as shown in Figure 11 below. At that point visibility is limited to 120m. This crest forms a constraint on any future access to Constable Road at this location.



Figure 11: Southern Intersection Visibility to the North (120m)

An advantage of having this crest in the road is it limits traffic speeds in advance of the proposed site access. A reduction in the speed limit on the section of Constable Road along the frontage of the plan change area to 50km/h could accompany the development. A symbol on the Precinct Plan shows a 'Gateway Area' that is intended to work with the crest in delineating the transition from a rural to an urban environment. The Gateway Area would be a good location for a new speed restriction sign.

#### 4.5 Internal Intersections

All internal intersections would require approval only as part of a future subdivision application. There is nothing that requires assessment or approval at this time.

#### 4.6 Parking

The general Auckland Unitary Plan rules currently apply to all sites within the area. Individual owners will need to show compliance with these rules at the time of consent. The rules for the Single House zone require 1 parking space per dwelling. There is no maximum.

#### 4.7 No Stopping Restrictions

No specific requirements for No Stopping restrictions have been identified in this ITA. However, the requirement for No Stopping restrictions will be assessed as part of any future subdivision and as part of detailed intersection design. Should any No Stopping restrictions or other traffic controls be required these will be legalised and implemented by Auckland Transport in conjunction with the owner at the time of any future subdivision.

#### 4.8 Walking and Cycling

A footpath would be constructed along the site frontage on the same side of the road. Footpaths would also be constructed on the internal roads. Using these footpaths, it is expected that pedestrians could access the entire development area and by crossing to the existing footpath on the opposite side of the road near Breaker Grove, pedestrians could access all of Waiuku centre and coastal reserve walk and cycleways.

No specific cycle infrastructure will be provided and nor is any required. The internal roads are all local roads that would not carry sufficient traffic to justify cycle lane provisions. No specific cycle lanes are provided on Constable Road. Any future improvements to the cycling network in Waiuku

are the responsibility of Auckland Transport. None are required to avoid, remedy or mitigate effects of this plan change.

#### 4.9 Other Connections

No other connections are proposed as part of this Plan Change; however, the Precinct Plan has been designed to make a future connection to the Council reserve land behind the College as a possibility for Council and the College to pursue if they desire and as and when it is deemed appropriate for these landowners.

The connection to the neighbouring site at 45 Constable Road would allow interconnection between the two residential areas and allow some vehicles from the Plan Change area to access through that approved and soon to be completed site. That site already has an approved intersection with significant available capacity. Should Auckland Transport not want that connection it could be removed from this indicative plan at subdivision consent application stage.

## 5. TRIP GENERATION AND EXPECTED MODE SHARE

### 5.1 Trip Generation

The ITA Guideline requires estimation of trip generation in terms of person trips rather than vehicle trips. To achieve that we have used the Census Journey to Work data collected by Statistics New Zealand and presented in the Commuter Waka application. Data from the 2018 Census of Population and Dwellings has been aggregated for the five urban Waiuku SA2 level areas as follows:

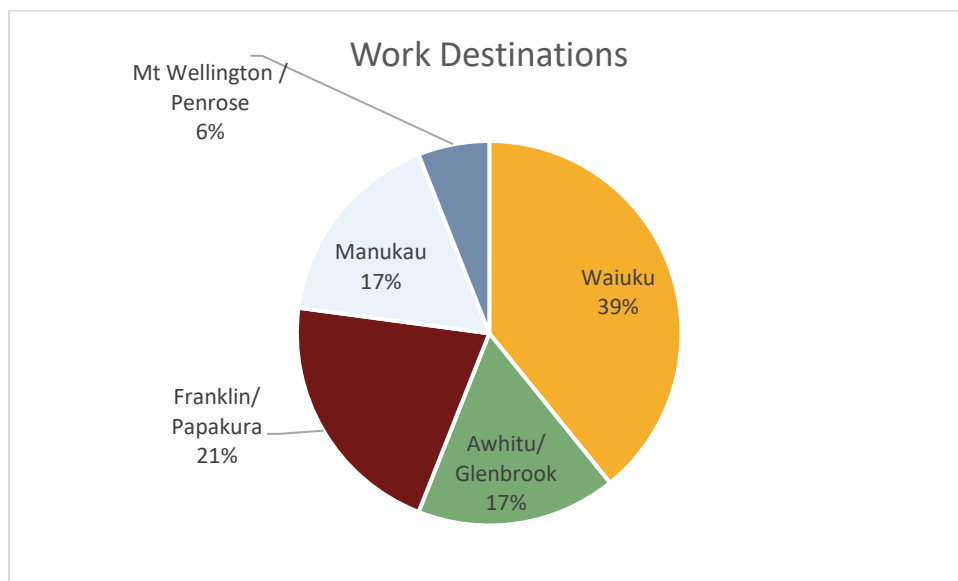
- Tamakae
- Waiuku Central
- Waiuku East
- Kendallvale
- Hamilton Estate.

Aggregation allows for greater accuracy from the Means of Journey to Work and Means of Journey to School datasets because small numbers are obscured by Statistics NZ in order to protect individual privacy. This means that the data becomes more accurate for larger areas and groupings of areas. The detailed results are in Attachment 2.



From the data a total of 2910 people from 3261 households completed the journey to work question on census day. Of these 1140 travelled to a destination within Waiuku, 489 travelled to a destination near Waiuku, 615 travelled to a destination in the wider district such as Pukekohe or Papakura and 492 travelled to the Manukau District and 174 travelled outside of these areas to somewhere more distance such as the Auckland Isthmus. This data is shown in the pie chart in Figure 12. As shown, the proportion of resident workers who travel to destinations in Waiuku or the neighbouring Awhitu and Glenbrook areas total 56%. This means people are more likely than not to work locally.

Of the few people who travelled to the Auckland Isthmus, most travelled to Penrose and Mt Wellington. Nobody in the available data set listed Auckland Central as their destination<sup>4</sup>.



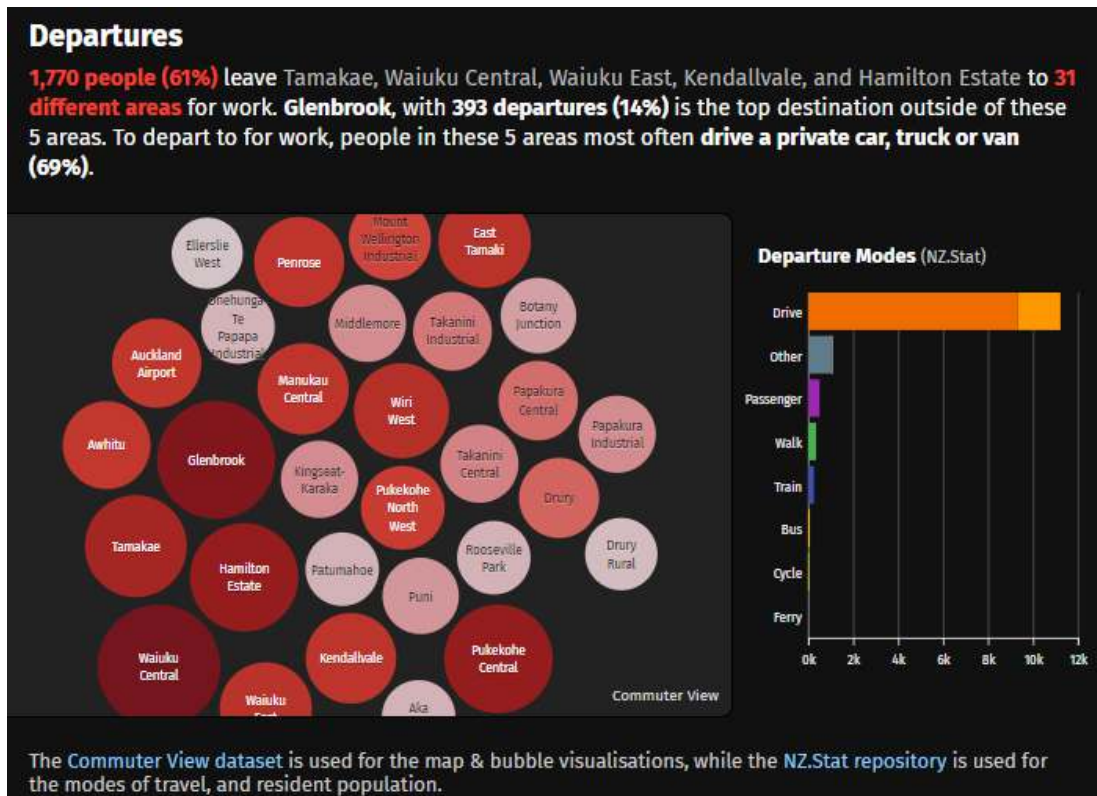
**Figure 12: Work Destinations for Waiuku Trips**

The data does not cover person trips that were for shopping purposes and nor does it include any other non-work or non-school trips for leisure activities. However, given that an ITA is focussed on peak activities then the data gives a very good idea of the current trip generation from existing homes.

## 5.2 Mode Share

The Census data for work trips from the five Waiuku areas is summarised in Figure 13 below.

<sup>4</sup> Statistics New Zealand round numbers less than 2 to zero in order to preserve privacy for individuals.



**Figure 13: Work Destinations and Mode Share**

This shows that 69% of people drove to work in a private vehicle, 14% of people drove in a company vehicle, 8% worked at home (other), 4% were passengers, 2% went by train and 1% used a bus as their main means of travel.

School travel mode share is shown in Figure 14. This shows that 48% of students travelled as passengers in cars, 26% walked, 6% stayed home on census day, 3% cycled, 3% used the school bus and 3% went by train to their educational institution.

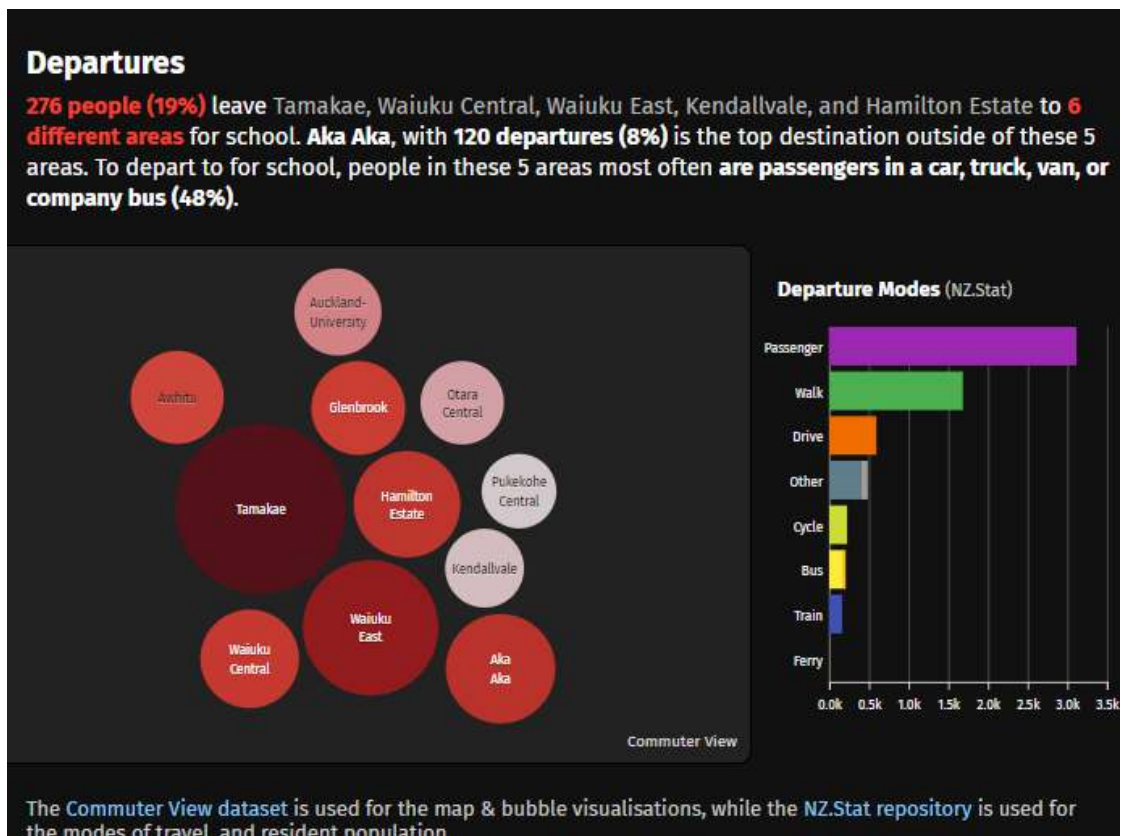


Figure 14: Education Destinations and Mode Share

### 5.3 Vehicle Trips

The number of car trips that would be generated by the proposed plan change was initially estimated from standard traffic generation rates. Since the first draft of this ITA, we have refined those rates to reflect the slightly lower trip rate that occurs in Waiuku due to it being a standalone town that is reasonably separate from the wider Auckland metropolitan area.

Specifically, we have used a traffic count on Sandspit Road, and we have counted the number of houses located within the catchment on Sandspit Road using Google Maps. This gave a peak hour rate of 0.75 trips per household<sup>5</sup>. Similarly, the school peak has been revised to 0.5 trips per household.

The assessment has assumed that 75% of trips will occur in the peak direction and 25% in the opposite direction during the morning and evening peak hours. The split is assumed to be 50:50 for the school peak.

<sup>5</sup> An average hourly flow of 291 vehicles per hour (Mon-Fri) and 386 houses in the catchment where the counts were taken.

These assumptions will tend to overestimate traffic generated in a small town such as Waiuku where walking trips are more convenient. The standard rates are also largely based on commuter areas where people will leave a dormitory suburb or town in the morning and return home in the evening. Nevertheless, these assumed rates give a good level of traffic generation for design purposes as shown in Table 5 below.

	Houses	Trip Rate Veh/house	Trips Vehicle/Hour	In		Out	
				% Entering	In flow	%Leaving	Out Flow
Morning Peak	910	0.75	683	0.25	171	0.75	512
Afternoon School Peak	910	0.5	455	0.5	228	0.5	228
Evening	910	0.75	683	0.75	512	0.25	171

**Table 5 - Traffic Generation**

The slightly lower trip rates for residential housing in Waiuku when compared to other more car-based developments in parts of Auckland was then confirmed using the Census Journey to Work data 2018. A selection of suburbs where people might be expected to commute by car were compared with Waiuku Central (where the site is located). This included finding the number of drivers from the Journey to Work data and calculating the ratio of work trip drivers per household. This showed a range of 0.6 up to 0.93 with an average of 0.74. By comparison Waiuku Central has a ratio of 0.51 or only 70% of the other areas considered.

Area	Driver			Households	Driver/HH
	Private Vehicle	Company Vehicle	Total		
Botany East	330	36	366	606	0.60
Botany South	690	57	747	975	0.77
Dannemora N	474	42	516	684	0.75
Dannemora S	615	51	666	711	0.94
Conifer Grove E+W	858	153	1011	1608	0.63
Karaka Lakes	396	54	450	684	0.66
Redhill	441	60	501	834	0.60
East Tamaki Heights	579	84	663	711	0.93
Average for Group					0.74
Waiuku Central	255	0	255	498	0.51

**Table 6 - Drivers per HH in Waiuku Central Compared to a Selection of Commuter Suburbs**

This lower level of work trip drivers is important as it demonstrates that Waiuku is not a commuter suburb in the traditional sense and trip rates measured in commuter suburbs are not applicable in Waiuku.

## 6. REGIONAL POLICY ISSUES

The AUP sets out higher level policy issues for land use development which relate to transport in the Regional Policy Statement Section B2.2.1 which seeks to ensure a compact urban form that enables:

- better use of existing infrastructure and efficient provision of new infrastructure (B2.2.1(1)(c),
- improved public transport (B2.2.1(1)(d),
- reduced adverse environmental effects (B2.2.1(1)(g),
- the development of land within the Rural Urban Boundary, towns, and rural and coastal towns and villages is integrated with the provision of appropriate infrastructure (B2.2.1(5).

These higher-level objectives are then expanded with Regional Policy Statement policies that ensure that the location or any relocation of the Rural Urban Boundary identifies land suitable for urbanisation in locations that:

- promote the achievement of a quality compact urban form (B2.2.2(2)(a),
- enable the efficient supply of land for residential, commercial and industrial activities and social facilities (B2.2.2(2)(b),
- integrate land use and transport supporting a range of transport modes (B2.2.2(2)(c),
- support the efficient provision of infrastructure (B2.2.2(2)(d)
- Enable rezoning of future urban zoned land for urbanisation following structure planning and plan change processes in accordance with Appendix 1 Structure plan guidelines (B2.2.2(3).

Further transport related objectives and policies specific to rural and coastal towns are then set out to require that rural and coastal towns have adequate infrastructure<sup>6</sup>. B 2.6.2 then sets out policies that require the establishment of new or expansion of existing rural and coastal towns and villages to be undertaken in a manner that:

- incorporates adequate provision for infrastructure (B2.6.2(1)(b),

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<sup>6</sup> AUP Objective B2.6.1(2)

- provides access to the town or village through a range of transport options including walking and cycling B2.6.2(1)(g).

So, the overall policies and objectives that ensure that land use and transport are integrated allow for rural and coastal towns such as Waiuku to expand, provided the infrastructure exists to support the expansion, or provided the infrastructure can be provided, and so long as the expansion does not undermine the larger goal of a compact urban form.

Vision Zero has been adopted by Auckland Transport. This is an ethics-based approach that requires us to design a safe transportation system. Any works required to mitigate transportation effects of a Plan Change will need to be designed in accordance with the Safe System approach.

## **7. ASSESSMENT OF EFFECTS**

### **7.1 Tier 1 or Regional Assessment**

Regional level assessments are often carried out using the Auckland Regional Transport (ART) model. I understand that ART has been extended to include Waiuku, but Waiuku sits at the extremity of the model (the purpose being to ensure Waiuku is included when assessing impacts of overall regional development strategies). That does not mean that a model on the scale of ART is suitable for assessing fine detail or impacts within or near Waiuku itself.

In order to assess the regional impact of a residential development in Waiuku a better method is to consider the 2018 Census of Population and Dwellings datasets that are now publicly available. These include the Means of Travel to Employment and Means of Travel to Education. Both datasets set out information collected from individuals such as their main means of travel and their destination on census day.

Using the Statistics New Zealand Commuter Waka tool, we can filter the Journey to Work and Journey to School data to only consider trips originating within Waiuku. We see from the Journey to Work data that more than 56% of workers living in Waiuku travel to a destination within Waiuku or the immediate surrounding area. This indicates that the impact of residential development within Waiuku has a limited impact on other areas and it also indicates that houses within Waiuku are desirable for the planned and current growth of the area from a transport perspective as it further reduces the need to travel as a commuter out of the area.

Looking further afield for regional impacts we see that very few Waiuku residents travel into the centre of Auckland or the Auckland Isthmus. Waiuku simply isn't part of the main commuter belt for Auckland due to the distances involved and the good availability of jobs in the area.

A similar but more pronounced pattern is clear when considering the Means of Journey to Education data. Again, filtering only trips originating in Waiuku, we see that there is really very little travel beyond the old Franklin District area with some 81% of all current students travelling within Waiuku itself.

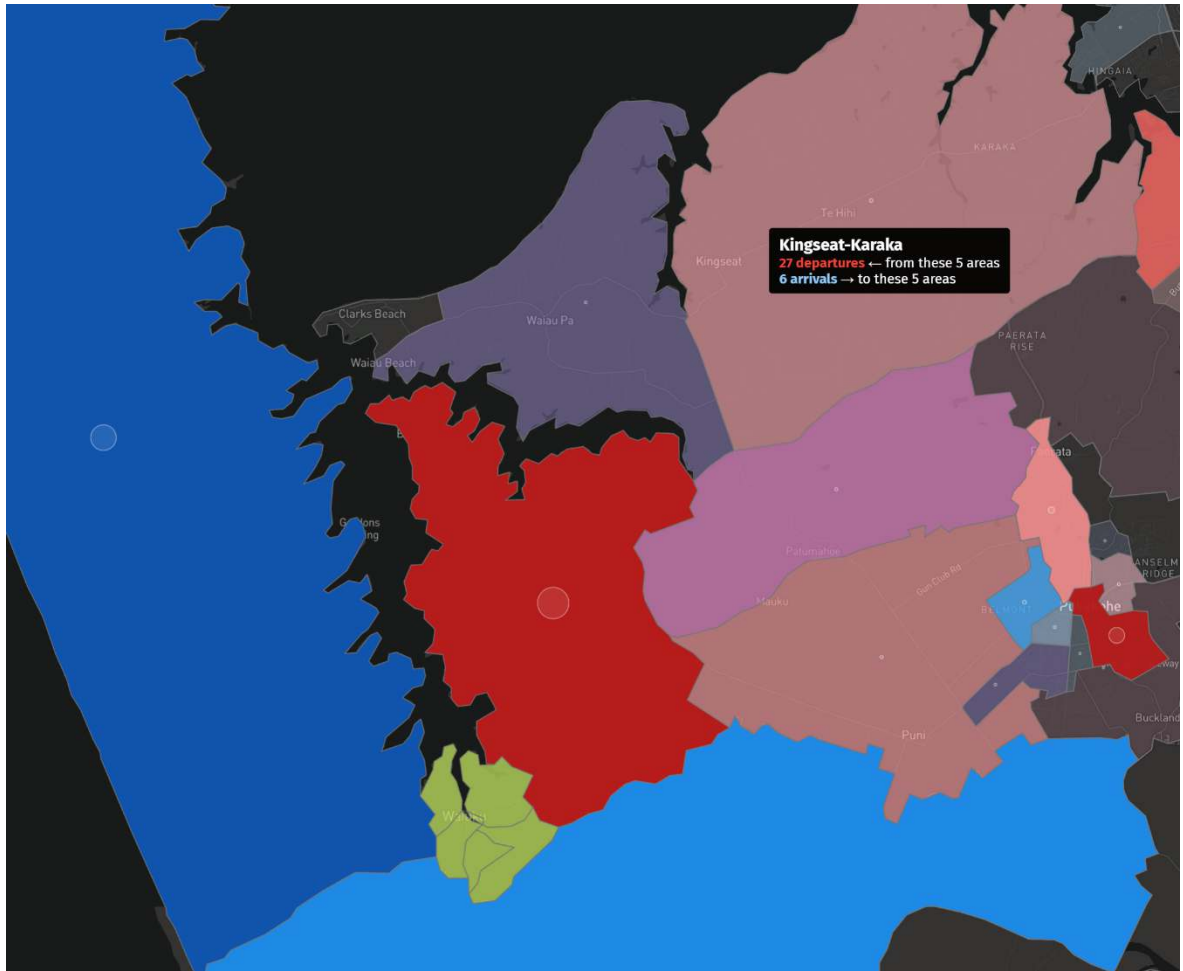
From a regional perspective we can conclude that wider transport impacts of houses in Waiuku are limited to local effects and to a lesser degree district effect.

Specific consideration has been given to any potential tier 1 traffic or transport effects that could occur due to the combination of the proposed development together with approved developments at Clarks Beach and Kingseat. Clarks Beach has been developing rapidly as a residential area with scope for further development to occur. Currently there is no travel recorded in the Journey to Work or Journey to School datasets compiled by Statistics New Zealand. Figure 15 below shows Clarks Beach in grey with no trips to or from the five Waiuku census areas.

Similarly, there is very little interaction between Waiuku and Kingseat with only 27 work trips (no school trips) starting in Waiuku and ending in the entire Kingseat Karaka area. There are only 6 work trips (again no school trips) that start in Kingseat Karaka and end in Waiuku.

Kingseat is zoned to expand but as a residential area rather than as an employment zone. Any expected growth in travel demand is therefore likely to be from Kingseat to Waiuku which is in no way affected by the proposed development at Constable Road.

The only way residential development in Waiuku can have combined effects with other residential developments would be if there were cumulative effects somewhere downstream such as at SH22. The evidence is that is unlikely to occur. Indeed, more housing within Waiuku to support local jobs is more likely to create positive transport benefits.



**Figure 15: Travel Demand between Waiuku and Clarks Beach and Kingseat**

## 7.2 District Level Assessment (Tier 2)

We see from the Means of Journey to Work data that the main destinations outside of Waiuku itself are Glenbrook and Pukekohe. The predicted proposed housing development additional flows are therefore not likely to have any impact on the local arterial road network. However, the increase in population and increase in travel within the district means that the existing bus services should become more popular over time.

Sidra models have been built to test the two existing roundabouts on King Street which will carry most of the traffic generated by the Plan Change. Traffic generated for the morning, school and evening peak hours was assigned to the road network pro-rata to existing traffic flows. Future light vehicle traffic flows were then added to the existing vehicle counted flows and tested in a SIDRA model for each period. Additional traffic flows for each period and Sidra results are set out below.



### 7.2.1 Morning Peak Hour Assessment

Additional traffic generated by the 910 houses during the morning peak are set out below in Figure 16. We have assumed for the sake of assessment that all traffic generated by the Plan Change area will pass through these intersections. The reality is that some of the trips will be to the centre of Waiuku via Leonard Street instead. The assessment is therefore a worst-case scenario.

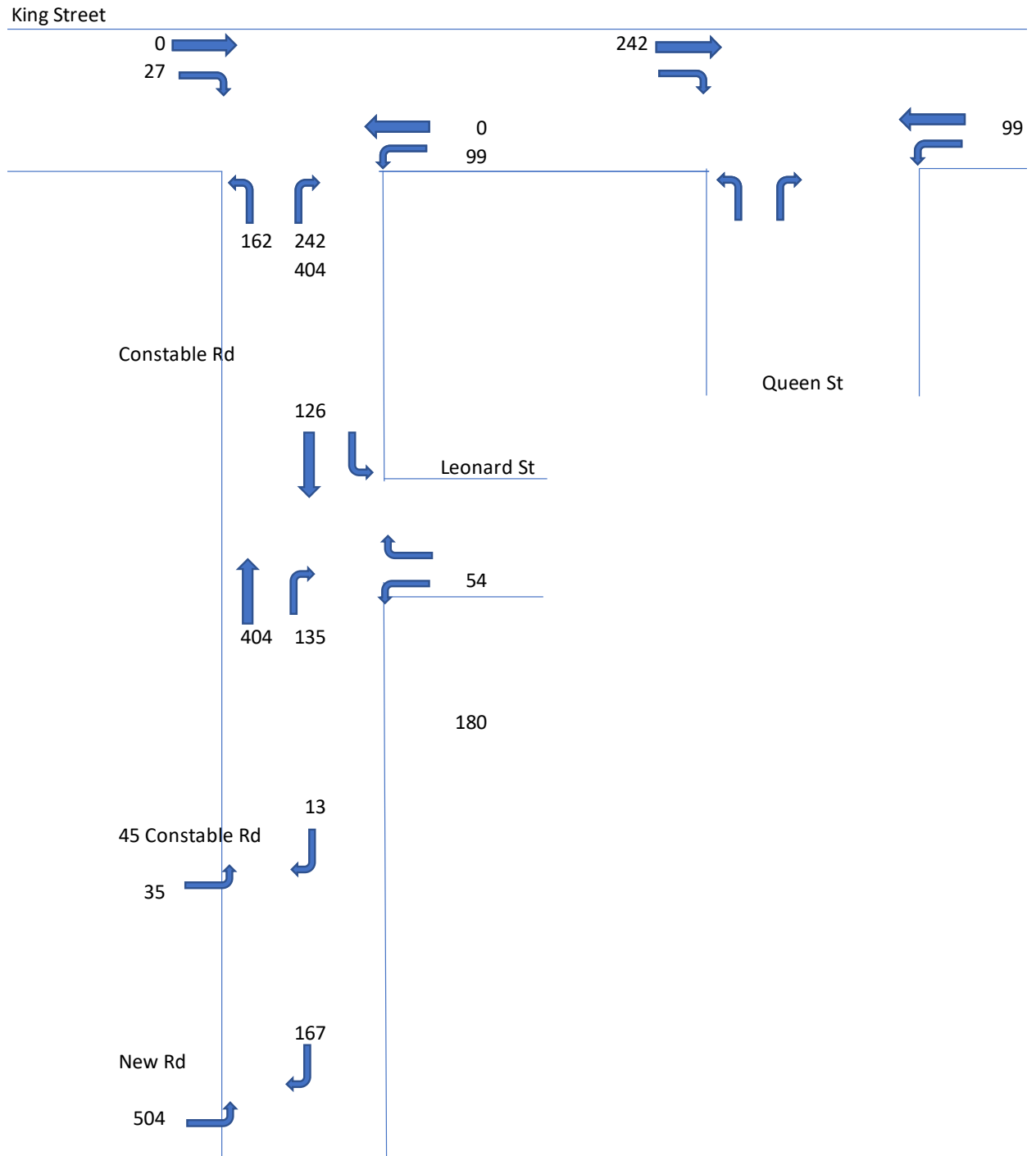
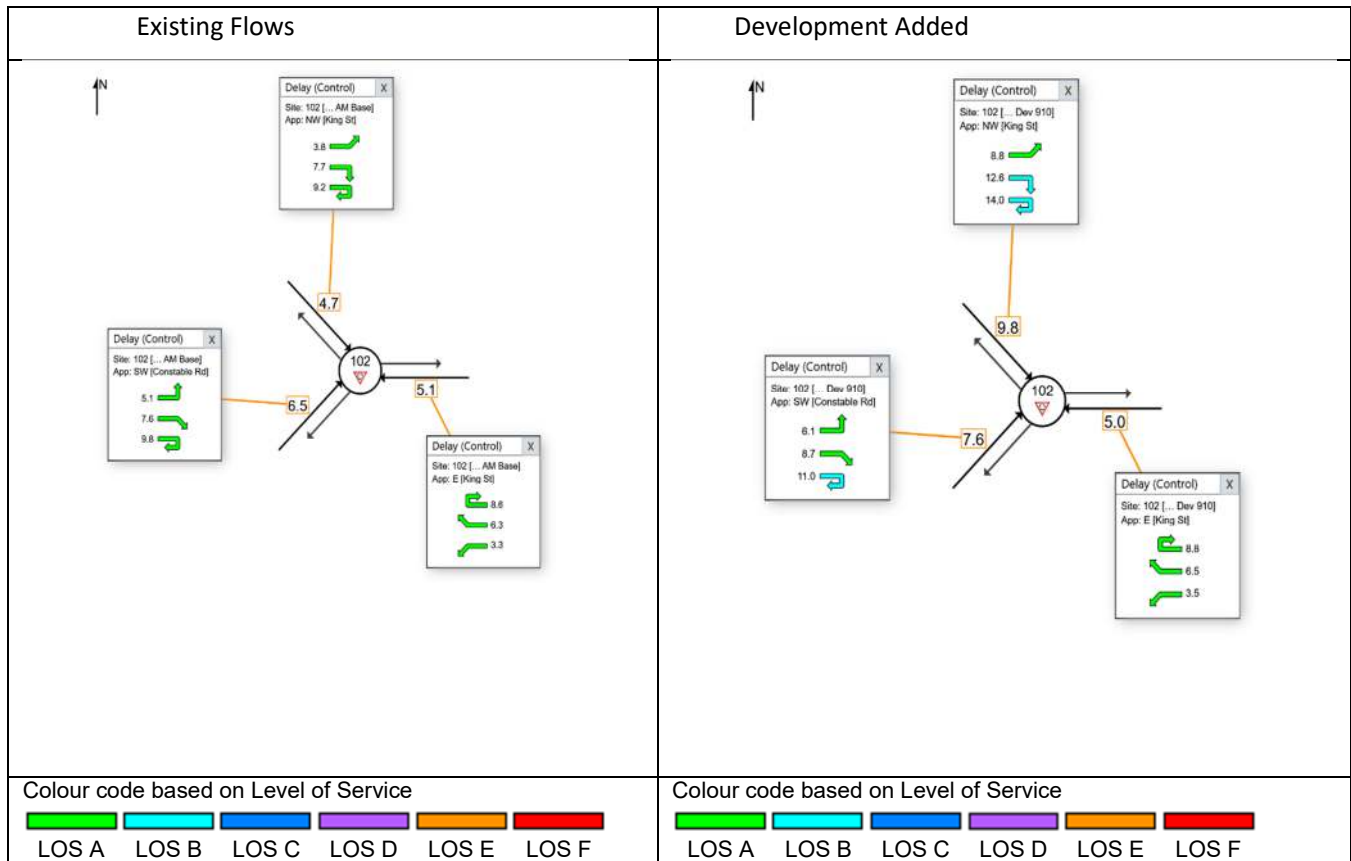


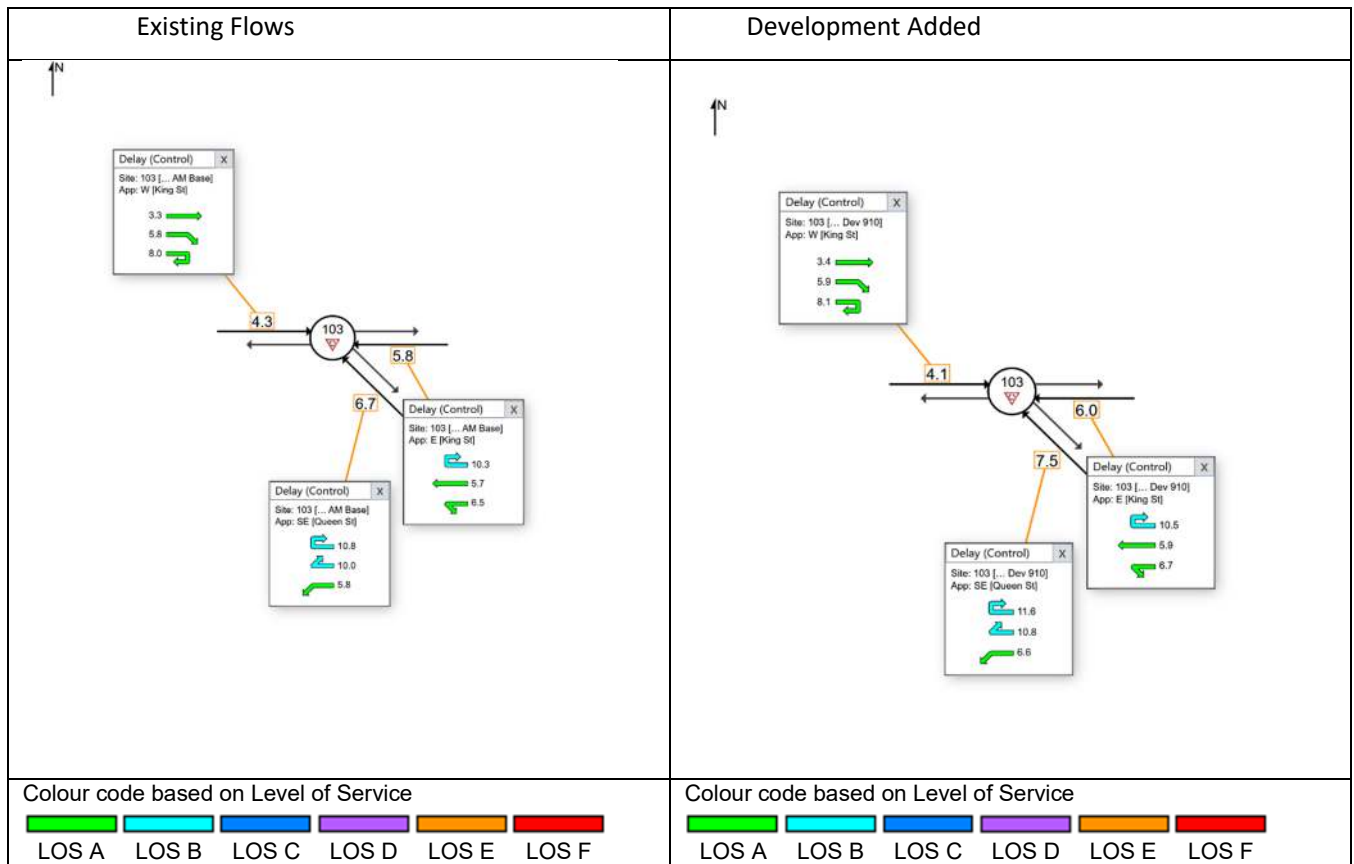
Figure 16: Additional Morning Peak Traffic Schematic (Not to Scale)

Using these additional flows, a Sidra assessment of intersection capacity was then carried out by testing the existing situation with current observed traffic flows against future flows.



**Figure 17: Model Results for Constable Road King Street in Morning Peak**

The model shows that in a worst-case scenario there is only a marginal increase in delays at the Constable Road roundabout in the morning peak. The base traffic flows all pass through the roundabout at level of service A which means that traffic conditions are very good. The development does result in the right turn into Constable Road becoming level of service B which is still a good result.

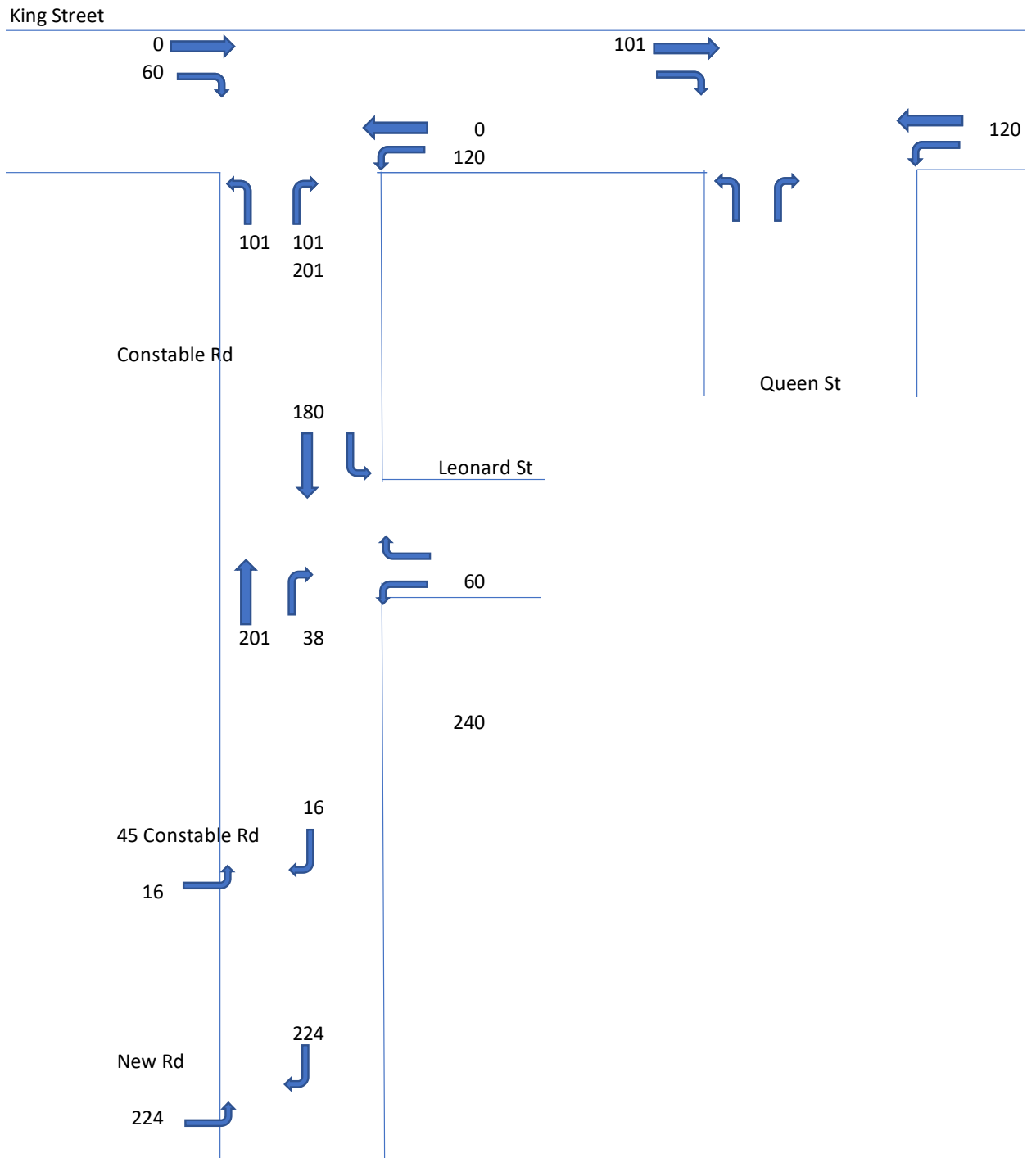


**Figure 18: Model Results for King Street & Queen Street in Morning Peak**

The King Street roundabout at the Queen Street intersection currently operates at a level of service of A or B. The development flows again only have a very minor impact on this operation in terms of delays.

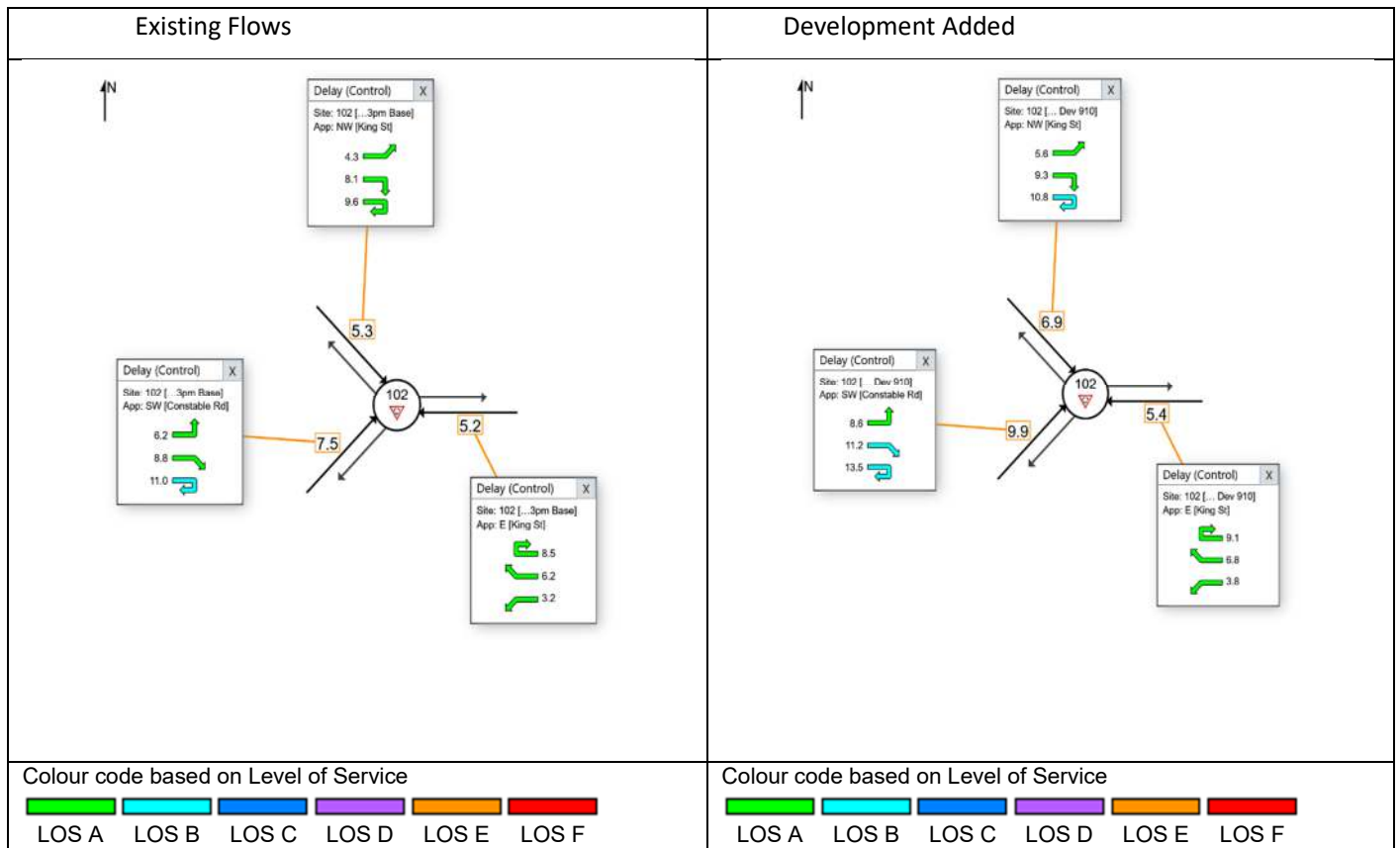
### 7.2.2 Afternoon School Peak

The busiest vehicle traffic conditions in Waiuku actually occur during the afternoon school pick up time. Additional traffic flows for this period are shown in Figure 19 below.



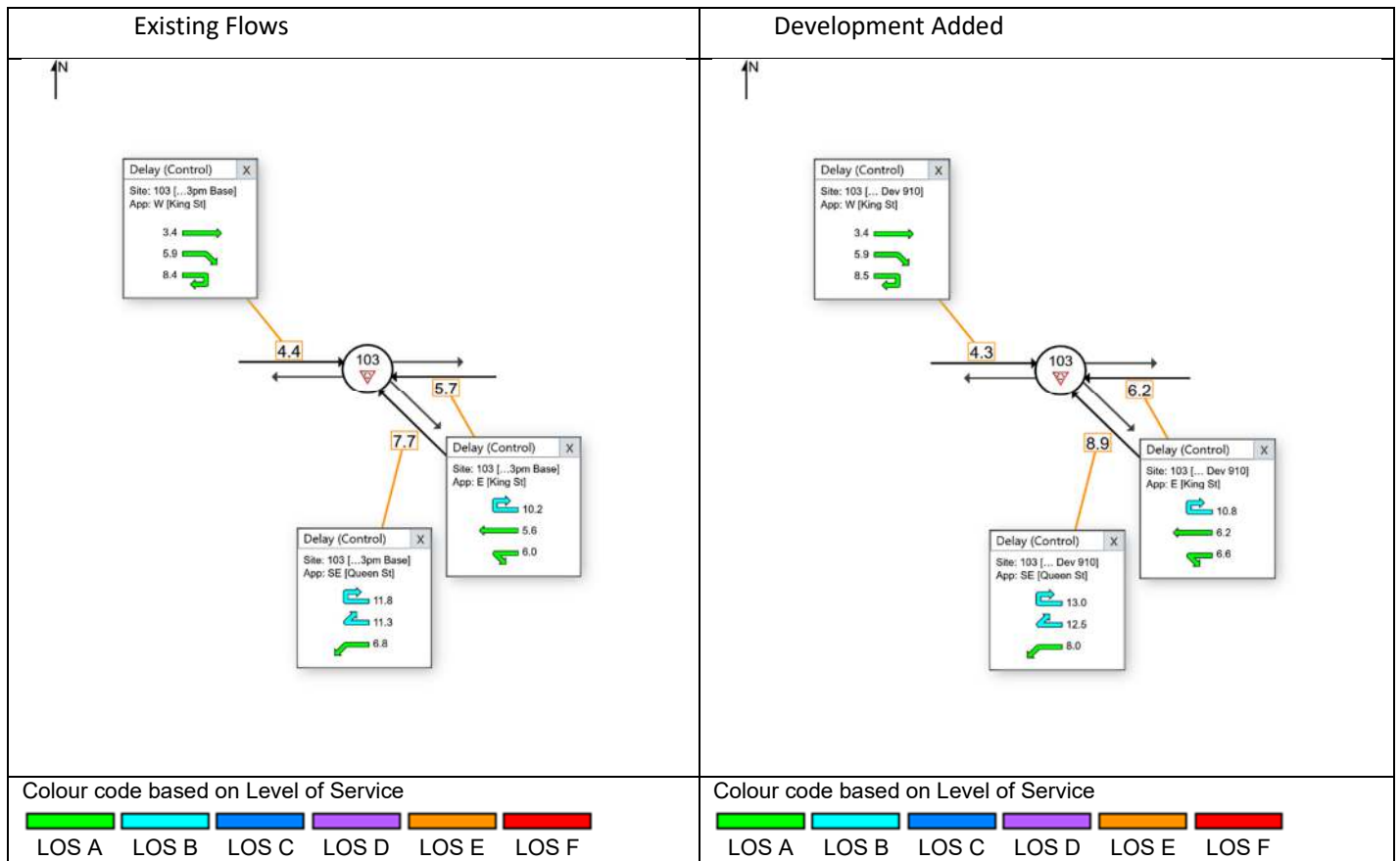
**Figure 19: Afternoon School Peak Additional Flows Schematic (Not to Scale)**

Again, adding these flows to the existing vehicle traffic counts means we are able to model before and after effects at the three key intersections.



**Figure 20: Model Results for Constable Road King Street in 3pm Peak**

The model shows the proposed development does not create any noticeable issues at the Constable Road roundabout during the school peak.

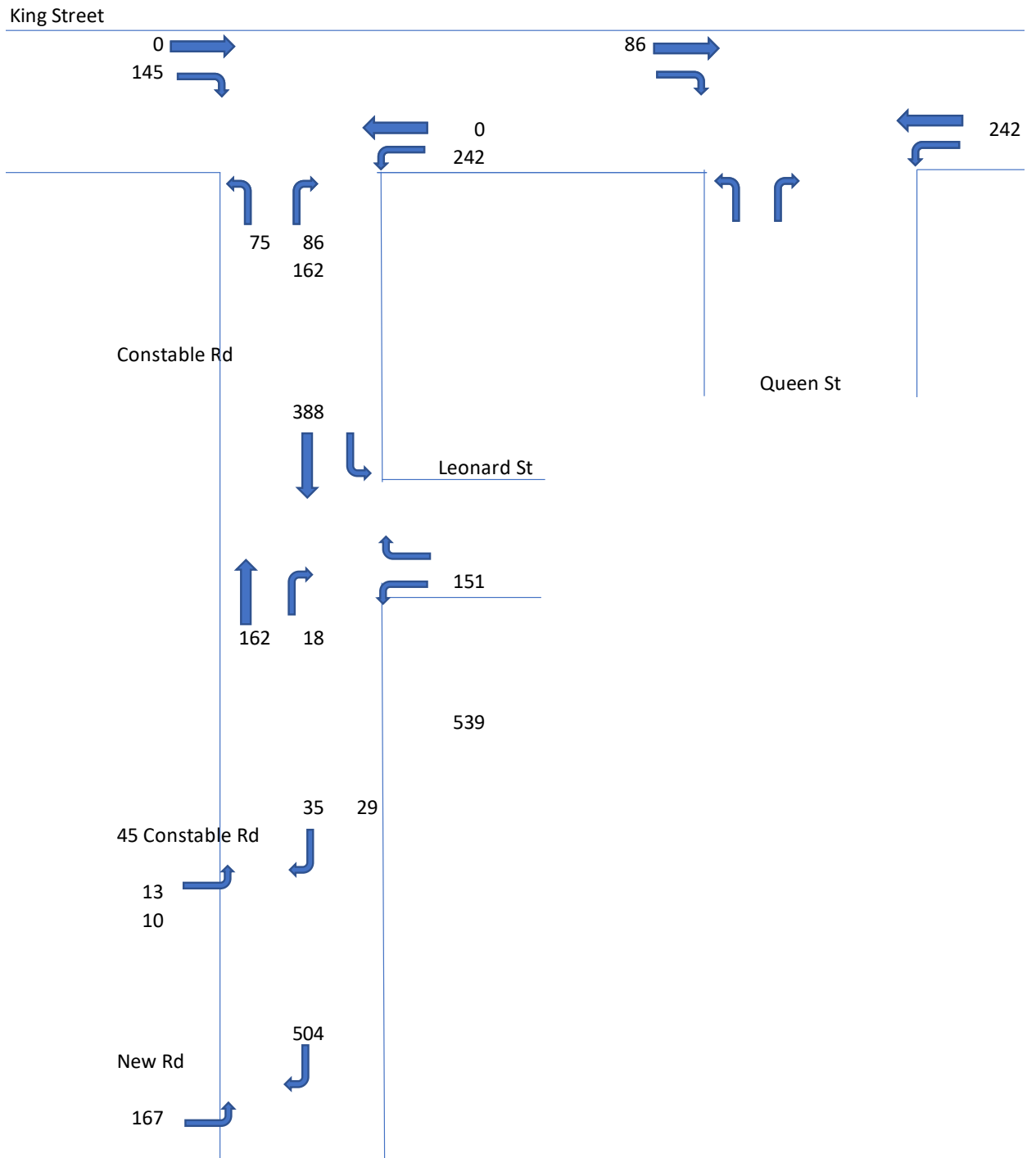


**Figure 21: Model Results for King Street Queen Street in 3pm Peak**

As with the other roundabout the development does not pose any issues for traffic at Queen Street during the school peak hour.

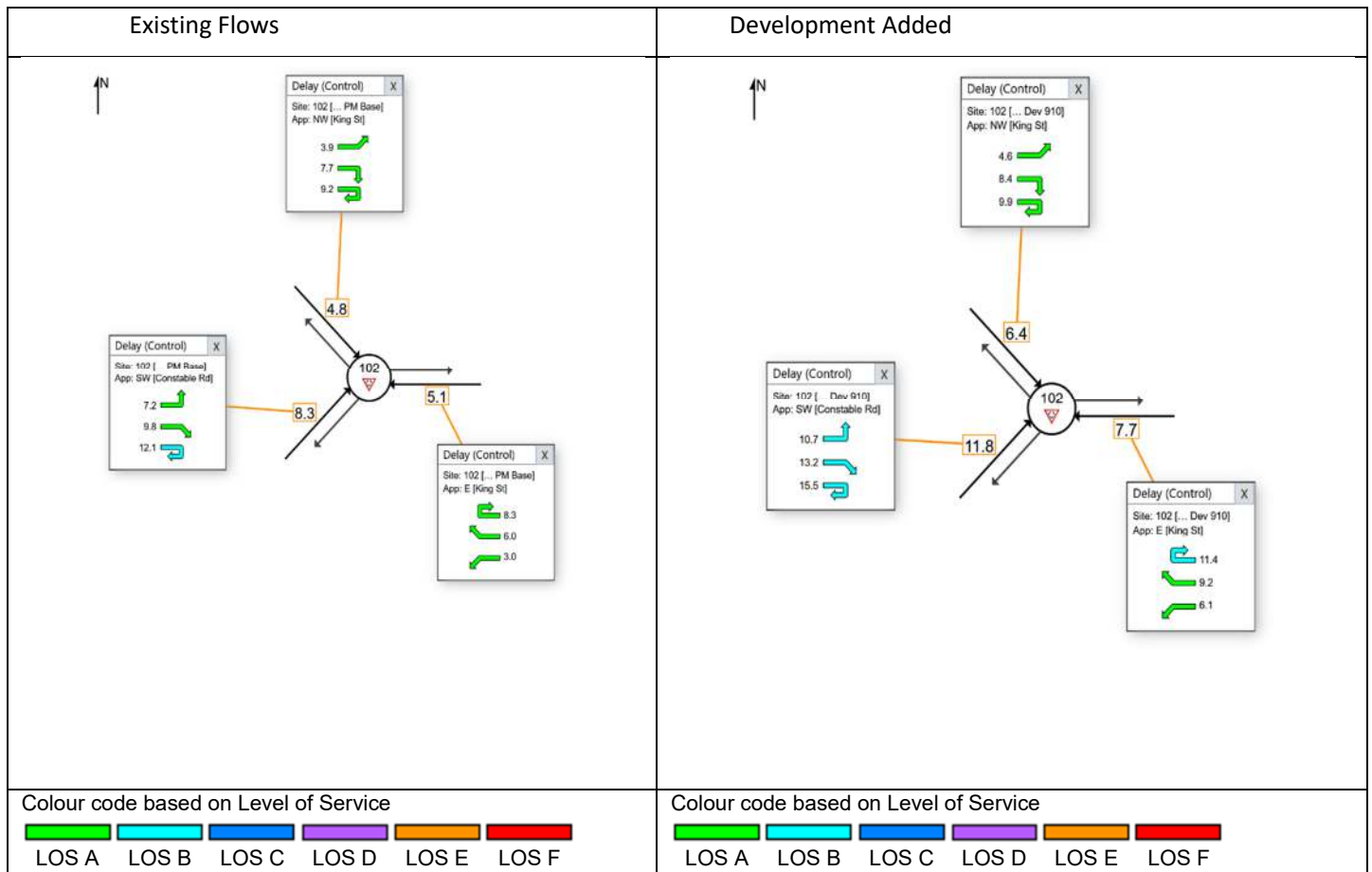
### 7.2.3 Evening Peak Assessment

Additional evening peak hour flows generated by the development are shown below.



**Figure 22: Evening Peak Additional Flows Schematic (Not to Scale)**

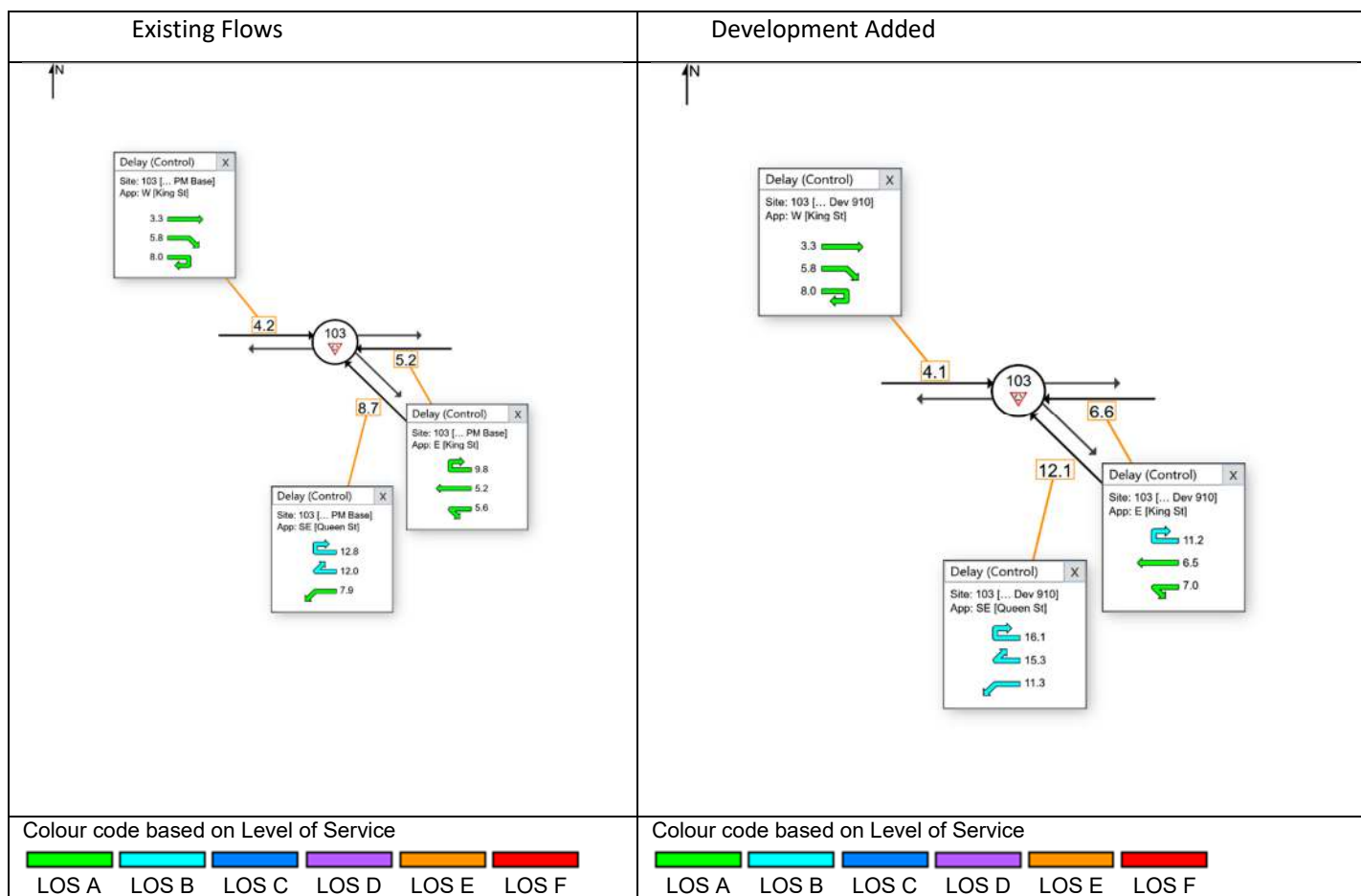
These flows were then added to the current traffic counts and modelled.



**Figure 23: Model Results for Constable Road King Street in Evening Peak**

The King Street Constable Road roundabout is not affected at all by the potential additional traffic generated by the development.





**Figure 24: Model Results for King Street Queen Street in Evening Peak**

Similarly, no traffic issues are indicated at the Queen Street King Street roundabout.

#### 7.2.4 Future Traffic Growth

A request was received from the Council’s reviewer for future year assessments at the intersections tested. I have carried out additional modelling of these two intersections using the flow scale feature and design life function of Sidra to add 18% through traffic at the intersections to represent 10 years of 1.8% assumed arithmetic growth.

These tests all resulted in acceptable traffic conditions despite the very conservative assumption that all traffic from the future development would pass through the two intersections being tested. It is more likely many trips would use the local road network via Leonard Street.

Detailed model results are shown in Attachment 3.

### 7.2.5 Tier 2 Summary

The Tier 2 traffic assessment shows that the intersections will operate well with even the highest possible increased housing vehicle traffic numbers having very little impact.

In reality except for local trips most travel will still occur by car as is the case in all rural towns. However, the increase in population does make it more likely that bus services could be improved in the future. Also, the connectivity in the proposed plan change would promote walking and cycling for new and existing residents in this compact rural town.

In conclusion the detailed vehicle traffic modelling has not indicated any issues that require further mitigation. This indicates that the Unitary Plan policy of using existing infrastructure can be met.

### 7.3 Tier 3 Assessment – Local Traffic Issues

An assessment has been undertaken of any potential traffic effects that would occur at the Constable Road Access to the Plan Change area. The assessment has included a generous allowance for growth in the through traffic on Constable Road to ensure the intersection would work even with considerable further additional traffic.

A new intersection would be formed on Constable Road that would allow a right turn pocket for traffic entering the plan change area. Sidra Results for the expected development flows in the Morning Peak are shown below. Table 7 shows that all of the turns at this intersection will operate at Level of Service A with minimal delays and no significant queuing.

The assessment assumes all traffic will use the proposed intersection with none of it passing through the neighbouring development at 45 Constable Road. Any traffic that does use that connection will reduce the demand level at the new intersection. There are no capacity issues and both the approved development at 45 Constable Road and the proposed Plan Change area will have intersections designed to modern design requirements and approval by Auckland Transport.

## MOVEMENT SUMMARY

Site: 104 [Access AM (Site Folder: General)]

New Site

Site Category: (None)

Give-Way (Two-Way)

### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [ Total HV ] veh/h veh/h		DEMAND FLOWS [ Total HV ] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [ Veh. Dist ] veh m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Constable Rd													
25	T1	337	0	355	0.0	0.182	3.5	LOS A	0.0	0.00	0.45	0.00	47.5
26	R2	167	0	176	0.0	0.260	7.9	LOS A	1.0	7.0	0.52	0.77	44.5
Approach		504	0	531	0.0	0.260	4.9	LOS A	1.0	7.0	0.17	0.56	46.3
NorthWest: New Road													
27	L2	504	0	531	0.0	0.381	5.4	LOS A	2.0	14.3	0.37	0.57	45.8
29	R2	10	0	11	0.0	0.017	7.9	LOS A	0.1	0.4	0.49	0.67	44.3
Approach		514	0	541	0.0	0.381	5.5	LOS A	2.0	14.3	0.37	0.57	45.7
SouthWest: Constable Rd													
30	L2	10	0	11	0.0	0.102	4.6	LOS A	0.0	0.0	0.00	0.46	47.3
31	T1	178	0	187	0.0	0.102	3.4	LOS A	0.0	0.0	0.00	0.46	47.5
Approach		188	0	198	0.0	0.102	3.5	LOS A	0.0	0.0	0.00	0.46	47.5
All Vehicles		1206	0	1269	0.0	0.381	4.9	NA	2.0	14.3	0.23	0.55	46.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### Table 7 Model Results at New Intersection Morning Peak

The results of the 3pm School peak model are shown in Table 8 below. Once again, these flows are well within the operating capacity of the proposed intersection

## MOVEMENT SUMMARY

Site: 104 [Access 3pm (Site Folder: General)]

New Site

Site Category: (None)

Give-Way (Two-Way)

### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [ Total HV ] veh/h veh/h		DEMAND FLOWS [ Total HV ] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [ Veh. Dist ] veh m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Constable Rd													
25	T1	348	0	366	0.0	0.188	3.5	LOS A	0.0	0.00	0.45	0.00	47.5
26	R2	224	0	236	0.0	0.388	9.8	LOS A	1.8	12.9	0.59	0.78	43.5
Approach		572	0	602	0.0	0.388	6.0	LOS A	1.8	12.9	0.23	0.30	45.9
NorthWest: New Road													
27	L2	224	0	236	0.0	0.212	6.3	LOS A	0.9	6.3	0.47	0.47	45.5
29	R2	10	0	11	0.0	0.024	10.3	LOS B	0.1	0.5	0.61	0.61	43.1
Approach		234	0	246	0.0	0.212	6.4	LOS A	0.9	6.3	0.48	0.48	45.4
SouthWest: Constable Rd													
30	L2	10	0	11	0.0	0.215	4.6	LOS A	0.0	0.0	0.45	0.00	47.3
31	T1	387	0	407	0.0	0.215	3.5	LOS A	0.0	0.0	0.45	0.00	47.5
Approach		397	0	418	0.0	0.215	3.5	LOS A	0.0	0.0	0.45	0.00	47.5
All Vehicles		1203	0	1266	0.0	0.388	5.2	NA	1.8	12.9	0.20	0.24	46.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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### Table 8 Model Results at New Intersection 3pm School Peak

The model results for the evening peak hour when most vehicles are returning is shown in Table 9 below. Again, the intersection would be well within capacity limits. The expected queue (95%) for the right turn into the plan change area is 1.8 cars, well within the capacity of the proposed design.

## MOVEMENT SUMMARY

Site: 104 [Access PM (Site Folder: General)]

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

### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [ Total HV ] veh/h veh/h		DEMAND FLOWS [ Total HV ] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [ Veh. Dist ] veh m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
NorthEast: Constable Rd													
25	T1	286	0	301	0.0	0.154	3.4	LOS A	0.0	0.00	0.45	0.00	47.5
26	R2	504	0	531	0.0	0.448	6.5	LOS A	2.1	14.9	0.46	0.79	45.3
Approach		790	0	832	0.0	0.448	5.4	LOS A	2.1	14.9	0.29	0.67	46.1
NorthWest: New Road													
27	L2	167	0	176	0.0	0.159	6.2	LOS A	0.6	4.5	0.46	0.66	45.5
29	R2	10	0	11	0.0	0.010	6.0	LOS A	0.0	0.2	0.40	0.63	45.3
Approach		177	0	186	0.0	0.159	6.2	LOS A	0.6	4.5	0.45	0.65	45.5
SouthWest: Constable Rd													
30	L2	10	0	11	0.0	0.218	4.6	LOS A	0.0	0.0	0.45	0.00	47.3
31	T1	394	0	415	0.0	0.218	3.5	LOS A	0.0	0.0	0.45	0.00	47.5
Approach		404	0	425	0.0	0.218	3.5	LOS A	0.0	0.0	0.45	0.00	47.5
All Vehicles		1371	0	1443	0.0	0.448	4.9	NA	2.1	14.9	0.23	0.60	46.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

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

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: E:\Projects\533 Waiuku\533 Waiuku 910 Houses.sip9

Table 9 Model Results at New Intersection Evening Peak

## 8. OTHER TRAFFIC AND TRANSPORTATION ISSUES

### 8.1 Waiuku College

Waiuku College is the major generator of person trips in the town. Many of these trips involve parents dropping off children at or near the entrance to the school which has caused both traffic safety and pedestrian safety issues in the past. There is minimal parking available at the entrance to the College. I understand this has led to a local landowner making space available for short-term school parking to the College. At some point the ownership of that land could change or the land could be developed and therefore no longer be available. The proposed Plan change is unlikely to make this situation worse as all of the houses are a short walk from the school and hence vehicle parking is not required. As noted earlier a proposed stub road will be built that could

be extended by the Council if they wish to work with the College to access the reserve and the college at the rear of the college.

## 8.2 Traffic Flows to Karioitahi Beach

Karioitahi Beach has become a local destination with traffic generated all week when the weather is good and particularly higher traffic flows on sunny public holidays. This through traffic has increased exposure to the potential existing traffic issues in the area including around Waiuku College.

The plan change area has been designed to integrate with both the existing road layout and to improve modal choice that reduces local vehicle trips, while providing a practical opportunity for the Council reserve land and the Waiuku College development of safe drop off pick up, bus and parking facilities at the rear of the college. This will eliminate potential existing and future demand congestion as well as traffic safety issues generated on Constable Road near Waiuku College.

## 9. CONSULTATION SUMMARY AND IMPLEMENTATION PLAN

### 9.1 Consultation

Initial traffic studies were based on an assumed residential yield of 700 houses on the land. An earlier draft of this ITA report dated 13 July 2021 was provided to Auckland Council for comment. Subsequently a comprehensive clause 23 request for further information was received that set out 21 items. Many of these items related to detailed design information that was not available at that time because the proposal at that stage did not include a Precinct Plan. The intention was to leave these details to a future subdivision application. However, in order to provide more certainty to the Council and AT the Plan Change has been amended to include a Precinct Plan that will note key issues such as the location of the intersection on Constable Road. Matters relating to the Precinct Plan have been updated in this new ITA report.

To avoid confusion, we have also removed or reduced references to works that could be carried out by other parties such as the possibility of a future access to the High School through the land and the possibility of a future Council road link to King Street to access the Council reserve land. These are not proposed as part of the Plan Change. Neither of these projects is required to avoid, remedy or mitigate traffic effects for this Plan Change so for simplicity we have removed all analysis of them.

All of the relevant matters raised in the Clause 23 request have been addressed through changes to the ITA. Those that are not addressed are matters of detail that can't be determined at this 'plan change' stage but will be covered by an assessment at a future subdivision consent.

A newer version of the ITA was then issued on 14 January 2022.

Changes to the current version of the ITA include increasing the number of houses from 700 as was proposed in a Mixed Housing Suburban zone to 910 houses as proposed in a Mixed Housing Urban zone. This reflects the impact of the new Medium Density Residential Standards (MDRS).

Other changes include using a trip rate of 0.7 trips per household to reflect local Waiuku travel patterns and a trip rate during the 3pm hour of 0.5 trips per household to also reflect local observations.

## 9.2 Mitigation Works Likely at Subdivision Stage

A future proposed subdivision application is likely to require traffic and transportation mitigation as follows:

Item	Responsibility	Funding
Internal Roads as shown on the Scheme Plan	Applicant	Applicant
Give Way controls at all intersections	Applicant as part of a future subdivision	Applicant
Intersection on Constable Road including a right turn pocket.	Applicant as part of a future subdivision	Applicant
Footpath of Constable Road on developers side only.	Applicant as part of a future subdivision	Applicant
Extend 50km/h speed limit on Constable Road. An application will be made by the developer to extend the speed limit.	Auckland Transport but only at the time of subdivision	Applicant
Footpath and kerb on opposite side of Constable Road	Other landowners when they develop.	Other landowners

**Table 10 – Mitigation Works**

These are all matters that are standard in subdivision applications and are dealt with at that time. The subdivision rules of the Auckland Unitary Plan can be expected to achieve these results successfully.

## **10. CONCLUSION**

The proposal to rezone land at Constable Road in Waiuku with the capacity for 910 houses would not result in any adverse regional transportation effects. It would also not result in any district level issues. Detailed testing of the local intersections shows that no mitigation works other than construction of the new intersection and frontage would be required. The proposed plan change aligns with Council policy and promotes integrated transport and land use in Waiuku.

Accordingly, it is submitted that the plan change can be approved on the basis that adverse effects will be mitigated and that the proposal is in accordance with regional land use and transport policies.

**John Parlane BE(Civil), BAppEcon, CMEngNZ**

Consulting Traffic Engineer

10 March 2022

## **11. ATTACHMENT 1 CRASH LISTING 2017 TO 2021**





12.

ATTACHMENT 2 MEANS OF JOURNEY TO WORK DATA 2018 CENSUS (STATISTICS NZ)

SA2_code	SA2_name_usual_r	SA2_code	SA2_name_workp	Work_at_home	Drive_a_priv	mpany_car	a_car_truck_va	Public_b	Train	Bicycle	Walk_or_jog	Ferry	Other	Total
					ate_car_truc	truck_or_va	n_or_company	us						
					k_or_van	n	bus							
164700	Waiuku Central	164800	Waiuku East	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164500	Hamilton Estate	164900	Kendallvale	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164400	Tamakae	164800	Waiuku East	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	12
164700	Waiuku Central	164900	Kendallvale	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	9
164500	Hamilton Estate	163800	Patumahoe	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164400	Tamakae	165900	Cloverlea (Auckla	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164400	Tamakae	165700	Rosa Birch Park	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164800	Waiuku East	166200	Buckland	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164400	Tamakae	165800	Rooseville Park	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	9
164800	Waiuku East	165100	Ramarama	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164500	Hamilton Estate	164100	Papakura Industri	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164400	Tamakae	162200	Takanini Central	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164700	Waiuku Central	161700	Takanini Industria	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	9
164500	Hamilton Estate	152700	Middlemore	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164800	Waiuku East	152700	Middlemore	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164900	Kendallvale	156000	Botany Junction	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164800	Waiuku East	156000	Botany Junction	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164500	Hamilton Estate	145500	Onehunga-Te Pap	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164800	Waiuku East	145500	Onehunga-Te Pap	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	9
164900	Kendallvale	147700	Mount Wellington	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	9
164900	Kendallvale	118600	North Harbour	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	6
164800	Waiuku East	164800	Waiuku East	63	6	-999	-999	-999	-999	-999	-999	-999	-999	81
164500	Hamilton Estate	164800	Waiuku East	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	12
164900	Kendallvale	164400	Tamakae	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	12
164400	Tamakae	164900	Kendallvale	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	9
164700	Waiuku Central	169700	Aka Aka	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	6
164500	Hamilton Estate	165000	Puni	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	12
164500	Hamilton Estate	159800	Karaka Creek	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	6
164700	Waiuku Central	163800	Patumahoe	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	9
164900	Kendallvale	165300	Pukekohe North V	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	9
164500	Hamilton Estate	161400	Kingseat-Karaka	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	9
164400	Tamakae	161400	Kingseat-Karaka	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	6
164500	Hamilton Estate	165800	Rooseville Park	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	6
164800	Waiuku East	161400	Kingseat-Karaka	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	6
164700	Waiuku Central	161400	Kingseat-Karaka	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	6
164700	Waiuku Central	165300	Pukekohe North V	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	6
164800	Waiuku East	164300	Drury	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	9
164500	Hamilton Estate	161700	Takanini Industria	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	12
164700	Waiuku Central	163200	Papakura Central	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	9
164400	Tamakae	161700	Takanini Industria	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	6
164400	Tamakae	152700	Middlemore	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	6
164700	Waiuku Central	152700	Middlemore	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	9
164500	Hamilton Estate	144200	Ellerslie West	-999	6	-999	-999	-999	-999	-999	-999	-999	-999	9
164900	Kendallvale	164500	Hamilton Estate	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164700	Waiuku Central	164400	Tamakae	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	15
164800	Waiuku East	164500	Hamilton Estate	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	15
164500	Hamilton Estate	169700	Aka Aka	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	9
164700	Waiuku Central	149900	Awhitu	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	9
164900	Kendallvale	149900	Awhitu	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164500	Hamilton Estate	165300	Pukekohe North V	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	15
164800	Waiuku East	165300	Pukekohe North V	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	9
164500	Hamilton Estate	164300	Drury	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164400	Tamakae	164600	Drury Rural	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164500	Hamilton Estate	163200	Papakura Central	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	9
164500	Hamilton Estate	162200	Takanini Central	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164800	Waiuku East	162200	Takanini Central	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164400	Tamakae	164100	Papakura Industri	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	9
164800	Waiuku East	164100	Papakura Industri	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164900	Kendallvale	155500	Manukau Central	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	15
164500	Hamilton Estate	156000	Botany Junction	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	9
164700	Waiuku Central	152300	East Tamaki	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164500	Hamilton Estate	147700	Mount Wellington	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	15
164400	Tamakae	147700	Mount Wellington	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164700	Waiuku Central	145900	Penrose	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164800	Waiuku East	147700	Mount Wellington	-999	9	-999	-999	-999	-999	-999	-999	-999	-999	12
164800	Waiuku East	149900	Awhitu	-999	12	-999	-999	-999	-999	-999	-999	-999	-999	18
164800	Waiuku East	165000	Puni	-999	12	-999	-999	-999	-999	-999	-999	-999	-999	12
164900	Kendallvale	157600	Wiri West	-999	12	-999	-999	-999	-999	-999	-999	-999	-999	18
164900	Kendallvale	147900	Auckland Airport	-999	12	-999	-999	-999	-999	-999	-999	-999	-999	15
164700	Waiuku Central	147900	Auckland Airport	-999	12	-999	-999	-999	-999	-999	-999	-999	-999	15
164800	Waiuku East	147900	Auckland Airport	-999	12	-999	-999	-999	-999	-999	-999	-999	-999	18
164500	Hamilton Estate	149900	Awhitu	-999	15	-999	-999	-999	-999	-999	-999	-999	-999	21
164400	Tamakae	165300	Pukekohe North V	-999	15	-999	-999	-999	-999	-999	-999	-999	-999	18
164400	Tamakae	164300	Drury	-999	15	-999	-999	-999	-999	-999	-999	-999	-999	18

164400	Tamakae	163200	Papakura Central	-999	15	-999	-999	-999	-999	-999	-999	-999	-999	18
164700	Waiuku Central	157600	Wiri West	-999	15	-999	-999	-999	-999	-999	-999	-999	-999	21
164800	Waiuku East	155500	Manukau Central	-999	15	-999	-999	-999	-999	-999	-999	-999	-999	18
164700	Waiuku Central	155500	Manukau Central	-999	15	-999	-999	-999	-999	-999	-999	-999	-999	15
164800	Waiuku East	164400	Tamakae	-999	18	-999	-999	-999	-999	-999	-999	-999	-999	21
164400	Tamakae	149900	Awhitu	-999	18	-999	-999	-999	-999	-999	-999	-999	-999	21
164500	Hamilton Estate	147900	Auckland Airport	-999	18	-999	-999	-999	-999	-999	-999	-999	-999	18
164800	Waiuku East	145900	Penrose	-999	18	-999	-999	-999	-999	-999	-999	-999	-999	21
164500	Hamilton Estate	164400	Tamakae	-999	21	-999	-999	-999	-999	-999	-999	-999	-999	24
164700	Waiuku Central	164500	Hamilton Estate	-999	21	-999	-999	-999	-999	-999	-999	-999	-999	21
164400	Tamakae	155500	Manukau Central	-999	21	-999	-999	-999	-999	-999	-999	-999	-999	30
164700	Waiuku Central	166000	Pukekohe Central	-999	24	-999	-999	-999	-999	-999	-999	-999	-999	30
164400	Tamakae	147900	Auckland Airport	-999	24	-999	-999	-999	-999	-999	-999	-999	-999	24
164800	Waiuku East	157600	Wiri West	-999	24	-999	-999	-999	-999	-999	-999	-999	-999	30
164500	Hamilton Estate	155500	Manukau Central	-999	27	-999	-999	-999	-999	-999	-999	-999	-999	27
164700	Waiuku Central	164700	Waiuku Central	60	45	-999	-999	-999	-999	-999	12	-999	-999	123
164400	Tamakae	164500	Hamilton Estate	-999	45	-999	-999	-999	-999	-999	-999	-999	-999	54
164700	Waiuku Central	162400	Glenbrook	-999	51	-999	-999	-999	-999	-999	-999	-999	-999	51
164900	Kendallvale	162400	Glenbrook	-999	54	-999	-999	-999	-999	-999	-999	-999	-999	57
164500	Hamilton Estate	164700	Waiuku Central	-999	63	-999	-999	-999	-999	-999	9	-999	-999	87
164800	Waiuku East	162400	Glenbrook	-999	72	-999	-999	-999	-999	-999	-999	-999	-999	81
164500	Hamilton Estate	162400	Glenbrook	-999	84	-999	-999	-999	-999	-999	-999	-999	-999	87
164400	Tamakae	162400	Glenbrook	-999	111	-999	-999	-999	-999	-999	-999	-999	-999	117
164900	Kendallvale	164900	Kendallvale	66	-999	6	-999	-999	-999	-999	-999	-999	-999	75
164900	Kendallvale	161700	Takanini Industria	-999	-999	6	-999	-999	-999	-999	-999	-999	-999	6
164500	Hamilton Estate	145900	Penrose	-999	9	6	-999	-999	-999	-999	-999	-999	-999	18
164400	Tamakae	157600	Wiri West	-999	27	6	-999	-999	-999	-999	-999	-999	-999	36
164900	Kendallvale	164700	Waiuku Central	-999	36	6	-999	-999	-999	-999	-999	-999	-999	54
164400	Tamakae	164400	Tamakae	66	39	6	-999	-999	-999	-999	18	-999	-999	126
164800	Waiuku East	164700	Waiuku Central	-999	57	6	-999	-999	-999	-999	-999	-999	-999	75
164500	Hamilton Estate	166000	Pukekohe Central	-999	57	6	-999	-999	-999	-999	-999	-999	-999	66
164900	Kendallvale	152300	East Tamaki	-999	12	9	-999	-999	-999	-999	-999	-999	-999	21
164400	Tamakae	145900	Penrose	-999	12	9	-999	-999	-999	-999	-999	-999	-999	27
164900	Kendallvale	145900	Penrose	-999	12	9	-999	-999	-999	-999	-999	-999	-999	18
164500	Hamilton Estate	157600	Wiri West	-999	21	9	-999	-999	-999	-999	-999	-999	-999	30
164900	Kendallvale	166000	Pukekohe Central	-999	24	9	-999	-999	-999	-999	-999	-999	-999	36
164800	Waiuku East	166000	Pukekohe Central	-999	48	9	-999	-999	-999	-999	-999	-999	-999	63
164400	Tamakae	152300	East Tamaki	-999	9	12	-999	-999	-999	-999	-999	-999	-999	18
164800	Waiuku East	152300	East Tamaki	-999	15	12	-999	-999	-999	-999	-999	-999	-999	30
164500	Hamilton Estate	152300	East Tamaki	-999	18	12	-999	-999	-999	-999	-999	-999	-999	33
164500	Hamilton Estate	164500	Hamilton Estate	84	54	12	-999	-999	-999	-999	9	-999	-999	165
164400	Tamakae	166000	Pukekohe Central	-999	57	12	-999	-999	-999	-999	-999	-999	-999	75
164400	Tamakae	164700	Waiuku Central	-999	90	18	9	-999	-999	-999	9	-999	-999	126

### 13. ATTACHMENT 3 SIDRA MODEL RESULTS (AS PER CLAUSE 23 REQUEST)

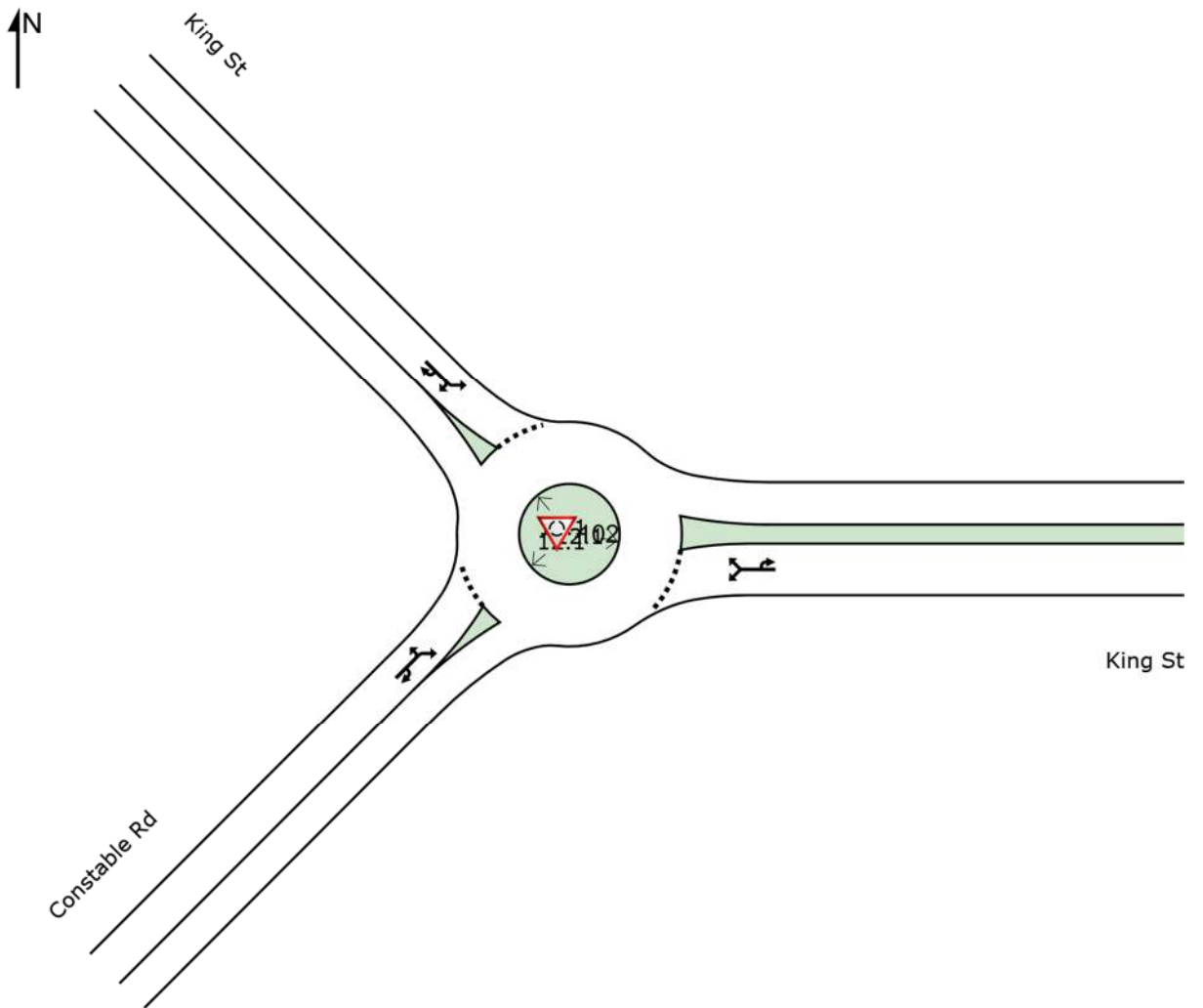
#### 13.1 Constable Road King Street Roundabout Layout

## SITE LAYOUT

 **Site: 102 [Constable AM Dev (Site Folder: General)]**

Waiuku ITA  
Site Category: (None)  
Roundabout

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



13.2 Constable Road King Street Roundabout Morning Peak Base Model

## MOVEMENT SUMMARY

 Site: 102 [Constable AM Base (Site Folder: General)]

Waiuku ITA  
 Site Category: (None)  
 Roundabout

### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
East: King St														
4a	L1	189	13	199	6.9	0.414	3.3	LOS A	1.9	14.2	0.32	0.58	0.32	44.1
6a	R1	285	21	300	7.4	0.414	6.3	LOS A	1.9	14.2	0.32	0.58	0.32	43.8
6u	U	1	0	1	0.0	0.414	8.6	LOS A	1.9	14.2	0.32	0.58	0.32	27.9
Approach		475	34	500	7.2	0.414	5.1	LOS A	1.9	14.2	0.32	0.58	0.32	43.9
NorthWest: King St														
27a	L1	540	19	568	3.5	0.572	3.8	LOS A	4.3	30.9	0.40	0.52	0.40	43.1
29	R2	167	6	176	3.6	0.572	7.7	LOS A	4.3	30.9	0.40	0.52	0.40	46.6
29u	U	1	0	1	0.0	0.572	9.2	LOS A	4.3	30.9	0.40	0.52	0.40	47.2
Approach		708	25	745	3.5	0.572	4.7	LOS A	4.3	30.9	0.40	0.52	0.40	44.3
SouthWest: Constable Rd														
30	L2	89	7	94	7.9	0.205	5.1	LOS A	1.0	7.2	0.43	0.64	0.43	45.3
32a	R1	105	9	111	8.6	0.205	7.6	LOS A	1.0	7.2	0.43	0.64	0.43	41.3
32u	U	1	0	1	0.0	0.205	9.8	LOS A	1.0	7.2	0.43	0.64	0.43	46.6
Approach		195	16	205	8.2	0.205	6.5	LOS A	1.0	7.2	0.43	0.64	0.43	43.7
All Vehicles		1378	75	1451	5.4	0.572	5.1	LOS A	4.3	30.9	0.38	0.56	0.38	44.1

13.3 Constable Road King Street Roundabout Morning Peak Development Model

**MOVEMENT SUMMARY**

**Site: 102 [Constable AM Dev 910 (Site Folder: General)]**

Waiuku ITA  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [ Veh.	QUEUE [ Dist ]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %	v/c	sec		veh	m				km/h
<b>East: King St</b>														
4a	L1	288	13	303	4.5	0.516	3.5	LOS A	3.2	23.2	0.45	0.60	0.45	44.0
6a	R1	285	21	300	7.4	0.516	6.5	LOS A	3.2	23.2	0.45	0.60	0.45	43.7
6u	U	1	0	1	0.0	0.516	8.8	LOS A	3.2	23.2	0.45	0.60	0.45	27.6
<b>Approach</b>		<b>574</b>	<b>34</b>	<b>604</b>	<b>5.9</b>	<b>0.516</b>	<b>5.0</b>	<b>LOS A</b>	<b>3.2</b>	<b>23.2</b>	<b>0.45</b>	<b>0.60</b>	<b>0.45</b>	<b>43.9</b>
<b>NorthWest: King St</b>														
27a	L1	540	19	568	3.5	0.773	8.8	LOS A	9.7	69.8	0.86	0.94	1.08	39.6
29	R2	194	6	204	3.1	0.773	12.6	LOS B	9.7	69.8	0.86	0.94	1.08	44.3
29u	U	1	0	1	0.0	0.773	14.0	LOS B	9.7	69.8	0.86	0.94	1.08	44.8
<b>Approach</b>		<b>735</b>	<b>25</b>	<b>774</b>	<b>3.4</b>	<b>0.773</b>	<b>9.8</b>	<b>LOS A</b>	<b>9.7</b>	<b>69.8</b>	<b>0.86</b>	<b>0.94</b>	<b>1.08</b>	<b>41.3</b>
<b>SouthWest: Constable Rd</b>														
30	L2	251	7	264	2.8	0.597	6.1	LOS A	4.7	33.9	0.64	0.74	0.68	44.8
32a	R1	347	9	365	2.6	0.597	8.7	LOS A	4.7	33.9	0.64	0.74	0.68	40.6
32u	U	1	0	1	0.0	0.597	11.0	LOS B	4.7	33.9	0.64	0.74	0.68	46.0
<b>Approach</b>		<b>599</b>	<b>16</b>	<b>631</b>	<b>2.7</b>	<b>0.597</b>	<b>7.6</b>	<b>LOS A</b>	<b>4.7</b>	<b>33.9</b>	<b>0.64</b>	<b>0.74</b>	<b>0.68</b>	<b>42.8</b>
<b>All Vehicles</b>		<b>1908</b>	<b>75</b>	<b>2008</b>	<b>3.9</b>	<b>0.773</b>	<b>7.7</b>	<b>LOS A</b>	<b>9.7</b>	<b>69.8</b>	<b>0.67</b>	<b>0.77</b>	<b>0.77</b>	<b>42.5</b>

The effects of the development are to increase the average delay from 5.1 seconds per vehicle to 7.7 seconds per vehicle. The overall level of service is unchanged by this almost unnoticeable change.

13.4 Constable Road King Street Roundabout Morning Peak 10 Year Growth Model

**MOVEMENT SUMMARY**

**Site: 102 [Constable AM Dev 910 + growth (Site Folder: General)]**

Waiuku ITA  
 Site Category: (None)  
 Roundabout  
 Design Life Analysis (Final Year): Results for 10 years

<b>Vehicle Movement Performance</b>														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
<b>East: King St</b>														
4a	L1	288	13	358	4.5	0.631	4.0	LOS A	4.9	35.7	0.58	0.67	0.60	43.6
6a	R1	285	21	354	7.4	0.631	7.0	LOS A	4.9	35.7	0.58	0.67	0.60	43.3
6u	U	1	0	1	0.0	0.631	9.3	LOS A	4.9	35.7	0.58	0.67	0.60	26.9
<b>Approach</b>		<b>574</b>	<b>34</b>	<b>713</b>	<b>5.9</b>	<b>0.631</b>	<b>5.5</b>	<b>LOS A</b>	<b>4.9</b>	<b>35.7</b>	<b>0.58</b>	<b>0.67</b>	<b>0.60</b>	<b>43.4</b>
<b>NorthWest: King St</b>														
27a	L1	540	19	671	3.5	0.914	15.4	LOS B	19.7	141.8	1.00	1.22	1.62	35.2
29	R2	194	6	241	3.1	0.914	19.2	LOS B	19.7	141.8	1.00	1.22	1.62	41.0
29u	U	1	0	1	0.0	0.914	20.6	LOS C	19.7	141.8	1.00	1.22	1.62	41.5
<b>Approach</b>		<b>735</b>	<b>25</b>	<b>913</b>	<b>3.4</b>	<b>0.914</b>	<b>16.4</b>	<b>LOS B</b>	<b>19.7</b>	<b>141.8</b>	<b>1.00</b>	<b>1.22</b>	<b>1.62</b>	<b>37.3</b>
<b>SouthWest: Constable Rd</b>														
30	L2	251	7	264	2.8	0.638	7.2	LOS A	5.7	41.1	0.73	0.82	0.83	44.2
32a	R1	347	9	365	2.6	0.638	9.8	LOS A	5.7	41.1	0.73	0.82	0.83	39.7
32u	U	1	0	1	0.0	0.638	12.0	LOS B	5.7	41.1	0.73	0.82	0.83	45.4
<b>Approach</b>		<b>599</b>	<b>16</b>	<b>631</b>	<b>2.7</b>	<b>0.638</b>	<b>8.7</b>	<b>LOS A</b>	<b>5.7</b>	<b>41.1</b>	<b>0.73</b>	<b>0.82</b>	<b>0.83</b>	<b>42.1</b>
<b>All Vehicles</b>		<b>1908</b>	<b>75</b>	<b>2256</b>	<b>4.0</b>	<b>0.914</b>	<b>10.8</b>	<b>LOS B</b>	<b>19.7</b>	<b>141.8</b>	<b>0.79</b>	<b>0.93</b>	<b>1.08</b>	<b>40.3</b>

The extreme test shows that even with known growth and a generous allocation of unknown growth, the roundabout is still operating within its capacity.

13.5 Constable Road King Street Roundabout 3pm Base Model

## MOVEMENT SUMMARY

 Site: 102 [Constable 3pm Base (Site Folder: General)]

Waiuku ITA  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
East: King St														
4a	L1	227	8	239	3.5	0.523	3.2	LOS A	2.9	21.0	0.34	0.58	0.34	44.0
6a	R1	405	20	426	4.9	0.523	6.2	LOS A	2.9	21.0	0.34	0.58	0.34	43.7
6u	U	1	0	1	0.0	0.523	8.5	LOS A	2.9	21.0	0.34	0.58	0.34	27.7
Approach		633	28	666	4.4	0.523	5.2	LOS A	2.9	21.0	0.34	0.58	0.34	43.8
NorthWest: King St														
27a	L1	371	22	391	5.9	0.471	4.3	LOS A	3.1	22.3	0.48	0.59	0.48	42.6
29	R2	132	3	139	2.3	0.471	8.1	LOS A	3.1	22.3	0.48	0.59	0.48	46.4
29u	U	2	0	2	0.0	0.471	9.6	LOS A	3.1	22.3	0.48	0.59	0.48	46.9
Approach		505	25	532	5.0	0.471	5.3	LOS A	3.1	22.3	0.48	0.59	0.48	44.0
SouthWest: Constable Rd														
30	L2	207	4	218	1.9	0.453	6.2	LOS A	2.7	19.6	0.62	0.75	0.63	44.9
32a	R1	192	8	202	4.2	0.453	8.8	LOS A	2.7	19.6	0.62	0.75	0.63	40.6
32u	U	6	0	6	0.0	0.453	11.0	LOS B	2.7	19.6	0.62	0.75	0.63	46.1
Approach		405	12	426	3.0	0.453	7.5	LOS A	2.7	19.6	0.62	0.75	0.63	43.4
All Vehicles		1543	65	1624	4.2	0.523	5.8	LOS A	3.1	22.3	0.46	0.63	0.46	43.7



13.6 Constable Road King Street Roundabout 3PM Development Model

## MOVEMENT SUMMARY

Site: 102 [Constable 3pm Dev 910 (Site Folder: General)]

Waiuku ITA  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [ Veh.	QUEUE [ Dist ]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %	v/c	sec		veh	m				km/h
East: King St														
4a	L1	347	8	365	2.3	0.654	3.8	LOS A	4.8	34.6	0.52	0.63	0.53	43.7
6a	R1	405	20	426	4.9	0.654	6.8	LOS A	4.8	34.6	0.52	0.63	0.53	43.4
6u	U	1	0	1	0.0	0.654	9.1	LOS A	4.8	34.6	0.52	0.63	0.53	27.1
Approach		753	28	793	3.7	0.654	5.4	LOS A	4.8	34.6	0.52	0.63	0.53	43.6
NorthWest: King St														
27a	L1	371	22	391	5.9	0.585	5.6	LOS A	4.7	34.5	0.67	0.74	0.71	41.6
29	R2	192	3	202	1.6	0.585	9.3	LOS A	4.7	34.5	0.67	0.74	0.71	45.7
29u	U	2	0	2	0.0	0.585	10.8	LOS B	4.7	34.5	0.67	0.74	0.71	46.3
Approach		565	25	595	4.4	0.585	6.9	LOS A	4.7	34.5	0.67	0.74	0.71	43.5
SouthWest: Constable Rd														
30	L2	308	4	324	1.3	0.679	8.6	LOS A	6.8	48.1	0.80	0.92	0.97	43.6
32a	R1	293	8	308	2.7	0.679	11.2	LOS B	6.8	48.1	0.80	0.92	0.97	38.8
32u	U	6	0	6	0.0	0.679	13.5	LOS B	6.8	48.1	0.80	0.92	0.97	44.7
Approach		607	12	639	2.0	0.679	9.9	LOS A	6.8	48.1	0.80	0.92	0.97	41.8
All Vehicles		1925	65	2026	3.4	0.679	7.3	LOS A	6.8	48.1	0.65	0.75	0.72	42.9

The school peak period traffic conditions will be practically unchanged by the proposed development.

13.7 Constable Road King Street Roundabout 3PM Growth Model

## MOVEMENT SUMMARY

Site: 102 [Constable 3pm Dev 910 + growth (Site Folder: General)]

Waiuku ITA  
 Site Category: (None)  
 Roundabout  
 Design Life Analysis (Final Year): Results for 10 years

### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
East: King St														
4a	L1	347	8	431	2.3	0.802	5.5	LOS A	9.5	68.9	0.76	0.76	0.85	42.7
6a	R1	405	20	503	4.9	0.802	8.6	LOS A	9.5	68.9	0.76	0.76	0.85	42.4
6u	U	1	0	1	0.0	0.802	10.9	LOS B	9.5	68.9	0.76	0.76	0.85	25.4
Approach		753	28	935	3.7	0.802	7.2	LOS A	9.5	68.9	0.76	0.76	0.85	42.5
NorthWest: King St														
27a	L1	371	22	461	5.9	0.745	8.3	LOS A	8.8	63.7	0.87	0.93	1.06	39.8
29	R2	192	3	238	1.6	0.745	12.0	LOS B	8.8	63.7	0.87	0.93	1.06	44.4
29u	U	2	0	2	0.0	0.745	13.5	LOS B	8.8	63.7	0.87	0.93	1.06	44.9
Approach		565	25	702	4.4	0.745	9.6	LOS A	8.8	63.7	0.87	0.93	1.06	41.9
SouthWest: Constable Rd														
30	L2	308	4	383	1.3	0.891	18.2	LOS B	16.6	117.9	1.00	1.34	1.77	39.1
32a	R1	293	8	364	2.7	0.891	20.8	LOS C	16.6	117.9	1.00	1.34	1.77	32.9
32u	U	6	0	7	0.0	0.891	23.0	LOS C	16.6	117.9	1.00	1.34	1.77	40.1
Approach		607	12	754	2.0	0.891	19.5	LOS B	16.6	117.9	1.00	1.34	1.77	36.7
All Vehicles		1925	65	2391	3.4	0.891	11.8	LOS B	16.6	117.9	0.87	0.99	1.20	40.0

The assessment shows that school peak traffic can easily be accommodated.

## MOVEMENT SUMMARY

### Site: 102 [Constable PM Base (Site Folder: General)]

Waiuku ITA  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
East: King St														
4a	L1	212	9	223	4.2	0.549	3.0	LOS A	3.1	22.8	0.26	0.55	0.26	44.1
6a	R1	495	31	521	6.3	0.549	6.0	LOS A	3.1	22.8	0.26	0.55	0.26	43.8
6u	U	1	0	1	0.0	0.549	8.3	LOS A	3.1	22.8	0.26	0.55	0.26	27.8
Approach		708	40	745	5.6	0.549	5.1	LOS A	3.1	22.8	0.26	0.55	0.26	43.9
NorthWest: King St														
27a	L1	267	11	281	4.1	0.322	3.9	LOS A	1.8	13.0	0.39	0.54	0.39	43.1
29	R2	84	1	88	1.2	0.322	7.7	LOS A	1.8	13.0	0.39	0.54	0.39	46.7
29u	U	1	0	1	0.0	0.322	9.2	LOS A	1.8	13.0	0.39	0.54	0.39	47.2
Approach		352	12	371	3.4	0.322	4.8	LOS A	1.8	13.0	0.39	0.54	0.39	44.3
SouthWest: Constable Rd														
30	L2	233	3	245	1.3	0.472	7.2	LOS A	3.1	21.6	0.67	0.82	0.72	44.4
32a	R1	166	2	175	1.2	0.472	9.8	LOS A	3.1	21.6	0.67	0.82	0.72	40.0
32u	U	2	0	2	0.0	0.472	12.1	LOS B	3.1	21.6	0.67	0.82	0.72	45.6
Approach		401	5	422	1.2	0.472	8.3	LOS A	3.1	21.6	0.67	0.82	0.72	43.1
All Vehicles		1461	57	1538	3.9	0.549	5.9	LOS A	3.1	22.8	0.41	0.62	0.42	43.7

## MOVEMENT SUMMARY

 Site: 102 [Constable PM Dev 910 (Site Folder: General)]

Waiuku ITA  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [ Veh.	QUEUE [ Dist ]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %	v/c	sec		veh.	m				km/h
East: King St														
4a	L1	454	9	478	2.0	0.838	6.1	LOS A	10.9	78.8	0.77	0.77	0.89	42.3
6a	R1	495	31	521	6.3	0.838	9.2	LOS A	10.9	78.8	0.77	0.77	0.89	41.9
6u	U	1	0	1	0.0	0.838	11.4	LOS B	10.9	78.8	0.77	0.77	0.89	24.7
Approach		950	40	1000	4.2	0.838	7.7	LOS A	10.9	78.8	0.77	0.77	0.89	42.1
NorthWest: King St														
27a	L1	267	11	281	4.1	0.495	4.6	LOS A	3.4	24.6	0.58	0.67	0.58	41.8
29	R2	229	1	241	0.4	0.495	8.4	LOS A	3.4	24.6	0.58	0.67	0.58	45.8
29u	U	1	0	1	0.0	0.495	9.9	LOS A	3.4	24.6	0.58	0.67	0.58	46.4
Approach		497	12	523	2.4	0.495	6.4	LOS A	3.4	24.6	0.58	0.67	0.58	44.1
SouthWest: Constable Rd														
30	L2	308	3	324	1.0	0.718	10.7	LOS B	7.9	55.6	0.90	1.05	1.18	42.6
32a	R1	252	2	265	0.8	0.718	13.2	LOS B	7.9	55.6	0.90	1.05	1.18	37.4
32u	U	2	0	2	0.0	0.718	15.5	LOS B	7.9	55.6	0.90	1.05	1.18	43.7
Approach		562	5	592	0.9	0.718	11.8	LOS B	7.9	55.6	0.90	1.05	1.18	40.8
All Vehicles		2009	57	2115	2.8	0.838	8.5	LOS A	10.9	78.8	0.76	0.82	0.89	42.2

There will be an increase in traffic on the Constable Road approach but that does not result in any noticeable traffic congestion effects.

13.10 Constable Road King Street Roundabout Evening Peak Growth Model

## MOVEMENT SUMMARY

Site: 102 [Constable PM Dev 910 + growth (Site Folder: General)]

Waiuku ITA  
 Site Category: (None)  
 Roundabout  
 Design Life Analysis (Final Year): Results for 10 years

### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
East: King St														
4a	L1	454	9	478	2.0	0.915	8.7	LOS A	17.4	126.0	0.97	0.89	1.21	40.1
6a	R1	495	31	615	6.3	0.915	11.7	LOS B	17.4	126.0	0.97	0.89	1.21	39.8
6u	U	1	0	1	0.0	0.915	14.0	LOS B	17.4	126.0	0.97	0.89	1.21	21.7
Approach		950	40	1094	4.4	0.915	10.4	LOS B	17.4	126.0	0.97	0.89	1.21	39.9
NorthWest: King St														
27a	L1	267	11	332	4.1	0.544	4.7	LOS A	4.1	29.2	0.62	0.67	0.62	41.8
29	R2	229	1	241	0.4	0.544	8.5	LOS A	4.1	29.2	0.62	0.67	0.62	45.8
29u	U	1	0	1	0.0	0.544	10.0	LOS B	4.1	29.2	0.62	0.67	0.62	46.3
Approach		497	12	574	2.6	0.544	6.3	LOS A	4.1	29.2	0.62	0.67	0.62	44.0
SouthWest: Constable Rd														
30	L2	308	3	324	1.0	0.827	16.5	LOS B	11.8	83.0	1.00	1.27	1.59	39.9
32a	R1	252	2	265	0.8	0.827	19.1	LOS B	11.8	83.0	1.00	1.27	1.59	33.8
32u	U	2	0	2	0.0	0.827	21.4	LOS C	11.8	83.0	1.00	1.27	1.59	40.9
Approach		562	5	592	0.9	0.827	17.7	LOS B	11.8	83.0	1.00	1.27	1.59	37.8
All Vehicles		2009	57	2259	3.0	0.915	11.3	LOS B	17.4	126.0	0.89	0.94	1.16	40.2

While the roundabout will be well loaded if all of these growth assumptions occur, the roundabout still has sufficient capacity.

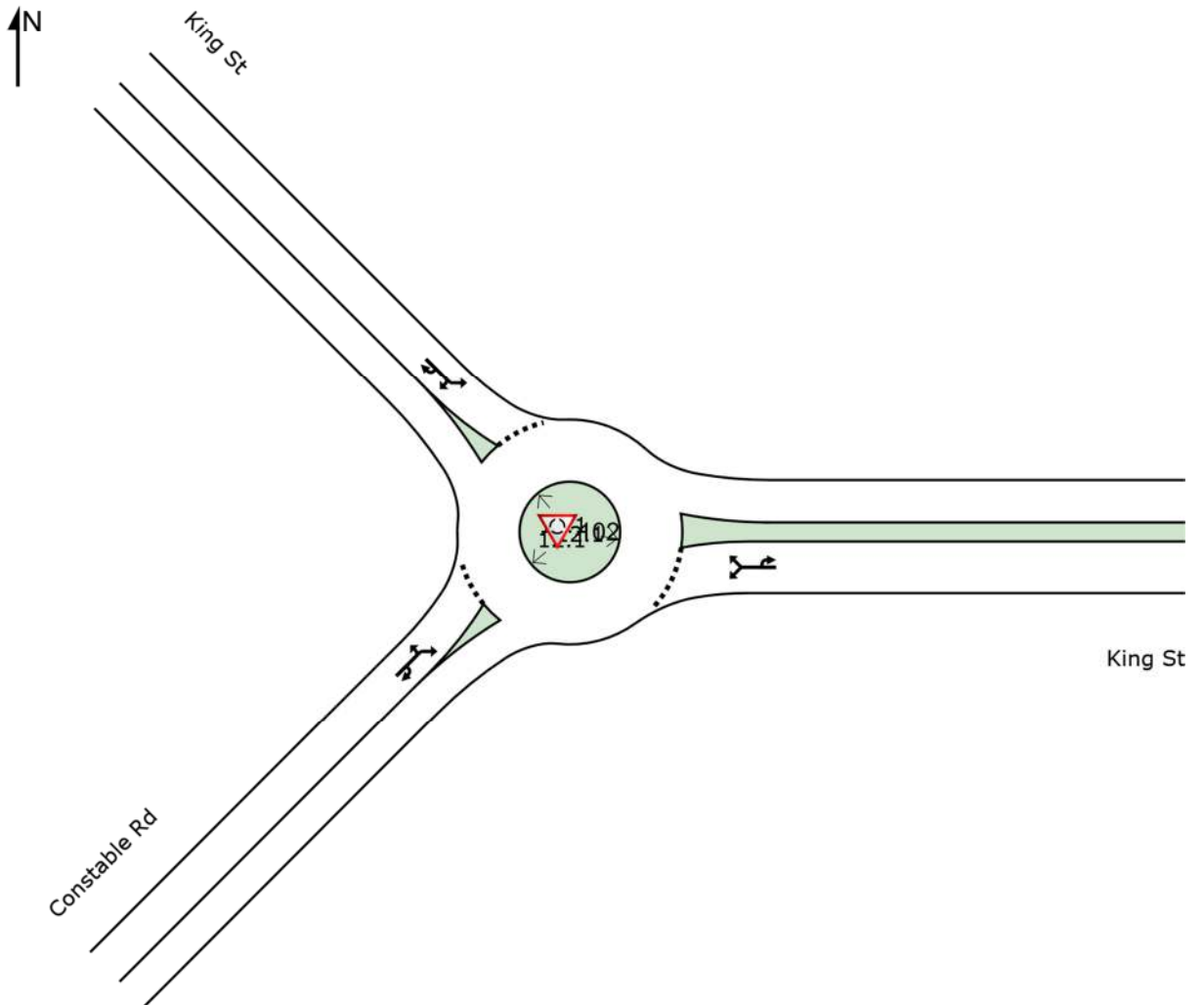
13.11 King Street Queen Street Roundabout Layout

## SITE LAYOUT

 **Site: 102 [Constable AM Dev (Site Folder: General)]**

Waiuku ITA  
Site Category: (None)  
Roundabout

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



## MOVEMENT SUMMARY

### Site: 103 [Queen AM Base (Site Folder: General)]

New Site  
 Site Category: (None)  
 Roundabout

#### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV veh/h ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist m ]				
SouthEast: Queen St														
21a	L1	125	5	132	4.0	0.186	5.8	LOS A	1.1	8.0	0.60	0.66	0.60	2
23b	R3	16	0	17	0.0	0.186	10.0	LOS B	1.1	8.0	0.60	0.66	0.60	4
23u	U	12	0	13	0.0	0.186	10.8	LOS B	1.1	8.0	0.60	0.66	0.60	4
Approach		153	5	161	3.3	0.186	6.7	LOS A	1.1	8.0	0.60	0.66	0.60	3
East: King St														
4b	L3	32	5	34	15.6	0.412	6.5	LOS A	2.6	19.2	0.55	0.62	0.55	4
5	T1	350	29	368	8.3	0.412	5.7	LOS A	2.6	19.2	0.55	0.62	0.55	2
6u	U	1	0	1	0.0	0.412	10.3	LOS B	2.6	19.2	0.55	0.62	0.55	4
Approach		383	34	403	8.9	0.412	5.8	LOS A	2.6	19.2	0.55	0.62	0.55	3
West: King St														
11	T1	375	17	395	4.5	0.452	3.3	LOS A	3.9	28.6	0.21	0.47	0.21	4
12a	R1	256	11	269	4.3	0.452	5.8	LOS A	3.9	28.6	0.21	0.47	0.21	4
12u	U	1	0	1	0.0	0.452	8.0	LOS A	3.9	28.6	0.21	0.47	0.21	3
Approach		632	28	665	4.4	0.452	4.3	LOS A	3.9	28.6	0.21	0.47	0.21	4
All Vehicles		1168	67	1229	5.7	0.452	5.1	LOS A	3.9	28.6	0.37	0.54	0.37	3

13.13 King Street Queen Street Roundabout Morning Peak Development Model

**MOVEMENT SUMMARY**

**Site: 103 [Queen AM Dev 910 (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [ Veh.	QUEUE [ Dist ]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %	v/c	sec		veh	m				km/h
<b>SouthEast: Queen St</b>														
21a	L1	125	5	132	4.0	0.208	6.6	LOS A	1.3	9.2	0.67	0.72	0.67	26.2
23b	R3	16	0	17	0.0	0.208	10.8	LOS B	1.3	9.2	0.67	0.72	0.67	45.6
23u	U	12	0	13	0.0	0.208	11.6	LOS B	1.3	9.2	0.67	0.72	0.67	45.9
<b>Approach</b>		<b>153</b>	<b>5</b>	<b>161</b>	<b>3.3</b>	<b>0.208</b>	<b>7.5</b>	<b>LOS A</b>	<b>1.3</b>	<b>9.2</b>	<b>0.67</b>	<b>0.72</b>	<b>0.67</b>	<b>29.8</b>
<b>East: King St</b>														
4b	L3	32	5	34	15.6	0.508	6.7	LOS A	3.5	26.2	0.61	0.64	0.61	44.9
5	T1	449	29	473	6.5	0.508	5.9	LOS A	3.5	26.2	0.61	0.64	0.61	26.6
6u	U	1	0	1	0.0	0.508	10.5	LOS B	3.5	26.2	0.61	0.64	0.61	46.4
<b>Approach</b>		<b>482</b>	<b>34</b>	<b>507</b>	<b>7.1</b>	<b>0.508</b>	<b>6.0</b>	<b>LOS A</b>	<b>3.5</b>	<b>26.2</b>	<b>0.61</b>	<b>0.64</b>	<b>0.61</b>	<b>27.9</b>
<b>West: King St</b>														
11	T1	617	17	649	2.8	0.611	3.4	LOS A	7.1	51.4	0.27	0.44	0.27	45.0
12a	R1	256	11	269	4.3	0.611	5.9	LOS A	7.1	51.4	0.27	0.44	0.27	44.2
12u	U	1	0	1	0.0	0.611	8.1	LOS A	7.1	51.4	0.27	0.44	0.27	11.4
<b>Approach</b>		<b>874</b>	<b>28</b>	<b>920</b>	<b>3.2</b>	<b>0.611</b>	<b>4.1</b>	<b>LOS A</b>	<b>7.1</b>	<b>51.4</b>	<b>0.27</b>	<b>0.44</b>	<b>0.27</b>	<b>44.7</b>
<b>All Vehicles</b>		<b>1509</b>	<b>67</b>	<b>1588</b>	<b>4.4</b>	<b>0.611</b>	<b>5.0</b>	<b>LOS A</b>	<b>7.1</b>	<b>51.4</b>	<b>0.42</b>	<b>0.54</b>	<b>0.42</b>	<b>35.7</b>

There are no noticeable traffic impacts in the morning peak.

13.14 King Street Queen Street Roundabout Morning Peak Growth Model



## MOVEMENT SUMMARY

 Site: 103 [Queen AM Dev 910+ growth (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

Design Life Analysis (Final Year): Results for 10 years

### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF [ Veh. veh	QUEUE [ Dist ]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %									
SouthEast: Queen St														
21a	L1	125	5	155	4.0	0.275	7.5	LOS A	1.8	13.1	0.76	0.79	0.76	25.9
23b	R3	16	0	20	0.0	0.275	11.7	LOS B	1.8	13.1	0.76	0.79	0.76	45.1
23u	U	12	0	15	0.0	0.275	12.5	LOS B	1.8	13.1	0.76	0.79	0.76	45.4
Approach		153	5	190	3.3	0.275	8.4	LOS A	1.8	13.1	0.76	0.79	0.76	29.5
East: King St														
4b	L3	32	5	40	15.6	0.630	8.7	LOS A	5.9	44.1	0.75	0.79	0.85	44.3
5	T1	449	29	558	6.5	0.630	7.8	LOS A	5.9	44.1	0.75	0.79	0.85	26.2
6u	U	1	0	1	0.0	0.630	12.4	LOS B	5.9	44.1	0.75	0.79	0.85	45.7
Approach		482	34	599	7.1	0.630	7.9	LOS A	5.9	44.1	0.75	0.79	0.85	27.5
West: King St														
11	T1	617	17	766	2.8	0.726	3.5	LOS A	11.2	80.7	0.40	0.44	0.40	44.5
12a	R1	256	11	318	4.3	0.726	6.0	LOS A	11.2	80.7	0.40	0.44	0.40	43.8
12u	U	1	0	1	0.0	0.726	8.3	LOS A	11.2	80.7	0.40	0.44	0.40	11.2
Approach		874	28	1086	3.2	0.726	4.3	LOS A	11.2	80.7	0.40	0.44	0.40	44.2
All Vehicles		1509	67	1874	4.4	0.726	5.9	LOS A	11.2	80.7	0.55	0.59	0.58	35.3

Even with high traffic growth assumptions there are no congestion effects expected.

## MOVEMENT SUMMARY

### Site: 103 [Queen 3pm Base (Site Folder: General)]

New Site  
 Site Category: (None)  
 Roundabout

#### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	A Sp
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: Queen St														
21a	L1	166	4	175	2.4	0.278	6.8	LOS A	1.8	12.7	0.70	0.74	0.70	
23b	R3	18	1	19	5.6	0.278	11.3	LOS B	1.8	12.7	0.70	0.74	0.70	
23u	U	22	0	23	0.0	0.278	11.8	LOS B	1.8	12.7	0.70	0.74	0.70	
Approach		206	5	217	2.4	0.278	7.7	LOS A	1.8	12.7	0.70	0.74	0.70	
East: King St														
4b	L3	38	0	40	0.0	0.496	6.0	LOS A	3.4	24.9	0.57	0.61	0.57	
5	T1	455	22	479	4.8	0.496	5.6	LOS A	3.4	24.9	0.57	0.61	0.57	
6u	U	1	0	1	0.0	0.496	10.2	LOS B	3.4	24.9	0.57	0.61	0.57	
Approach		494	22	520	4.5	0.496	5.7	LOS A	3.4	24.9	0.57	0.61	0.57	
West: King St														
11	T1	330	21	347	6.4	0.415	3.4	LOS A	3.5	25.6	0.25	0.48	0.25	
12a	R1	219	12	231	5.5	0.415	5.9	LOS A	3.5	25.6	0.25	0.48	0.25	
12u	U	1	1	1	100.0	0.415	8.4	LOS A	3.5	25.6	0.25	0.48	0.25	
Approach		550	34	579	6.2	0.415	4.4	LOS A	3.5	25.6	0.25	0.48	0.25	
All Vehicles		1250	61	1316	4.9	0.496	5.4	LOS A	3.5	25.6	0.45	0.57	0.45	

13.16 King Street Queen Street Roundabout 3PM Development Model

## MOVEMENT SUMMARY

 Site: 103 [Queen 3pm Dev 910 (Site Folder: General)]

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [ Veh.	QUEUE Dist ]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %	v/c	sec		veh	m				
SouthEast: Queen St														
21a	L1	166	4	175	2.4	0.320	8.0	LOS A	2.2	15.4	0.79	0.82	0.79	27.7
23b	R3	18	1	19	5.6	0.320	12.5	LOS B	2.2	15.4	0.79	0.82	0.79	44.8
23u	U	22	0	23	0.0	0.320	13.0	LOS B	2.2	15.4	0.79	0.82	0.79	45.1
Approach		206	5	217	2.4	0.320	8.9	LOS A	2.2	15.4	0.79	0.82	0.79	31.3
East: King St														
4b	L3	38	0	40	0.0	0.606	6.6	LOS A	5.1	37.0	0.65	0.66	0.68	45.0
5	T1	575	22	605	3.8	0.606	6.2	LOS A	5.1	37.0	0.65	0.66	0.68	26.5
6u	U	1	0	1	0.0	0.606	10.8	LOS B	5.1	37.0	0.65	0.66	0.68	46.3
Approach		614	22	646	3.6	0.606	6.2	LOS A	5.1	37.0	0.65	0.66	0.68	27.8
West: King St														
11	T1	431	21	454	4.9	0.484	3.4	LOS A	4.6	33.6	0.29	0.46	0.29	44.8
12a	R1	219	12	231	5.5	0.484	5.9	LOS A	4.6	33.6	0.29	0.46	0.29	44.1
12u	U	1	1	1	100.0	0.484	8.5	LOS A	4.6	33.6	0.29	0.46	0.29	10.9
Approach		651	34	685	5.2	0.484	4.3	LOS A	4.6	33.6	0.29	0.46	0.29	44.5
All Vehicles		1471	61	1548	4.1	0.606	5.7	LOS A	5.1	37.0	0.51	0.60	0.52	33.8

The development will have no noticeable effects.

13.17 King Street Queen Street Roundabout 3PM Growth Model

## MOVEMENT SUMMARY

**Site: 103 [Queen 3pm Dev 910 + growth (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout  
 Design Life Analysis (Final Year): Results for 10 years

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF [ Veh. veh	QUEUE [ Dist ] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %									
SouthEast: Queen St														
21a	L1	166	4	210	2.4	0.473	11.2	LOS B	3.9	27.7	0.93	1.00	1.05	26.6
23b	R3	18	1	23	5.6	0.473	15.7	LOS B	3.9	27.7	0.93	1.00	1.05	43.1
23u	U	22	0	28	0.0	0.473	16.2	LOS B	3.9	27.7	0.93	1.00	1.05	43.4
Approach		206	5	260	2.4	0.473	12.2	LOS B	3.9	27.7	0.93	1.00	1.05	30.0
East: King St														
4b	L3	38	0	48	0.0	0.764	10.1	LOS B	10.2	73.4	0.86	0.88	1.06	43.5
5	T1	575	22	726	3.8	0.764	9.6	LOS A	10.2	73.4	0.86	0.88	1.06	25.6
6u	U	1	0	1	0.0	0.764	14.3	LOS B	10.2	73.4	0.86	0.88	1.06	44.7
Approach		614	22	776	3.6	0.764	9.7	LOS A	10.2	73.4	0.86	0.88	1.06	26.8
West: King St														
11	T1	431	21	544	4.9	0.589	3.6	LOS A	6.8	49.6	0.38	0.46	0.38	44.4
12a	R1	219	12	277	5.5	0.589	6.1	LOS A	6.8	49.6	0.38	0.46	0.38	43.7
12u	U	1	1	1	100.0	0.589	8.8	LOS A	6.8	49.6	0.38	0.46	0.38	10.8
Approach		651	34	822	5.2	0.589	4.4	LOS A	6.8	49.6	0.38	0.46	0.38	44.1
All Vehicles		1471	61	1858	4.1	0.764	7.7	LOS A	10.2	73.4	0.66	0.72	0.76	32.8

There is ample spare capacity to cater for high growth assumptions.

## MOVEMENT SUMMARY

### Site: 103 [Queen PM Base (Site Folder: General)]

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	A Sp k
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: Queen St														
21a	L1	136	7	143	5.1	0.252	7.9	LOS A	1.6	11.5	0.75	0.79	0.75	
23b	R3	13	0	14	0.0	0.252	12.0	LOS B	1.6	11.5	0.75	0.79	0.75	
23u	U	15	0	16	0.0	0.252	12.8	LOS B	1.6	11.5	0.75	0.79	0.75	
Approach		164	7	173	4.3	0.252	8.7	LOS A	1.6	11.5	0.75	0.79	0.75	
East: King St														
4b	L3	42	0	44	0.0	0.558	5.6	LOS A	4.3	31.1	0.53	0.56	0.53	
5	T1	568	31	598	5.5	0.558	5.2	LOS A	4.3	31.1	0.53	0.56	0.53	
6u	U	1	0	1	0.0	0.558	9.8	LOS A	4.3	31.1	0.53	0.56	0.53	
Approach		611	31	643	5.1	0.558	5.2	LOS A	4.3	31.1	0.53	0.56	0.53	
West: King St														
11	T1	270	7	284	2.6	0.312	3.3	LOS A	2.4	16.8	0.18	0.47	0.18	
12a	R1	159	2	167	1.3	0.312	5.8	LOS A	2.4	16.8	0.18	0.47	0.18	
12u	U	2	0	2	0.0	0.312	8.0	LOS A	2.4	16.8	0.18	0.47	0.18	
Approach		431	9	454	2.1	0.312	4.2	LOS A	2.4	16.8	0.18	0.47	0.18	
All Vehicles		1206	47	1269	3.9	0.558	5.3	LOS A	4.3	31.1	0.44	0.56	0.44	

13.19 King Street Queen Street Roundabout Evening Peak Development Model

## MOVEMENT SUMMARY

 Site: 103 [Queen PM Dev 910 (Site Folder: General)]

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [ Veh.	QUEUE [ Dist ]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %	v/c	sec		veh	m				km/h
SouthEast: Queen St														
21a	L1	136	7	143	5.1	0.363	11.3	LOS B	2.6	18.8	0.92	0.95	0.93	24.7
23b	R3	13	0	14	0.0	0.363	15.3	LOS B	2.6	18.8	0.92	0.95	0.93	43.2
23u	U	15	0	16	0.0	0.363	16.1	LOS B	2.6	18.8	0.92	0.95	0.93	43.4
Approach		164	7	173	4.3	0.363	12.1	LOS B	2.6	18.8	0.92	0.95	0.93	27.9
East: King St														
4b	L3	42	0	44	0.0	0.758	7.0	LOS A	9.2	66.4	0.72	0.64	0.77	44.8
5	T1	810	31	853	3.8	0.758	6.5	LOS A	9.2	66.4	0.72	0.64	0.77	26.4
6u	U	1	0	1	0.0	0.758	11.2	LOS B	9.2	66.4	0.72	0.64	0.77	46.0
Approach		853	31	898	3.6	0.758	6.6	LOS A	9.2	66.4	0.72	0.64	0.77	27.4
West: King St														
11	T1	356	7	375	2.0	0.370	3.3	LOS A	3.2	22.4	0.21	0.45	0.21	45.2
12a	R1	159	2	167	1.3	0.370	5.8	LOS A	3.2	22.4	0.21	0.45	0.21	44.5
12u	U	2	0	2	0.0	0.370	8.0	LOS A	3.2	22.4	0.21	0.45	0.21	11.4
Approach		517	9	544	1.7	0.370	4.1	LOS A	3.2	22.4	0.21	0.45	0.21	44.9
All Vehicles		1534	47	1615	3.1	0.758	6.3	LOS A	9.2	66.4	0.57	0.61	0.60	31.4

With the development completed the level of services remains unchanged at A overall.

## 13.20 King Street Queen Street Roundabout Evening Peak Growth Model

### MOVEMENT SUMMARY

**Site: 103 [Queen PM Dev 910 + growth (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout  
 Design Life Analysis (Final Year): Results for 10 years

#### Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: Queen St														
21a	L1	136	7	169	5.1	0.587	23.5	LOS C	5.3	38.9	1.00	1.14	1.33	21.6
23b	R3	13	0	16	0.0	0.587	27.5	LOS C	5.3	38.9	1.00	1.14	1.33	37.9
23u	U	1	0	1	0.0	0.587	28.2	LOS C	5.3	38.9	1.00	1.14	1.33	38.1
Approach		150	7	186	4.7	0.587	23.9	LOS C	5.3	38.9	1.00	1.14	1.33	23.2
East: King St														
4b	L3	42	0	52	0.0	0.900	12.1	LOS B	20.4	147.3	1.00	0.88	1.26	42.5
5	T1	810	31	1006	3.8	0.900	11.7	LOS B	20.4	147.3	1.00	0.88	1.26	25.0
6u	U	1	0	1	0.0	0.900	16.3	LOS B	20.4	147.3	1.00	0.88	1.26	43.6
Approach		853	31	1060	3.6	0.900	11.8	LOS B	20.4	147.3	1.00	0.88	1.26	25.9
West: King St														
11	T1	356	7	442	2.0	0.416	3.2	LOS A	3.9	27.6	0.17	0.45	0.17	45.3
12a	R1	159	2	197	1.3	0.416	5.7	LOS A	3.9	27.6	0.17	0.45	0.17	44.7
12u	U	2	0	2	0.0	0.416	7.9	LOS A	3.9	27.6	0.17	0.45	0.17	11.5
Approach		517	9	642	1.7	0.416	4.0	LOS A	3.9	27.6	0.17	0.45	0.17	45.0
All Vehicles		1520	47	1888	3.1	0.900	10.3	LOS B	20.4	147.3	0.72	0.76	0.89	29.7

The roundabout has capacity to accommodate both the development and further growth.

## 13.21 Assessment of Future Growth

All of the models demonstrate that the intersections have ample capacity to cope with all of the expected flows that might be generated by the plan change. The growth models were requested by Auckland Council. These demonstrate that there is also adequate capacity to cope with on-going growth in traffic due to other developments. To some extent this is double counting growth. Nevertheless, the roundabouts have capacity for the development, other growth for 10 years and in the case of the morning and school peak periods there is further capacity for growth beyond that.