Supporting Growth

Warkworth Structure Plan

Integrated Transport Assessment
13 February 2019

TE TUPU NGĀTAHI
Supporting Growth

NZ TRANSPORT AGENCY
WAKA KOTAHI

Document Status

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Disclaimer:

At the time of production of this ITA, the Supporting Growth Programme's draft business case for Warkworth has not been approved by both the Auckland Transport and NZ Transport Agency boards (due in early to mid-2019). Projects identified in this ITA are therefore indicative only and subject to change. Projects are also yet to be prioritised for funding and delivery over the next 30 years, and will require further technical investigations and consultation to confirm detailed location and land requirements. They may also require statutory approvals, which will be subject to the Resource Management Act and Land Transport Management Act.

Executive Summary

Auckland Council's (Council's) strategic direction for growth in Auckland includes the urbanisation of Future Urban zones in Warkworth. The first step toward that urbanisation is to prepare a structure plan for the Warkworth area.

The draft Warkworth structure plan (the 'structure plan') has identified approximately 1,000 ha of future urban land to provide some 7,300 dwellings and 5,400 jobs by 2046. In order to support the structure plan, various technical reports are required, one of which is an Integrated Transport Assessment, or 'ITA'.

Te Tupu Ngātahi, the Supporting Growth Alliance ('SGA'), has been engaged by Auckland Transport ('AT') to prepare the Warkworth ITA, on behalf of AT, for Council. The ITA is based on:

- the land uses proposed in the draft Warkworth Structure Plan;
- the corresponding draft strategic transport network plan as at (December 2018) being developed by SGA as part of the Supporting Growth Programme's Warkworth indicative business case*;
- additional assumptions by SGA on likely corresponding future collector network-level roading, public transport and walking and cycling facilities. These future collector roads and other facilities are not identified in the Supporting Growth Programme which is focussed on the strategic level transport network. Collector roads and other facilities have been included after meeting with various AT departments, and in line with the network principles agreed by AT and SGA, the Regional Land Transport Plan 2018-2028, the Regional Public Transport Network Plan, the Rodney Greenways Plan and general AT design guidance.

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Land Use

The design of Warkworth's future transport network has been an integral part of the structure planning process. The draft Warkworth Structure Plan sets out a pattern of land uses and the supporting infrastructure network for the Future Urban zoned land around Warkworth. The structure plan has been prepared in the context of the existing town of Warkworth and seeks to weave the new development areas back into the fabric of the existing urban area.

The structure plan builds on the opportunities and constraints in and around the Future Urban zone. It also has taken on board feedback from a number of public engagement phases, including community workshops held to generate ideas for how Warkworth's Future Urban zone could be laid out.

Some of the key high-level features of the structure plan include:

- Ecological and stormwater areas are set aside from any built urban development;
- The new residential areas across the Future Urban zone enable around 7,300 dwellings and offer a range of living types from spacious sections around the fringe to more intensive dwellings such as town houses and apartments around the new small centres and along public transport routes;
- Warkworth's local and rural character is protected through various measures including provisions to protect the bush-clad town centre backdrop by the Mahurangi River and retaining the Morrisons orchard as a rural feature of the town, and
- New employment areas are identified, comprising land for new industry (e.g. warehousing, manufacturing, wholesalers, repair services) and land for small centres (e.g. convenience retail, local offices, restaurants/cafés). The existing Warkworth town centre by the Mahurangi River will remain as the focal point of the town.

The land uses are supported by transport infrastructure including:

- A separated walking and cycling network providing connectivity to new and existing centres, employment areas, schools and public transport stations;
- An arterial road network including a southern interchange (with south facing ramps only) on Ara Tūhono – Pūhoi to Warkworth is shown along with a possible collector road network;
- A public transport network building upon the recently introduced 'New Network for Warkworth' and in the long term has a bus station/interchange in Warkworth's southern local centre and a Park and Ride near the southern interchange, and
- Other planned infrastructure such utilities, parks, schools, and community facilities to service the planned growth of Warkworth.

It is important to note that this ITA is unique, and that it differs from typical developer-led plan changes and resource consent ITAs that seek to integrate land use within the constraints of an existing transport network. This ITA provides analysis based on draft land use scenarios, and a corresponding draft strategic transport network plan being developed by SGA. There is greater freedom (and obligation) in the structure plan process to develop land use preferences iteratively with the transport network and other infrastructure. The structure plan process is still being progressed by Council who will seek community feedback in early 2019. As a result of that engagement, this ITA may need to be amended if land use locations, activity mixes, infrastructure provisions and land release/ infrastructure timings are revisited.

Integration with Other Studies

The transport network plans included in this ITA are also based on the corresponding draft strategic transport network plans being developed by the SGA as at December 2018 and are therefore subject to change. This is because at the time of submitting this ITA to Auckland Transport and Council, the SGA had not completed their draft Indicative Business Case (IBC) for Warkworth. The draft IBC is not due for finalisation until early-2019, and both Auckland Transport and NZ Transport Agency board approvals are not expected to be sought until early to mid-2019.

The draft IBC follows on from earlier Transport for Urban Growth (TfUG) analysis and is testing various strategic state highway, arterial road, public transport ('PT'), active mode and demand management responses to support the planned growth in Warkworth.

Because the draft IBC is progressing in parallel, this ITA has made assumptions regarding the potential final outcomes of the business case for the strategic transport network elements. In this regard, there is a risk that some elements of this ITA will need refreshing following the Auckland Transport and NZ Transport Agency board approvals in early to mid-2019, and prior to the subsequent Council plan change processes, in order to clarify various transport road network design responses. It may also need updating following the various Notice of Requirement (NOR) processes the SGA will progress over the next few years as part of its route protection programme. Once approved, the projects will also require further design and consultation to refine location and land requirements. They may also require other statutory approvals, which will be subject to the Resource Management Act and Land Transport Management Act.

The ITA has also made assumptions regarding the outcome of the NOR process for Matakana Link Road and the Ara Tūhono – Warkworth to Wellsford project, both of which are currently progressing. The ITA has also been prepared with input from the Matakana Link Road and Hill Street project teams (regarding design works and option testing respectively) to understand the current status of these projects which are progressing via separate workstreams.

For the purposes of this ITA, the strategic transport network includes:

- Ara Tūhono –Puhoi to Warkworth motorway
- Ara Tūhono – Warkworth to Wellsford indicative alignment
- Matakana Link Road –Te Honohono ki Tai
- Western Link Road between SH1 (north) and SH1 (south) including Mansel Drive
- Sandspit Link Road
- Wider Western Link Road
- Ara Tūhono Warkworth Southern Interchange (with south facing ramps only).

Proposed Collector Road Network

The proposed road network is shown in Attachment C.

In addition to the strategic road network (arterial road and state highway infrastructure) identified in the draft IBC, this ITA has proposed indicative collector roads. The process for determining these collector roads has included:

- Review of current developer proposals (where possible, similar connections and route alignments are proposed to those already planned)
- Utilisation of the draft IBC “Infraworks” models to understand topography and watercourse constraints to establish potential collector road alignments
- Utilisation of existing road corridors where possible.

The collector road network is indicative and identifies key collector routes. These have been developed in consultation with AT. Additional collector roads may be established as part of ongoing land development.

The collector roads shown in the transport maps are therefore also indicative and there is flexibility for developers to potentially change these routes as part of further Resource Management Act processes. In this regard some roads will have greater flexibility compared to others (public transport routes and active mode routes in particular will have lesser flexibility).

The proposed road network improvements are discussed in the staging tables at the end of this executive summary.

Public Transport Network

The proposed public transport network is shown in Attachment C, and has been proposed by combining the draft IBC network plan and additional services discussed with AT public transport specialists. Census data reveals public transport use in Warkworth is very low and this is largely due to no significant AT services being provided at the time of the last census (a private shuttle bus was in operation at the time of the census however). In the short term, it is proposed to build upon the recently introduced 'New Network for Warkworth' with four key routes: Snells Beach/ Algies Bay Connector (996), Omaha/ Leigh Connector (997), and a higher frequency bus service between Warkworth and Hibiscus Coast Station in Silverdale (995). A new Wellsford bus service is also proposed to be implemented in 2019 (998) funded by the Rodney Local Board targeted transport rate.

Initially, the existing stops in the town centre will be supplemented by an interim 'northern station' near SH1 north of Warkworth (the specific location is yet to be confirmed). The interim northern station will also provide a Park and Ride facility to enable convenient access to the 995 route. The town centre stops will remain an important facility to provide access to retail, commercial and community facilities at this location.

In the long term, the preference is to retain town centre stops however have a larger bus station/ interchange and Park and Ride in Warkworth South (the 'southern station'). The reasons for recommending a southern station are:

- It simplifies the 995 route (the high frequency route between Warkworth and Hibiscus Coast Station). The Ara Tūhono Warkworth Southern interchange enables buses to efficiently gain access to and from the motorway route.
- Due to land constraints, there is limited space within the Warkworth town centre to accommodate pulsed/ layover arrivals (there would need to be greater than five bus stops including inter-regional buses).
- Private land to the north will be further developed and the ability to accommodate an interim station facility without land purchase is limited.
- The existing 996 (Snells/Algies Bay) and 997 (Omaha/Leigh) routes, and proposed 998 (Wellsford) route, can be extended south through the new Warkworth South residential catchment to the new southern station. This will enable the new residential catchment to be served by public transport without significant changes to the existing bus network.
- Higher intensity THAB and local centre zoning is proposed near the southern station. This will encourage walk-up public transport to both the 995 route and the other Warkworth routes also passing through the station.

With a proposed southern station/interchange, it is not considered necessary to retain the interim northern station, however it may be difficult to remove once established. The retention or removal of the interim northern station can be re-examined once the southern station is operational. Should the interim northern station be retained, a bus connection between the northern station and the southern station would need to be provided. As no north-facing ramps are proposed at the Ara Tūhono southern interchange, this would require the 995 route to follow the Western Link Road and extend the

running time of the service. In addition, outside of peak times, there would likely be a significant number of 'empty-running' buses between the northern and southern stations.

The proposed public transport network improvements are discussed in the staging tables at the end of this executive summary.

Walking/ Cycling Network

The proposed walking and cycling network is shown in Attachment C. This proposal has been developed using the draft IBC network plan, the draft SGA network principles, and additional connections on the collector road network developed as part of this ITA. The Rodney Greenways plan has also been used to inform further cycle connections.

Currently Warkworth has a large number of walking trips however cycling trips are very low. In order to increase cycling mode share, significant improvements to the cycle network are proposed.

The draft SGA **Network Principles** for the primary routes in Warkworth are:

- Connecting people to key destinations (hub and spoke network concept):
  - Between town/ local centres and public transport stations;
  - Between town/ local centres and town/ local centres – these routes generally follow arterial roads (existing SH1, Matakana Road, Matakana Link Road, Western Link Road, Wider Western Link Road, Woodcocks Road etc);
  - Between public transport stations and medium to high density residential areas – these routes comprise both arterial roads and collector roads;
  - Between town/ local centres and employment centres – these routes generally follow arterial roads, and
  - Between medium to high density residential areas and educational facilities – these routes generally follow arterial roads (Mahurangi College) and collector roads (Warkworth Primary School).
- Utilising riparian stream corridors to provide connections to key destinations and residential areas.
- Utilising the arterial road network (including the existing state highway and any upgrades to existing arterial roads) to provide connections to key destinations and residential areas.

The proposed walking and cycling network utilises the arterial road network and riparian corridor alongside the Mahurangi River, and other greenways routes along riparian margins, to provide connectivity throughout Warkworth. In addition, a collector road network with separated cycle lanes is proposed to provide further permeability through the Structure Plan area.

The proposed walking and cycling network improvements are discussed in the staging tables at the end of this executive summary.

Effects Assessment

A traditional development ITA would consider the effect of the land use change on the existing transport system. This Structure Plan ITA has been developed in parallel to the draft Supporting Growth IBC, which itself has identified the strategic network elements required to support the planned

growth. This means that this ITA is focussed on the development of the recommended network, rather than the impact on an 'existing' network.

The transport network has been assessed using a combination of the Auckland Transport Macro Strategic Model (MSM) and a SATURN mesoscopic transport model. The MSM has been constructed using Auckland Council Scenario I11.4 land use and aligns with the proposed dwelling and employment forecasts anticipated by the structure plan.

Peak hour assessments have been undertaken for the critical 2046 evening peak hour which has the highest traffic volumes. Assessments of key intersections demonstrate the road network can operate acceptably. The SH1/ Hill Street intersection is currently being assessed as part of a separate workstream led by Auckland Transport and the NZ Transport Agency. Two broad intersection options were consulted on in late 2018, namely a roundabout and a signalised intersection. At this time, a preferred option has not been identified. The Hill Street project team has indicated that regardless of which option is selected, there will not be a significant increase in vehicle capacity at the intersection. To this end, the SATURN modelling undertaken for the draft IBC and ITA, which assumed no increase in vehicle capacity at the intersection, is considered appropriate to understand the effects on the wider Warkworth road network.

While there is no increase in vehicle capacity at the SH1/ Hill Street intersection, the preferred option will need to cater for a number of bus routes and walking and cycling routes. The Hill Street project team has been provided a copy of this ITA to understand the proposed bus, walking and cycling routes at the intersection.

Staging

The transport network in this ITA has been assessed for the full build out (2046) design year. In terms of staging, Warkworth has well defined land release sequencing as outlined within Auckland Council's Future Urban Land Supply Strategy (FULSS, July 2017). The proposed transport network staging is as follows:

- Stage 1 – to align with Warkworth North which is proposed to be development ready in 2022;
- Stage 2 – to align with Warkworth South which is proposed to be development ready from 2028 to 2032, and
- Stage 3 –to align with Warkworth North-east which is proposed to be development ready from 2033 to 2037.

The transport network staging proposes to broadly follow this land release sequencing as per the following tables. The proposed network staging is indicative only and may be subject to change depending on whether funding for transport projects is available, how the projects are prioritised, and if there are future land use changes (private plan changes for example).

The majority of proposed transport infrastructure outlined in this ITA is currently unfunded. As such, the timing of proposed transport infrastructure is dependant on funding for construction, which could come from a number of sources.

Stage 1 – Warkworth North

Land Use	Structure Plan Transport Network			
	Item	Network Role/ Mode		
		Road	PT	Active
Stage 1 2,100 dwellings • Includes Warkworth North development/ Stubbs Farm • New small centre near Woodcocks Road/ Falls Road intersection 1,500 jobs • New industrial land near Western Link Road (northern section) and SH1	**New** – Western Link Road (northern section) between SH1 and Falls Road (four-lane). Construction could be potentially staged so that two lanes are constructed initially.	✓	✓	✓
	New – Western Link Road (southern section) between Woodcocks Road and SH1 (four-lane). Construction could be potentially staged so that two lanes are constructed initially.	✓	✓	✓
	New – Western Link Road/ Falls Road Signalised Intersection	✓	✓	✓
	New – Western Link Road/ Woodcocks Road Signalised Intersection	✓	✓	✓
	New – SH1/ Western Link Road/ South-eastern Collector Signalised Intersection	✓	✓	✓
	New – Interim Northern Bus Station inc. Park and Ride		✓	
	New – Shared Path along Mahurangi River between SH1 and Mansel Drive			✓
	Upgrade – SH1/ Goatley Road intersection to roundabout	✓	✓	
	Upgrade – SH1/ Western Link Road/ Matakana Link Road signalised intersection (new southern leg) and to accommodate active modes	✓	✓	✓
	Upgrade – Mansel Drive between Falls Road and Woodcocks Road to urban arterial standard including footpaths and separated cycle facilities (four-lane). If sections of Western Link Road to the north and south of Mansel Drive are staged, four-laning of Mansel Drive could occur at a later time.	✓	✓	✓
	Upgrade – Increased bus frequencies (995) (depending on passenger demand).		✓	

Stage 2 – Warkworth South

Land Use	Structure Plan Transport Network			
	Item	Network Role		
		Road	PT	Active
Stage 2 3,900 dwellings • New small centre on Wider Western Link Road • THAB zone adjacent to small centre 3,300 jobs • New industrial land at southern end of Western Link Road and to east of Puhoi to Warkworth motorway	**New** – Ara Tūhono Warkworth Southern Interchange (south facing ramps)	✓	✓	
	New – Wider Western Link Road between SH1 and Woodcocks Road (two-lane) inc. connection to Warkworth Southern Interchange	✓	✓	✓
	New – SH1/ Wider Western Link Road Roundabout	✓	✓	✓
	New – Wider Western Link Road/ Southern Interchange Signalised Intersection	✓	✓	✓
	New – Wider Western Link Road/ Woodcocks Road Roundabout	✓	✓	✓
	New – Park and Ride near Warkworth Southern Interchange		✓	
	New – Southern Bus Station within small centre (Warkworth South)		✓	
	New – Warkworth Loop Bus Route (999) connecting to new Southern Bus Station		✓	
	Upgrade – Existing SH1 between northern and southern extents of urban area to urban arterial standard including footpaths and separated cycle facilities (retain existing number of lanes however localised widening may be required at intersections. Four lanes may be required between the Wider Western Link Road and Western Link Road. Includes facility on SH1 over Mahurangi River between Hill Street and Whitaker Road for active modes.	✓	✓	✓
	Upgrade – Woodcocks Road between SH1 and western extent of urban area to urban arterial standard including footpaths and separated cycle facilities (retain existing number of lanes however localised widening may be required at intersections).	✓	✓	✓
	Upgrade – SH1/ Hill Street Intersection (design subject to separate business case workstream)	✓	✓	✓
	Upgrade – Key collector road cycle improvements and upgrade to urban standard inc. Elizabeth Street, Whitaker Road, Hill Street/ Falls Road (between SH1 and Mansel Drive), McKinney Road (whole length), Wilson Road (between McKinney Road and Pulham Road), Pulham Road (whole length) and Alnwick Street (between Neville Street and Pulham Road inc gap connection for 999 bus route)	✓	✓	✓
	Upgrade – SH1/ McKinney Road Signalised Intersection	✓	✓	✓

Stage 2 – Warkworth South

Land Use	Structure Plan Transport Network			
	Item	Network Role		
		Road	PT	Active
	Upgrade – Extend and improve frequency of existing bus routes to new Southern Bus Station (996, 997 and 998) and shorten higher frequency bus route to only serve new Southern Bus Station (995)		✓	

Stage 3 – Warkworth North-East

Land Use	Structure Plan Transport Network			
	Item	Role		
		Road	PT	Active
Stage 3 1,300 dwellings 600 jobs • New small centre near Matakana Road/ Matakana Link Road intersection	**New** – Sandspit Link Road between Matakana Road and Sandspit Road (two-lane)	✓	✓	✓
	New – Sandspit Road/ Sandspit Link Road Roundabout	✓	✓	✓
	Upgrade – Matakana Road between SH1 and northern extent of urban area to urban arterial standard including footpaths and separated cycle facilities (retain existing number of lanes however localised widening may be required at intersections)	✓	✓	✓
	Upgrade – Sandspit Road between SH1 and northern extent of urban area to urban arterial standard including footpaths and separated cycle facilities (retain existing number of lanes however localised widening may be required at intersections)	✓	✓	✓
	Upgrade – Matakana Road/ Matakana Link Road/ Sandspit Link Road intersection (new eastern leg)	✓	✓	✓

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Glossary

Acronym	Description
AT	Auckland Transport
ATAP	Auckland Transport Alignment Project
FULSS	Future Urban Land Supply Strategy
GFA	Gross Floor Area
IBC	Indicative Business Case
ITA	Integrated Transport Assessment
LATM	Local Area Traffic Management
MHS	Mixed Housing Suburban [Zone]
MHU	Mixed Housing Urban [Zone]
MOE	Ministry of Education
MSM	Macro Strategic Model
NOR	Notice of Requirement
NZTA	New Zealand Transport Agency
PCG	Project Control Group
PT	Public Transport
SGA	Supporting Growth Alliance
RLTP	Regional Land Transport Plan
RPTP	Regional Public Transport Plan
RUB	Rural Urban Boundary
SGA	Supporting Growth Alliance
SH	Single House [Zone]
TfUG	Transport for Urban Growth
THAB	Terrace Housing and Apartment Building [Zone]
vpd	Vehicles per Day
vph	Vehicles per Hour

1. Introduction

1.1. Purpose of ITA

Auckland Council's (Council's) strategic direction for growth in Auckland includes the urbanisation of Future Urban zones in Warkworth. The first step toward that urbanisation is to prepare a structure plan for the Warkworth area.

The Warkworth structure plan (the 'structure plan') has identified approximately 1,000 ha of future urban land to provide some 7,300 dwellings and 5,400 jobs by 2046. In order to support the structure plan, various technical reports are required, one of which is an Integrated Transport Assessment, or 'ITA'.

SGA has been engaged by Auckland Transport ('AT') to prepare the Warkworth ITA on behalf of AT for Council. With respect to transport, the structure planning guidelines outlined in Appendix 1 of the Auckland Unitary Plan[1] requires that an ITA should cover the following matters:

1. *Integration of land use and development with the local and strategic transport networks;*
2. *Ensure the transport network and facilities are laid out in a manner that is safe, attractive, efficient, resilient to hazards, well connected to local facilities and integrated with land uses, the surrounding area and the wider transport network;*
3. *Provide support for transport and accessibility that is multi-modal and interconnected with an appropriate number and location of access points, and*
4. *Assess transport effects on land uses and how to manage these effects.*

The Warkworth ITA has been undertaken in accordance with AT guidelines[2]. As noted in those guidelines, the primary objective of an ITA is to:

> *"ensure that the transportation effects of a new development proposal are well considered, that there is an emphasis on efficiency, safety and accessibility to and from the development by all transport modes where practical; and that the adverse transport effects of the development have been effectively avoided, remedied or mitigated. The preparation of an ITA seeks to ensure that appropriate thought is given to the zoning or land use proposed so that integrated transport and land use outcomes occur.*
>
> *A proposal that is achieving this integration will ensure consistency with the "four R's" being the* ***right type of activity, in the right place, at the right intensity, and occurring at the right time****".*

The Warkworth ITA specifically addresses the following:

- The extent of the Warkworth study area and existing zoning and land use patterns;
- Existing transport networks, known constraints and committed transport projects (currently in planning, design or construction phases);

[1] Auckland Unitary Plan, operative in part.

[2] Integrated Transport Assessment Guidelines, Auckland Transport, January 2015.

- Relevant transport plans and strategies;
- Known private developments and relevant background documents;
- The proposed zoning (including residential yields and employment projections) and how, and when, urban land is proposed to be released in Warkworth provided by Council;
- The proposed strategic transport network plan being developed in the corresponding Supporting Growth Programme's Warkworth IBC;
- An additional proposed local network-level transport network (collector road, public transport services and walking and cycling network);
- The mode split and trip generation that is expected by the structure plan activities;
- Accessibility of proposed activities to various transport modes (private vehicle, public transport and active modes);
- Traffic modelling outputs, recommended intersection treatments and road cross-sections;
- Transport network staging, and
- Consultation Summary.

The ITA has been prepared in parallel with the draft Indicative Business Case (IBC) for transport networks in Warkworth that is also being prepared by SGA. The draft IBC sets out the strategic transport network to support the growth within Warkworth, and the ITA further proposes collector roads and other facilities, and the likely form, and staging, of transport infrastructure. The traffic modelling undertaken for Warkworth is common to both the draft IBC and ITA assessment ensuring alignment between the two workstreams.

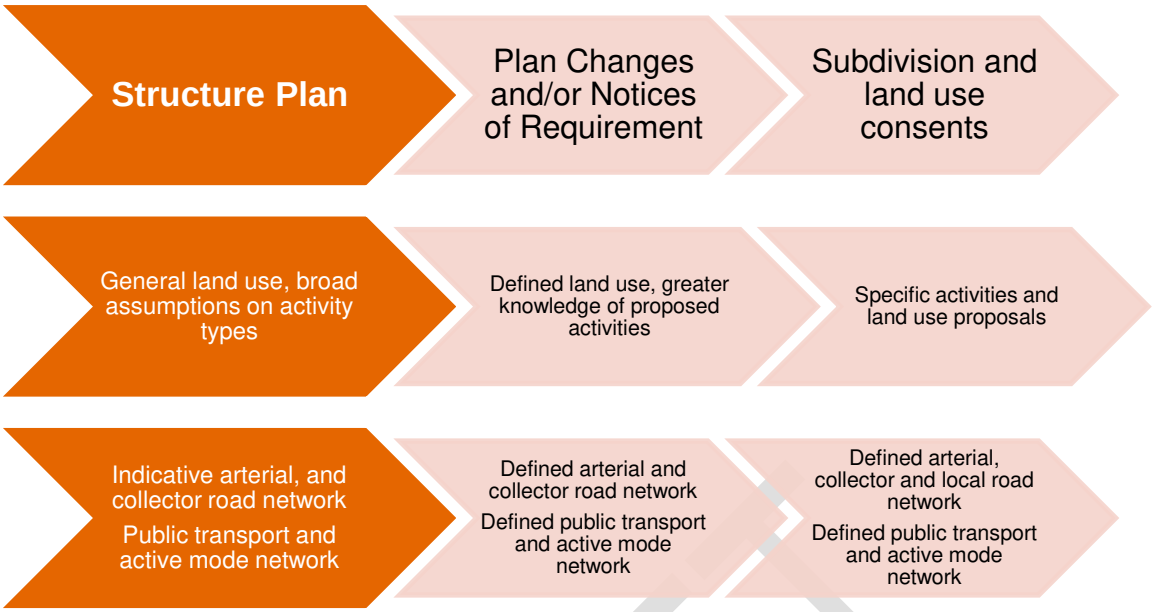
1.2. Scope of ITA

The scope of the ITA is to identify at a high-level, proposed:

- Arterial and collector road network;
- Public transport network, and
- Active mode network.

It also discusses the potential staging of land urbanisation and the consequent considerations for staging of transport networks to serve it. Given the uncertainty at this time about the exact sequencing of plan changes and development, this should only be seen as a foundation for further transport assessments at later plan change, Notice of Requirement (NOR) and consenting stages if required. The relationship between the structure plan ITA and further assessments is summarised in Figure 1.

Figure 1: ITA Level of Detail



The scope of the ITA has been approved by a Project Control Group (PCG) comprising SGA, AT and the NZ Transport Agency.

The ITA has been developed with the SGA and Council structure plan teams to integrate land use and transport planning. This has included regular discussions with Council regarding the specific location, form and yield for the proposed land use. Council is also a partner in delivering the draft Supporting Growth Programme IBC.

Because the draft IBC is progressing in a parallel workstream, and is still subject to final AT and NZ Transport Agency board approvals in 2019, this ITA has made assumptions regarding the potential final outcomes of the draft IBC and Council's structure plan. In this regard, some elements of this ITA may need refreshing prior to the subsequent Plan Change processes, in order to clarify various transport network design matters, such as:

- The outcomes of the draft Supporting Growth Programme IBC; any refinement of indicative routes and alignments, and subsequent NOR processes;
- The outcomes of the separate Ara Tūhono – Warkworth to Wellsford project and Matakana Link Road – Te Honohono ki Tai project RMA processes and SH1/ Hill Street intersection business case workstreams, and
- The outcomes of the final Warkworth Structure Plan and subsequent decisions on plan change zoning and staging.

Any changes to the above may result in changes to the proposed transport network, and/or the timing at which various infrastructure is implemented. This ITA therefore represents the assessment of the transport network at a point in time (January 2019) and may need to be updated once there is greater clarity on these other workstreams.

2. Site Description

2.1. General

Warkworth is defined as a satellite town[3] in the Auckland Plan and the Unitary Plan[4] and is located at the northern end of the Auckland region, approximately 60 km from the Auckland city centre. Warkworth's population is around 4,000 (2013 census) and it is expected to grow to around 25,000 over the next 30 years. It is currently the largest rural town between Auckland and Whangarei and it is expected to continue to be so into the future.

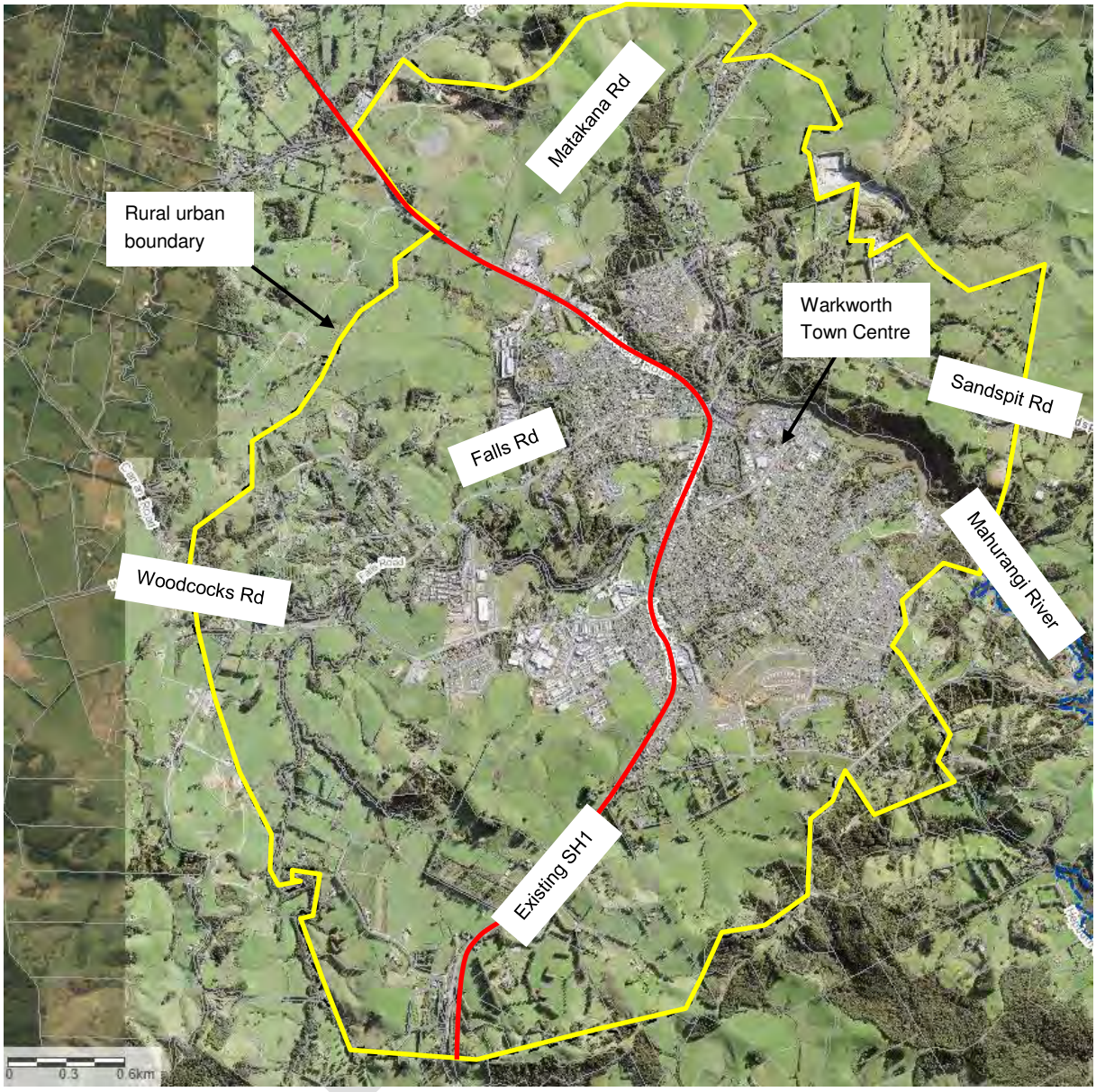
The current land uses are predominately rural with low density residential, lifestyle blocks and general farming activity. Closer to the existing town centre, there are typical retail and suburban residential land uses. The Warkworth town centre is relatively constrained with the Mahurangi River to the north and SH1 to the west. Business and industrial activities are relatively dispersed with these activities primarily occurring near Woodcocks Road and Hudson Road, however there is also live zoned business land to the north of SH1 near Goatley Road.

Figure 2 shows the Warkworth rural-urban boundary (yellow line) and the existing alignment of SH1 (red line).

[3] Auckland Unitary Plan J1 Definitions, *Town in the region which functions semi-independently from the Auckland metropolitan area, providing a full range of services and employment opportunities to the surrounding rural areas. It applies to the towns of Pukekohe and Warkworth*.

[4] Auckland Unitary Plan Operative in part

Figure 2: Rural Urban Boundary



There are several rural and coastal settlements surrounding Warkworth including:

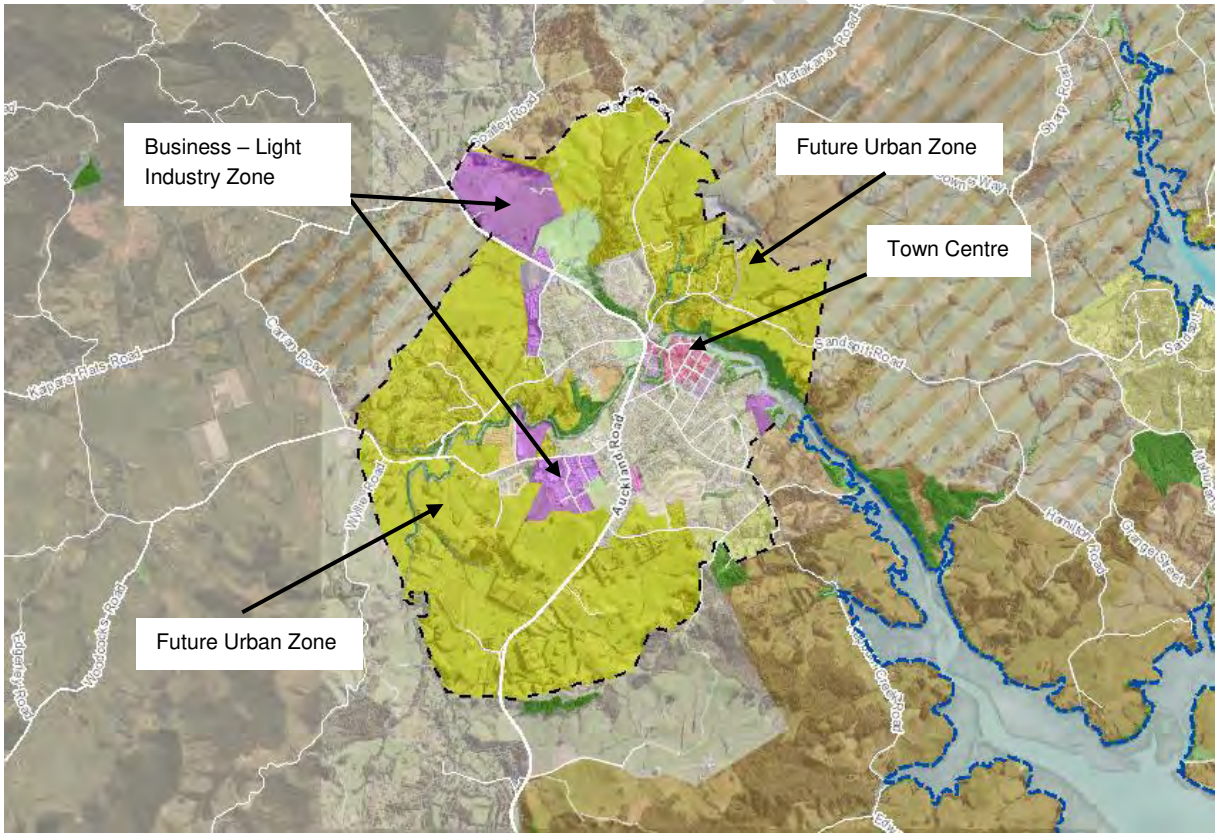
- Kaipara Flats/Streamlands;
- Matakana;
- Leigh;
- Omaha;
- Snells Beach;
- Algies Bay;
- Wellsford, and
- Pūhoi.

Algies Bay has also been identified as an area for future population growth but with a much smaller area of Future Urban zone (39ha)[5].

2.2. Unitary Plan Zoning

The Unitary Plan[6] has numerous zones in Warkworth. Figure 3 shows the operative zoning within Warkworth. The predominant urban zoning is residential including 'Single House' (SH), 'Mixed Housing Suburban'(MHS) and 'Mixed Housing Urban' (MHU) zones. The predominant business zoning is 'Light Industry' however there are also 'Mixed Use', 'General Business', and 'Town Centre' zones within and around the main Warkworth township. The large yellow areas to the north and south of the wider Warkworth urban area are 'Future Urban Zone' land, and are the primary focus of the structure plan process.

Figure 3: Warkworth Unitary Plan Zoning



As a result of this zoning, it is clear that future residential and business growth is planned for Warkworth.

[5] Future Urban Land Supply Strategy (FULSS), 2017

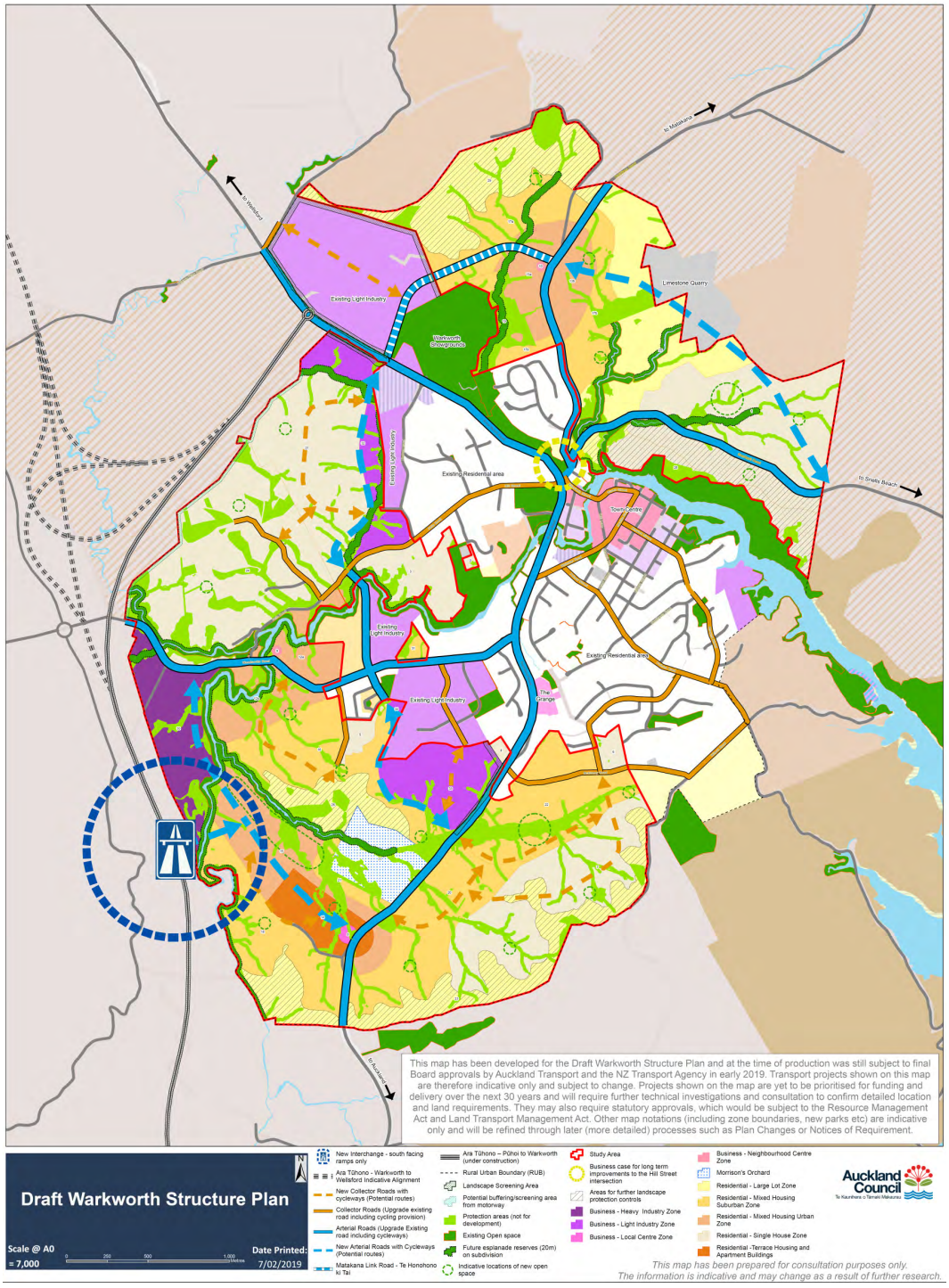
[6] Auckland Unitary Plan Operative in part

3. Proposed Structure Plan

3.1. Proposed Zoning

The proposed Warkworth structure plan used in this assessment is shown in Figure 4. The structure plan focusses on the Future Urban Zoned land bounded by the red lines below and proposes several new residential and business zones. This is due for public consultation in early 2019 and therefore may be subject to change.

Figure 4: Proposed Warkworth Structure Plan



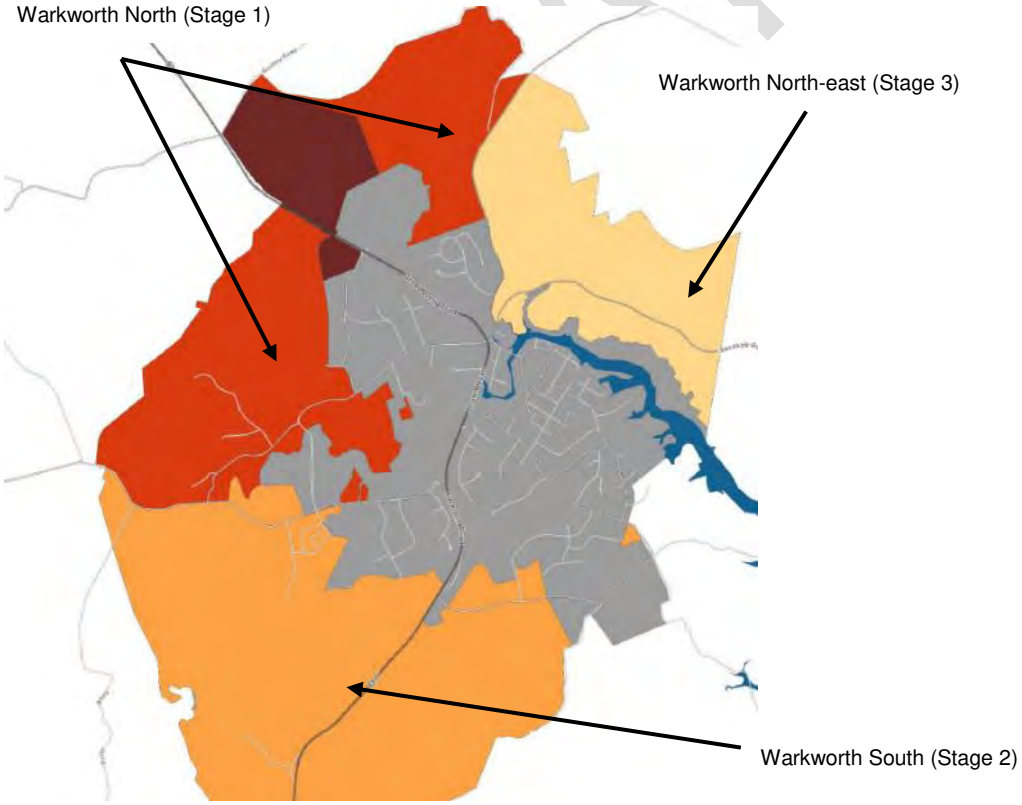
The key features of the structure plan are:

- Two new 'Neighbourhood Centres' located near the Matakana Link Road/ Matakana Road intersection and near the Woodcocks Road/ Falls Road intersection;
- A new 'Local Centre' near the intersection of the existing SH1 and the Wider Western Link Road (a new road link between existing SH1 and Woodcocks Road in Warkworth south);
- Higher density residential zones (MHU and MHS) near the Neighbourhood Centres and 'Terraced Housing and Apartment Building Zone' (THAB) near the Local Centre;
- New industrial land located south of the existing Woodcocks Road industrial catchment (toward existing SH1), at the western edge of the Warkworth urban area near Woodcocks Road and Wyllie Road, and south of existing SH1 near Hudson Road, and
- New arterial road links (discussed in Section 8). These are indicative only and are being developed as part of the draft IBC.

3.2. Future Urban Land Supply Strategy (FULSS)

The release of urbanised land within the Warkworth structure plan area is proposed to follow the Auckland Future Urban Land Supply Strategy[7] (FULSS). The purpose of the FULSS is to identify the anticipated staging of future urban land over a 30-year timeframe. The proposed staging is shown in Figure 5.

Figure 5: FULSS Staging[i]



[7] Auckland Future Urban Land Supply Strategy, July 2017

For Warkworth, urban land is proposed to be released in three stages as follows:

- Warkworth North – development ready 2022;
- Warkworth South – development ready 2028-2032, and
- Warkworth North-east – development ready 2033-2037.

The definition of 'development ready' means that the land has had a structure plan prepared, is zoned for urban uses in the Auckland Unitary Plan and bulk infrastructure is available. Warkworth North has been identified as the first stage for a number of reasons including:

- The Unitary Plan already identifies 69 hectares of live zoned business land in the north of Warkworth;
- Warkworth North is timed to align with the construction of the Pūhoi to Warkworth (Ara Tūhono) motorway (completed 2021), Matakana Link Road (Te Honohono ki Tai) and Watercare wastewater upgrades. A new wastewater treatment plant at Snells Beach, along with new associated new pipeline from Warkworth and upgraded outfall, is required to service development in the rest of Warkworth North. The wastewater works are currently being consented and are expected to be implemented by 2022.

The later sequencing of Warkworth South provides for the efficient staging of wastewater infrastructure. Warkworth North East is sequenced later to enable transport connections to the town centre to be adequately addressed.

The Structure Plan transport network has been assessed for the full build out (2046) design year. The proposed transport network staging is as follows:

- Stage 1 – to align with Warkworth North which is proposed to be development ready in 2022;
- Stage 2 – to align with Warkworth South which is proposed to be development ready from 2028 to 2032, and
- Stage 3 – to align with Warkworth North-east which is proposed to be development ready from 2033 to 2037.

The proposed network staging is indicative only and may be subject to change depending on whether funding for transport projects is available, how the projects are prioritised, and if there are future land use changes (private plan changes for example).

The majority of proposed transport infrastructure outlined in this ITA is currently unfunded. As such, the timing of proposed transport infrastructure is dependant on funding for construction, which could come from a number of sources.

Alternative land release sequencing has been investigated as part of the overall Structure Plan process however when considering all infrastructure and planning matters (transport infrastructure staging and costs, non-transport infrastructure staging and costs, current land uses, and planning for future schools) the current FULSS sequencing is considered appropriate to continue to be the basis for this assessment.

4. Transport Planning Context and Background

4.1. Auckland Plan 2050

Auckland Council produced the first Auckland Plan in 2012. The document covered every aspect of Auckland life and economy. It was accompanied by a highly detailed series of objectives and targets, and progress has been made towards achieving them. One of its provisions was that it would be reviewed after six years.

Auckland Council has therefore developed the Auckland Plan 2050[8]. It is a long-term spatial plan to ensure Auckland grows in a way that will meet the opportunities and challenges of the future. It is required by legislation to contribute to Auckland's social, economic, environmental and cultural well-being. The plan outlines the big issues facing Auckland and recommends the way in which Aucklanders and others involved in the future of Auckland can best respond to them.

There are six desired outcomes to achieve Auckland's strategy to 2050. These outcomes are:

- Belonging and Participation;
- Māori Identity and Wellbeing;
- Homes and Places;
- Transport and Access;
- Environment and Cultural Heritage, and
- Opportunity and Prosperity.

To achieve the 'Transport and Access' outcome, there are three Directions as follows:

- **Direction 1** – Better connect people, places, goods and services;
- **Direction 2** – Increase genuine travel choices for a healthy, vibrant and equitable Auckland, and
- **Direction 3** – Maximise safety and environmental protection.

These directions are supplemented by seven focus areas:

- **Focus Area 1** – Make better use of existing transport networks;
- **Focus Area 2** – Target new transport investment to the most significant challenges;
- **Focus Area 3** – Maximise the benefits from transport technology;
- **Focus Area 4** – Make walking, cycling and public transport preferred choices for many more Aucklanders;
- **Focus Area 5** – Better integrate land-use and transport;
- **Focus Area 6** – Move to a safe transport network, free from death and serious injury, and
- **Focus Area 7** – Develop a sustainable and resilient transport system.

[8] Auckland Plan 2050, Auckland Council, June 2018

4.2. Government Policy Statement (Land Transport)

The Government Policy Statement on Land Transport (GPS) outlines the Government's strategy to guide land transport investment over the next 10 years. The GPS influences decisions on how money from the National Land Transport Fund (the Fund) will be invested across activity classes, such as state highways and public transport. It also guides the NZ Transport Agency and local government on the type of activities that should be included in Regional Land Transport Plans and the National Land Transport Programme.

The strategic direction sets the 10-year view for the GPS to drive improved performance from the land transport system. The four strategic priorities are:

- Safety
- Access
- Environment
- Value for money

These are summarised in Figure 6.

Figure 6: GPS Strategic Direction

As shown above, there is a direction for increased access, transport choice, safety and reduction in greenhouse gases.

4.3. Auckland Transport Alignment Project (ATAP)

ATAP[9] is a joint project involving Auckland Council and the Government to determine an aligned strategic approach on transport. A number of investment priorities (called the 'ATAP Package') have been recommended for the 2018- 2028 decade to reflect the Government's and Auckland Council's shared direction for transport in Auckland. The ATAP Package guides statutory planning processes, including the Regional Land Transport Plan (RLTP) and the National Land Transport Programme (NLTP).

The ATAP project's Terms of Reference directed the development of a ten-year investment package that places greater weight on the following priorities:

(i) Accelerating the development of Auckland's rapid transit network, particularly to unlock housing and urban development opportunities;
(ii) Encouraging walking and cycling and making these active modes safer for Aucklanders;
(iii) Delivering improvements in health, safety, the environment and access, including disability access, and
(iv) Ensuring the indicative package delivers the best possible value for money, including broader non-monetary costs and benefits.

The ATAP package is a significant step towards a transformative programme for Auckland's transport system. The ATAP package contains around $28 billion of investment in Auckland's transport over the next decade. This is based on planned and assumed funding, including an expected increase of $4.6 billion on previous funding plans from the following sources:

- An additional $2.8 billion from the National Land Transport Fund;
- $1.5 billion from the proposed Regional Fuel Tax, and
- $360 million from Crown Infrastructure Partners.

This level of funding enables substantial progress towards improving Auckland's transport system. Key investment priorities have been identified and available funding has been broadly allocated (assuming a flexible approach to funding arrangements) across major investment areas. This will help guide the Regional Land Transport Plan (RLTP).

The key transport funding available for Warkworth is the $1.3 billion of 'Greenfield transport infrastructure' which ATAP describes as follows:

> *"Arterial roads and footpaths (including bus and cycle lanes where required) and public transport stations within greenfield growth areas. Wherever possible, agencies seek to ensure that the public cost of these projects is the net cost between the collector road a developer would build and fund, and the arterial road considered necessary to meet future demand."*

Key transport projects for Warkworth have already been identified, namely the Matakana Link Road. and Hill Street intersection upgrades which are being progressed via separate workstreams. The following section covers the funding status of these projects.

[9] Auckland Transport Alignment Project, April 2018

4.4. Regional Land Transport Plan

Following the release of ATAP, the Government and Auckland Council agreed on a transformative and visionary plan for Auckland, supported by a $28 billion package of transport investment over the next 10 years. The 10-year programme or works is set out in the Regional Land Transport Plan[10] (RLTP).

The RLTP must be prepared every six years in accordance with the Land Transport Management Act 2003 (LTMA) and include a 10-year programme of activities to support the achievement of these objectives. It includes the land transport activities of Auckland Transport (AT), the New Zealand Transport Agency (the Transport Agency), KiwiRail and other agencies. The RLTP must contribute to the purpose of the LTMA that seeks an effective, efficient and safe land transport system in the public interest. It is also required to be consistent with the Government Policy Statement on Land Transport (GPS). It must take into account a range of other matters, including likely funding from any source and any relevant national and regional policy statements.

It provides for significant improvements to be made in public transport, including rapid transit, walking and cycling, network initiatives to help to address congestion, and support for greenfield and urban redevelopment. It also provides for a major focus on improving safety on Auckland's road network.

Appendix 1 of the RLTP contains the transport capital programme with projects prioritised with the following classifications:

- 1 – Committed/ Ring fenced
- 2 – Funded
- 3 – Unfunded

For Warkworth, the following projects have been identified:

- Corridor Improvements – Matakana Link Road ($89 million from 2018 – 2022). This is classified as Funded (Priority 2). It should be noted however that recent funding of $62.7 million has been approved for a staged approach (two-lanes initially followed by widening to four lanes as a later stage). Four lanes may be still possible initially however, if through value engineering, a four-lane solution can fit within the approved budget.
- Supporting Growth Warkworth – Matakana Road to Sandspit Realignment or Hill Street works[11] (indicative project cost of $51 million). This is classified as Unfunded (Priority 3).
- Supporting Growth Warkworth – Warkworth Park and Ride near the end of the Puhoi to Warkworth motorway (indicative project cost of $15 million). This is classified as Unfunded (Priority 3).
- Supporting Growth Warkworth – Western Collector (indicative project cost of $68 million). This is classified as Unfunded (Priority 3).

[10] Auckland Regional Land Transport Plan, 2018-2028,

[11] RLTP 2018-2028, page 68, *"Road network improvements where SH1, Hill Street, Matakana Road and Sandspit Road meet"*.

As noted above, the majority of these projects are unfunded and will require funding to be allocated as part of future RLTPs or from alternative funding sources. Where required, route protection for some of the unfunded projects may be implemented via the Supporting Growth Programme's route protection process.

4.5. Transport for Urban Growth

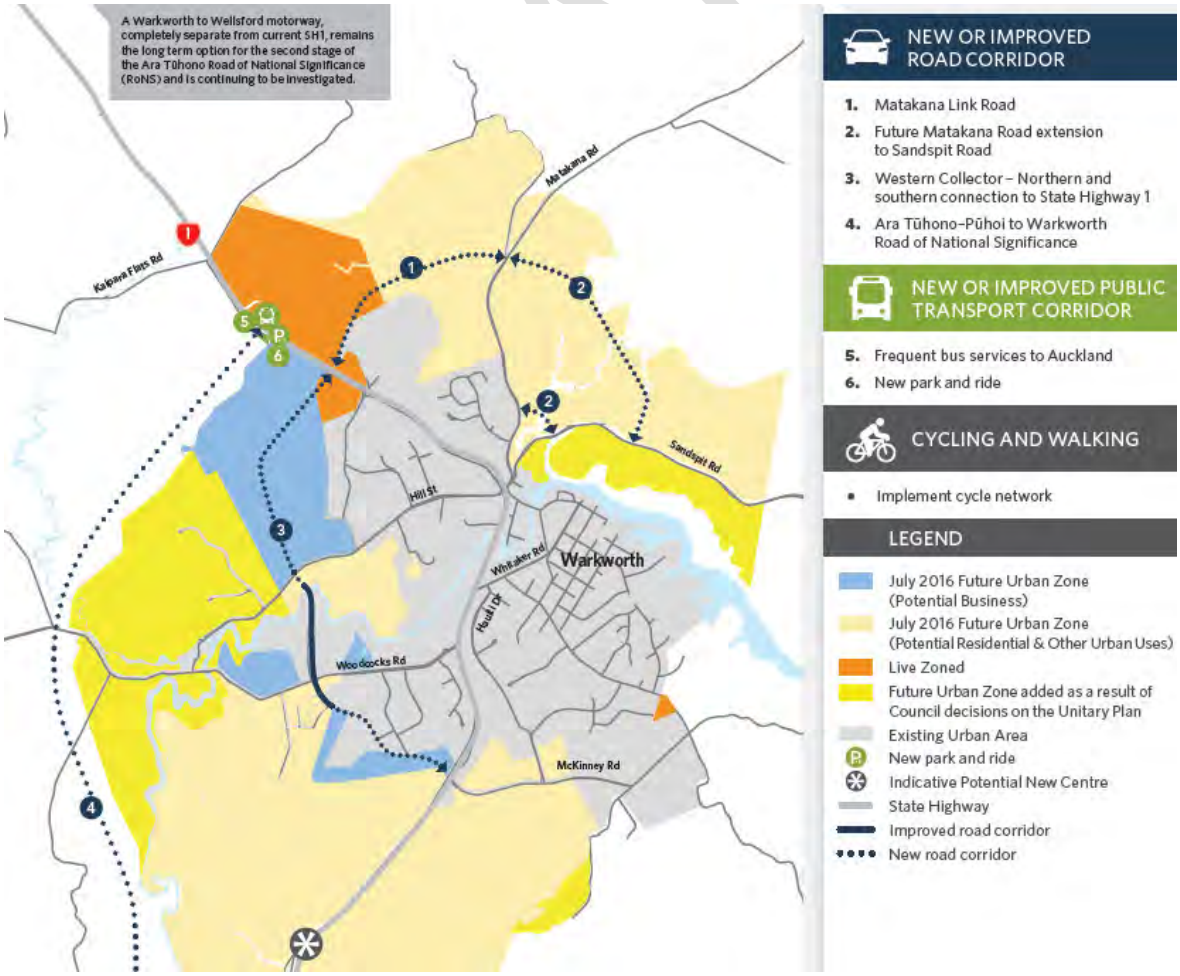
During 2015-16, the Transport for Future Urban Growth (TfUG)) partnership was formed between the New Zealand Transport Agency, Auckland Council and Auckland Transport in order to plan the future transport networks and required urban infrastructure for four main growth areas of Auckland identified over the next 30 years.

Four areas were identified for future urbanisation in accordance with the FULSS and the Unitary Plan:

- North Auckland (Dairy Flat, Silverdale & Wainui)
- North Auckland (Warkworth)
- Northwest Auckland (Whenuapai, Kumeu & Huapai)
- South Auckland (Drury, Paerata & Pukekohe).

The preferred network identified for Warkworth from TfUG's Programme Business Case (PBC) approved in late 2016 is shown in Figure 7.

Figure 7: PBC Network for Warkworth[ii]



The PBC preferred transport network was developed following technical workshops and subsequent feedback. Through that engagement process, the following transport aspirations were confirmed[12]:

- Warkworth expands as a successful satellite town, and
- Residents have transport choices, with good walking and cycling facilities and frequent, reliable public transport.

The TFUG work also acknowledged a potential further road link within the Warkworth South area:

> *"A new road network will also be investigated in the wider southern growth area when this begins to develop, providing more local road options for north-south travel and east-west movements connecting back into the existing SH1."*

The 'Supporting Growth Alliance (SGA) is now responsible for following on from this earlier work and preparing a draft Indicative Business Case (IBC) for Warkworth. The structure plan is being developed with Auckland Council to build upon the proposed transport network in the draft IBC.

4.6. Regional Public Transport Plan

The draft 2018-2028 Auckland Regional Public Transport Plan[13] (RPTP) outlines the proposed public transport network that Auckland Transport plans to operate within Auckland over the next ten years.

In 2015, AT published the Auckland Regional Public Transport Plan 2015-2025 which drove the implementation of the New Bus Network, increased train and ferry services, the Simpler Fares programme, signalled the City Rail Link and the investigation of Light Rail. Four years later, the Auckland Unitary Plan, which sets land use regulations, is now operative and the Auckland Plan has been refreshed. A new Government Policy Statement on Land Transport (GPS) has set the direction for change, with a much stronger emphasis on public transport and active transport (primarily walking and cycling). This new direction has been given substance through a refreshed Auckland Transport Alignment Project (ATAP) report, which outlined an ambitious programme which will see the expansion of the rapid transit network from the mid-2020s.

The RPTP has four focus areas as follows:

- Focus area one – Expanding and enhancing rapid and frequent networks;
- Focus area two – Improving customer access to public transport;
- Focus area three – Improving Māori responsiveness, and
- Focus area four – Harnessing emerging technologies.

The plan notes three bus routes in Warkworth (995, 996 and 997) and indicates proposed improvements to service frequencies over time. The RPTP therefore clearly signals improvements to PT services within the Warkworth structure plan area.

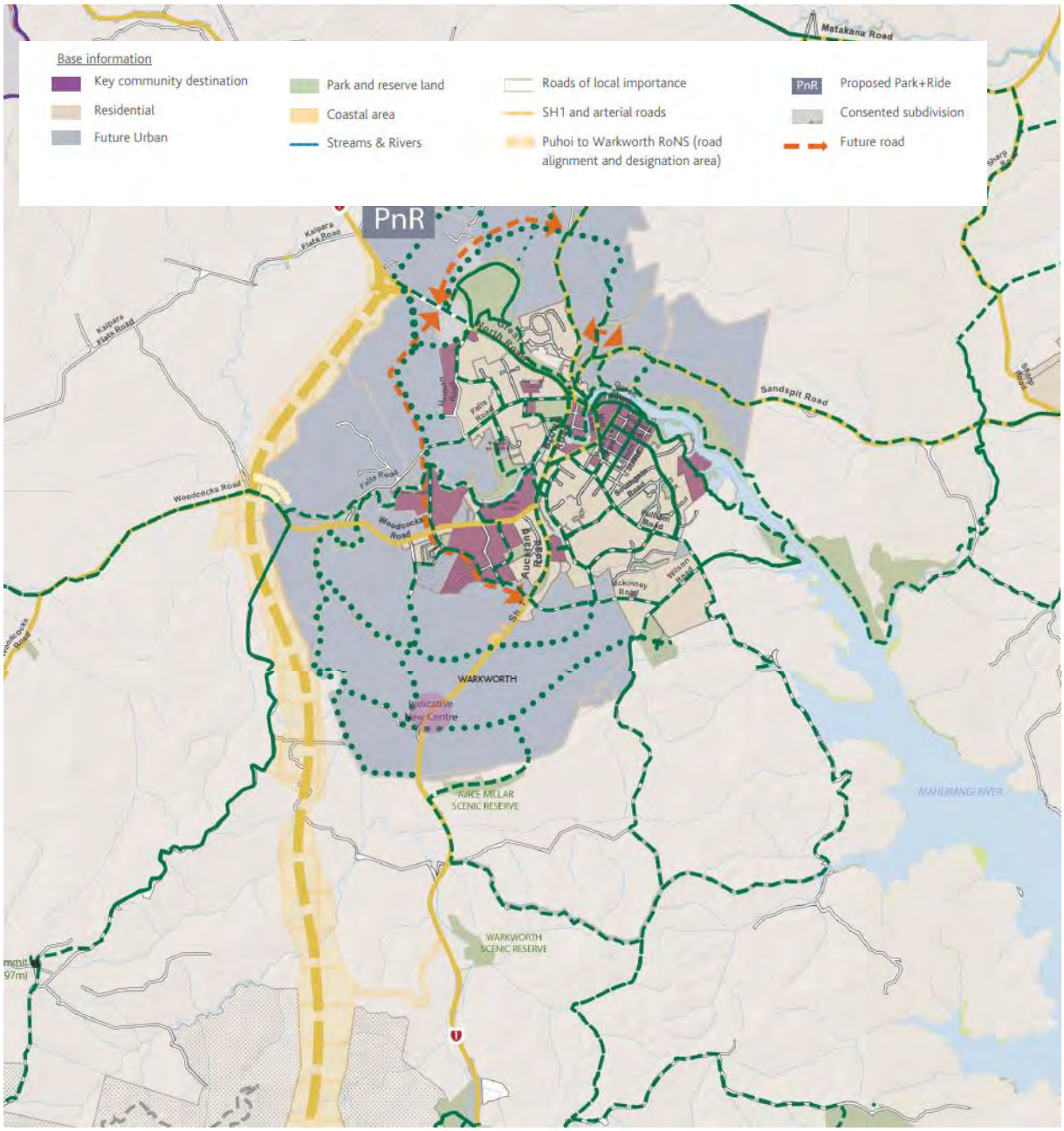
[12] Supporting Growth, Delivering transport networks, Summary

[13] Draft Auckland Regional Public Transport Plan, 2018-2028, Auckland Transport

4.7. Greenways Plan

The Rodney Greenways plan[14] is a new greenways network to provide a better connection for active modes (walking and cycling) and to enable ecological regeneration across this area of Auckland. The plan shows a number of routes that travel in and around the township of Warkworth, that link to popular destinations such as Matakana and Omaha. The proposed greenways network is shown in Figure 8.

Figure 8: Rodney Greenways Plan (Warkworth)[iii]



[14] Rodney Greenways, Paths and Trails Plan, Puhoi to Pakiri, May 2017

As shown above, there are a number of greenways routes planned by the local board through Warkworth. A number of these routes follow riparian margins that are unaffected by the proposed structure plan. There are a number of planned routes that follow the road network, and these are discussed further in Section 6. It should be noted that the Park and Ride located above is indicative only and representative of the thinking at the time these plans were prepared (mid 2017).

5. Land Use and Transport Environment

5.1. Known Development Proposals

The existing land use planning environment includes several unimplemented resource consents. That is, land use developments that have gained a resource consent but have not yet been built. The purpose of assessing these developments is to understand how future transport networks are proposed to occur on these sites.

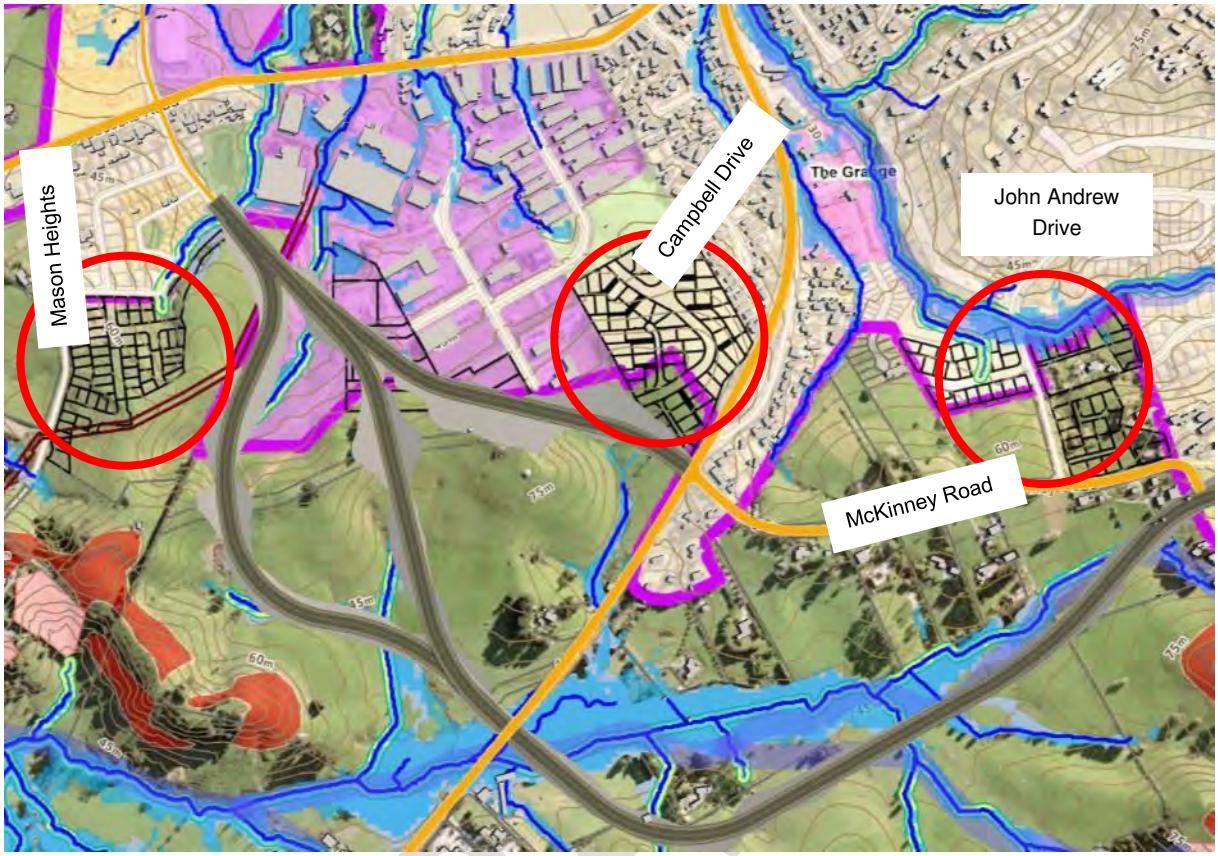
Within the study area there are several unimplemented consents that are worthy of noting:

- BUN20461239 – 67 John Andrew Drive (12 lot subdivision)
- BUN20458429 – 79A McKinney Road (20 lot subdivision)
- BUN60313175 – 123 Valerie Close (boundary adjustment)
- SUB60036342-A – Morrison Drive (industrial subdivision)
- R56088 – McKinney Valley (185 lot subdivision)
- R55961/B – Mason Heights (2 lot subdivision and establishment of church)
- SLC66949 – Campbell Drive (68 lot subdivision)
- SUB60035635-A – Mason Heights (54 lot subdivision)
- RMA65327 – 67-69 Auckland Road (33 lot subdivision)

In addition, a Private Plan Change has been lodged for the 'Stubbs Farm' land. At the time of preparing this ITA the private plan change had not yet been initially considered by the council's Planning Committee. However preliminary plans have been received for SGA road design purposes. The most significant unimplemented consents for the transport network are shown in Figure 9 and Figure 10.

Figure 9: Unconsented Development – Warkworth North private plan change

Figure 10: Unimplemented Consent Developments – Campbell Drive, Mason Heights, John Andrew Drive



Under the RMA a resource consent only becomes part of the 'environment' if it is implemented or if it is likely to be implemented. Given this ITA is being prepared for a structure plan, and so is at a higher level, it is not necessary to assess whether those consents are likely to be implemented. However, it is noted that the Warkworth structure plan project has assumed these consents will be implemented and it is noted that a number of these are currently progressing with earthworks. Consideration has been given to future transport networks on those sites to ensure appropriate integration with the arterial and collector road network proposed within this ITA. The recommendations of this report are unlikely to change regardless of whether these consents are implemented or not.

5.2. Road Network and Hierarchy

The Warkworth road network comprises of a main north-south spine (SH1) complemented by the following arterial roads as defined in the Unitary Plan:

- Woodcocks Road;
- Sandspit Road, and
- Matakana Road.

Woodcocks Road serves as an alternative State Highway route if there are incidents on SH1 south of Warkworth (that is, providing a route west to SH16). The Unitary Plan does not identify secondary roads.

Following the completion of the Ara Tūhono – Puhoi to Warkworth Motorway, it is expected that the current SH1 section will be revoked as a state highway and divested to Auckland Council under Auckland Transport management. However, it is expected to retain a regionally important role in the network for connections to Mauhurangi East, Puhoi and Upper Orewa and Waiwera. It would also have a strategic role providing resilience to the new state highway network.

5.2.1. Committed Transport Projects

There are two major committed transport projects within Warkworth which will be delivered in the next 3-4 years. These projects are:

- Ara Tūhono – Pūhoi to Warkworth Motorway, and
- Matakana Link Road – Te Honohono ki Tai (subject to obtaining approvals).

Collectively these projects are expected to significantly alter the travel patterns in the area, providing additional capacity and resilience to both the local Warkworth and wider strategic networks.

5.2.1.1. Ara T hono - Phoi to Warkworth Motorway

The Ara Tūhono – Pūhoi to Warkworth Project will extend the four-lane Northern Motorway (SH1) from the Johnstone's Hill tunnels to the north-west of Warkworth. The project was part of the Roads of National Significance (RONS) and sought to achieve better connectivity to Northland and enable economic growth in the region.

The project provides a motorway standard route to the west of Warkworth and separates strategic traffic movements from local Warkworth movements. It is expected that this project will be completed in late 2021. The northern termination of Ara Tūhono – Puhoi to Warkworth is shown in Figure 11 and the section of SH1 to the south of the roundabout is shown in

Figure 12. The section south of the roundabout is still subject to authorisations, consents and land acquisition.

Figure 11: Ara T hono – Puhoi to Warkworth Northern Termination[iv]

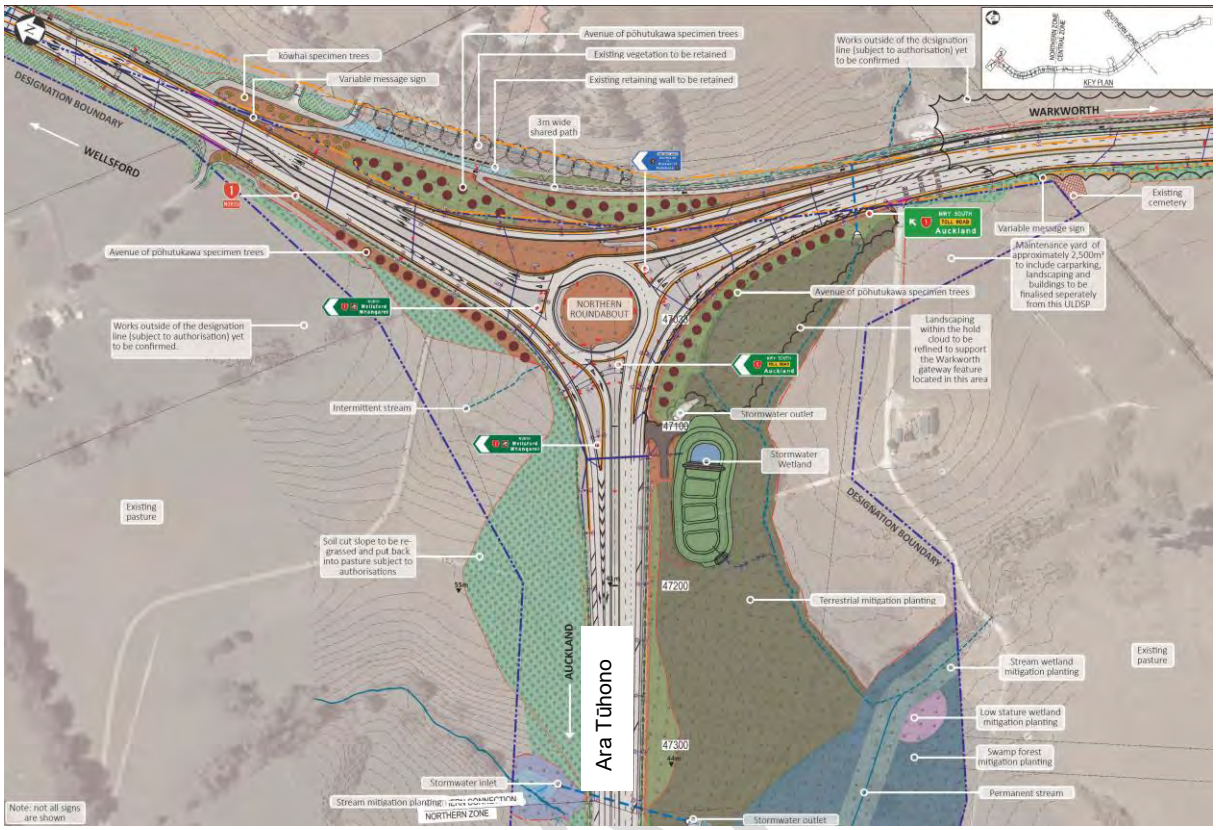
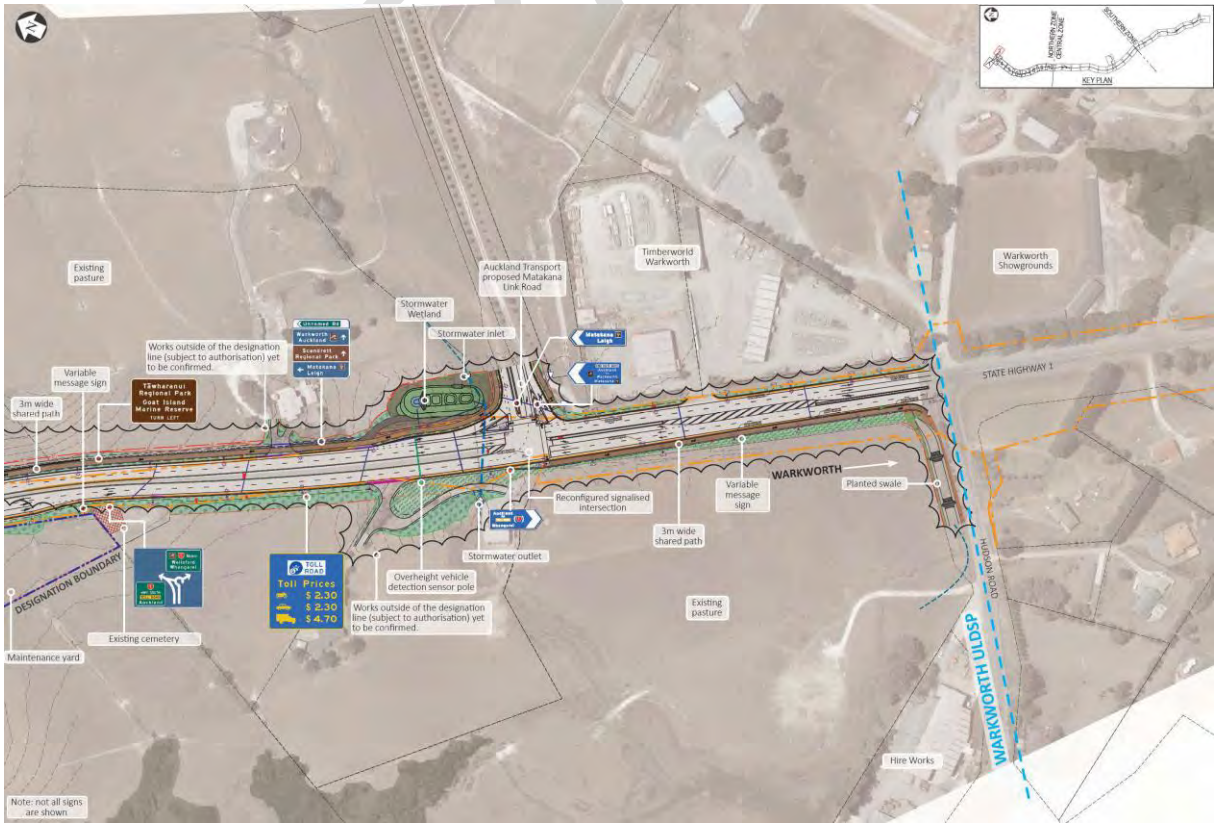


Figure 12: Ara Thono – Puhoi to Warkworth south of Roundabout[v]

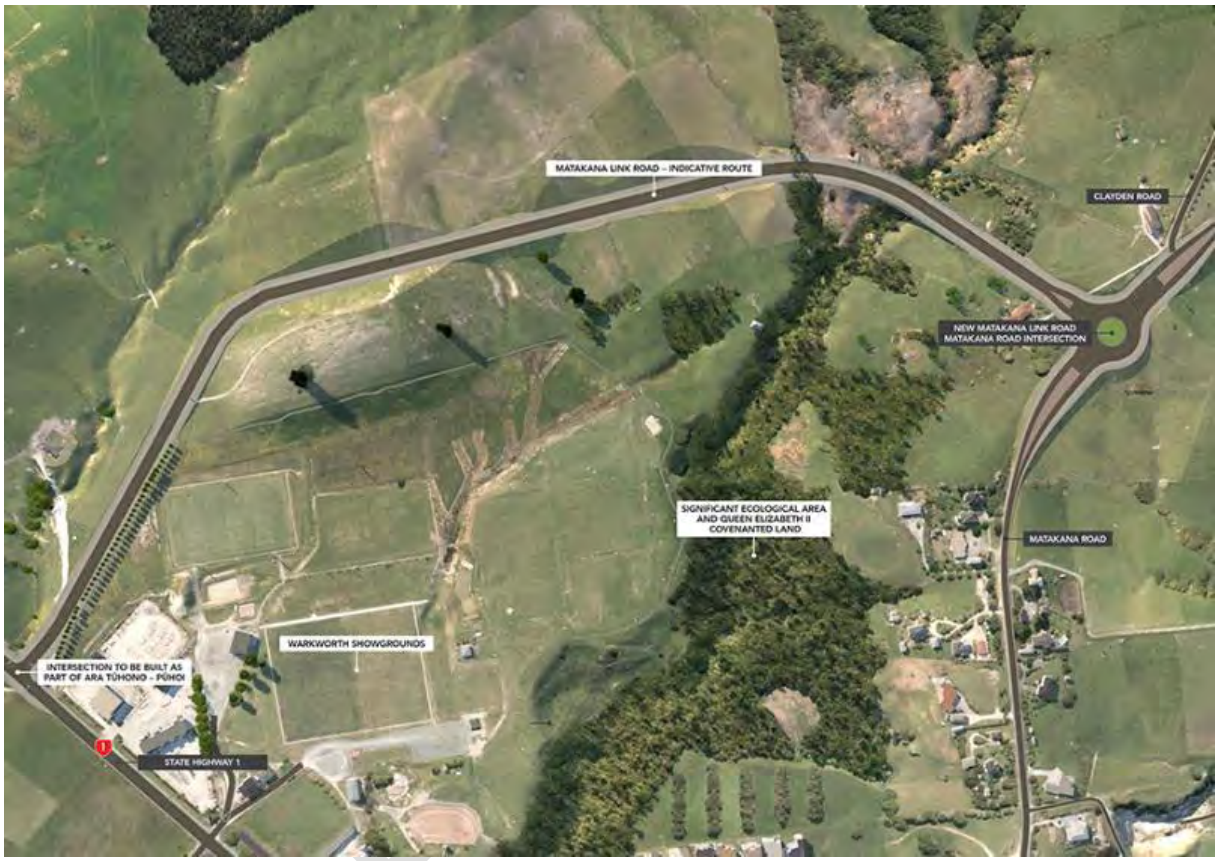


5.2.1.2. Matakana Link Road (Te Honohono ki Tai)

Matakana Link Road (Te Honohono ki Tai) will connect SH1 and Matakana Road and provide an alternative route to the eastern beaches and settlements therefore reducing congestion at the Hill Street intersection.

Whilst still being confirmed through the statutory planning process, a Notice of Requirement (NoR) has been served for route protection of the Matakana Link Road corridor. The NoR was notified on 1 November 2018. The proposed layout is shown in Figure 13.

Figure 13: Matakana Link Road (Te Honohono ki Tai)[vi]



5.2.2. Future Projects

5.2.2.1. Hill Street Intersection Improvements

A business case is currently being developed to assess options for relieving congestion and improve multi-modal connectivity at the SH1/ Hill Street intersection. This intersection has been identified as a significant bottleneck in the Warkworth network as it provides the only local and strategic crossing of the Mahurangi River to the settlements located to the east (Snells Beach, Algies Bay, Matakana, Omaha, Leigh). Particularly problematic are weekends and holiday periods where increased traffic through this intersection causes significant congestion. This has the effect of causing congestion on both local and strategic roads in the region.

At present, there is a business case being prepared to determine the most appropriate solution for the intersection post-completion of the new Ara Tūhono - Pūhoi to Warkworth motorway and Matakana Link Road. It seeks to address the following problems:

1. The existing Hill Street intersection limits the capacity of the Warkworth transport network to provide for desired land use and economic outcomes;
2. The traffic congestion at the Hill Street intersection restricts access to businesses, education, tourism, and core services, and
3. The lack of effective alternatives to private vehicles will reduce the efficiency of the Warkworth transport network.

There are currently two short-listed intersection options, both of which were consulted on in late 2018. These two options are:

- Five-leg roundabout, and
- Traffic signals with additional signalised intersection at SH1/ Bank Street.

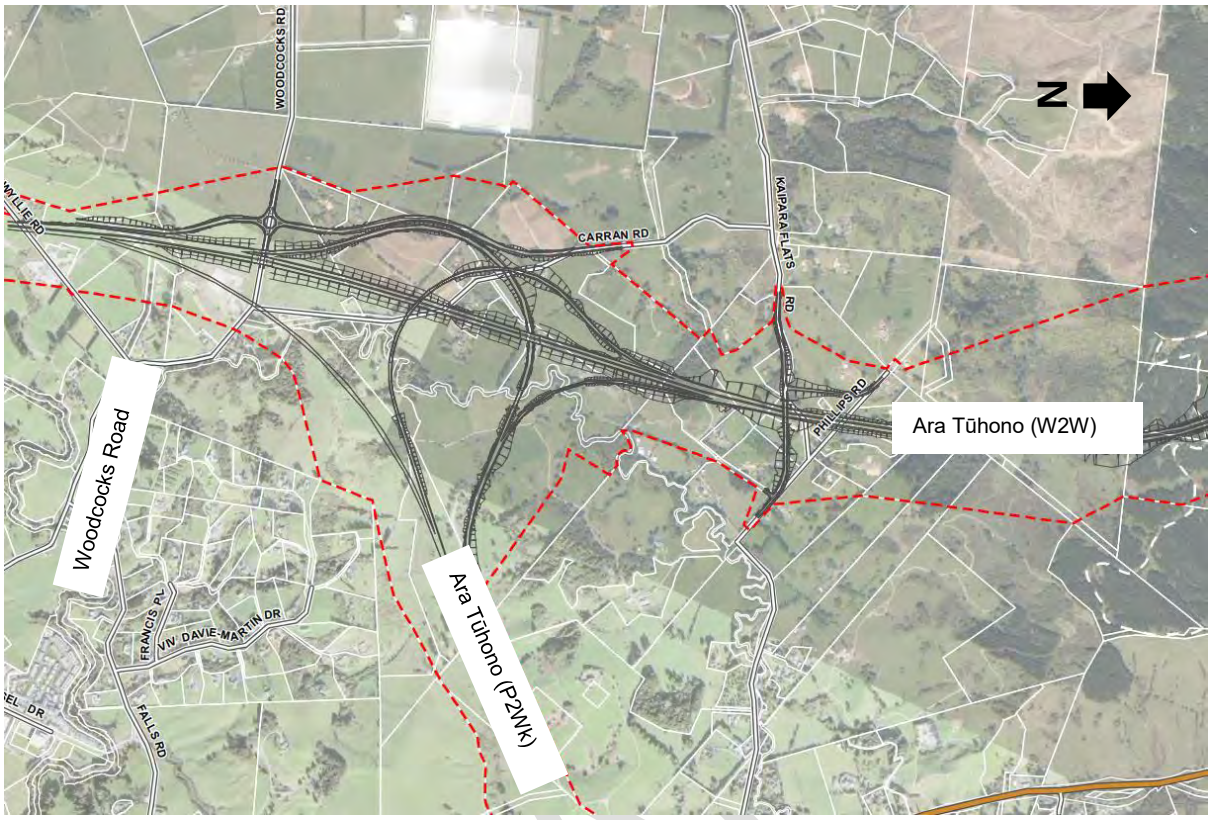
The preferred option has not been identified with both options currently undergoing further traffic modelling assessments. It is evident, in discussing the intersection options with the Hill Street project team, that there will not be significant improvements to vehicle capacity at the intersection. As such the assumptions made by SGA to assess the intersection in its current (2019) form are considered appropriate.

5.2.2.2. Ara Tūhono – Warkworth to Wellsford

The Transport Agency is progressing with route protection (designation and consents) for the Ara Tūhono – Warkworth to Wellsford project. Ara Tūhono – Warkworth to Wellsford is the second section of Ara Tūhono.

The Indicative Route was presented for public consultation in February 2017 and the Indicative Alignment announced in December 2018. Lodgement of designation and consents is currently programmed for the second quarter (April- June) 2019. A system interchange is proposed at the southern end of the Warkworth to Wellsford route connecting to the current SH1 roundabout at the end of Ara Tūhono Puhoi to Warkworth. This is shown in Figure 14.

Figure 14: Ara T hono – Warkworth to Wellsford, Indicative Route (Dec 18)



5.3. Public Transport

5.3.1. New Network for Warkworth

As part of region-wide public transport improvements, Auckland Transport has completed a new public transport network to better serve Warkworth and the Kowhai Coast (Snells Beach, Algies Bay, Omaha etc).

Warkworth is now connected to the Hibiscus Coast Station in Silverdale with a new bus route (995). This currently runs along the existing SH1 route from Warkworth to Silverdale. New bus routes 996 (connecting Algies Bay and Snells Beach to Warkworth) and 997 (connecting Omaha, Matakana and Point Wells to Warkworth) have replaced the recently operated 'Kowhai Connection'.

AT describes the benefits of the new routes as follows:

- Warkworth is now connected to Auckland's bus network via Hibiscus Coast Station.
- Buses operate 7 days a week.
- Fares can be paid using an AT HOP card which gives at least 25% discount off single trip cash bus, train and ferry fares (excludes Night bus and SkyBus services and Waiheke ferry services).
- SuperGold card holders can get a SuperGold concession loaded onto a gold AT HOP card. A SuperGold concession allows free travel on trains and selected bus and ferry services in Auckland after 9 am on weekdays and all-day on weekends and public holidays.
- More direct connections between Warkworth and the Kowhai Coast.

Route 995 is shown in Figure 15, Route 996 is shown in Figure 16 and Route 997 is shown in Figure 17.

Figure 15: New Network for Warkworth - Bus Route 995[vii]

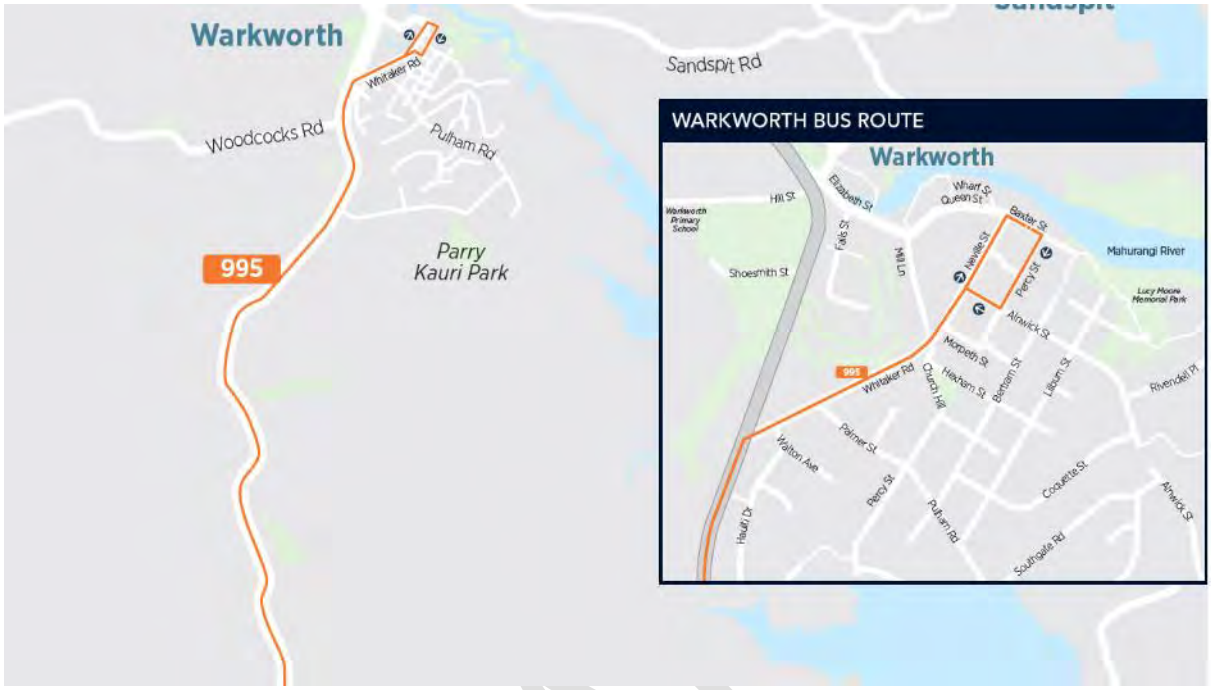
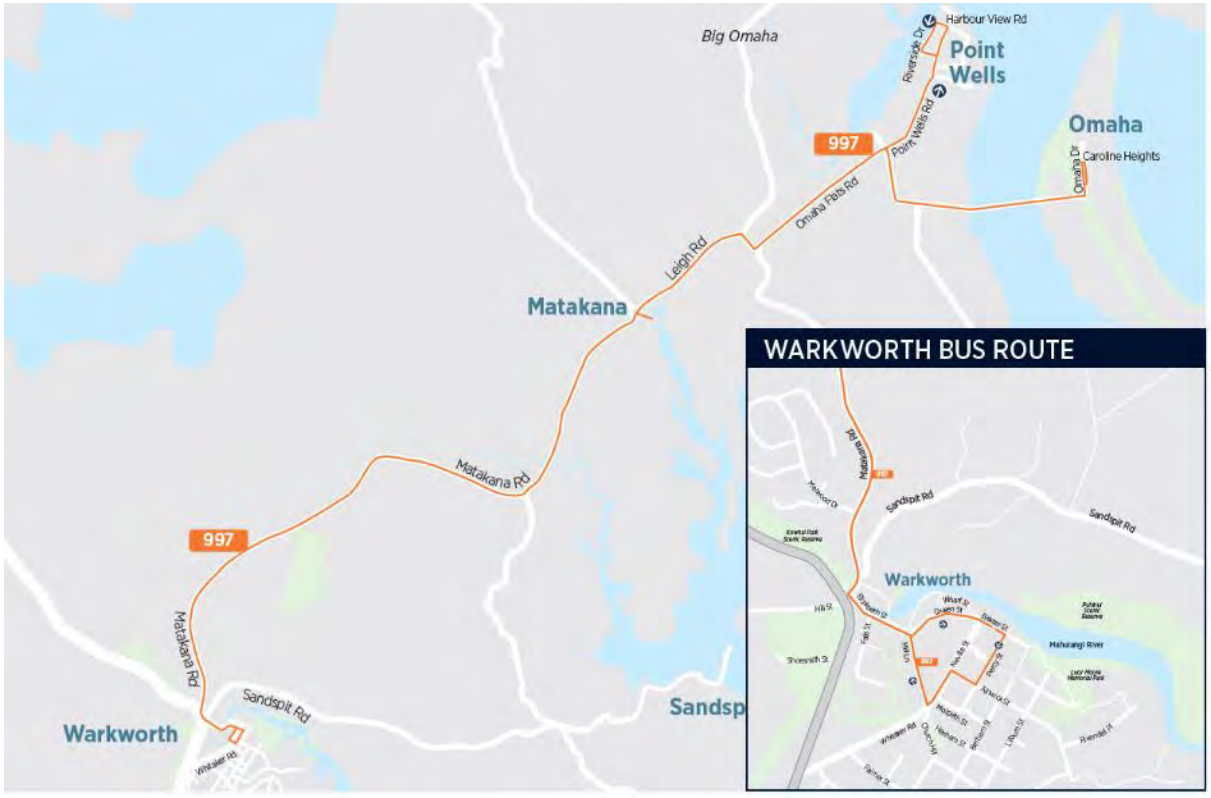


Figure 16: New Network for Warkworth - Bus Route 996[viii]

Figure 17: New Network for Warkworth - Bus Route 997[ix]



The 995 route operates half hourly with the 996 and 997 routes operating hourly. As patronage grows, more frequent services are proposed to be investigated. Once Ara Tūhono – Puhoi to Warkworth is completed, the 995 is proposed to follow the motorway route between Warkworth and Hibiscus Coast Station. The current time to travel between Warkworth and the Auckland City Centre using 995 and NX1 routes is approximately 91 minutes (35 minutes between Warkworth and Hibsicus Coast Station, and 56 minutes between Hibiscus Coast Station and Britomart).

A new 998 route between Warkworth and Wellsford is also proposed to be operating from late February 2019. This service will generally operate hourly 7 days per week.

5.3.2. Commuter Buses (Privately Operated)

The Mahu City Express[15] is a privately-operated bus service which runs between Snell's Beach, and Auckland CBD via Warkworth and the North Shore. There are three morning departures each weekday, and three return services in the evening.

Up to 40 seats are provided on each bus. A review of booking availability on the Mahu City Express website suggests occupancy rates in the region of 50%. Fares are $19 each way. There is also an option to buy a ten-trip ticket for $170.

[15] Mahu City Express (2016) https://www.mahucityexpress.co.nz/

Travel between Warkworth and Auckland CBD on this service takes approximately 50-60 minutes using the Northern Busway.

5.4. Cycling Infrastructure

There are few formal cycling routes or facilities in the Warkworth area. The following facilities are currently provided:

- Shared path on southern side of SH1 between Hill Street and Hudson Road,
- Shared path on northern side of Woodcocks Road between Mansel Drive and Morrison Drive, and
- On-road cycle lane in eastbound direction on Woodcocks Road in front of Mahurangi College.

There are several informal recreational routes as well as low volume roads suitable for mixed vehicle-cyclist traffic. As noted, the Rodney Greenways Paths and Trails Plan has identified several potential routes for further investigation by the Rodney Local Board.

5.5. Pedestrian Infrastructure

Footpaths are generally provided on at least one side of the road in the existing urban area. There are some locations on SH1 where footpaths are not continuous, and where no formal pedestrian crossing locations are provided (this includes major intersections such as SH1/ Hill Street).

There are considered to be several deficiencies in the pedestrian network, including:

- No footpath on SH1, east and north side, north of Whitaker Road through to Hudson Road (the current urban/rural threshold). No signalised pedestrian crossing at Hill Street for pedestrian on west side of SH1 to access Matakana Road footpath;
- No footpaths on SH1 south of Wech Drive;
- No footpaths on Sandspit Road;
- No footpaths on Matakana Road north of Melwood Drive. Footpath on western side of Matakana Road only south of Melwood Drive;
- No footpaths on Hudson Road;
- No footpaths on McKinney Road;
- No footpath on southern side of Whitaker Road between Palmer Street and Church Hill Road;
- No footpath on northern side of Pulham Road;
- No footpath on northern side of Hill Street west of Albert Road. No footpaths on Falls Road, and
- Intermittent footpath provisions on suburban roads within Warkworth (one side etc). Requests to AT for footpaths have been received for the above roads plus Kaspar Street, Albert Road, Blue Gum Drive, Wech Drive, Wilson Road South and Palmer Street.

These facilities are of an appropriate scale for a rural town at the current size of Warkworth. However, as Warkworth continues to grow, investment in pedestrian infrastructure will need to be undertaken to accommodate future demand. It is noted that $14 million has been allocated for footpath upgrades that the Rodney Local Board will fund via the Rodney Targeted Rate.

5.6. Current Traffic Volumes

Traffic volumes have been obtained from AT and NZTA. The traffic volumes for key routes are summarised in Table 1.

Table 1: Existing Traffic Volumes

Location	Source	Date	7-day ADT	%HCV
SH1 (south of Kaipara Flats Road)	NZTA	2017	15,200	8.0
SH1 (south of Hill Street)	NZTA	2017	23,200	6.7
SH1 (south of McKinney Road)	NZTA	2017	23,800	7.2
Matakana Road (near Golf Road)	AT	2018	8,100	6.0
Sandspit Road (near Hamilton Road)	AT	2018	8,500	4.0
Woodcocks Road (near SH1)	AT	2017	9,600	10.0
Whitaker Road	AT	2017	10,600	5.0
McKinney Road (near SH1)	AT	2014	1,000	7.2
Falls Road (near Woodcocks Road)	AT	2015	1,200	7.6
Mansel Drive	No data			

As shown, SH1 is the busiest road in Warkworth carrying over 23,000 vpd.

5.7. Overdimensional Vehicle Routes

Warkworth has a number of Overdimensional Vehicle Routes. Figure 18 shows the routes.

Figure 18: Overdimensional Vehicle Routes[x]

As shown above, SH1, Matakana Road and Sandspit Road are all overdimensional vehicle routes. The overdimensional routes are expected to remain post-completion of Ara Tūhono and therefore will affect any proposed intersections along these routes.

5.8. Road Safety

In assessing the safety of the existing transport network, there are two key metrics:

- Collective Risk, and
- Personal Risk.

For intersections, collective risk is defined as:

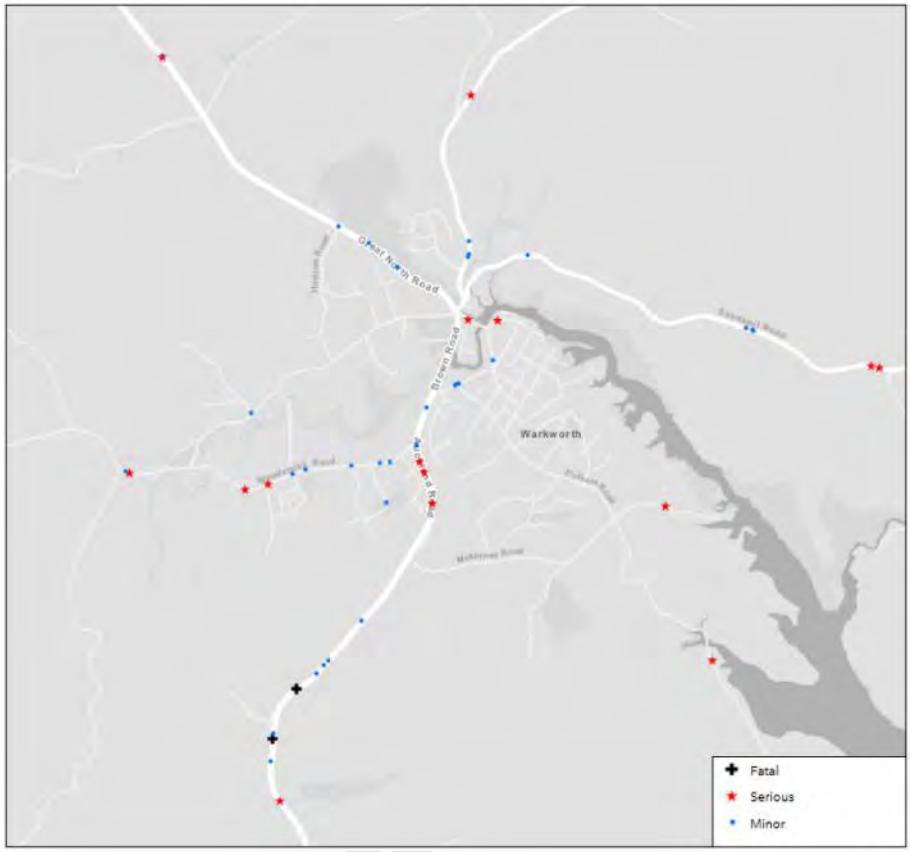
> *"Collective risk is measured as the total number of fatal and serious crashes or deaths and serious injury equivalents per intersection in a crash period."*

Personal risk is defined as:

> *"Personal risk is the risk of death or serious injuries to each vehicle entering the intersection. The personal risk is calculated from the collective risk divided by a measure of traffic volume."*

These metrics are referred to in the High Risk Intersection Guide[16] and High Risk Rural Roads Guide[17]. The total number of reported injury crashes (fatal, serious injury and minor injury crashes) are shown in Figure 19. Personal and Collective risk maps are shown in **Attachment A**. Only collective risk at intersections are shown as there are no personal risk maps available (as these did not reach the 'low' threshold).

Figure 19: Fatal, Serious and Minor Injury Crashes

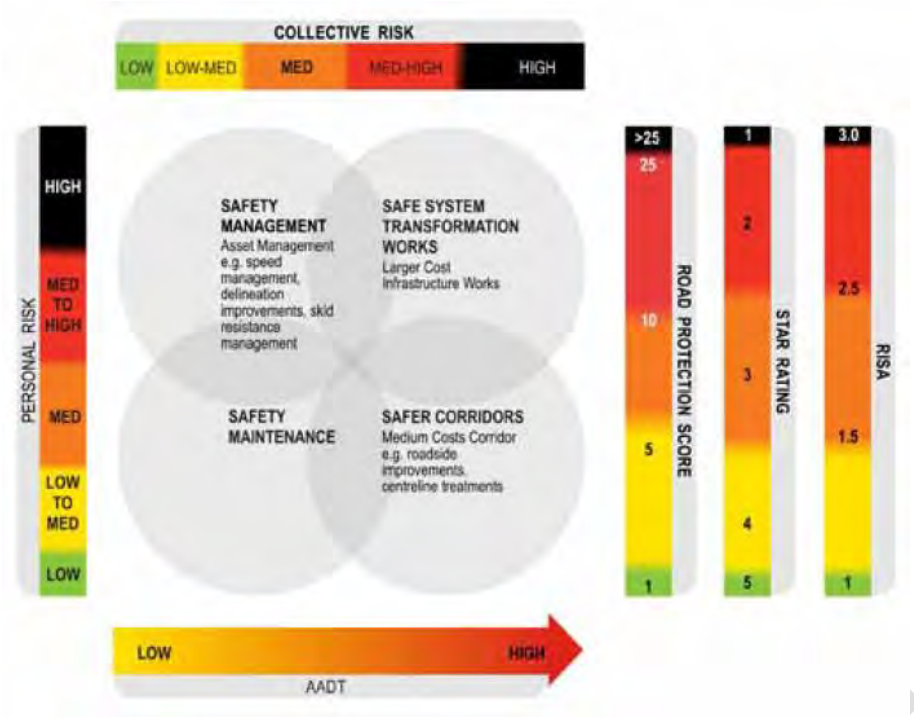


The corridor collective and personal risk maps are also shown in Attachment A. Corridor risk assessments follow a similar procedure to the intersection assessments however are calculated per unit of length of the corridor section. In terms of collective risk, the section of SH1 from Valerie Close to Woodcocks Road is classified as 'Medium-High' while sections of Woodcocks Road, Sandspit Road and Wilson Road South are classified as 'Medium'. The majority of roads are classified as 'Low' to 'Low Medium'. In terms of personal risk, Woodcocks Road west of Mansel Drive is classified as 'High'. The treatment philosophy for High Risk corridors is shown in Figure 20.

[16] High Risk Intersection Guide, July 2013, NZTA

[17] High Risk Rural Roads Guide, September 2011, NZTA

Figure 20: Treatment Matrix[xi]



As shown above, the worst section of the Warkworth road network (Woodcocks Road) falls within the top left quadrant (high personal risk and medium collective risk). The typical treatment process for this risk profile is Safety Management (speed management, delineation, high friction surfacing etc). As will be described, this section of Woodcocks Road, and others, can be upgraded as part of the proposed improvements to the overall transport network as part of the recommended Structure Plan transport network.

6. Proposed Transport Network

6.1. Transport Network Development Process

The development of the ITA's transport network has been undertaken in parallel with the Supporting Growth Programme's draft IBC process to determine the preferred road network within Warkworth. As noted, because the draft IBC is progressing in parallel, this ITA has made assumptions regarding the potential final outcomes of the draft IBC. In this regard, there is a risk that some elements of this ITA will need refreshing prior to the subsequent NOR and Plan Change processes, in order to clarify various transport network design matters, such as:

- The outcomes of the draft IBC;
- The outcomes of the separate Ara Tūhono – Warkworth to Wellsford and Matakana Link NOR and Hill Street business case workstreams, and
- The outcomes of the final structure plan and subsequent decisions on plan change zoning and staging.

The proposed residential and employment yields are shown in **Attachment B** and the proposed ITA transport network maps are shown in **Attachment C**. These maps include the proposed road network, the proposed public transport network and proposed active mode network. These transport networks are discussed later in this chapter.

6.2. Influencing Travel Demand

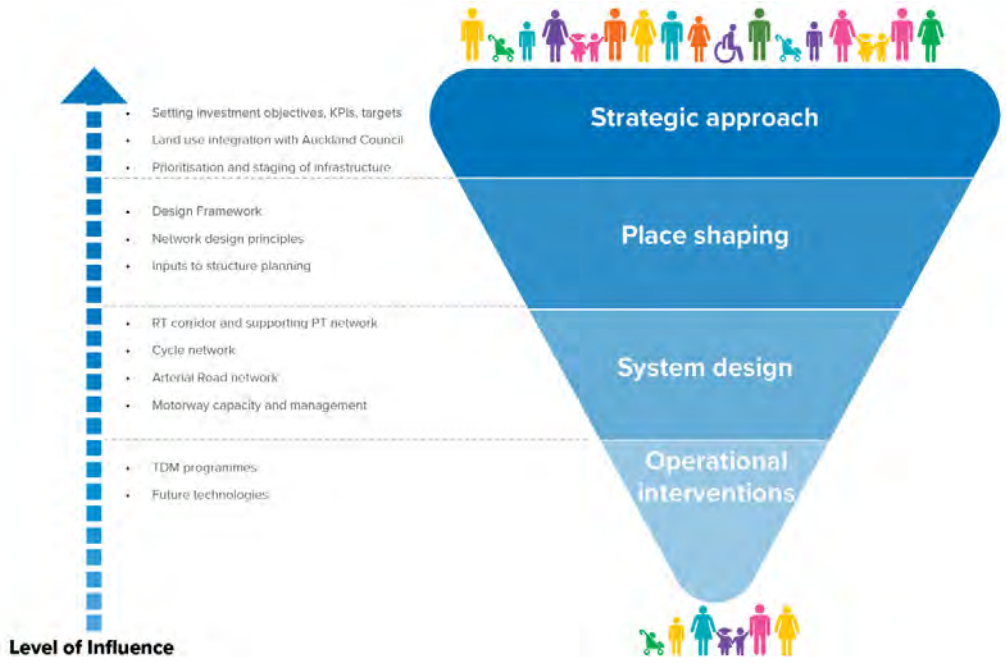
The draft IBC concluded that it is not feasible or economic to build transport infrastructure with a view to accommodating unconstrained travel demand, and that it is not possible to achieve desired mode share and other desired access and placemaking outcomes without seeking to change historic patterns of travel behaviour and choice. Accordingly, the need to proactively plan to influence travel demand is being considered as an integral part of the Supporting Growth programme, and as a starting assumption for this ITA.

Importantly, there are two complementary drivers which manifest slightly differently in terms of strategic response:

- Reducing the need to travel from an area to reduce pressure on the wider transport network – the strategic response of which is to generally increase the level of local employment/ activity, and
- Achieving a mode shift to provide transport choice/ reduce general traffic congestion exposure – the strategic response of which is to intensify land use around public transport nodes and provide high quality public transport and active mode networks.

As shown in Figure 21, the strategic transport approach and land use integration are the most significant influences on travel demand. Accordingly, the process of developing the ITA and the structure plan presents the best opportunity to embed travel demand management strategies given it is sufficiently early in the planning process to influence key decisions, and is more spatially specific than the business case process.

Figure 21: Demand Management Influence



The main opportunities to influence travel demand through the ITA and structure planning process are as follows:

- **Land use integration** – Demonstrating that land use sufficiently provides for local employment opportunities, centre and social infrastructure to substantiate a reduction in outbound travel demand, and mode shift for both inbound and outbound trips. Furthermore, it is important that opportunities to increase density around public transport routes are maximised to support the frequent public transport provision necessary to induce mode shift;
- **Transport network design** – The transport network proposed through the ITA needs to be conducive to a reduction in travel demand and a mode shift away from single-occupant private vehicles. From a network design perspective, ensuring that the overall urban form and configuration of transport corridors are walkable, cyclable, and able to support public transport provision are key considerations, and
- **Influencing investment decisions** – The ITA in its more detailed consideration of the structure plan area over time will help inform future investment decisions which will in turn influence the level and type of travel demand. This is particularly important given that sequencing to date in the business case process has primarily been considered in the context of consenting methodology.

All of the above opportunities are inherent within the proposed structure plan and transport network including provision of a high ratio of employment to residential development (to promote shorter internal trips within Warkworth), increased residential density around public transport stations, a transport network that is multi-modal and connected, and staged to occur in line with proposed land release.

In terms of system design, there are a number of measures available to reduce demand for private motor vehicles. These are outlined in Table 2.

Table 2: Examples of System Design Options

System Design Options	Likely Effectiveness
Infrastructure projects: • New cycle and walking facilities • New rapid transit corridor and interchanges • New/ upgraded arterial corridors that provide for walking and cycling facilities • New road connections	HIGH
Facility design: • Park and Ride facilities • Secure cycle parking at key destinations • Electric bike charging infrastructure • Electric vehicle charging infrastructure • CPTED principles and active surveillance	MEDIUM
Local network planning: • Car-free/ pedestrianised zones in centres • Shared space in centres • Safe routes to school/ kea crossings	MEDIUM
Parking provision: • Limited parking in centres • Parking regulations to limit vehicle ownership e.g. maximum parking requirements	MEDIUM
Priority measures implemented on corridors • Priority lanes on arterial corridors (e.g. high occupancy vehicles/ bus lanes) • Managed lanes on SH1 (e.g. for freight/ high occupancy vehicles/ public transport) • Managed lanes on SH1 on-ramps (as above)	LOW

In addition, a number of operational interventions can be applied to individual activities as outlined in Table 3.

Table 3: Examples of Operational Options

Operational Options	Likely Effectiveness
Travel behaviour change schemes: • Workplace travel planning: • School travel planning • Personalised journey planning • Community cycling/ walking groups • Walking school buses	MEDIUM
Service provision: • Carpooling schemes and support • Carsharing schemes • Bicycle hire schemes	MEDIUM
Promotional/ educational campaigns: • Fund-raising/ schemes for free bikes • Cycle incentives and training • Cycling proficiency/ safety in schools • Information provision • Advertising/ media campaigns	MEDIUM
Technology • Mobility as a Service • Protecting corridors for drones • On-demand services • Online shopping	LOW
Priority measures implemented on corridors • Priority lanes on arterial corridors (e.g. high occupancy vehicles/ bus lanes) • Managed lanes on SH1 (e.g. for freight/ high occupancy vehicles/ public transport) • Managed lanes on SH1 on-ramps (as above)	LOW

As part of subsequent development processes, the opportunities for TDM measures should be investigated as part of those individual traffic studies to ensure the desired mode shift can be achieved.

6.3. Network Design

6.3.1. Road Network

The Supporting Growth Programme's draft IBC assesses the road network to arterial road-level only. These are the key routes through the Warkworth structure plan area. This ITA has made assumptions on preferred arterial routes and refines the network further to identify an additional level of indicative collector roads. The process for determining these collector roads has included:

- Review of current developer proposals (where possible, similar connections and route alignments to those already planned are proposed)
- Utilisation of the draft IBC Infraworks models to understand topography and watercourse constraints to establish potential collector road alignments. These models were also used to test various road alignments with Auckland Council specialists on 13 September 2018, and
- Utilisation of existing road corridors where possible.

It should be noted that the collector roads shown in the transport maps are indicative and there is flexibility for developers to potentially change these routes as part of later resource consent processes (when proposed earthworks for instance are better understood). In this regard some roads will have greater flexibility compared to others (public transport routes and active mode routes in particular will have lesser flexibility). Similarly, the preferred major transport network elements identified in the draft IBC are also subject to design refinement as part of ongoing processes (for example IBC approvals, structure plan finalisation, NOR and plan changes).

The collector road network has also been discussed with Auckland Council specialists.

6.3.2. Road Classification

In designing the road network, a key consideration has been the classification of the roads, particularly, whether roads should be classified as arterial roads or collector roads. To inform this process, various criteria have been developed by AT and SGA. The criteria have been developed using a combination of the Roads and Street Framework[18], One Network Road Classification[19] and relevant ATCOP documents[20]. Table 4 shows the key considerations in classifying a road as an arterial road. Importantly, traffic volumes are not the only consideration.

[18] https://at.govt.nz/media/1976084/roads-and-streets-framework-webcompressed.pdf

[19] https://www.nzta.govt.nz/assets/Road-Efficiency-Group/docs/functional-classification.pdf

[20] https://at.govt.nz/media/309804/Section_4_Road_Classification.pdf

Table 4: Road Classification

Function	Measure	Road Classification			
		Strategic	Arterial	Collector	Local
Classification Criteria					
Public Transport	Route type	High frequency and capacity, focussed on longer-distance trips with infrequent, but major stations.	Forms part of Frequent Transit Network (FTN) or Collector network.	Lower frequency routes as part of Connector or Local Service network.	Limited bus services along these routes.
Freight	Heavy Vehicle volumes	>500 vpd	>300 vpd	>150 vpd	<150 vpd
	Access and Connections	Inter-regional connections. Articulated truck design vehicle.	Intra-regional connections and connectivity to major industrial areas/ ports. Articulated truck design vehicle.	Connections between arterials and minor business areas. Large rigid truck/ bus design vehicle.	Waste vehicle access. 10.3 m rear steering waste collection vehicle (can cross centreline)
Connectivity	Through traffic	Greatest through movement	Predominantly through-put function	Carries some through traffic	Only local movement within individual areas expected
	Place Connections	Connections between or through regions	Connecting major suburbs/areas	Connecting local communities and property access	Access to property
	Connections to major airports/ hospitals/ social amenities etc.	Yes	Yes	No	No

Function	Measure	Road Classification			
		Strategic	Arterial	Collector	Local
	Function	Major, longer-distance connections	Connections to major destinations and to strategic routes	Safe local routes and connections to major routes and destinations	Local access
Traffic Volumes	Daily Flows, AADT (urban)	>20,000	Typically >15,000	Typically >3,000	Typically <2,000
Classification Outcomes					
Public Transport	Priority	Separate facilities (busway, bus lanes, bus shoulder) where possible.	Separate facilities (bus lanes, bus advance at signals) where practicable.	Generally mixed traffic. In-lane bus stops.	Generally mixed traffic. In-lane bus stops.
Active Modes	Segregation	Full segregation expected	Segregated in urban areas	Desirably segregated	Mostly on-road or on designated paths
Property Access	Accessibility	Generally prohibited direct property access	Generally limited access	Controlled access only at key locations	Full access
Parking	Controls	Generally prohibited	Generally controlled	Designated areas	As determined by street function
Movement Lanes	Traffic lanes (2-way)	Typically >=4	2-4 in urban areas	2	2

In summary, a road providing a high connectivity function and/or having a frequent public transport route(s) operating on it, will generally be classified as an arterial road even though it may have relatively low daily traffic volumes. In addition, any roads that carry greater than 15,000 vpd are proposed to be classified as arterial roads (and can be either two-lane or four-lane). The road network volumes are discussed in Section 8.2.1.

6.3.3. Public Transport Network

The ITA proposed public transport network has been discussed with Auckland Transport public transport specialists. The long-term preference is to establish a permanent bus station in Warkworth South (to coincide with development in Warkworth South) complemented by a major stop facility in the Warkworth town centre. While an interim northern station has been identified within Warkworth North in the draft IBC, it is preferred to remove this facility in the long term and utilise a southern station only. The southern station enables the following:

- It simplifies the 995 route (the high frequency route between Warkworth and the Northern RTN south of Warkworth). The Ara Tūhono - Puhoi to Warkworth Southern interchange enables buses to efficiently gain access to and from the motorway route;
- Due to land constraints, there is limited space within the Warkworth town centre to accommodate pulsed bus arrivals/ bus layover facilities (there would need to be greater than five bus stops including inter-regional buses). The southern station can serve this purpose. It should be noted however that the town centre is still an important destination however and therefore a high quality bus facility will still be required;
- The existing 996 (Snells/Algies Bay), 997 (Omaha/Leigh) and 998 (Wellsford) routes can be extended south through the new Warkworth South residential catchment to the new station. This will enable the new residential catchment to be served by public transport without significant changes to the existing bus network.
- Higher intensity terrace house and apartment buildings (THAB) and local centre zoning is proposed within, or adjacent to, the southern bus station. This will encourage walk-up public transport to both the 995 route and the other Warkworth routes also passing through the facility.

With respect to Park and Ride, the preference is to shift this adjacent to the southern motorway interchange in the long-term. The reasons for this are:

- The southern motorway interchange enables the 995 route to remain on the motorway for the majority of its route and utilise the south facing ramps at the Ara Tūhono – Puhoi to Warkworth Southern interchange to enable faster running times between the proposed Park and Ride facility and the proposed RTN to the south.
- The preference is to locate any Park and Ride facilities adjacent to the high frequency Hibiscus Coast Station route (995).
- If a northern station with Park and Ride is maintained, there would need to be a connection between the northern station and the southern station. As no north-facing ramps are proposed at the southern Ara Tūhono – Puhoi to Warkworth interchange, this would require the 995 route to follow the Western Link Road and extend the running time of the service. In addition, outside of peak times, there would likely be a significant number of 'empty-running' buses between the northern and southern stations.

Until such time as the southern station is developed (as part of Stage 2 upgrades), it is anticipated that a Park and Ride facility at the interim northern station using parking resources on private land (yet to be identified) could be utilised.

6.3.4. Active Mode Network

The **Network Principles** for the primary routes in Warkworth are:

- Connecting people to key destinations (hub and spoke network concept):
  - Between town/ local centres and public transport stations;
  - Between town/ local centres and town/ local centres – these routes generally follow arterial roads (existing SH1, Matakana Road, Matakana Link Road, Western Collector, Wider Western Link, Woodcocks Road etc);
  - Between public transport stations and medium to high density residential areas – these routes comprise both arterial roads and collector roads;
  - Between town/ local centres and employment centres – these routes generally follow arterial roads, and
  - Between medium to high density residential areas and educational facilities – these routes generally follow arterial roads (Mahurangi College) and collector roads (Warkworth Primary School).
- Utilise riparian stream corridors to provide connections to key destinations and residential areas (these are predominantly greenways routes however the Mahurangi route is considered a primary active mode route).
- Utilise the arterial road network (including the existing state highway and any upgrades to existing arterial roads) to provide connections to key destinations and residential areas.

Design principles were developed internally by SGA. These principles are:

- Prevent conflict between vehicles and people on bikes:
  - Require physical separation between cycleway and vehicles, including parked vehicles, and
  - Vehicle separation to be designed to prevent or minimise the possibility of vehicles parking and blocking the cycleway or footpath.
- Minimise conflict between pedestrians and people on bikes:
  - Require physical separation between cycleway and footpath, and
  - Footpath separation to be designed to prevent pedestrians crossing unconsciously into the cycleway, including vision impaired pedestrians.
- Minimise driveway entrances:
  - Continuity of the separator is key to safety;
  - Driveway must show priority for pedestrians and people on bikes, and
  - Reduce speed for entering/egressing vehicles and ensure good visibility.
- Comfortable to use for all ages and abilities:
  - Smooth, continuous, and skid-resistant surface;
  - Wide enough to allow riders between 5 km/h and 30 km/h with areas where comfortable overtaking is possible, and
  - Gradients of 5% or less.
- Quality, integrated outcomes:
  - Designed to support the land use and/or anticipated future land use of the street.

On all arterial roads, the above design principles are proposed to be achieved with the exception of some existing arterial roads which may need to retain vehicle access to existing properties.

In addition, AT has developed their own cycling design code (currently draft). A key threshold in the design code is that mixed traffic operation should only occur in situations where traffic volumes are less than 2,000 vpd and vehicle speeds are lower than 30 km/hr. For higher volumes and speeds, separated facilities are generally sought. While separated facilities can likely be provided on new roads, there are likely to be a number of constraints on existing roads, including narrow road widths, vehicle crossings, road geometry (horizontal and vertical) and street trees/ services that will make separated facilities difficult to implement. Other options will need to be considered on these roads including LATM, reduced speed limits and shared paths.

6.4. Transport Network Design Principles

In preparing the ITA, the design principles have followed the internally developed SGA design framework. There are 9 principles that inform the transport network as described in Table 5.

Table 5: SGA Design Principles

Design Principle	Description
Land use and demographics	
Public Transport directed and integrated into centres	Locate bus interchanges so that mixed-use centres can develop around them as a node.
Strategic corridors as definers	Use strategic corridors i.e. motorways as a barrier to reinforce urban and rural land uses.
Proximity and convenience of community facilities	Provide clear and direct connections from the places where people live to community facilities (schools, open space). Connections shall minimise crossings over or through high speed environments.
Transport Network	
Connect nodes	Provide connections between the common destinations that connect people to activities, goods and/or services
Connect modes	Provide for choice in travel and the ability to connect at interchanges between modes
Provide access to employment and industry	Align the location and corridor typology to the scale of the employment and industry land it serves
Prioritise active modes	Consider the quality, character and continuity of the active mode corridors
Place function as well as movement	Facilitate the opportunity for place as well as movement in corridors (people-oriented streets)

Design Principle	Description
Climatic site considerations	Consider the existing microclimate and the contribution that the orientation of transport corridors makes to the desired climatic environment

The proposed network satisfies the above design principles, in particular:

- The southern bus interchange is located within the southern local centre and surrounded by higher density residential development;
- The town centre stops remain;
- The arterial road network, with its provision of road, public transport and active mode facilities serve key destinations including centres, open space, existing and potential future schools, and public transport stations.
- The active mode network has been designed to provide additional links where the road network would be difficult to provide due to topographical and watercourse constraints.

7. Trip Generation and Mode Share

7.1. Land Use Characteristics

The structure plan predominantly proposes the following land uses:

- Residential;
- Industry, and
- Small centres.

In order to reduce reliance on private passenger vehicle movements, there is a need to ensure the walking and cycling network is safe (separated from vehicle movements), attractive (direct and high amenity) and broad (covering a large geographical area), and that public transport is frequent, has a reasonable cost and operates over a large portion of the day. If the public transport network or walking and cycling network does not achieve these goals, significant mode shift is unlikely to occur.

As Warkworth is a satellite town, and relatively compact, the main opportunities for mode shift are considered to be walking and cycling trips for internal trips, and public transport for longer trips (such as connectivity between the coastal settlements and Warkworth, and Warkworth and the Auckland metropolitan and city centres to the south). While public transport is unlikely to compete favourably against the private vehicle for internal trips, it will provide accessibility to users who do not have, or do not want, private vehicles (the elderly and students for example).

The key focus of the proposed public transport network, and walking and cycling network, is therefore to provide connectivity to centres, public transport stations, employment areas and schools. As land is proposed to be released however, it is intended to ensure appropriate public transport and walking and cycling networks are provided early i.e. new residential and business activities have alternative transport options from the outset.

7.2. Vehicle Accessibility

The proposed road network provides both north-south and east-west arterial roads to carry the majority of traffic movements generated by the proposed land use activities within the structure plan area. Due to topographical and watercourse constraints, there is limited opportunity to establish a grid network ideally sought for greenfields development. As a result, the collector road network typically comprises crescent roads that direct traffic back to the arterial road network. It is likely that in some locations, local roads will also access directly off arterial roads.

The Warkworth southern interchange enables a large proportion of Warkworth, in particular Warkworth south, to travel to and from the south without utilising the existing SH1 route (a less safe route than the Ara Tūhono – Puhoi to Warkworth motorway), or utilisation of the internal Warkworth road network to access the Ara Tūhono – Puhoi to Warkworth roundabout to the north. As part of connecting to the southern interchange, a new Wider Western Link Road is proposed to connect the southern interchange to both the existing SH1 route and Woodcocks Road. This will allow the southern interchange to be accessed by the wider Warkworth area. The interchange is also proposed located nearby to proposed industrial land which will shorten travel distances to strategic routes for heavy vehicles and lessen the amount of heavy vehicle traffic on roads within Warkworth.

The proposed Sandspit Link Road will enable better vehicle accessibility for vehicles travelling between Sandspit, Snells Beach and Algies Bay, and Ara Tūhono – Puhoi to Warkworth, by avoiding the need to pass through the SH1/ Hill Street intersection. Essentially, these vehicles can bypass the intersection by following a route along the Sandspit Link Road, Matakana Link Road and SH1 (north of Hudson Road). While the design of the SH1/ Hill Street intersection is yet to be determined, the Sandspit Link Road and Matakana Link Road provide the opportunity for this intersection to focus on improving accessibility for public transport, and walking and cycling.

As part of the structure plan, local and neighbourhood centres have been located near arterial roads where they can be accessed by private vehicles, public transport and walking and cycling modes.

The staging of the proposed road network is shown in Attachment E. As noted, this generally aligns with the FULSS land release sequencing.

7.3. Public Transport Accessibility

As part of the initial Warkworth North land release, the public transport network is proposed to follow the New Network for Warkworth shown in Section 5.3.1. The only differences proposed are:

- Following completion of Ara Tūhono – Puhoi to Warkworth, the 995 route to Hibiscus Coast Station will shift to using the safer motorway route rather than the existing SH1 route, and
- An interim northern bus station including Park and Ride is proposed to be established in partnership with private land owners (site yet to be determined). The 995 route is anticipated to travel via the station on the way to and from the Warkworth town centre.

For the Warkworth South land release, the following changes are proposed:

- A new southern bus station in the local centre with a park and ride adjacent to the southern interchange. The 995 route is proposed to utilise the southern interchange to enable high frequency connectivity between the southern station and the RTN to the south and therefore offers connectivity to the wider Auckland region;
- A new Warkworth loop route (utilising Hill Street, Woodcocks Road, the Western Link road, existing SH1, a new eastern collector road, John Andrew Drive and Alnwick Street). The 996, 997, 998 and Warkworth loop (999) routes are proposed to pass through the Warkworth town centre station before proceeding south to the southern station. At the southern station, bus arrivals are proposed to be 'pulsed' to enable an efficient passenger transfer between connecting routes;
- The northern station may be removed, as if it were retained, it would need to be served by the 995 route. As there are no north facing ramps at the southern interchange, the 995 route would need to travel through the Warkworth road network to the southern interchange and would likely be subject to significant 'empty running' between the northern and southern stations outside of peak commuter periods, and
- To facilitate the Warkworth loop (999) bus route, improvements to existing roads within Warkworth will be required including John Andrew Drive, Pulham Road (some 200 m) and Alnwick Street. On Alnwick Street, the 'gap' in the road between Coquette Street and Southgate Road will need to be connected.

The reasons for selecting a southern bus station are due to the following:

- There is limited space within the town centre to accommodate pulsed/layover bus arrivals (there would need to be greater than five bus stops including inter-regional buses). There is a need to maintain connectivity to the town centre however an alternative bus station with greater bus storage is required;
- The southern interchange enables easier access to and from the motorway for the higher frequency 995 route with potential for greater service reliability by avoiding the need to use the wider Warkworth road network (for instance passing through the SH1/ Hill Street intersection), and
- The southern interchange would enable the 996, 997 and 998 routes to be extended south, and in combination with the new Warkworth loop (999) route, have the ability to operate through the newly released Warkworth South land immediately. This is considered to encourage the utilisation of public transport.

The final Warkworth North-east land release is not proposed to add any additional public transport routes or public transport infrastructure. However, the area is well served by public transport (both the 996 and 997 routes pass through this area) and higher service frequencies and durations can be investigated to better serve this area of required. In addition, the extents of the Warkworth North-east area are some 2.3 km from the Warkworth town centre therefore enabling walking and cycling connectivity to the town centre station if required.

7.4. Walking and Cycling Accessibility

As noted, in order for walking and cycling to be encouraged, walking and cycling routes must be direct, safe and connected to key destinations. Safety is an important consideration in whether people choose to cycle[21], and therefore on arterial roads and key collector roads, walking and cycling movements are proposed to be separated from higher speed vehicle movements. Where separated facilities are not provided, it is recommended to reduce vehicle speeds so that deaths and serious injuries are avoided. It also requires a connected network of major routes accessing major destinations.

All roads within the Warkworth structure plan area are proposed to have safe walking and cycling facilities. In general:

- All new and existing arterial roads are proposed to have footpaths on both sides of the road and separated cycle facilities;
- All new collector roads identified on the active mode transport network are proposed to have footpaths on both sides of the road and separated cycle facilities. New residential and business development will be encouraged to be 'rear-loaded', where access occurs from rear lanes or consolidated accessways, on these new collector roads to enable separated facilities to be provided with minimal vehicle crossings;

[21] NZTA Research Report 449, Assessment of the type of cycling infrastructure required to attract new cyclists, October 2011

- All existing collector roads identified on the active mode transport network are proposed to have footpaths on both sides of the road. While separated cycle facilities are desirable and can be achieved for localised areas (Hill Street in front of Warkworth Primary School for example), most roads (Alnwick Street for example) are often limited by their existing geometry, such as wide carriageways and/or multiple vehicle crossings, that will make retrofitting separated cycle facilities both difficult and expensive. Solutions on these roads are therefore proposed to comprise a combination of separated cycle paths where possible, local area traffic management (LATM) to control vehicle speeds (traffic calming with cycle bypasses for example) and/or shared paths;
- All other collector road and local roads not on the active mode network map are anticipated to have traffic volumes less than 2,000 vpd and therefore can operate in a mixed traffic environment. There is strong need however to ensure vehicle speeds are 30 km/hr or less and therefore all new local and collector roads should have some form of LATM included. Existing roads, particularly those around the existing Warkworth town centre and identified on the greenways network, will need to be monitored to assess whether LATM is required, and
- Walking and cycling facilities are proposed to be provided 'off-road' along the Mahurangi River and other riparian margins to avoid the need to encounter vehicle traffic at all. These routes will serve both a commuter and recreational function.

With an appropriate road network catering for walking and cycling modes, in conjunction with off-road facilities, there is considered to be the opportunity to significantly increase walking and cycling mode share. In combination with improving e-bike and e-scooter technologies, there is the opportunity to travel greater distances by personal transport modes other than the private vehicle. It should be noted that the connection distances between residential areas, centres and key attractors, such as employment areas and schools, are generally less than 5 km further encouraging walking and cycling trips within the urban area.

The proposed active mode network provides connectivity to centres, employment areas, schools and public transport stations.

7.5. Mode Share

7.5.1. Existing Mode Share

The Census data for the Warkworth area unit has been reviewed to understand existing mode share. The Census data does not cover every trip however does cover the 'main means of travel to work' which comprise a large proportion of trips during the morning and evening peak hour. The existing mode share is summarised in Table 6.

Table 6: Existing Mode Share (Main Means of Travel to Work)

Main Means of Travel to Work	Number	Percentage
Drove private car	795	62.5%
Drove a company car	246	19.3%
Passenger	81	6.4%
Motor cycle	12	0.9%
Private Vehicle Sub Total	*1,134*	*89.2%*

Main Means of Travel to Work	Number	Percentage
Public bus	3	0.2%
Train	0	0.0%
Public Transport Sub Total	*3*	*0.2%*
Bicycle	6	0.5%
Walked or Jogged	117	9.2%
Other	12	0.9%
Active Mode Sub Total	*135*	*10.6%*
Total	**1,272**	**100%**

As shown above, private vehicles comprise the majority of vehicle trips (some 90%) while walking and cycling trips make up the remainder (some 10%). Public Transport use is virtually non-existent due to the Census data being collected in 2013. This is expected to have changed following the recent introduction of the New Network for Warkworth.

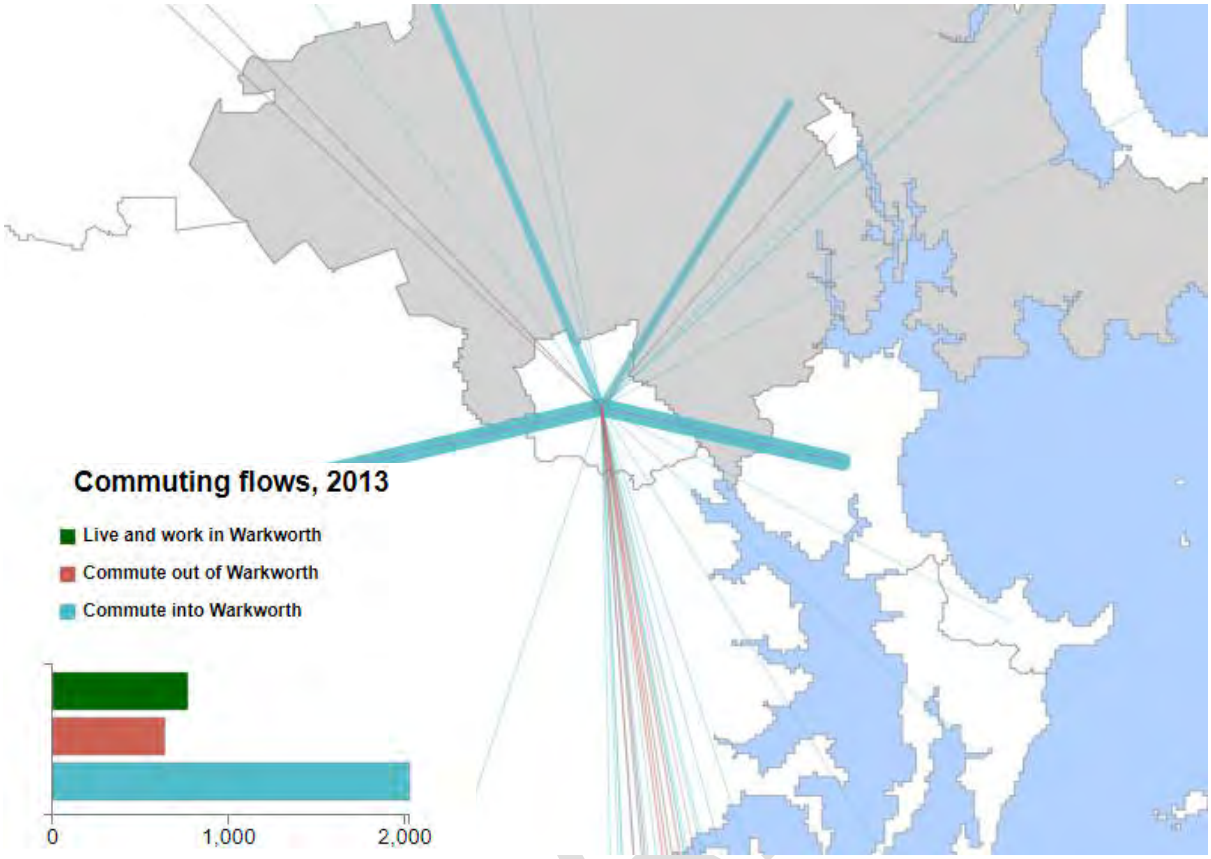
7.5.2. Existing Commuter Trip Patterns

In order to understand the potential for shifting commuter transport modes, reference has been made to the Statistics NZ Commuter View. For the Warkworth area, there are a significant proportion of commuters who live and work in the area that could utilise both public transport and active mode networks. Table 7 summarises this data and Figure 22 graphically displays this information.

Table 7: Commuter Travel Summary

Commuting Type	Number
Live and Work in Area Unit	768
Commute out	636
Commute in	2,028
Total people working in area unit	**2,796**

Figure 22: Statistics NZ Commuter View[xii]



As shown above, there are a large number of commuters from areas surrounding Warkworth. Those from Matakana and Snells Beach areas to the east could utilise the proposed public transport network. In addition, there are a significant proportion of commuters who live in Warkworth and commute outside the area (predominantly travelling south) that could utilise the proposed public transport network.

7.5.3. Future Mode Share

Based on existing data, there is capacity to increase cycling trips and public transport trips within Warkworth. In terms of a realistic future mode share, increasing public transport to 10% of all trips (by establishing a public transport network), and walking and cycling to 15% of all trips (by establishing a walking and cycle network) is considered an achievable goal.

The proposed mode share is summarised in Table 8.

Table 8: Proposed Mode Share

Main Means of Travel to Work	Percentage
Private Vehicle	75%
Public Transport	10%
Active Modes	15%

As a result of these changes, private vehicle trips would reduce by some 16% (going from 89% of trips to 75% of trips) and therefore existing vehicle trip rates would reduce accordingly. While these are only commuter trips, similar trip reductions could also be expected for school-based trips and retail trips.

7.5.4. Future Household Size

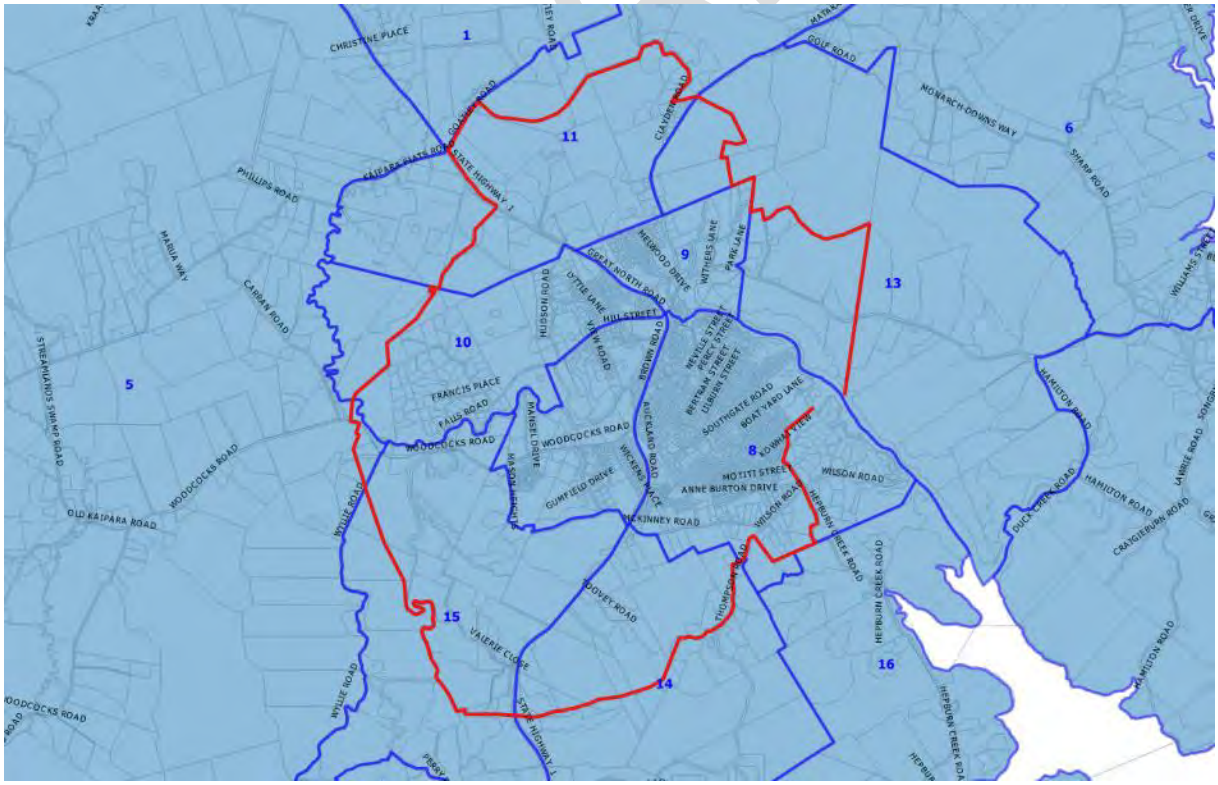
Future household sizes are expected to reduce in the future. The Scenario I11.4 Council land uses for Warkworth suggest a reduction of 2.44 persons per household to 2.16 persons per household[22] from 2016 to 2046. This would result in decreasing trip rates per dwelling (a reduction of some 11.5%).

7.5.5. General Modelling Methodology

The traffic modelling uses a strategic model, the Macro Strategic Model (MSM), a refinement of the ART model, and a mesoscopic model (SATURN) to further refine zoning and land use within the Warkworth structure plan area.

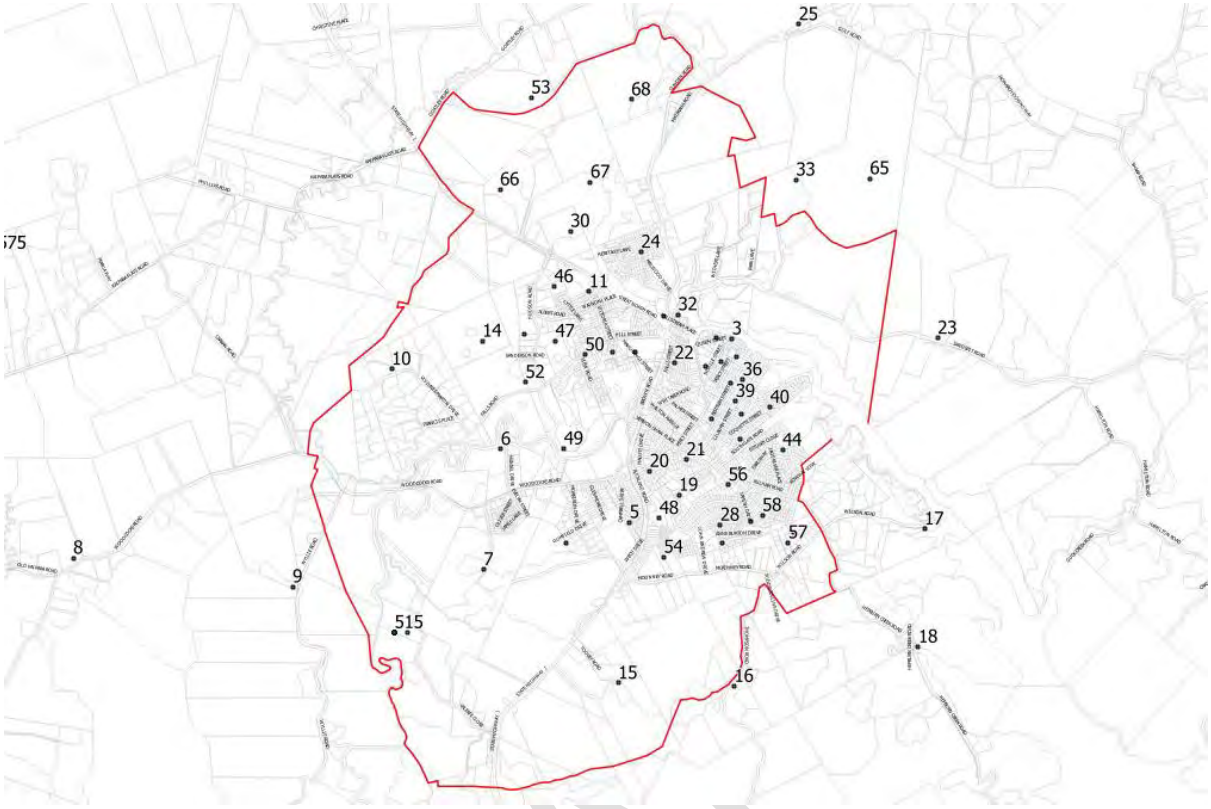
The MSM zones are shown in Figure 23 and the SATURN model zones are shown in Figure 24. The red line is the Rural Urban Boundary (RUB).

Figure 23: MSM Traffic Model Zones



[22] Scenario I11.4, ART3.2A Zones 4,5,6 and 7 - 2,107 dwellings and 5,133 population in 2016, 10,757 dwellings and 22,450 population in 2046.

Figure 24: SATURN Traffic Model Zones



The MSM zones have been disaggregated and refined within the SATURN model. The SATURN zoning has also taken account of different residential yields proposed within different areas within the structure plan. This proposed residential yields and job projections, and the locations and staging of these residential and employment areas, are detailed in Attachment B.

The MSM model assumes mode shift in the future away from private passenger vehicles, however for route protection purposes, there is a need to understand whether these modelled assumptions are realistic. The key traffic generator in Warkworth is residential activity and some 7,300 dwellings are proposed to be added over the next 30 years.

To understand MSM residential traffic generation rates, the MSM zones with employment less than 12% of population have been analysed. These zones have been analysed to avoid other activities (such as business uses) distorting the number of person movements, and therefore vehicle movements, in and out of the zone. The only zones with low job to population ratios are:

- MSM Zone 9 – 106 jobs and 1,585 persons (6.7%)
- MSM Zone 13 – 57 jobs and 2,274 persons (2.5%)
- MSM Zone 14 – 125 jobs and 3,916 persons (3.2%).

The trip rates for these zones are shown in Table 9, Table 10 and Table 11.

Table 9: MSM Zone 9 Summary

MSM Zone 9

Time Period	Dwellings	Person Trips	Pers by Car	Pers by PT	Occupancy	Car Trips	Trip Rate per dwelling	
							Cars	Persons
AM	842	709	684	25	1.1	622	0.74	0.84
IP	842	835	825	10	1.2	688	0.82	0.99
PM	842	978	955	23	1.1	868	1.03	1.16
Daily	842	5852	5764	88		4928	5.85	6.95

Table 10: MSM Zone 13 Summary

MSM Zone 13

Time Period	Dwellings	Person Trips	Pers by Car	Pers by PT	Occupancy	Car Trips	Trip Rate per dwelling	
							Cars	Persons
AM	1078	870	841	29	1.1	765	0.71	0.81
IP	1078	938	929	9	1.2	774	0.72	0.87
PM	1078	1170	1150	20	1.1	1045	0.97	1.09
Daily	1078	6721	6636	85		5681	5.27	6.23

Table 11: MSM Zone 14 Summary

MSM Zone 14

Time Period	Dwellings	Person Trips	Pers by Car	Pers by PT	Occupancy	Car Trips	Trip Rate per dwelling	
							Cars	Persons
AM	1741	1500	1445	55	1.1	1314	0.75	0.86
IP	1741	1505	1484	21	1.2	1237	0.71	0.86
PM	1741	2027	1984	43	1.1	1804	1.04	1.16
Daily	1741	11031	10849	182		9301	5.34	6.34

As shown above, the dwelling trip rates range between:

- 0.71 to 0.75 vehicle trips per dwelling in the morning peak period (2 hours);
- 0.71 to 0.82 vehicle trips per dwelling in the interpeak period (2 hours);
- 0.97 to 1.04 vehicle trips per dwelling in the evening peak period (2 hours), and
- 5.27 to 5.85 daily vehicle trips per dwelling.

To convert 2-hour peak period volumes into peak hour volumes, a factor of 0.55 is typically applied. This suggests the following peak hour rates:

- 0.39 to 0.41 vehicle trips per dwelling in the morning peak hour;
- 0.39 to 0.45 vehicle trips per dwelling in the interpeak hour, and
- 0.53 to 0.57 vehicle trips per dwelling in the evening peak hour.

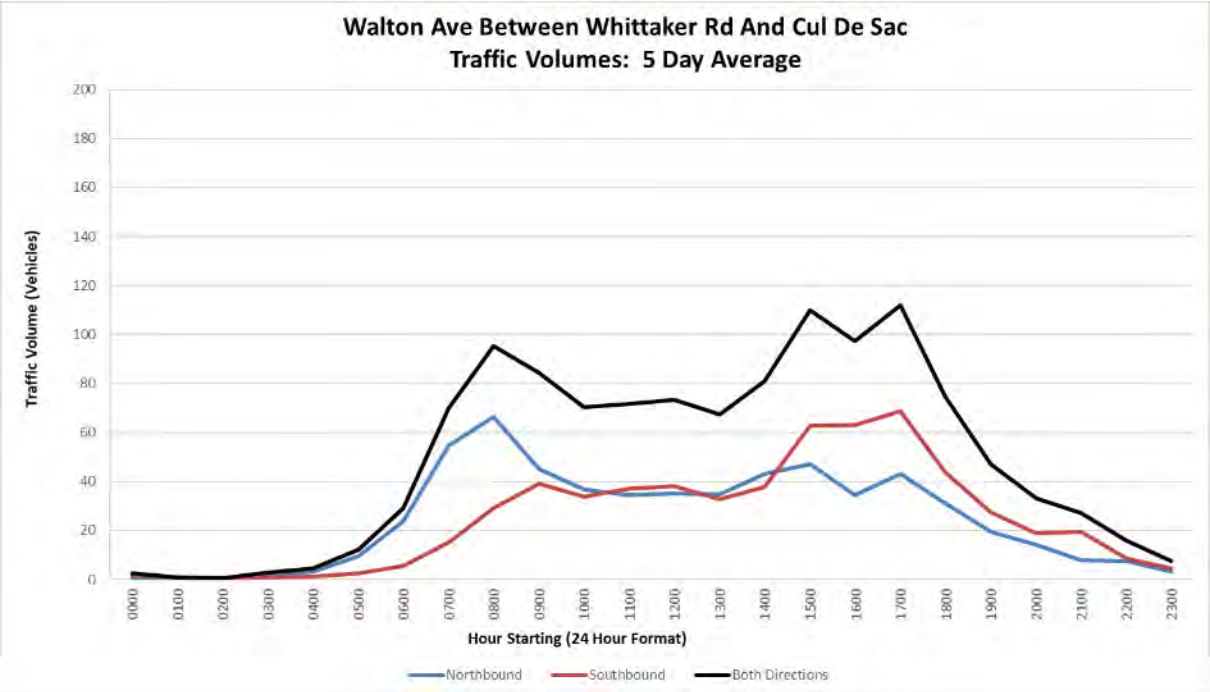
The daily rate remains unchanged.

7.5.6. Warkworth Surveys

In order to understand existing trip rates, a tube count survey was undertaken of a residential catchment in Warkworth. The tube count was located on Walton Avenue in Warkworth which serves 149 dwellings. The survey location was chosen as it is self-contained and there only one vehicle route to and from the catchment. The tube count therefore captures all vehicle movements associated with the catchment.

The average hourly trip profile for a five-day working week is shown in Figure 25.

Figure 25: Walton Avenue Trip Profile



As shown above, the trip profile is relatively flat overall with a peak in the morning around 8 am. The evening peak hour volumes are greatest with a broad peak from 3 pm to 5 pm.

The surveyed vehicle trip rates over a five-day working week are summarised as follows:

- Average of 95 trips in the morning peak hour (0.64 trips per dwelling)
- Average of 73 trips in the interpeak hour (0.49 trips per dwelling)
- Average of 112 trips in the evening peak hour (0.75 trips per dwelling)
- Average of 1,190 trips per day (8.0 trips per dwelling)

As can be seen, the surveyed residential peak hour and daily trip rates in Warkworth are higher than the peak hour rates within the MSM model.

However, based on the aforementioned changes to transport modes (factor x 0.84) and a reduction in household size (factor x 0.885), the trip rates are expected to change in the future, to the following:

- 0.48 trips per dwelling in the morning peak hour;
- 0.36 trips per dwelling in the interpeak hour;
- 0.56 trips per dwelling in the evening peak hour, and
- 5.95 trips per dwelling per day.

These factored rates are considered to align well with the MSM peak hour and daily trip rates, particularly in the PM peak hour which has been used for design purposes.

7.5.7. Assessment Trip Rates

To guide the assessment of the future road network, the trip rates within the MSM model were retained for IBC and ITA analysis purposes. The MSM rates align well with the modified future residential rates shown in the above section.

These have been input into the SATURN model for road and intersection assessment purposes.

Given that the MSM forecasts are influenced by the predicted change in demographics (especially reductions in people per household and an aging population), there is a risk of higher traffic generation if those demographic changes are not realised. Consideration of this risk was made by sensitivity testing on traffic flows in the SIDRA model checks on intersection performance (refer Section 8.2.2).

It should also be noted that dwelling sizes and the effects of the Unitary Plan parking rates will likely reduce trip rates. Many dwellings in the Auckland region are now smaller (one to two bedroom) and require less parking. This will likely continue in Warkworth and reinforces the reduction in household size that is predicted to occur over time, and the increased attractiveness of alternative transport modes.

8. Assessment of Proposed Transport Network

8.1. Assessment Methodology

The SATURN transport model has been used to assess major arterial and collector roads in the Warkworth structure plan area. The model has been used to generate daily traffic volumes and peak hour turning movements at key intersections.

The draft IBC has tested a number of road network scenarios however for this ITA, the 2046 'Scenario 8b' has been used for assessment. This is the same the road network identified in the transport maps in Attachment B. It includes the following new arterial roads:

- The Western Link Road between SH1 (north) and SH1 (south);
- The Wider Western Link Road;
- The Warkworth Southern Interchange, and
- The Sandspit Link Road.

The critical peak hour for analysis purposes is the evening peak hour and these volumes have been input into SIDRA models to understand intersection size requirements.

8.2. Modelled Network

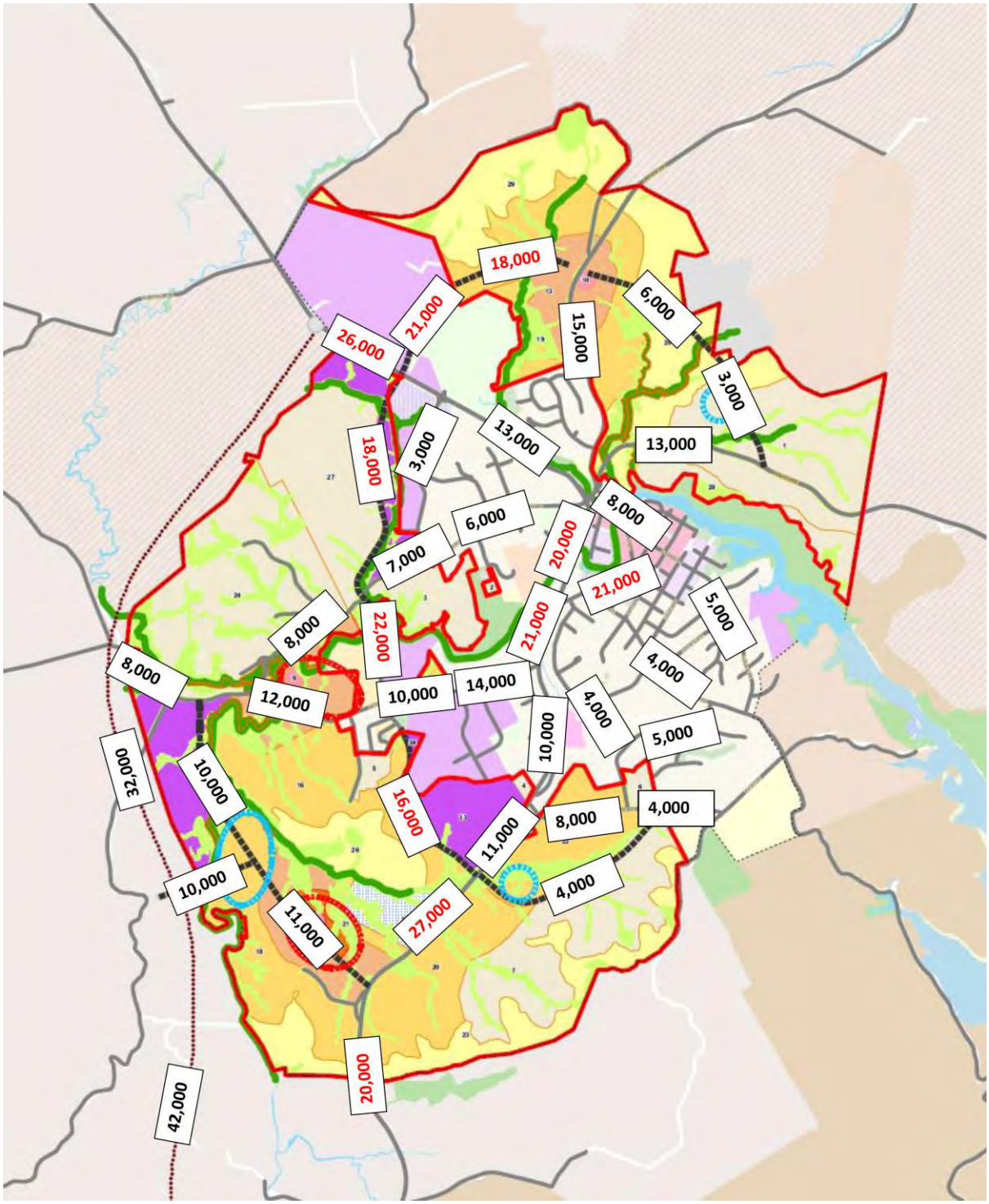
8.2.1. Road Widths

To inform the road reserve widths required, daily traffic volumes on various roads within the Warkworth structure plan network have been assessed. The daily volumes have been estimated based on applying factors to morning peak hour, interpeak hour and evening peak hour volumes. These factors are summarised as follows:

- Morning Peak Hour x 2, plus
- Interpeak Hour x 10.4, plus
- Evening Peak Hour x 2.

The daily volumes have been reported to the nearest 1,000 vehicle movements and are shown in Figure 26.

Figure 26: Daily Traffic Volumes



Based on these volumes, the recommended lane provisions and classification have been determined as follows:

- Roads with greater than 15,000 vpd may be route protected for two to four lanes;
- Roads with traffic volumes greater than 10,000 vpd and less than 15,000 vpd that serve a strategic connection and/or public transport function are proposed to be two-lane arterial roads, and

- All other roads which do not serve a strategic function are proposed to be collector roads or local roads. Generally, collector roads have traffic volumes between 5,000 vpd and 10,000 vpd. These roads may also serve a public transport function.

The recommended road classification and lane provisions for the major roads in Warkworth are summarised in Table 12.

Table 12: Recommended Road Classification and Lane Provision (Major Roads)

Road	Location	Daily Volume	Function		Recommended Lane Provision/ Classification
			Strategic connection	PT	
Existing SH1	Between Ara Tūhono – Puhoi to Warkworth and Matakana Link Road	26,000	✓	✓	Four lane arterial road (upgraded to urban standard) – already proposed as part of Ara Tūhono – Puhoi to Warkworth associated works.
Existing SH1	Between Matakana Link Road and Hill Street	13,000	✓	✓	Retain existing number of lanes (upgraded to urban standard). May require localised widening at proposed intersections.
Existing SH1	Between Hill Street and Whitaker Road	20,000		✓	Retain existing number of lanes (upgraded to urban standard). Includes widening bridge over Mahurangi River for active modes.
Existing SH1	Between Whitaker Road and Woodcocks Road	21,000	✓	✓	Retain existing number of lanes (upgraded with improvements to walking and cycling infrastructure).
Existing SH1	Between Woodcocks Road and McKinney Road	10,000	✓	✓	Retain existing number of lanes (upgraded to urban standard). May require localised widening at proposed SH1/ McKinney signalised intersection.
Existing SH1	Between McKinney Road and Western Link Road	11,000	✓	✓	Retain existing number of lanes (upgraded to urban standard). May require localised widening at proposed SH1/ Western Link Road signalised intersection.
Existing SH1	Between Western Link Road and Wider Western Link Road	27,000	✓	✓	Four lane arterial road (upgraded to urban standard).

Road	Location	Daily Volume	Function		Recommended Lane Provision/ Classification
			Strategic connection	PT	
Matakana Link Road	Between Existing SH1 and Matakana Road	21,000	✓		Four lane arterial road (planned to be constructed to urban standard). Planned to be constructed in two stages - two lanes initially followed by four-laning.
Matakana Road	Between Existing SH1 and Matakana Link Road	15,000	✓	✓	Retain existing number of lanes (upgraded to urban standard). May require localised widening at proposed Hill Street/ Matakana Road signalised intersection.
Sandspit Link Road	Between Matakana Road and Sandspit Road	6,000	✓		Two lane arterial road (constructed to urban standard). Although traffic volumes are relatively low, it serves a strategic function in terms of connecting Sandspit, Snells Beach and Algies Bay to Ara Tūhono – Puhoi to Warkworth therefore should be route protected.
Sandspit Road	Between Existing SH1 and Sandspit Link Road	13,000	✓	✓	Retain existing number of lanes (upgraded to urban standard). May require localised widening at proposed Matakana Road/ Sandspit Road intersection.
Western Link Road	Between Existing SH1 and Falls Road	18,000	✓	✓	Four lane arterial road (constructed to urban standard). May be constructed in two stages - two lanes initially followed by four-laning if required.
Mansel Drive	Between Falls Road and Woodcocks Road	22,000	✓		Four lane arterial road (currently urban standard however requires widening). If adjacent sections of Western Link Road were staged, widening of Mansel Drive could be delayed until later stages.

Road	Location	Daily Volume	Function		Recommended Lane Provision/ Classification
			Strategic connection	PT	
Western Link Road	Between Woodcocks Road and Existing SH1	16,000	✓		Four lane arterial road (constructed to urban standard). May be constructed in two stages - two lanes initially followed by four-laning if required.
Woodcocks Road	Between Existing SH1 and Western Link Road	10,000 – 14,000	✓	✓	Retain existing number of lanes (upgraded to urban standard). May require localised widening at proposed intersections.
Woodcocks Road	Between Western Link Road and Wider Western Link Road	12,000	✓	✓	Retain existing number of lanes (upgraded to urban standard). May require localised widening at proposed intersections.
Wider Western Link Road	Between Woodcocks Road and Southern Interchange	10,000	✓	✓	Two lane arterial road (constructed to urban standard). May require localised widening at proposed intersections.
Wider Western Link Road	Between Existing SH1 and Southern Interchange	11,000	✓	✓	Two lane arterial road (constructed to urban standard). May require localised widening at proposed intersections.

8.2.2. Intersection Types

On the key arterial and collector roads that have been assessed in the SATURN model, the general philosophy for selecting intersection types is as follows:

- Roundabouts are located at the outer extents of the structure plan area to serve as a rural/urban threshold and control vehicle speeds entering the urban area, and
- Traffic signals are provided at the inner intersections in order to provide greater amenity for pedestrians and cyclists.

On this basis, while the Hill Street intersection options are still being developed as part of a separate workstream (and investigating roundabout and traffic signal options), it is understood that controlled crossings will be provided for walking and cycling modes.

The recommended intersection types at key intersections are discussed in Table 13. These should be considered in conjunction with the recommended lane provisions outlined in Table 12. The intersection locations are shown in **Attachment C**.

Table 13: Intersection Types

Intersection	Intersection Type	Comment
Existing SH1/ Ara Tūhono – Puhoi to Warkworth (under construction)	Roundabout	**New** – Approved NX2 consortium design
Existing SH1/ Goatley Road/ Kaipara Flats Road	Roundabout	**Upgrade** – Priority controlled intersection proposed by NX2 consortium. As part of full development of the adjacent live-zoned industrial land, a dual-lane roundabout is recommended to provide an alternative route to Matakana Link Road.
Existing SH1/ Matakana Link Road/ Western Link Road	Traffic Signals	**Upgrade** – Signalised crossroads intersection with left turn slip lanes (raised tables are recommended on all slip lanes for pedestrian and cyclist amenity) plus upgrade for separated cycle facilities. Exclusive right turn bays should also be provided on all approaches. There is potential for a large number of weave movements on the northern approach to this intersection (southbound vehicles exiting Ara Tūhono – Puhoi to Warkworth and turning left into Matakana Link Road versus southbound vehicles on existing SH1 and turning right into Western Link Road). This may require changes to the Ara Tūhono – Puhoi to Warkworth roundabout in the future (removal of southbound through lane around the roundabout).
Existing SH1/ Hudson Road/ Showgrounds	Traffic Signals	**Upgrade** – As per existing plus upgrade for separated cycle facilities. Raised tables are recommended on all slip lanes for pedestrian and cyclist amenity.
Existing SH1/ Hill Street/ Matakana Road	Traffic Signals recommended	**Upgrade** – Subject to separate NZTA/ AT workstream with preferred option identified in 2019. Controlled pedestrian and cycle crossings are recommended i.e. traffic signals or roundabout with signalised crossings.
Existing SH1/ Whitaker Road	Traffic Signals	**Upgrade** – As per existing plus upgrade for separated cycle facilities. Raised tables are recommended on all slip lanes for pedestrian and cyclist amenity.
Existing SH1/ Woodcocks Road	Traffic Signals	**Upgrade** – As per existing plus upgrade for separated cycle facilities and additional signalised pedestrian crossing.

Intersection	Intersection Type	Comment
Existing SH1/ McKinney Road	Traffic Signals	**Upgrade** – Signalised T-intersection. The speed limit on SH1 is currently 60 km/hr at this intersection and is recommended to be reduced to 50 km/hr in conjunction with ongoing urbanisation. As this intersection is located on a ridge there have been previous concerns about acceptable sight distance to signal displays for southbound vehicles. The available sight distance is considered acceptable (exceeds 100 m) and additional visibility can be achieved with use of mast arm displays.
Existing SH1/ Western Link Road/ Eastern Collector	Traffic Signals	**New** – Signalised crossroads intersection with left turn slip lanes on all approaches (raised tables are recommended on all slip lanes for pedestrian and cyclist amenity). Exclusive right turn bays should also be provided on all approaches.
Existing SH1/ Wider Western Link Road	Roundabout	**New** – Dual lane roundabout.
Matakana Road/ Matakana Link Road	Roundabout or Traffic Signals	**Upgrade** – Provide protection for dual lane roundabout and also provide protection for traffic signal option due to nearby local centre. Any traffic signals at this location will require consideration of 'rural/ urban speed thresholds' on Matakana Road north of the intersection.
Sandspit Road/ Sandspit Link Road	Roundabout	**New** – Single lane roundabout.
Western Link Road/ Falls Road/ Mansel Drive	Traffic Signals	**Upgrade** – Signalised crossroads intersection with left turn slip lanes on all approaches (raised tables are recommended on all slip lanes for pedestrian and cyclist amenity). Exclusive right turn bays should also be provided on all approaches. Detailed design will need to consider horizontal and vertical geometry to ensure appropriate visibility to signal displays.
Western Link Road/ Woodcocks Road/ Mansel Drive	Traffic Signals	**Upgrade** – Signalised crossroads intersection with left turn slip lanes on all approaches (raised tables are recommended on all slip lanes for pedestrian and cyclist amenity). Exclusive right turn bays should also be provided on all approaches.
Wider Western Link Road/ Woodcocks Road	Roundabout	**New** – Dual lane roundabout.

Intersection	Intersection Type	Comment
Wider Western Link Road/ Southern Interchange Road	Traffic Signals	**New** – Signalised crossroads or T intersection (depending on development). Traffic signals are recommended in this location due to location of THAB zone, local centre, southern bus station, cycle route connections and future public reserve.

Initial SIDRA analysis has been undertaken for the above intersections and are shown in Attachment D. All intersections can operate acceptably except for the Existing SH1/ Matakana Road/ Hill Street intersection which is operating at its practical capacity. The SIDRA assessment has also simplified the assessment of this intersection and has not considered the interaction from the nearby Elizabeth Street approach which restricts operating capacity. This intersection is subject to a separate business case process currently underway.

The results of the intersection analysis are shown in Table 14.

Table 14: Intersection Performance Summary (PM Peak Hour)

Intersection	Intersection Type	LOS overall	LOS worst movement
Existing SH1/ Ara Tūhono – Puhoi to Warkworth (under construction)	Roundabout	A	B
Existing SH1/ Goatley Road/ Kaipara Flats Road	Roundabout	A	B
Existing SH1/ Matakana Link Road/ Western Link Road	Traffic Signals	C	D
Existing SH1/ Hudson Road/ Showgrounds	Traffic Signals	C	E
Existing SH1/ Hill Street/ Matakana Road	Traffic Signals	D	E
Existing SH1/ Whitaker Road	Traffic Signals	C	D
Existing SH1/ Woodcocks Road	Traffic Signals	B	D
Existing SH1/ McKinney Road	Traffic Signals	C	D
Existing SH1/ Western Link Road/ Eastern Collector	Traffic Signals	C	E
Existing SH1/ Wider Western Link Road	Roundabout	A	A

Intersection	Intersection Type	LOS overall	LOS worst movement
Matakana Road/ Matakana Link Road/ Sandspit Link Road	Roundabout or Traffic Signals	A	B
Sandspit Road/ Sandspit Link Road	Roundabout	A	B
Western Link Road/ Falls Road/ Mansel Drive	Traffic Signals	C	D
Western Link Road/ Woodcocks Road/ Mansel Drive	Traffic Signals	D	E
Wider Western Link Road/ Woodcocks Road	Roundabout	A	A
Wider Western Link Road/ Southern Interchange Road	Traffic Signals	C	D

As shown above, all intersections work appropriately however sensitivity testing has also been undertaken by increasing traffic volumes by 30% on all approaches. This has been undertaken to identify which intersections are likely to be operating at their capacity should trip generation not reduce to the levels identified in the MSM model. The following intersections will reach practical capacity when traffic volumes are increased by 30%:

- Existing SH1/ Western Link Road/ Eastern Collector intersection – all movements on the Western Link Road approach to SH1 are over capacity.
- Existing SH1/ Whitaker Road intersection – all movements at the intersection are over capacity.
- Existing SH1/ Hill Street/ Matakana Road intersection – all movements at the intersection are over capacity.
- Existing SH1/ Matakana Link Road/ Western Link Road intersection – the right turn movement from Matakana Link Road into SH1 (west), and the right turn movement from SH1 (west) into Western Link Road, are over capacity.
- Ara Tūhono – Puhoi to Warkworth/ Existing SH1 intersection – the right turn movement from Ara Tūhono – Puhoi to Warkworth into SH1 (east) is over capacity.
- Woodcocks Road/ Western Link Road/ Mansel Drive intersection – the Western Link Road and Mansel Drive approaches are over capacity.

Most intersections identified above already have significant footprints and are not recommended to be increased for route protection purposes. The only exceptions are the SH1/ Hill Street/ Matakana Road intersection which is subject to a separate business case workstream (which will identify the spatial requirements of the intersection), and the Ara Tūhono – Puhoi to Warkworth southern interchange/ Wider Western Link Road intersection (which is recommended to allow for two right turn lanes from the interchange into Wider Western Link Road (south) should it be needed).

It is worth noting that there are mechanisms included in the Ara Tūhono – Puhoi to Warkworth project to address potential performance issues with the SH1/ Kaipara Flats Road/ Goatley Road intersection, the SH1/ Matakana Link Road/ Western Link Road intersection and the roundabout at the end of the motorway. This includes additional turn lanes and a southbound flyover at the roundabout should they be required.

8.3. Proposed Road Cross-sections

There are four major road cross-sections planned to be established within the Warkworth structure plan area. These are:

- Urban Arterial
- Urban Arterial Bridge
- Primary Walking and Cycling Corridor, and
- Collector Road

The indicative road cross-sections to be applied within the Warkworth area are shown in Figure 27, Figure 28, Figure 29 and Figure 30. These cross-sections are still being finalised as part of the cost estimation exercises associated with the draft IBC. There is potential for these to change when the IBC is released in 2019. It should be noted that some arterial roads may be two-lane roads.

Figure 27: Urban Arterial Indicative Cross Section

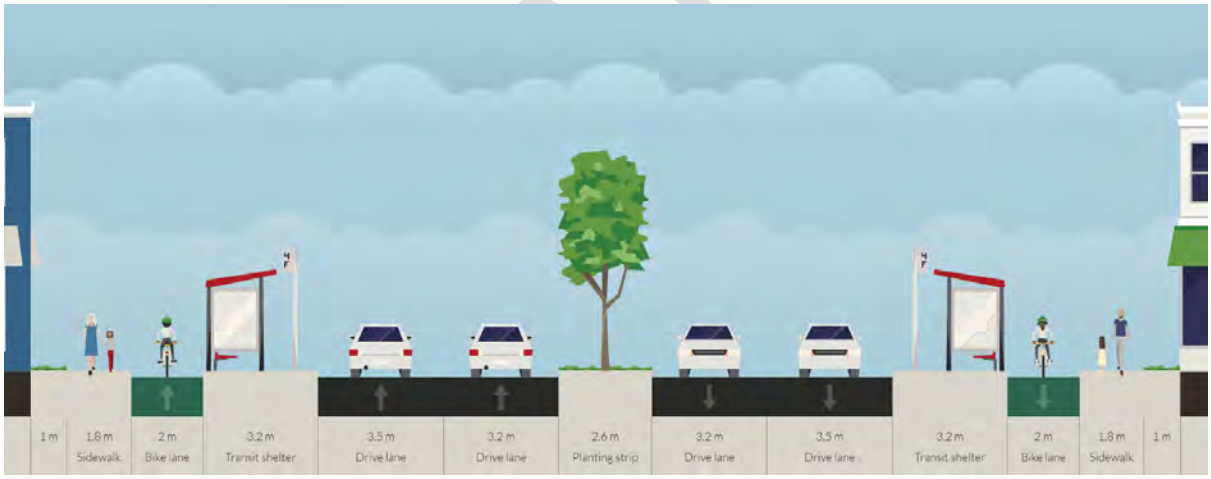


Figure 28: Urban Arterial Bridge Indicative Cross Section

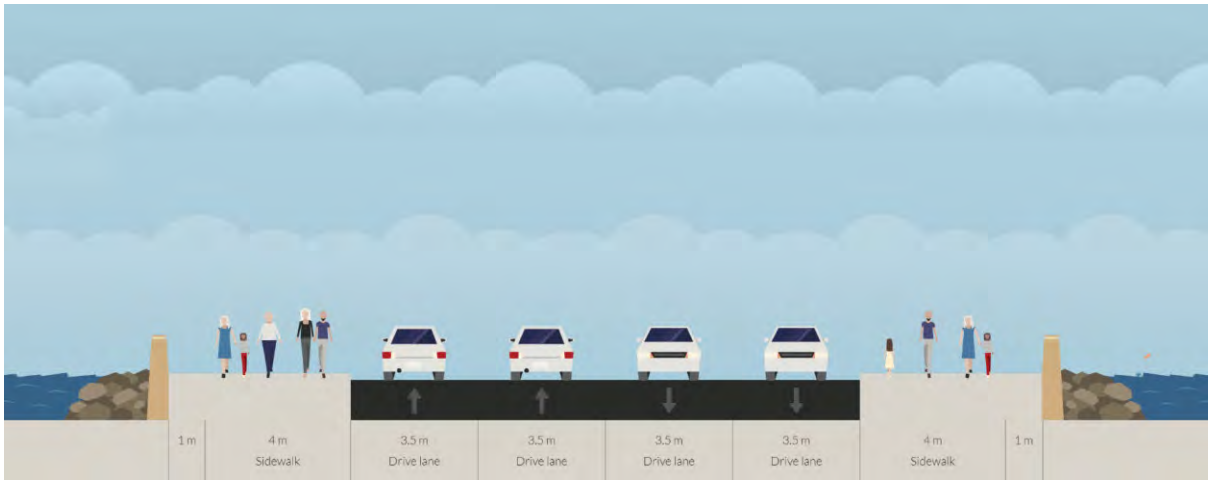


Figure 29: Primary Walking and Cycling Corridor (Off road) Indicative Cross Section

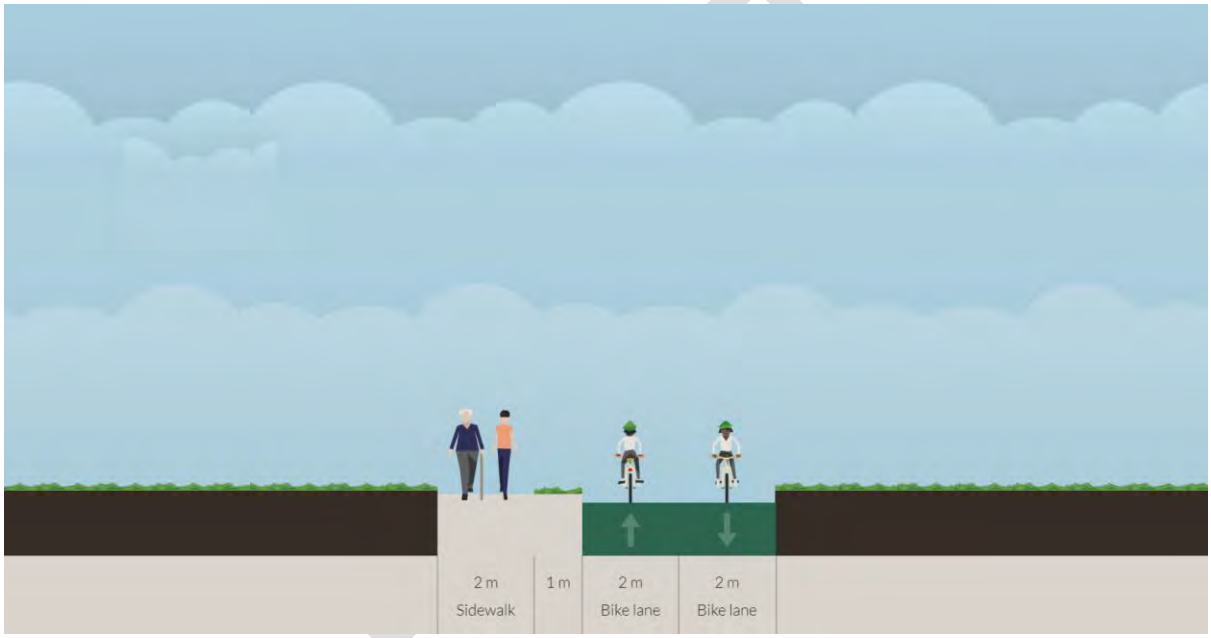
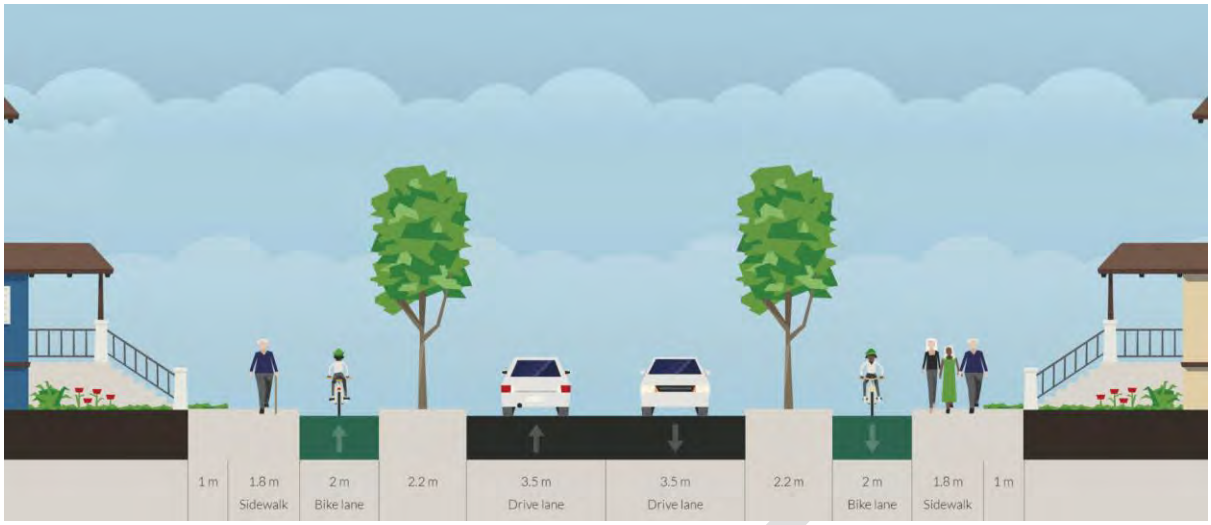


Figure 30: Collector Road Indicative Cross Section



As seen above, all of these roads provide separated cycle facilities and do not provide on-street parking. These cross-sections are the currently preferred road reserve widths and will be sought on all new roads. The exact configuration of facilities within the overall road reserve may change over time. In addition, there will be a need for some flexibility on existing roads where existing property access may already occur, and where there may be constraints that prevent these cross-sections being achieved.

8.4. Recommended Design Considerations

8.4.1. Intersection Spacing

Rule E27.6.4.1(3) of the Unitary Plan applies a 'Vehicle Access Restriction' to any proposed roads or vehicle accesses connecting to an arterial road. While vehicle access is not prohibited, it must be assessed as a Discretionary Activity and therefore requires the approval of AT. There is therefore a level of protection afforded to arterial roads in terms of limiting road/ property access and therefore controlling intersection spacing. It is recommended this is undertaken on a case by case basis rather than being specified in this ITA.

As further guidance, the AT Roads and Streets Framework provides guidance on intersection spacing depending on road classification. These spacing are summarised in Table 15.

Table 15: Roads and Streets Framework Intersection Spacing[xiii]

Land use context	Arterial to Arterial	Collector to Arterial	Local to Arterial	Collector to Collector	Collector to Local	Local to Local
City Centre / Metro Centre	150-400m	100-200m	50-200m	80-200m	50-200m	30-100m
Town centre	200-600m	100-200m	80-200m	100-200m	50-200m	50-150m
Mixed Use	400-600m	200-600m	100-300m	200-300m	100-300m	100-300m
Commercial / Industrial	1-2km	400-800m	200-600m	400-800m	150-400m	150m-300m
Residential (low density) (high density)	1-2km 400-600m	400m-1km 200-600m	200-500m 100-300m	400m-1km 200-400m	80-400m 50-200m	60-400m 30-200m

The above spacings are considered desirable however some land in Warkworth is constrained by steep topography and watercourses limiting road connection locations. It is therefore likely that collector roads or local roads may be required to access arterial roads with intersection spacings in the order of 200 m. The is also likely to apply to commercial/ industrial land use, which may also have 'Collector to Arterial' and 'Local to Arterial' spacings of at the lower range of values shown above. On all arterial and collector roads, an intersection spacing of 200 m is considered an appropriate minimum standard however the following additional matters would need to be considered:

- Effects of upstream intersections (such as queues that may extend back and affect intersection operation);
- Generally limiting the number of intersections to minimise conflicts with pedestrians and cyclists (this may mean some intersections are relatively closely spaced while there are longer road sections with no intersections), and
- Intersection geometry (such as sight distances at crests, horizontal curves etc).

Matakana Link Road has recommended intersection spacing distances as defined in the Jacobs memorandum[23] dated 5 June 2018. The key recommendations in the memorandum are:

- *"Minimum distance between intersections on Matakana Link Road:*
  - *~200 m*
- *Minimum distance based on queue:*
  - *~100 m from SH1 if first intersection is a roundabout*
  - *~270 m from SH1 if first intersection is signalised*

[23] MLR Guide for Intersection Location into Light Industrial Zone, Project No. IZ080100, Jacobs, 5 June 2018

Therefore, it is recommended that a roundabout be placed no closer than 200 m from the intersection with SH1, or a signalised intersection no closer than 270 m from the intersection. If the intersection is designed as a priority, then it is recommended to be at least 200 m from the SH1 intersection. This does not take into account the performance requirements of the SH1/ Matakana Link Road required of the Ara Tūhono - Pūhoi to Warkworth project as they are responsible for the construction and operation of the intersection of SH1 and the Matakana Link Road."

These requirements are considered appropriate and in accordance with the estimated required intersection spacing for other areas of Warkworth. It is noted that Matakana Link Road is an arterial road and AT, through the Unitary Plan Auckland-wide transport rules, therefore has control over where access connections can ultimately occur.

8.4.2. Sight Distances

Sight distances at all new intersections should meet Austroads guidance. At intersections, the minimum design standards shall be Safe Intersection Sight Distance (SISD) and Approach Sight Distance (ASD) using Normal Design Domain (NDD) criteria.

8.4.3. Collector Road Cycle Facilities

There are no Unitary Plan rules controlling vehicle access onto collector roads. There is therefore potential for a high number of vehicle crossings and reverse manoeuvres on those crossings to affect the operation of the proposed separated cycle facilities. It is therefore recommended that any structure plan planning framework promotes 'rear loaded' or rear-lane accessed dwellings on these routes to maximise the length of uninterrupted sections of separated cycle facilities.

8.4.4. Posted Speed Limits

As a result of the significant urbanisation of the structure plan area, post speeded limits are recommended to be assessed to ensure they are appropriate. As a general guide, the roundabouts at the perimeter of the structure plan area are considered appropriate speed change thresholds between higher speed rural roads (80 km/hr +) and urban roads. The urban posted speed limit is recommended to be a maximum of 50 km/hr however further speed limits could be considered as follows:

- Reduced speed limits of 30 km/hr in the town centre to improve safety and amenity for pedestrians and cyclists, and
- Reduced speed limits of 30-40 km/hr for local roads ('slow streets') and existing collector roads that serve a cycle connectivity function, and cannot provide separated cycle facilities. These speed limits could be supplemented by hard measures such as LATM to encourage compliance.

8.5. Requirements for 'Next Stage' Integrated Transport Assessments

As noted, further refinements to this ITA may be required for subsequent NOR and Plan Change applications. In undertaking these refinements, the following issues have been identified for further investigation:

- The SH1/ Goatley Road/ Kaipara Flats Road intersection – A priority intersection is initially proposed at this intersection however depending on development progress of the live-zoned industrial area between Goatley Road and Matakana Link Road, alternative access points to this area should be considered. This may bring forward the need to have a larger intersection such as a dual-lane roundabout;
- In relation to the Ara Tūhono – Puhoi to Warkworth roundabout, the latest plans (refer Figure 11 and Figure 12) show a southbound through lane on SH1 'bypassing' the roundabout. There is potential for a large number of weave movements between traffic from Ara Tūhono – Puhoi to Warkworth turning left onto Matakana Link Road, and southbound traffic from existing SH1 turning right onto the Western Link Road at the SH1/ Matakana Link Road intersection;
- The SH1/ Hill Street business case has not yet identified a preferred option however the two short list options recently consulted on are not expected to increase vehicle capacity at the intersection. Regardless of whichever intersection option is selected, it is not expected to change the wider road network identified in this ITA. However, the Hill Street intersection as outlined in this ITA accommodates a number of public transport routes and walking and cycling routes which will need to be carefully considered once a preferred intersection option is selected;
- The southern interchange is adjacent to a Special Ecological Area (SEA), the Mahurangi River, and some steep topography. There may be difficulties in establishing an interchange at the proposed location. Further analysis of the proposed location should be undertaken to confirm it can be provided,
- Investigation of TDM measures for specific development proposals within the structure plan area to ensure desired mode shift can be achieved (see Section 6.2), and
- Ongoing business case processes by SGA (such as detailed business cases) should be considered if the extent and timing of transport infrastructure works changes.

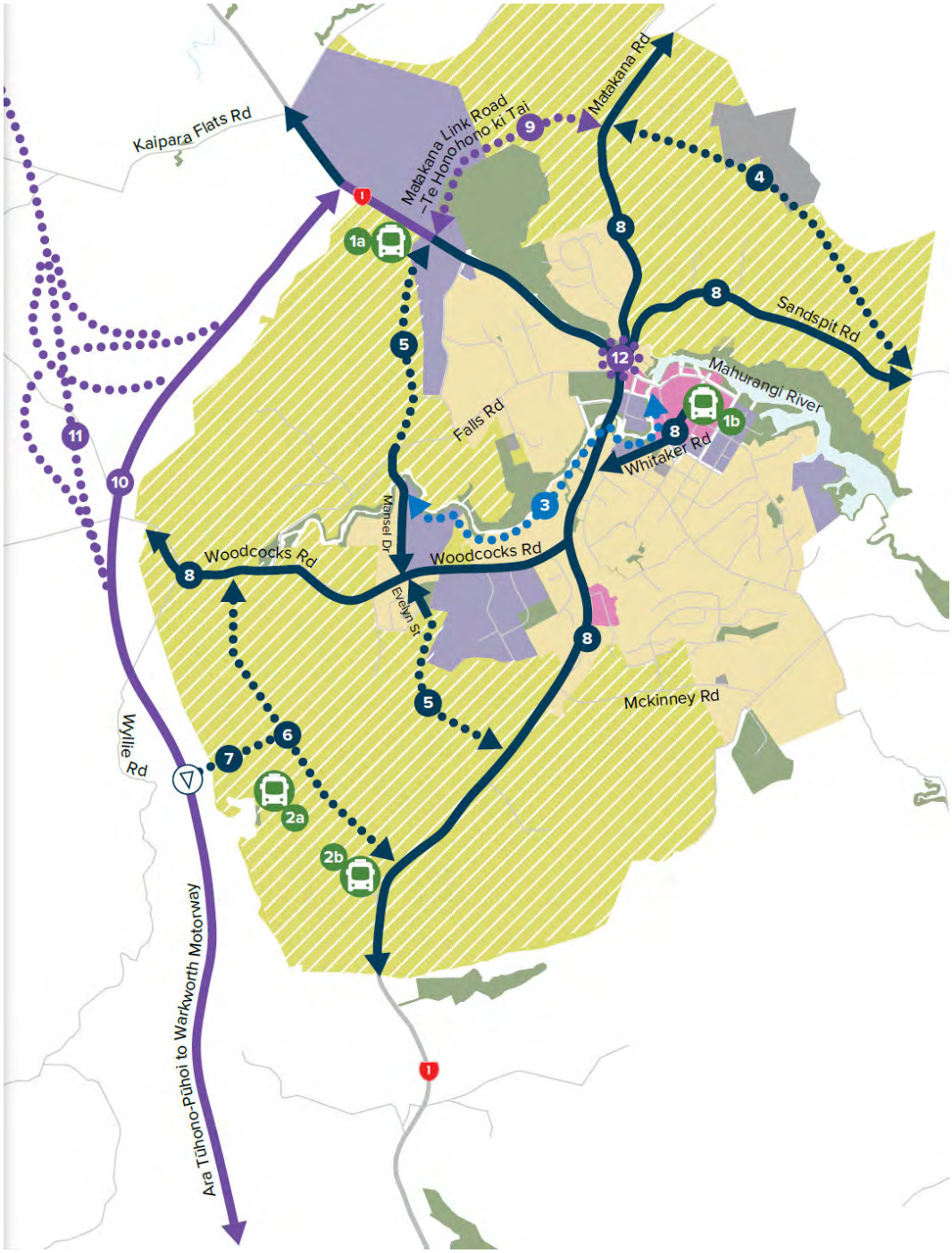
It should be noted that the majority of transport infrastructure identified in this ITA is not currently funded and therefore there is potential for the delivery of this infrastructure to lag behind proposed Plan Change processes. There will need to be consideration in any Plan Change provisions to encourage landowners/ developers to seek the same transport and land use outcomes as identified in the draft IBC and this ITA. This may require collaborative design processes and alternative funding mechanisms to deliver planned transport infrastructure.

9. Consideration of Alternatives and Mitigation of Adverse impacts

This ITA has benefitted from significant analysis and optioneering undertaken as part of the Supporting Growth Programme's Warkworth draft IBC which was undertaken in a parallel workstream. As noted, the draft IBC has been completed and is awaiting AT and NZTA board approvals. The transport network and land use optioneering involved extensive liaison (including workshops) with AT, NZTA, Auckland Council and mana whenua.

The draft IBC recommended the following transport network as shown in Figure 31.

Figure 31: Warkworth Draft IBC Transport Network



As well as arterial road options, several road network scenarios were analysed to test whether these arterial roads are required at all. The test scenarios are summarised in Table 16.

Table 16: Warkworth IBC Arterial Road Network Scenarios

Scenario	Description
S1	Do minimum. Includes Ara Tūhono – Puhoi to Warkworth and Matakana Link Road. Note: Hill Street intersection has been kept as per existing.
S2	S1 *plus* Western Link Road (Northern section)
S3	S2 *plus* Western Link Road (Southern section)
S4	S3 *plus* Sandspit Link Road
S5	S4 *plus* South-eastern Collector
S6	S5 *plus* bridge over Mahurangi River
S7	S5 *plus* Wider Western Link Road without Ara Tūhono – Puhoi to Warkworth Southern Interchange (south facing ramps only)
S8	S5 *plus* Wider Western Link Road with Ara Tūhono – Puhoi to Warkworth Southern Interchange (south facing ramps only)
S9	S5 *plus* Ara Tūhono – Puhoi to Warkworth Southern Interchange (south facing ramps only) without Wider Western link Road
S10	S8 *plus* bridge over Mahurangi River

The draft IBC and this ITA have used 'Scenario 8' for assessment purposes with additional collector road links reflected in this ITA (referred to as 'Scenario 8b').

Given the low volumes and Sandspit Link Road and the South-eastern Collector, these roads may be collector roads (developer funded) or 'collector plus roads' with mixed funding from Auckland Council and developers.

10. Consultation Summary and Implementation Plan

10.1. Consultation Summary

A series of structure plan workshops have been held by Auckland Council with input from AT, NZTA and SGA with respect to transport matters. The workshops were held on:

- Friday 13 July 2018
- Friday 20 July 2018, and
- Thursday 6 September 2018.

The September workshop considered potential alternative land release sequencing however it was concluded that the structure plan would progress based upon the FULSS sequencing. In addition to the structure plan process, SGA has also undertaken a series of workshops involving Auckland Council and Auckland Transport specialists. Public open days for the Warkworth transport network were held in August 2018 and written feedback closed on 7 September 2018. The results of the feedback revealed the following:

- Regarding walking and cycling, people valued safe, separated walking and cycling facilities that connect people to key destinations, public transport and greenways. There was strong support for a route alongside the Mahurangi River;
- Regarding public transport, most people liked the idea of a new bus network with a mix of Park and Ride station(s) and local bus feeder services to interchanges. Over 75% of people would use buses for local trips within Warkworth while 25% would use it to commute to the Auckland city centre.
- Regarding the Western Link Roads, most people saw the benefit in new connections that would improve resilience in the transport network and connect employment areas. Most people liked the idea of connecting the new southern area of Warkworth with other communities in the west, and
- Regarding the Eastern Link Roads, some people were concerned about a potential Mahurangi River bridge crossing (an option in the draft IBC). People felt strongly about linking the communities of Snells Beach and Algies Bay to the Warkworth town centre. Many people raised concerns about the challenging topography and impacts to the natural environment near the Sandspit Link Road options.

The structure plan itself is proposed to go to public consultation in early 2019 of which this ITA will form part of the overall document package. Following public consultation, there may be a need to refine the contents of the ITA should there be significant changes to land use, location and sequencing.

10.2. Implementation Plan

The proposed staging of transport network infrastructure is proposed to align with the land release sequencing in the FULSS. It is proposed to develop transport infrastructure in the following stages:

- Stage 1 – Warkworth North
- Stage 2 – Warkworth South, and
- Stage 3 – Warkworth North-east.

The proposed transport network staging is shown in Attachment E.

11. Conclusions

Based on the assessments contained in this report, the following is concluded:

- The arterial road network has been guided by the Supporting Growth Programme's Warkworth draft IBC. This ITA has assumed 'Scenario 8' as the preferred arterial road network. The ITA will need to be amended should an alternative road network be approved by the Auckland Transport and NZ Transport Boards in early to mid-2019;
- The proposed intersections are proposed to generally comprise roundabouts at the outside of the structure plan area to reduce vehicle speeds at the rural/ urban thresholds. Within the structure plan area, traffic signals are preferred at major intersections for pedestrian and cyclist amenity. Traffic modelling indicates that the road network can operate acceptably;
- In the short-term, it is recommended to establish a northern bus station with Park and Ride near SH1 north of the town centre. This will complement the existing stops in the town centre. Longer-term, a southern bus station and Park and Ride is recommended to be established in Warkworth South. This will enable better connectivity for the high-frequency 995 route to the motorway, have a greater area to accommodate 'pulsed' bus arrivals, and enable existing bus routes to be extended through the Warkworth South residential catchment. The town centre stops will be retained albeit not be the main location for bus transfers;
- All arterial roads (new and existing) are proposed to have separated cycle facilities with footpaths on both sides of the road. These will form the primary (on road) walking and cycling network. This will be complemented by offroad routes alongside key watercourses such as the Mahurangi River and greenways routes. These routes are located near centres, schools, employment areas and public transport facilities;
- All new collector roads are proposed to have cycle facilities and footpaths in accordance with AT standards. There will need to be careful design to prevent reverse manoeuvring and multiple 'interruptions' to the cycle facilities on these routes. On existing collector roads, while it would be desirable to include separated cycle facilities, this may not be possible due to narrow road reserve widths, multiple crossings and geometric constraints. Other cycle facilities may be required on these routes such as LATM and shared paths;
- The staging of transport infrastructure will generally align with land release sequencing as outlined in the FULSS, and
- Costings for infrastructure works are proposed to be informed by the Warkworth draft IBC and refined once a preferred transport network has been agreed.

12. References

[i] https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/topic-based-plans-strategies/housing-plans/Documents/future-urban-land-supply-strategy.pdf

[ii] http://supportinggrowth.govt.nz/assets/62d57f63db/Version-1-Warkworth-TFUG-poster.pdf

[iii] https://www.aucklandcouncil.govt.nz/about-auckland-council/how-auckland-council-works/local-boards/all-local-boards/rodney-local-board/docspuhoigreenways/puhoi-pakiri-greenways-part-one.pdf

[iv] https://nx2group.com/attachments/docs/section-7-1.pdf

[v] https://nx2group.com/attachments/docs/section-7-1.pdf

[vi] https://at.govt.nz/projects-roadworks/matakana-link-road/

[vii] https://at.govt.nz/media/1977185/995-warkworth-to-hibiscus-coast-station.pdf

[viii] https://at.govt.nz/media/1977183/996-warkworth-to-algies-bay-via-snells-beach.pdf

[ix] https://at.govt.nz/media/1977184/997-warkworth-to-omaha-via-matakana-and-snells-beach.pdf

[x] https://www.nzta.govt.nz/assets/resources/overdimen-veh-route-maps/3-northland/docs/OD_3-15%20Warkworth.pdf

[xi] https://www.nzta.govt.nz/assets/Uploads/High-risk-rural-roads-guide-September-2011.pdf

[xii] http://archive.stats.govt.nz/datavisualisation/commuterview/index.html?url=/datavisualisation/commuterview/index.html

[xiii] https://at.govt.nz/media/1976084/roads-and-streets-framework-webcompressed.pdf

Attachment A – Road Safety Risk Maps

Figure 32: Warkworth Intersections – Collective Risk

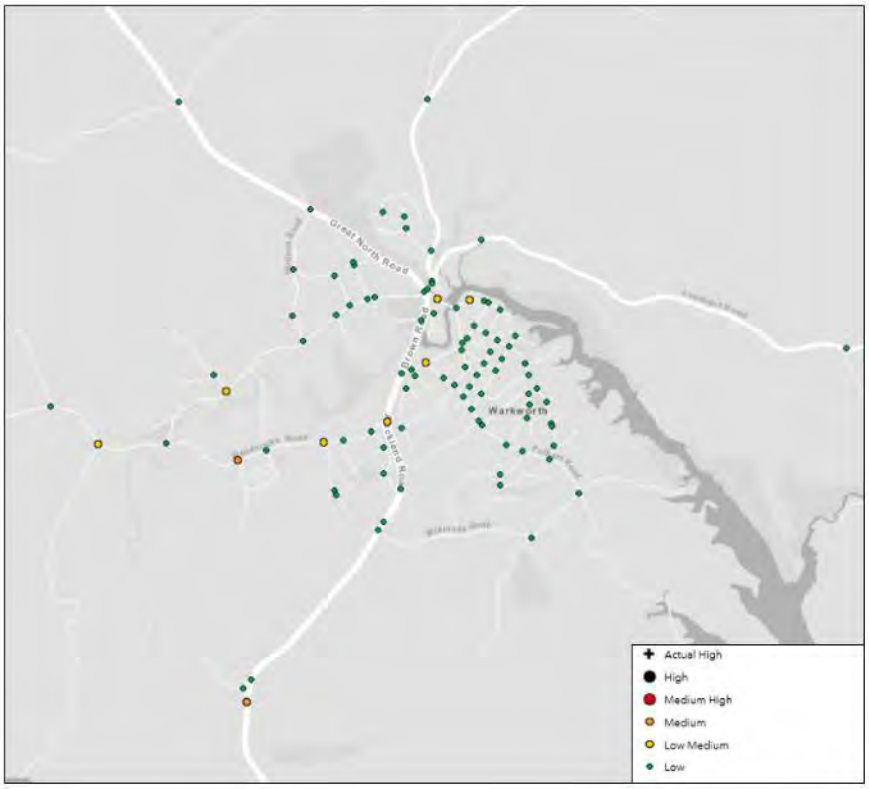


Figure 33: Warkworth Corridors – Collective Risk

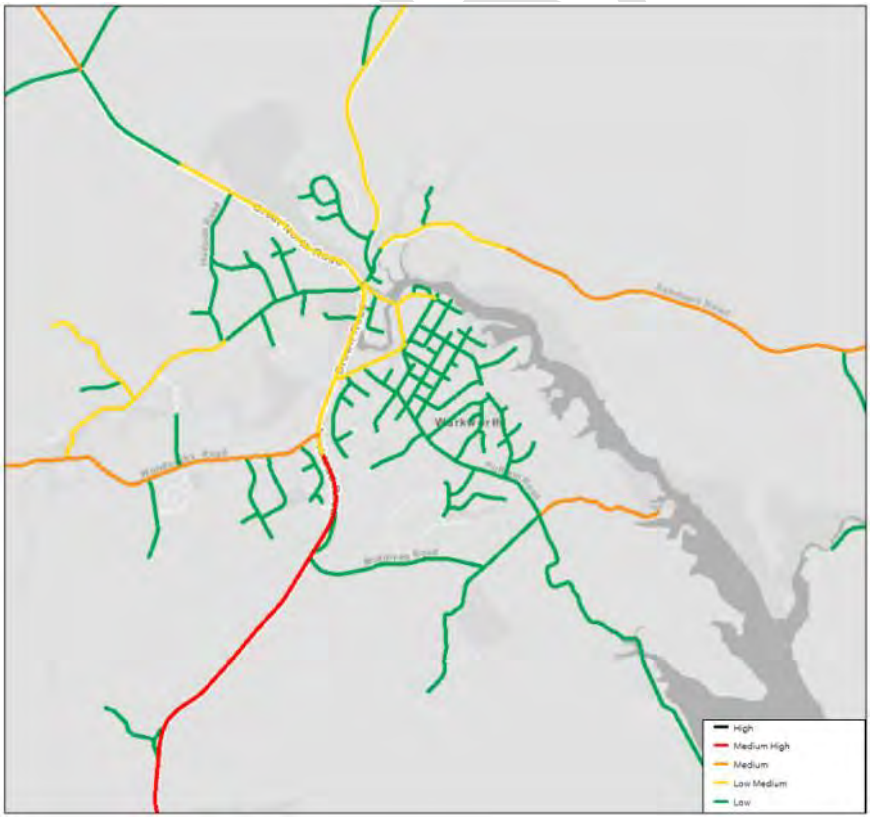
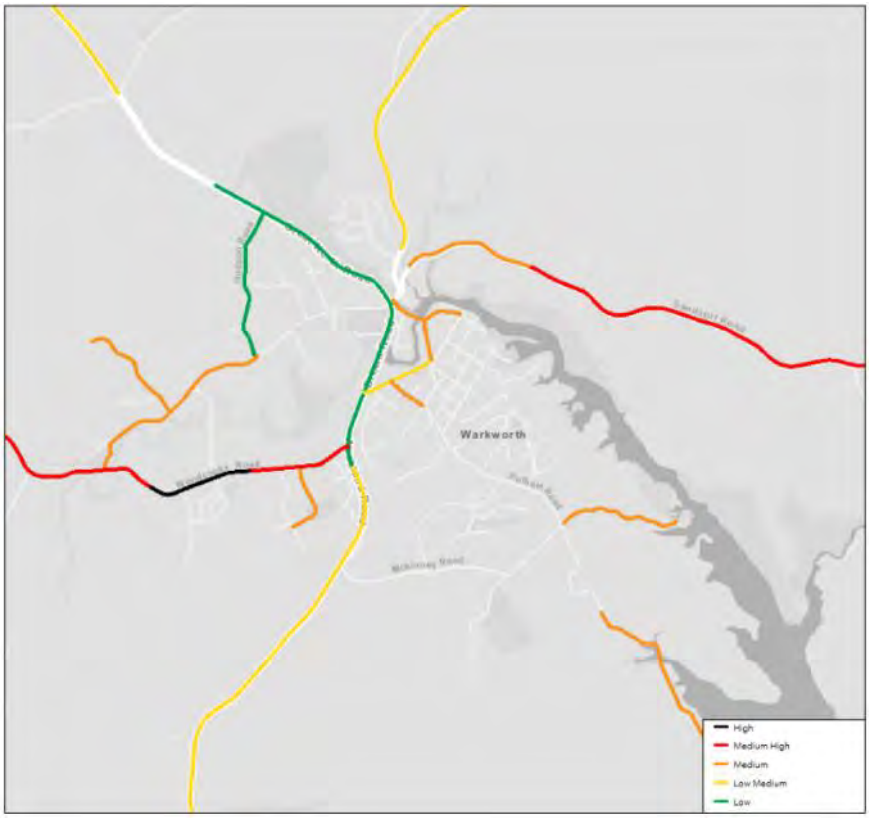


Figure 34: Warkworth Corridors – Personal Risk



Attachment B – Structure Plan Residential Yields and Employment Projections

Figure 35: Warkworth Structure Plan Zones

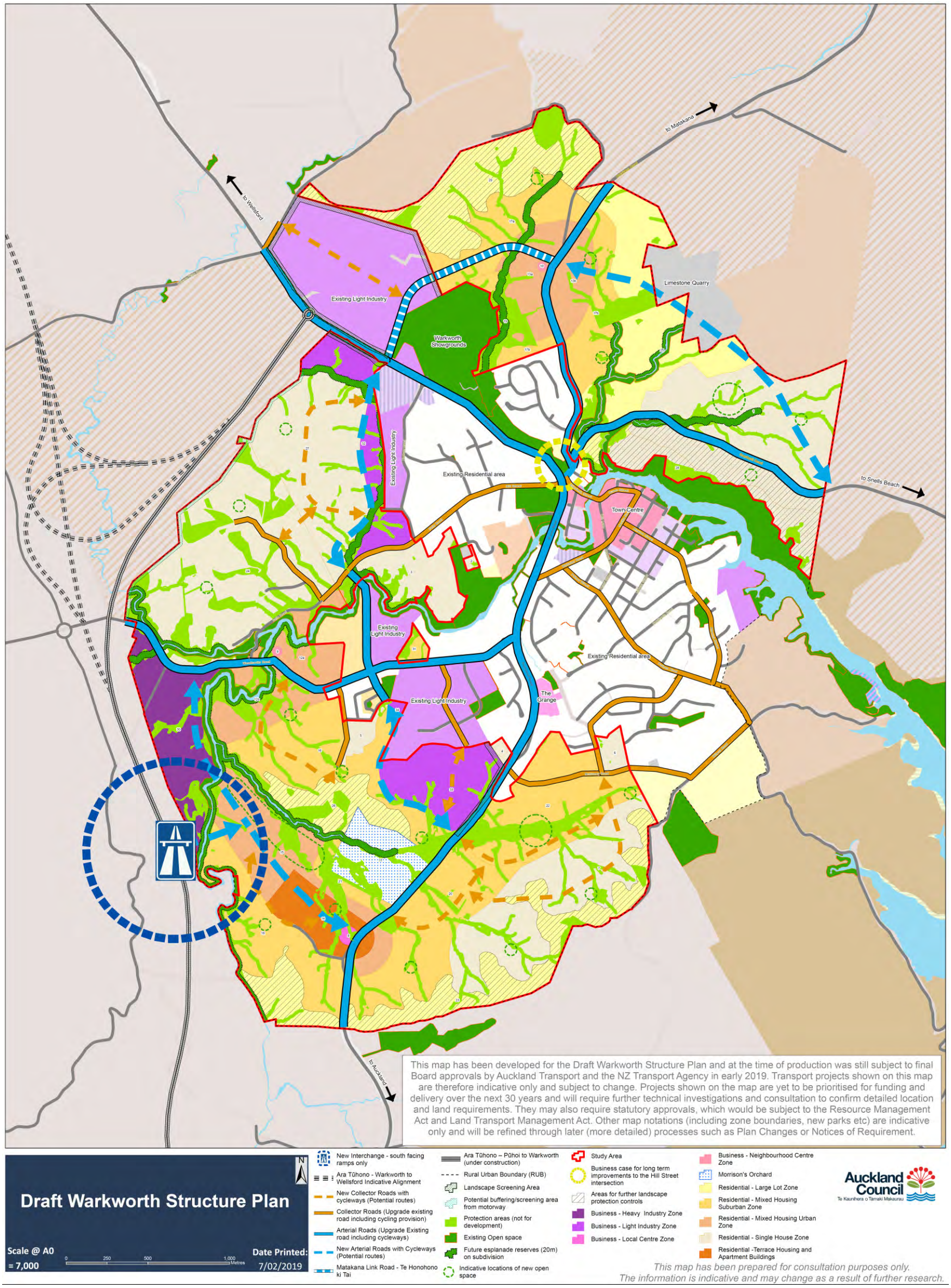


Table 17: Warkworth Structure Plan Residential Yields, Sequencing and Employment Projections

Area label	Area (m2)	Area (Hectares)	Area not for development* (ha)	% of Area not for development	Net Area after areas not for development removed (m2)	~ Roads (30%)	~ Other Uses (15%) *Except business land*	Total Roads/Other area (ha)	Net developable area (ha)	% Net developable (of gross)		Zoning	Residential? (for job yield)	THAB (180m^2) - dwellings	Mixed Housing Urban (300m^2) - dwellings	Mixed Housing Suburban (350m^2) - dwellings	Single House (600m^2) - dwellings	Large Lot (1,500m^2) - dwellings	Neighbourhood Centre - dwellings	Local Centre - dwellings	TOTAL dwellings	Future Urban Land Supply Strategy	2022	2028-32	2033-37	Local Centre - plans	Neighbourhood Centre - jobs	Light Industry - jobs	Heavy Industry - jobs	Residential - jobs	TOTAL Jobs	2022	2028-32	2033-37	Notes
1	782,500	78.25	13.6	17%	646,500	193,950	96,975	290,925	355,575	45%		Residential - Single House Zone	SH	TRUE	-	-	-	593	-	-	-	593	2032	-	-	593	-	-	-	-	296	296	-	-	296	
2	7,400	0.74	0.14	19%	6,000	1,800	900	2,700	3,300	45%		Residential - Single House Zone	SH	TRUE	-	-	-	6	-	-	-	6	2022	6	-	-	-	-	-	-	3	3	3	-	-	
3	214,200	21.42	4.75	22%	166,700	50,010	25,005	75,015	91,685	43%		Residential - Single House Zone	SH	TRUE	-	-	-	153	-	-	-	153	2022	153	-	-	-	-	-	-	76	76	76	-	-	
4	11,600	1.16	0	0%	11,600	3,480	1,740	5,220	6,380	55%		Residential - Single House Zone	SH	TRUE	-	-	-	15	-	-	-	15	2028	-	15	-	-	-	-	-	8	8	-	8	-	Approx 15 lots (within Area 4) through approved subdivision
5	41,300	4.13	0.55	13%	35,800	10,740	5,370	16,110	19,690	48%		Residential - Single House Zone	SH	TRUE	-	-	-	54	-	-	-	54	2028	-	54	-	-	-	-	-	27	27	-	27	-	54 lots in Area 5 through approved subdivision
6	37,400	3.74	0.28	7%	34,600	10,380	5,190	15,570	19,030	51%		Residential - Single House Zone	SH	TRUE	-	-	-	44	-	-	-	44	2028	-	44	-	-	-	-	-	22	22	-	22	-	Approx 29 lots subdivision approved. Space for around 15 additional lots so a total of 44 lots
7	523,500	52.35	8.4	16%	439,500	131,850	65,925	197,775	241,725	46%		Residential - Single House Zone	SH	TRUE	-	-	-	403	-	-	-	403	2028	-	403	-	-	-	-	-	201	201	-	201	-	
8	10,400	1.04	0.42	40%	6,200	1,860	930	2,790	3,410	33%		Business - Local Centre Zone	LC	FALSE	-	-	-	-	-	-	11	11	2028	-	11	-	20	-	-	-	-	20	-	20	-	
9	3,000	0.30	0	0%	3,000	900	450	1,350	1,650	55%		Business - Neighbourhood Centre Zone	NHC	FALSE	-	-	-	-	-	6		6	2022	6	-	-	-	10	-	-	10	10	-	-	
10	3,000	0.30	0.07	23%	2,300	690	345	1,035	1,265	42%		Business - Neighbourhood Centre Zone	NHC	FALSE	-	-	-	-	-	4		4	2022	4	-	-	-	7	-	-	-	7	7	-	-	
11	211,300	21.13	7.01	33%	141,200	42,360	-	42,360	98,840	47%		Morison's Orchard	ORCH	FALSE	-	-	-	-	-	-	-	-	2028	-	-	-	-	-	-	-	-	-	-	-	
12a	189,800	18.98	8.02	42%	109,600	32,880	16,440	49,320	60,280	32%		Residential - Mixed Housing Urban Zone	MHU	TRUE	-	201	-	-	-	-	-	201	2022	201	-	-	-	-	-	-	100	100	100	-	-	
12b	237,000	23.70	12.85	54%	108,500	32,550	16,275	48,825	59,675	25%		Residential - Mixed Housing Urban Zone	MHU	TRUE	-	199	-	-	-	-	-	199	2028	-	199	-	-	-	-	-	99	99	-	99	-	
13a	223,400	22.34	7.57	34%	147,700	44,310	22,155	66,465	81,235	36%		Residential - Mixed Housing Urban Zone	MHU	TRUE	-	271	-	-	-	-	-	271	2022	271	-	-	-	-	-	-	135	135	135	-	-	
13b	139,400	13.94	2.15	15%	117,900	35,370	17,685	53,055	64,845	47%		Residential - Mixed Housing Urban Zone	MHU	TRUE	-	216	-	-	-	-	-	216	2032	-	-	216	-	-	-	-	108	108	-	-	108	
14	167,200	16.72	2.66	16%	140,600	42,180	21,090	63,270	77,330	46%		Residential -Terrace Housing and Apartment	THAB	TRUE	430	-	-	-	-	-	-	430	2028	-	430	-	-	-	-	-	215	215	-	215	-	
15	382,400	38.24	8.88	23%	293,600	88,080	44,040	132,120	161,480	42%		Residential - Mixed Housing Urban Zone	MHU	TRUE	-	538	-	-	-	-	-	538	2028	-	538	-	-	-	-	-	269	269	-	269	-	
16	404,600	40.46	8.86	22%	316,000	94,800	47,400	142,200	173,800	43%		Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	497	-	-	-	-	497	2028	-	497	-	-	-	-	-	248	248	-	248	-	
17a	267,200	26.72	5.06	19%	216,600	64,980	32,490	97,470	119,130	45%		Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	340	-	-	-	-	340	2022	340	-	-	-	-	-	-	170	170	170	-	-	
17b	232,800	23.28	5.11	22%	181,700	54,510	27,255	81,765	99,935	43%		Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	286	-	-	-	-	286	2032	-	-	286	-	-	-	-	143	143	-	-	143	
18	354,300	35.43	8	23%	274,300	82,290	41,145	123,435	150,865	43%		Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	431	-	-	-	-	431	2028	-	431	-	-	-	-	-	216	216	-	216	-	
19	59,900	5.99	4.79	80%	12,000	3,600	1,800	5,400	6,600	11%		Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	19	-	-	-	-	19	2032	19	-	-	-	-	-	-	9	9	9	-	-	
20	454,700	45.47	7.57	17%	379,000	113,700	56,850	170,550	208,450	46%		Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	596	-	-	-	-	596	2028	-	596	-	-	-	-	-	298	298	-	298	-	
21	62,000	6.20	3.36	54%	28,400	8,520	4,260	12,780	15,620	25%		Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	45	-	-	-	-	45	2028	-	45	-	-	-	-	-	22	22	-	22	-	
22	465,100	46.51	13.34	29%	331,700	99,510	49,755	149,265	182,435	39%		Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	521	-	-	-	-	521	2028	-	521	-	-	-	-	-	261	261	-	261	-	
23	492,300	49.23	4.34	9%	448,900	134,670	67,335	202,005	246,895	50%		Residential - Large Lot Zone	LL	TRUE	-	-	-	-	62	-	-	62	2028	-	62	-	-	-	-	-	31	31	-	31	-	
24	1,005,000	100.50	37.31	37%	631,900	189,570	94,785	284,355	347,545	35%		Residential - Single House Zone	SH	TRUE	-	-	-	579	-	-	-	579	2022	579	-	-	-	-	-	-	290	290	290	-	-	
25	651,200	65.12	18.77	29%	463,500	139,050	69,525	208,575	254,925	39%		Residential - Large Lot Zone	LL	TRUE	-	-	-	-	64	-	-	64	2032	-	-	64	-	-	-	-	32	32	-	-	32	
26	196,900	19.69	5.34	27%	143,500	43,050	21,525	64,575	78,925	40%		Residential - Large Lot Zone	LL	TRUE	-	-	-	-	20	-	-	20	2028	-	20	-	-	-	-	-	10	10	-	10	-	
27	569,800	56.98	7.59	13%	493,900	148,170	74,085	222,255	271,645	48%		Residential - Single House Zone	SH	TRUE	-	-	-	453	-	-	-	453	2022	453	-	-	-	-	-	-	226	226	226	-	-	
28	169,200	16.92	3.6	21%	133,200	39,960	19,980	59,940	73,260	43%		Residential - Single House Zone	SH	TRUE	-	-	-	122	-	-	-	122	2032	-	-	122	-	-	-	-	61	61	-	-	61	
29	483,700	48.37	8.98	19%	393,900	118,170	59,085	177,255	216,645	45%		Residential - Large Lot Zone	LL	TRUE	-	-	-	-	54	-	-	54	2022	54	-	-	-	-	-	-	27	27	27	-	-	
30	374,300	37.43	10.18	27%	272,500	81,750	-	81,750	190,750	51%		Business - Heavy Industry Zone	HIZ	FALSE	-	-	-	-	-	-	-	-	2028	-	-	-	-	-	-	706	-	706	-	706	-	
31	26,200	2.62	1	38%	16,200	4,860	2,430	7,290	8,910	34%		Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	25	-	-	-	-	25	2022	25	-	-	-	-	-	-	13	13	13	-	-	
32	245,300	24.53	8.33	34%	162,000	48,600	-	48,600	113,400	46%		Business - Light Industry Zone	IND	FALSE	-	-	-	-	-	-	-	-	2022	-	-	-	-	-	420	-	420	420	-	-	
33	269,500	26.95	4.15	15%	228,000	68,400	-	68,400	159,600	59%		Business - Light Industry Zone	IND	FALSE	-	-	-	-	-	-	-	-	2028	-	-	-	-	-	591	-	591	-	591	-	
34	9,900	0.99	0.06	6%	9,300	2,790	-	2,790	6,510	66%		Business - Light Industry Zone	IND	FALSE	-	-	-	-	-	-	-	-	2028	-	-	-	-	-	24	-	24	-	24	-	
TOTALS	**9,978,700**	**998**	**243**	**24%**	**7,547,800**	**2,264,340**	**1,132,170**	**3,274,560**	**4,273,240**	**43%**					**430**	**1,425**	**2,759**	**2,421**	**199**	**10**	**11**	**7,255**		**2,111**	**3,865**	**1,280**	**20**	**17**	**1,034**	**706**	**3,617**	**5,394**	**1,487**	**3,267**	**640**	

Formula inputs	
Site sizes (m^2)	
THAB	180
MHU	300
MHS	350
SH	600
LL	4,000
NHC	300
LC	300
Jobs (per ha):	
NHC	58
LC	58
HIZ	37
LIZ	37
RES	0.5 per dwelling

TOTAL AREAS	Gross Area	%	*Dwellings*	%
THAB	17	*2%*	430	*6%*
MHU	117	*12%*	1,425	*20%*
MHS	233	*23%*	2,759	*38%*
SH	336	*34%*	2,421	*33%*
LL	182	*18%*	199	*3%*
LIZ	52	*5%*	-	*0%*
HIZ	37	*4%*	-	*0%*
NHC	1	*0%*	10	*0%*
LC	1	*0%*	11	*0%*
ORCH	21	*2%*	-	*0%*
TOTAL	**998**	***100%***	**7,255**	***100%***

***Areas not for development include:**
Flood plains
Streams (10m buffer)*
Wetlands
SEAs
Covenanted bush
Historic heriage - extent of place
Existing open space
Future esplanade reserves
Existing roads

**Streams = permanent, intermittent, and transitional*

Attachment C – Proposed Transport Network Maps

Figure 36: Proposed Arterial Road and Collector Road Network

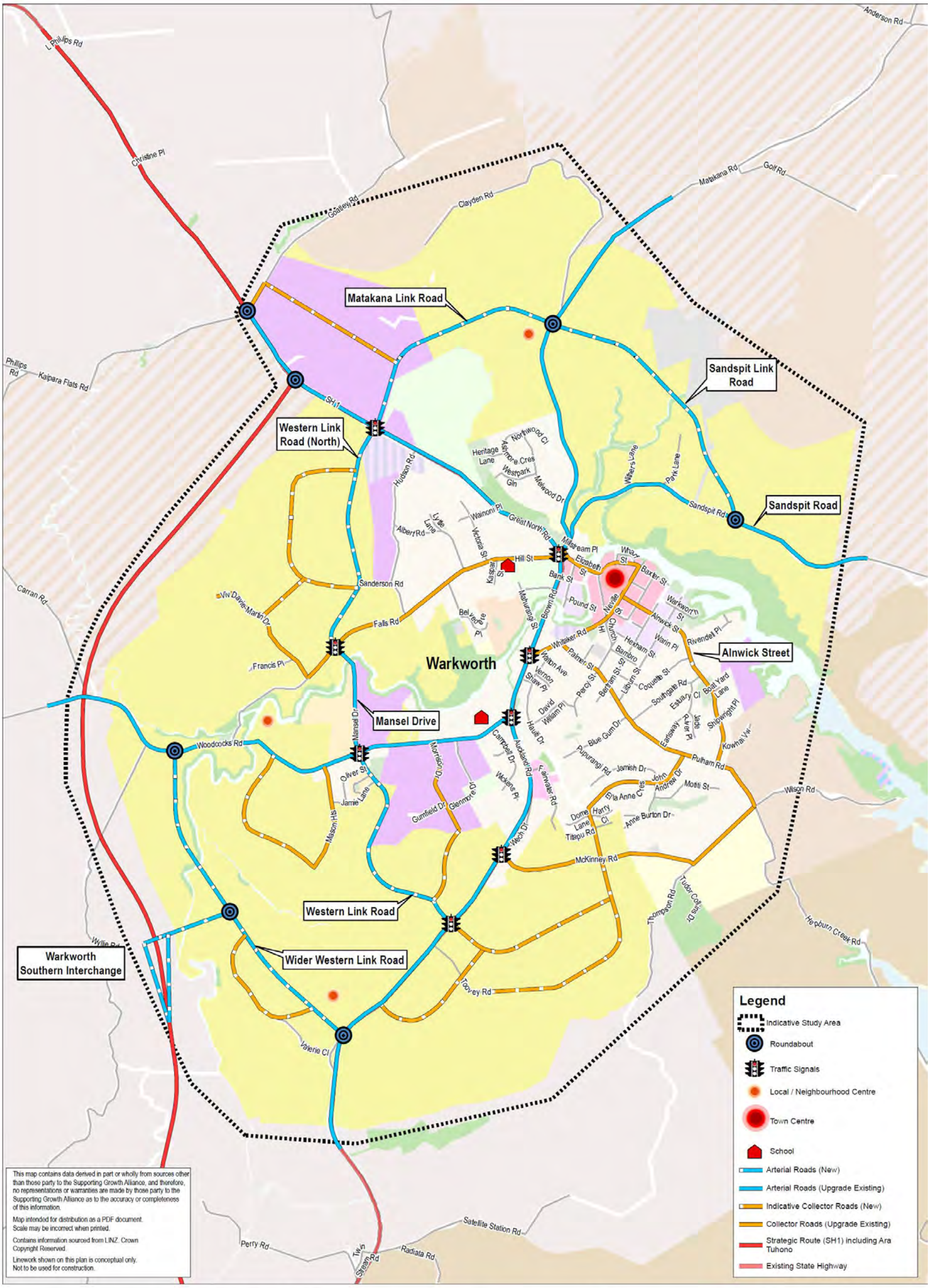


Figure 37: Proposed Public Transport Network

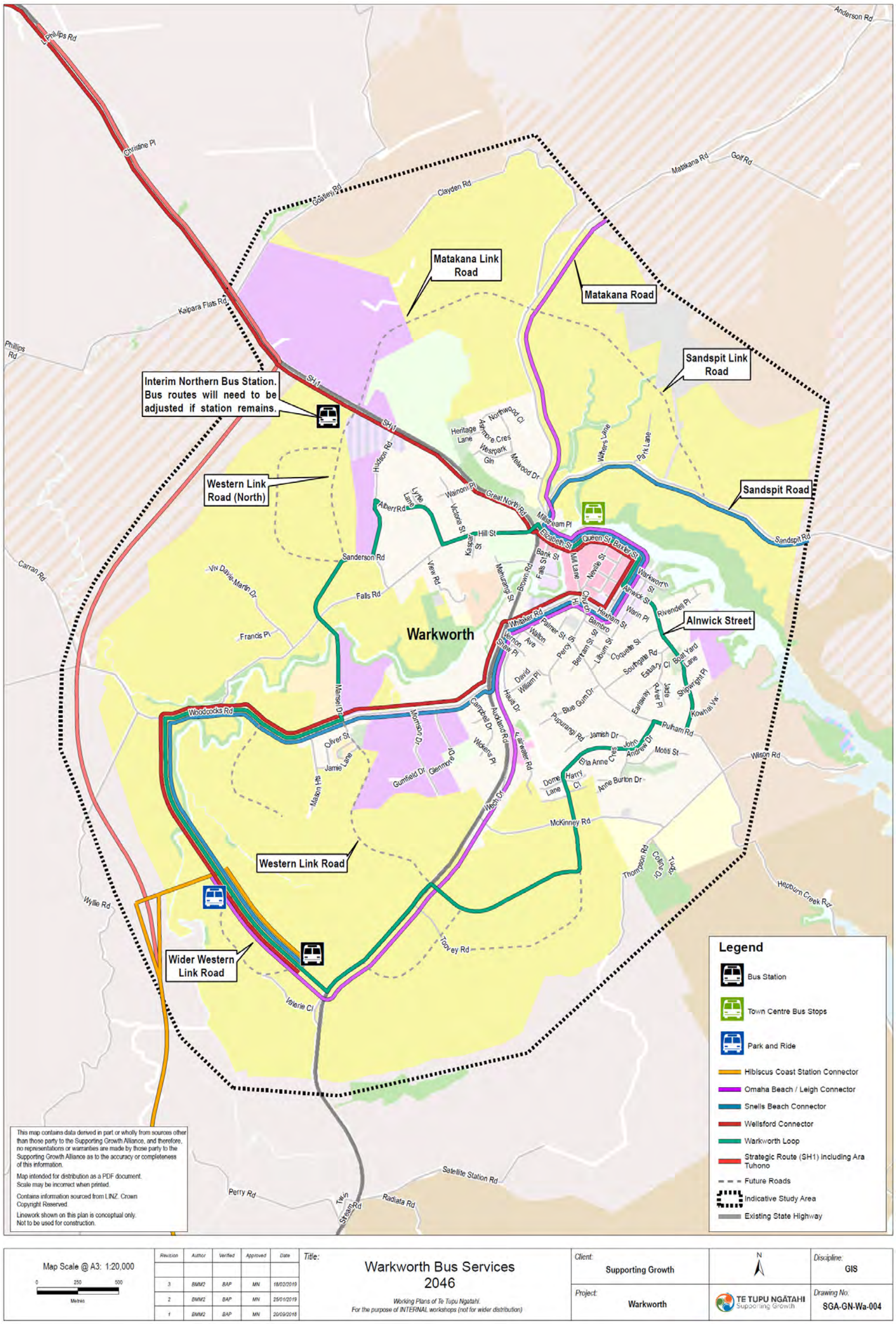
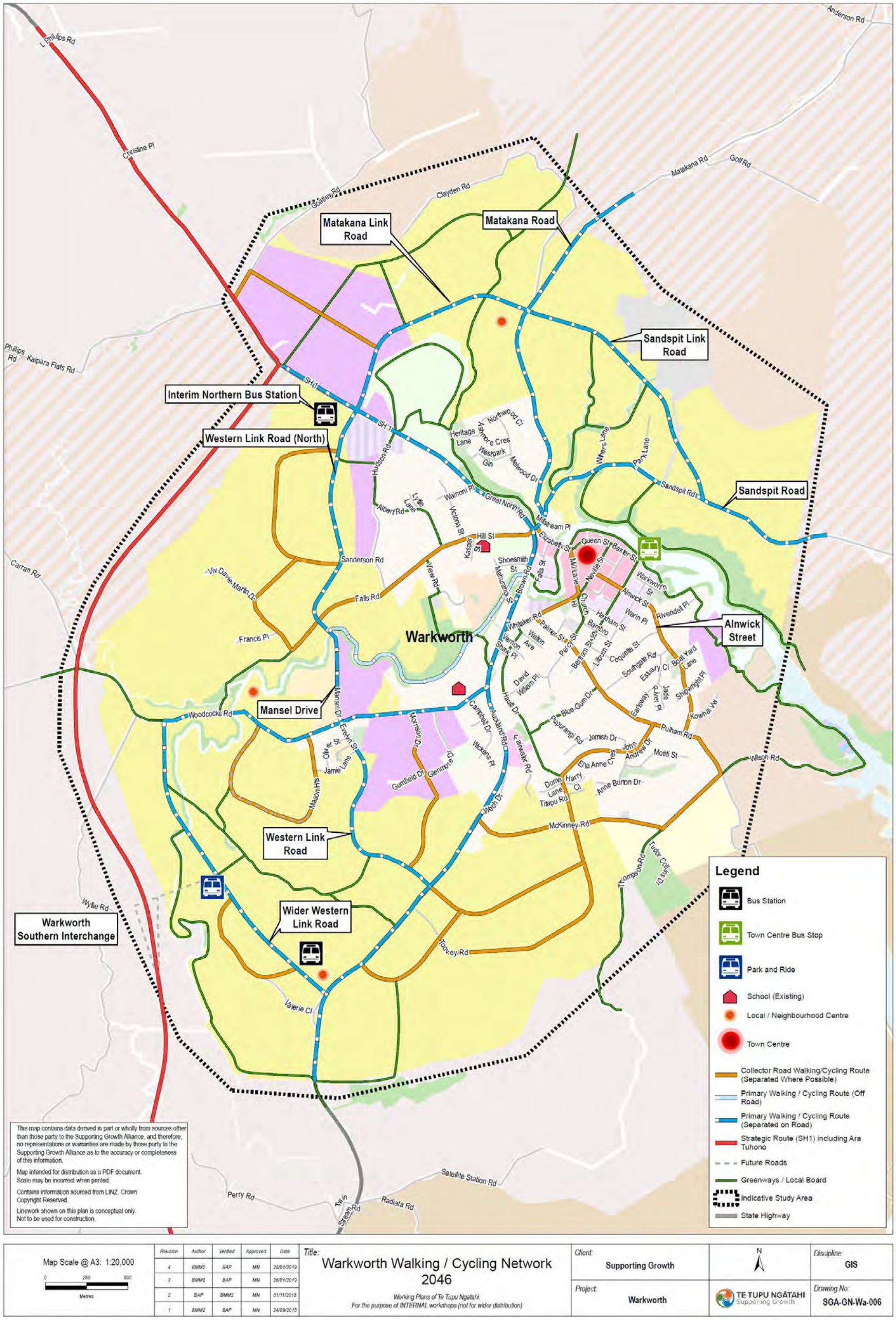


Figure 38: Proposed Walking and Cycling Network

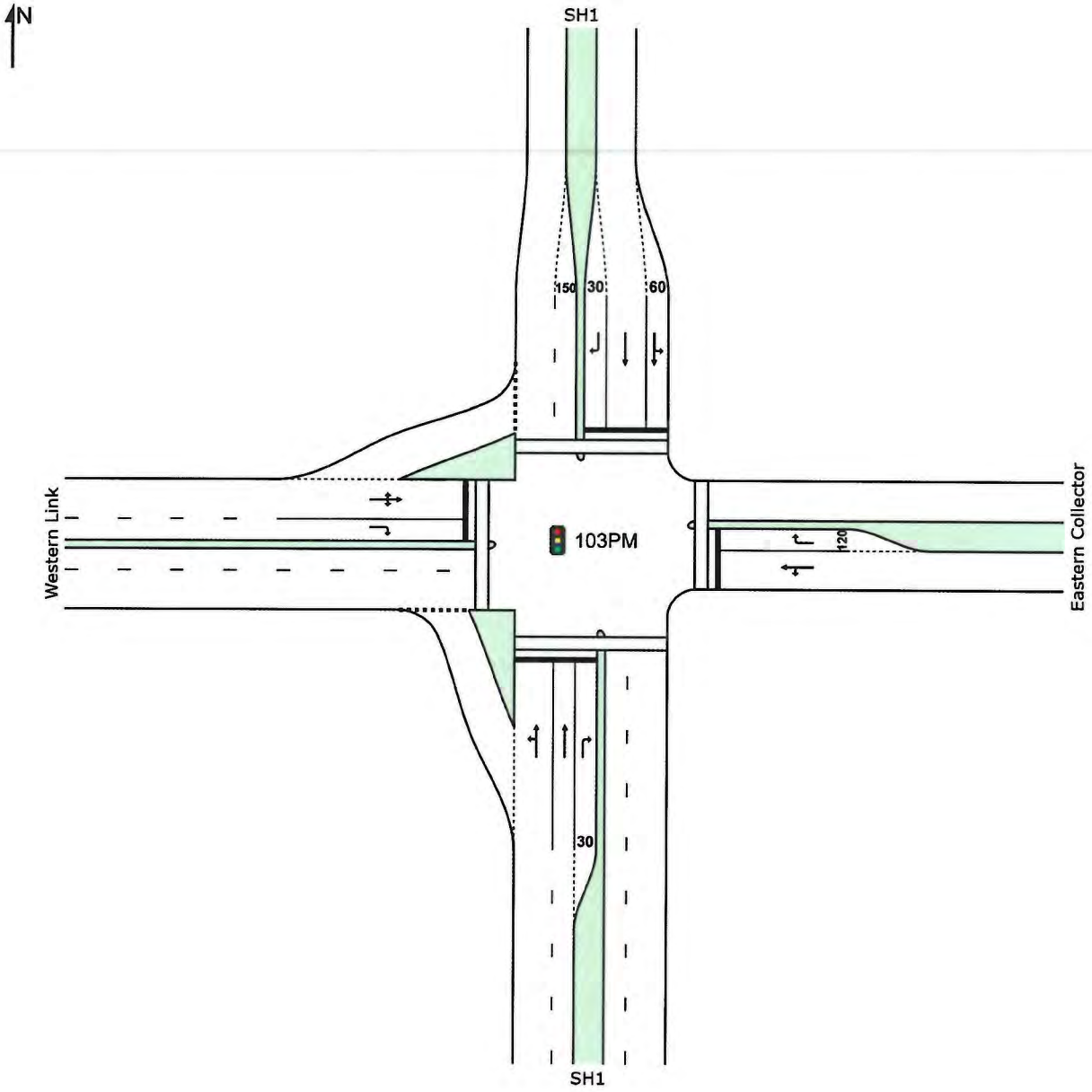


Attachment D – SIDRA Traffic Modelling Results

SITE LAYOUT

Site: 103PM [103 SH1/ Western Link/ Eastern Collector]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 103PM [103 SH1/ Western Link/ Eastern Collector]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SH1											
1	L2	606	6.6	0.638	13.5	LOS B	16.2	119.5	0.67	0.76	49.1
2	T1	401	5.5	0.638	23.2	LOS C	16.2	119.5	0.80	0.73	42.9
3	R2	54	2.0	0.489	58.5	LOS E	2.7	19.5	1.00	0.74	30.5
Approach		1061	6.0	0.638	19.4	LOS B	16.2	119.5	0.74	0.75	45.2
East: Eastern Collector											
4	L2	28	0.0	0.423	46.4	LOS D	6.3	48.0	0.94	0.76	35.0
5	T1	114	12.0	0.423	40.8	LOS D	6.3	48.0	0.94	0.76	35.6
6	R2	36	8.8	0.120	44.2	LOS D	1.5	11.3	0.88	0.72	34.5
Approach		178	9.5	0.423	42.4	LOS D	6.3	48.0	0.93	0.75	35.3
North: SH1											
7	L2	74	5.7	0.458	34.9	LOS C	10.3	78.1	0.85	0.74	39.0
8	T1	474	11.3	0.458	29.2	LOS C	11.0	84.8	0.85	0.73	40.3
9	R2	5	40.0	0.061	56.9	LOS E	0.3	2.4	0.97	0.65	30.5
Approach		553	10.9	0.458	30.2	LOS C	11.0	84.8	0.85	0.73	40.0
West: Western Link											
10	L2	9	11.1	0.763	49.2	LOS D	18.0	132.8	0.98	0.92	33.7
11	T1	169	6.8	0.763	43.5	LOS D	18.0	132.8	0.98	0.92	34.1
12	R2	542	5.6	0.763	47.3	LOS D	18.0	132.8	0.99	0.90	34.0
Approach		721	6.0	0.763	46.4	LOS D	18.0	132.8	0.99	0.91	34.0
All Vehicles		2513	7.3	0.763	31.2	LOS C	18.0	132.8	0.85	0.79	39.6

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

Movement Performance - Pedestrians

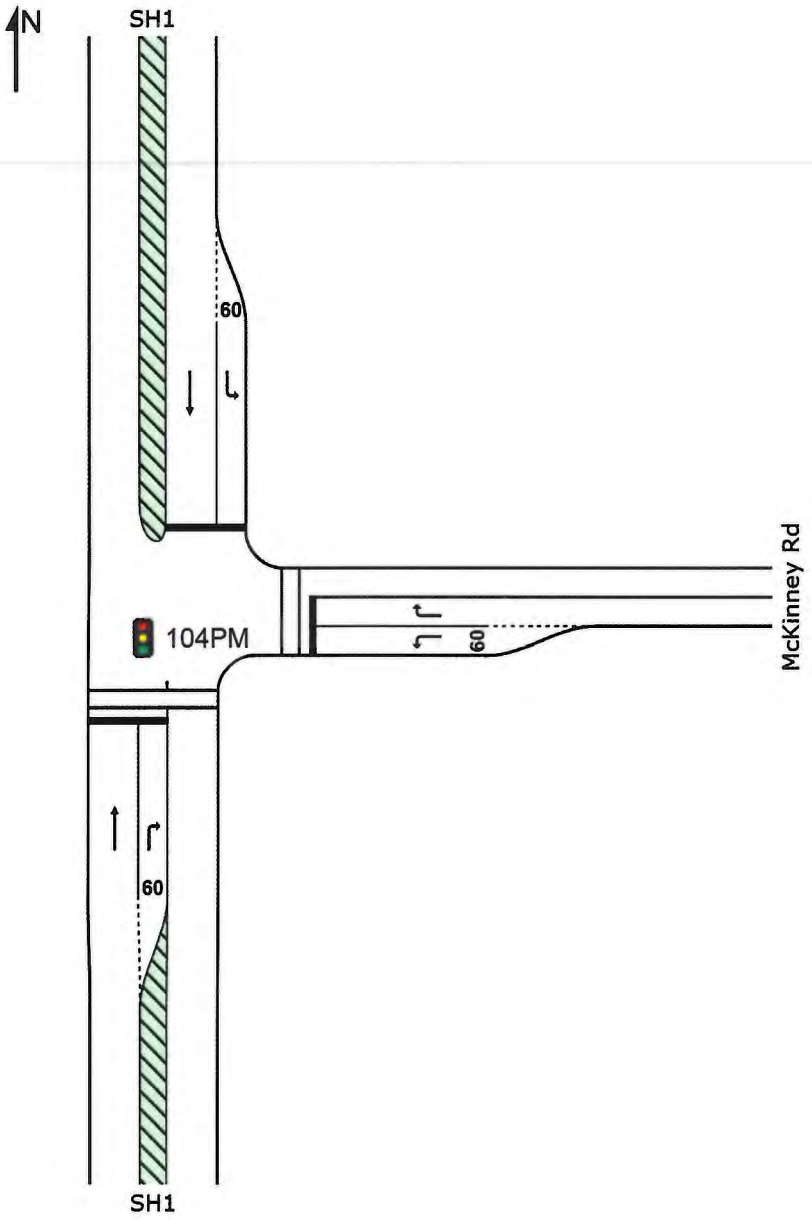
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	32.9	LOS D	0.1	0.1	0.81	0.81
P3	North Full Crossing	53	43.3	LOS E	0.1	0.1	0.93	0.93
P4	West Full Crossing	53	34.5	LOS D	0.1	0.1	0.83	0.83
All Pedestrians		211	38.8	LOS D			0.88	0.88

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 104PM [104 SH1/ McKinney]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



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MOVEMENT SUMMARY

Site: 104PM [104 SH1/ McKinney]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SH1											
2	T1	234	3.2	0.173	7.3	LOS A	4.4	31.6	0.42	0.36	45.5
3	R2	212	8.5	0.465	38.6	LOS D	8.8	66.1	0.89	0.80	32.5
Approach		445	5.7	0.465	22.2	LOS C	8.8	66.1	0.64	0.57	38.2
East: McKinney Rd											
4	L2	231	20.1	0.268	18.5	LOS B	6.1	50.1	0.58	0.72	39.5
6	R2	166	43.0	0.468	40.0	LOS D	7.1	67.7	0.90	0.80	32.0
Approach		397	29.7	0.468	27.5	LOS C	7.1	67.7	0.72	0.75	36.0
North: SH1											
7	L2	65	58.1	0.081	13.6	LOS B	1.3	13.5	0.43	0.64	41.4
8	T1	322	4.2	0.459	27.7	LOS C	12.3	89.1	0.83	0.71	36.2
Approach		387	13.3	0.459	25.4	LOS C	12.3	89.1	0.77	0.70	37.0
All Vehicles		1229	15.8	0.468	24.9	LOS C	12.3	89.1	0.71	0.67	37.1

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

Movement Performance - Pedestrians

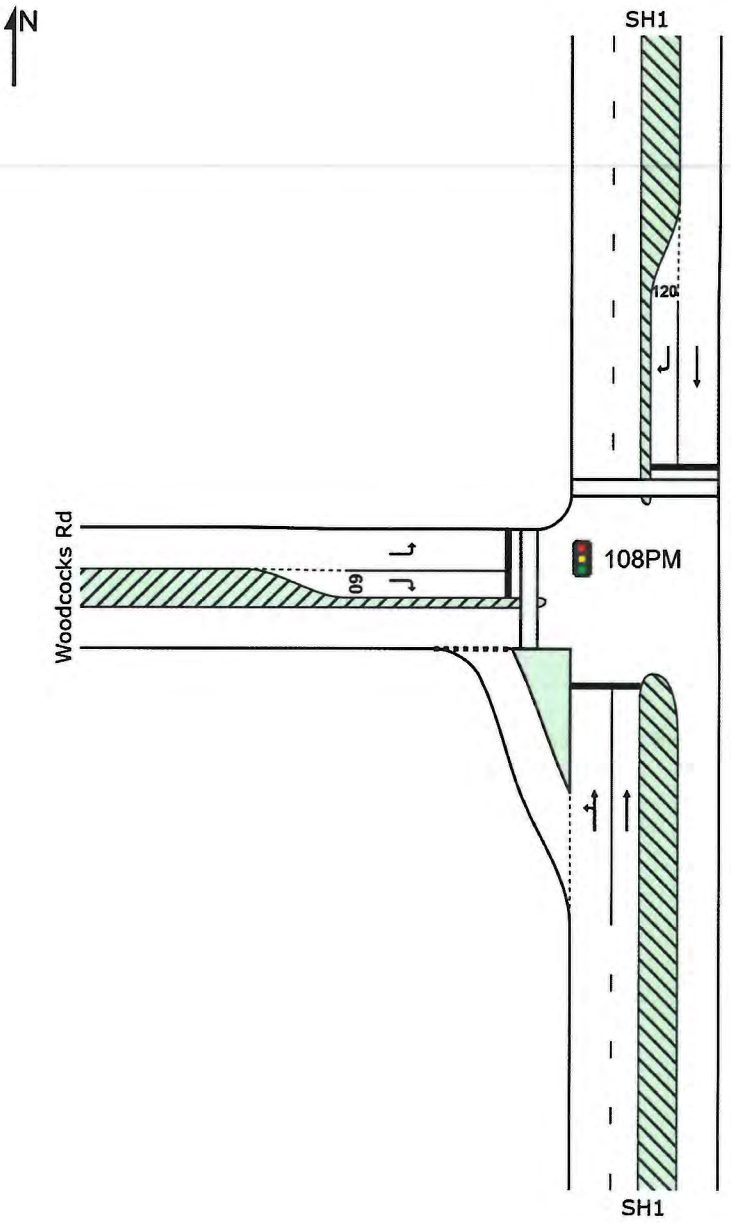
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	37.1	LOS D	0.1	0.1	0.86	0.86
P2	East Full Crossing	53	26.7	LOS C	0.1	0.1	0.73	0.73
All Pedestrians		105	31.9	LOS D			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 108PM [108 SH1/ Woodcocks]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



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MOVEMENT SUMMARY

Site: 108PM [108 SH1/ Woodcocks]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SH1											
1	L2	80	26.3	0.509	32.5	LOS C	7.6	63.9	0.89	0.84	40.0
2	T1	356	22.2	0.509	32.7	LOS C	8.0	67.0	0.91	0.80	38.7
Approach		436	22.9	0.509	32.6	LOS C	8.0	67.0	0.91	0.81	39.0
North: SH1											
8	T1	386	15.3	0.263	3.8	LOS A	5.5	43.8	0.32	0.28	56.5
9	R2	477	7.1	0.539	24.0	LOS C	15.8	117.6	0.74	0.80	42.4
Approach		863	10.7	0.539	15.0	LOS B	15.8	117.6	0.55	0.57	47.7
West: Woodcocks Rd											
10	L2	666	3.5	0.559	14.8	LOS B	16.4	118.5	0.55	0.76	47.1
12	R2	60	38.6	0.294	49.3	LOS D	2.7	25.5	0.94	0.76	32.3
Approach		726	6.4	0.559	17.7	LOS B	16.4	118.5	0.59	0.76	45.4
All Vehicles		2025	11.8	0.559	19.7	LOS B	16.4	118.5	0.64	0.69	44.7

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

Movement Performance - Pedestrians

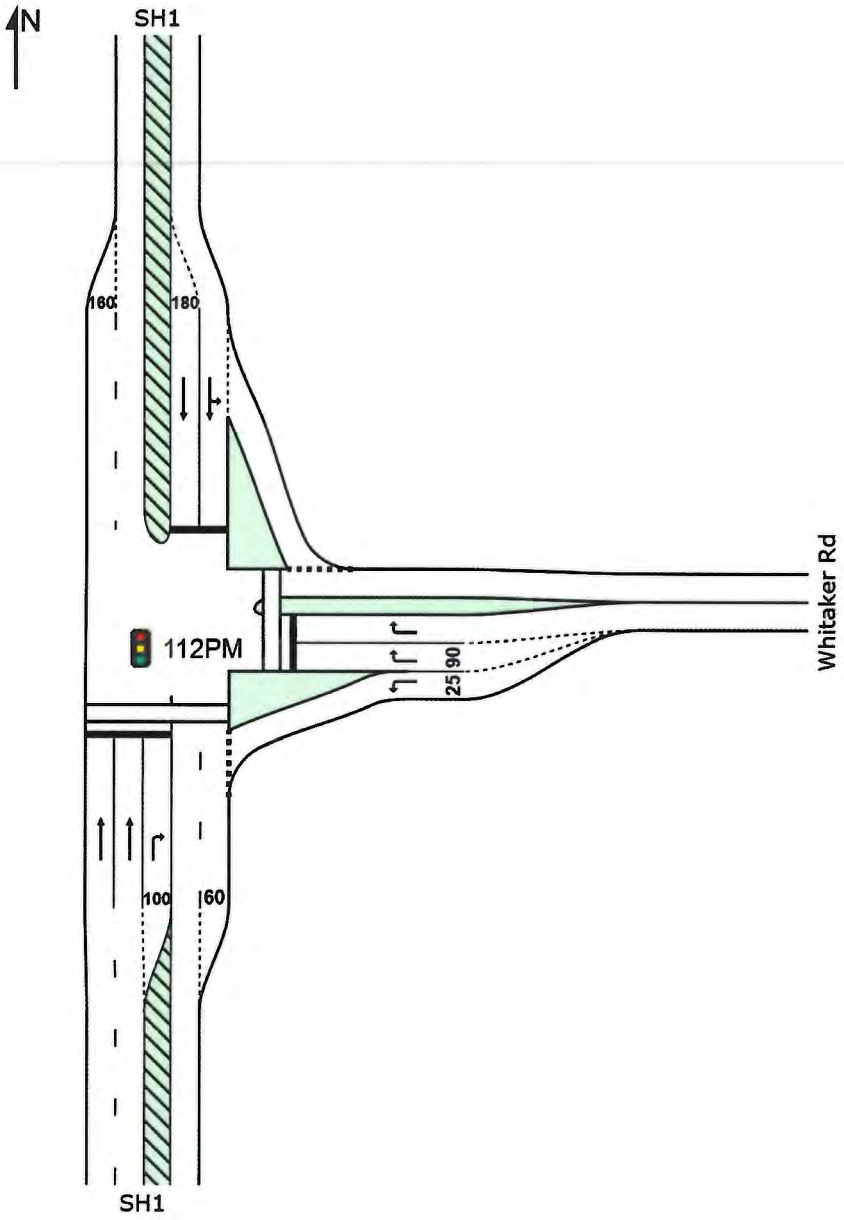
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	40.6	LOS E	0.1	0.1	0.90	0.90
All Pedestrians		105	42.4	LOS E			0.92	0.92

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 112PM [112 SH1/ Whitaker]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



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MOVEMENT SUMMARY

Site: 112PM [112 SH1/ Whitaker]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SH1											
2	T1	464	17.9	0.209	6.2	LOS A	4.4	35.9	0.39	0.34	54.4
3	R2	558	3.4	0.879	48.5	LOS D	29.9	215.5	0.99	0.97	33.0
Approach		1022	10.0	0.879	29.3	LOS C	29.9	215.5	0.72	0.68	40.2
East: Whitaker Rd											
4	L2	445	5.9	0.381	12.8	LOS B	7.8	57.3	0.49	0.74	48.9
6	R2	480	5.7	0.747	45.9	LOS D	14.2	104.1	0.96	0.85	33.5
Approach		925	5.8	0.747	30.0	LOS C	14.2	104.1	0.73	0.80	39.5
North: SH1											
7	L2	360	8.8	0.355	15.3	LOS B	7.9	59.8	0.56	0.75	47.3
8	T1	419	15.8	0.878	48.8	LOS D	23.1	183.9	1.00	1.05	33.3
Approach		779	12.6	0.878	33.3	LOS C	23.1	183.9	0.80	0.91	38.6
All Vehicles		2726	9.3	0.879	30.7	LOS C	29.9	215.5	0.75	0.79	39.5

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

Movement Performance - Pedestrians

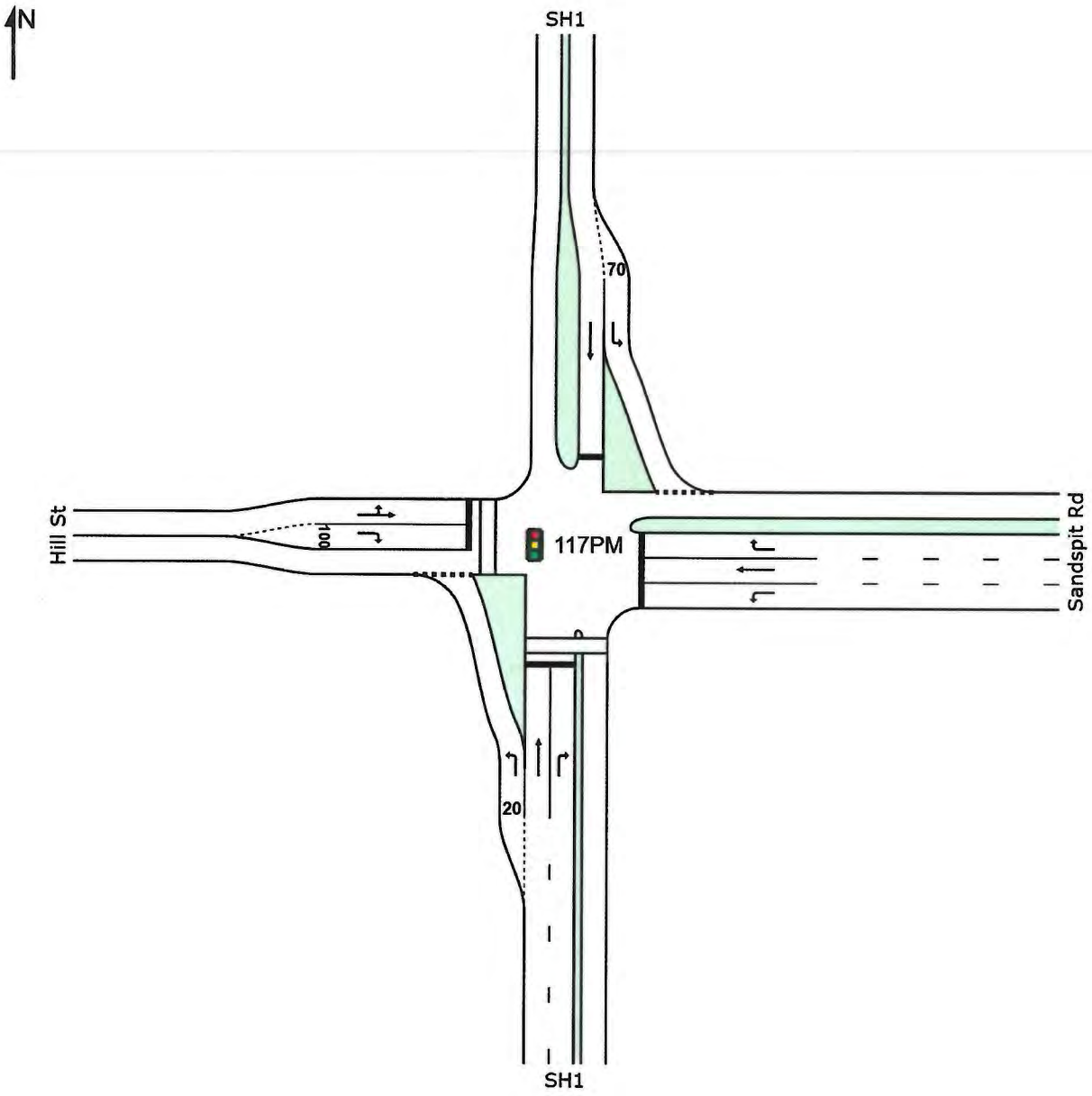
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	41.5	LOS E	0.1	0.1	0.91	0.91
P2	East Full Crossing	53	33.7	LOS D	0.1	0.1	0.82	0.82
All Pedestrians		105	37.6	LOS D			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 117PM [117 SH1/ Hill/ Sandspit]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 117PM [117 SH1/ Hill/ Sandspit]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SH1											
1	L2	36	5.9	0.025	7.4	LOS A	0.3	2.5	0.21	0.59	52.6
2	T1	245	23.2	0.258	10.9	LOS B	6.3	53.0	0.48	0.41	50.9
3	R2	626	8.1	0.892	37.8	LOS D	28.1	210.2	1.00	0.96	36.3
Approach		907	12.1	0.892	29.3	LOS C	28.1	210.2	0.83	0.80	39.9
East: Sandspit Rd											
4	L2	495	13.2	0.500	13.8	LOS B	9.3	72.4	0.63	0.77	47.5
5	T1	206	5.6	0.822	61.1	LOS E	12.9	94.6	1.00	0.94	30.0
6	R2	209	8.5	0.897	74.8	LOS E	14.2	106.6	1.00	0.97	26.4
Approach		911	10.4	0.897	38.6	LOS D	14.2	106.6	0.80	0.85	36.1
North: SH1											
7	L2	395	4.0	0.477	23.7	LOS C	13.9	100.9	0.71	0.78	42.7
8	T1	185	18.2	0.911	72.3	LOS E	12.8	103.4	1.00	1.06	27.5
Approach		580	8.5	0.911	39.2	LOS D	13.9	103.4	0.81	0.87	36.3
West: Hill St											
10	L2	1	0.0	0.849	71.3	LOS E	10.4	75.0	1.00	0.96	28.5
11	T1	161	3.3	0.849	65.7	LOS E	10.4	75.0	1.00	0.96	28.9
12	R2	87	4.8	0.487	62.9	LOS E	5.0	36.7	0.99	0.78	29.1
Approach		249	3.8	0.849	64.8	LOS E	10.4	75.0	1.00	0.89	29.0
All Vehicles		2647	9.9	0.911	38.0	LOS D	28.1	210.2	0.83	0.84	36.5

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

Movement Performance - Pedestrians

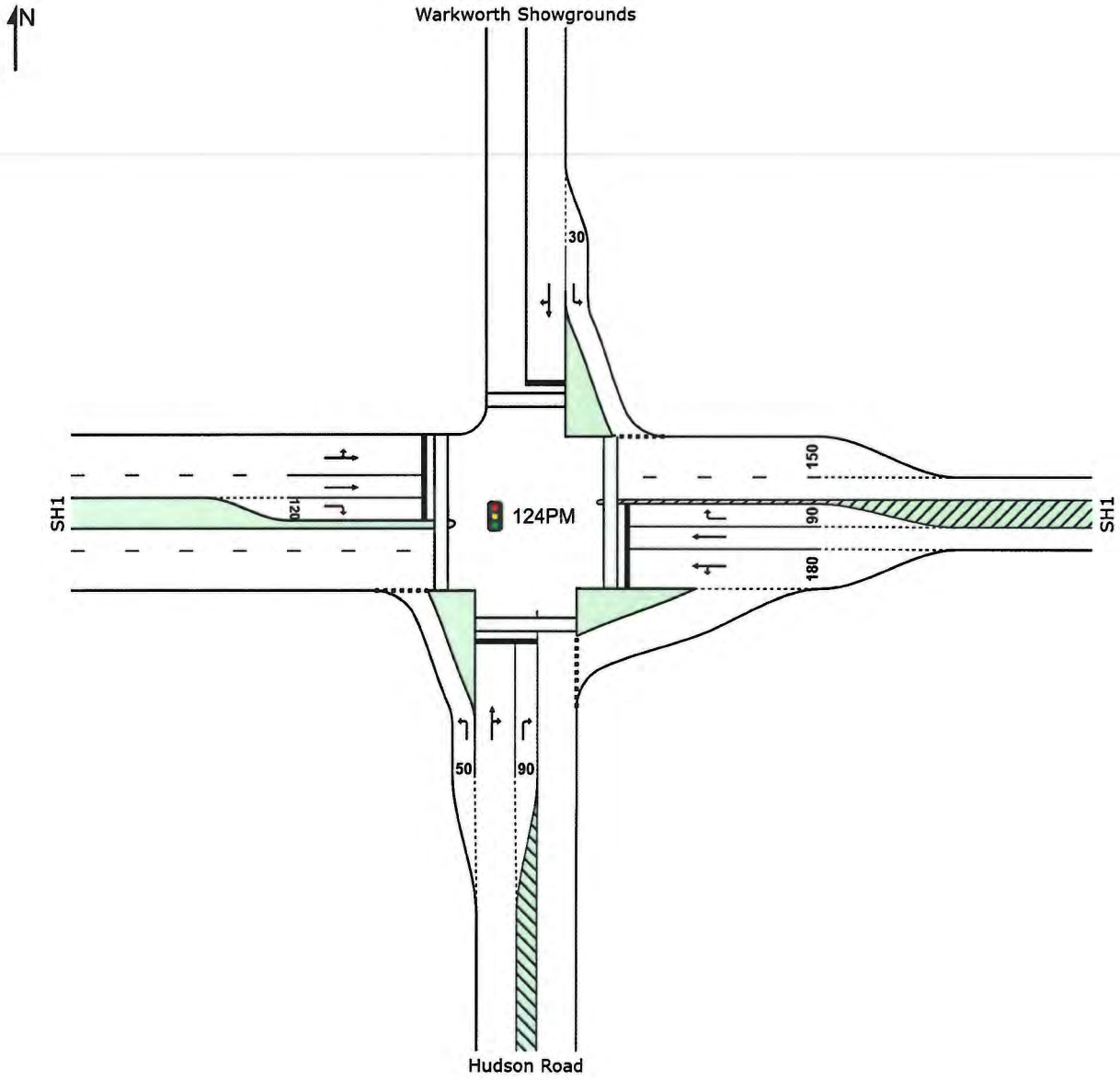
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	52.4	LOS E	0.2	0.2	0.94	0.94
P4	West Full Crossing	53	23.5	LOS C	0.1	0.1	0.63	0.63
All Pedestrians		105	37.9	LOS D			0.78	0.78

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 124PM [124 SH1/ Hudson/ Showgrounds]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



Organisation: COMMUTE TRANSPORTATION | Created: Tuesday, 22 January 2019 4:08:51 PM
Project: C:\Users\Modelling\COMMUTE TRANSPORTATON CONSULTANTS LTD\Projects 800 - Documents\J00829 Supporting Growth IPAA \ITAs\Warkworth\Traffic Modelling\SIDRA\Final ITA\Warkworth PM 2046 Full Build Out v3b.sip7

MOVEMENT SUMMARY

Site: 124PM [124 SH1/ Hudson/ Showgrounds]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hudson Road											
1	L2	39	16.2	0.038	10.5	LOS B	0.6	4.4	0.39	0.63	50.2
2	T1	3	33.3	0.178	38.8	LOS D	2.5	18.3	0.89	0.74	34.9
3	R2	120	3.5	0.208	44.7	LOS D	2.7	19.7	0.90	0.74	34.5
Approach		162	7.1	0.208	36.3	LOS D	2.7	19.7	0.77	0.71	37.3
East: SH1											
4	L2	8	25.0	0.586	42.5	LOS D	11.6	93.3	0.94	0.80	36.7
5	T1	507	17.4	0.586	36.7	LOS D	11.6	93.3	0.94	0.80	37.5
6	R2	8	12.5	0.082	56.3	LOS E	0.4	3.2	0.97	0.66	31.0
Approach		524	17.5	0.586	37.1	LOS D	11.6	93.3	0.94	0.79	37.3
North: Warkworth Showgrounds											
7	L2	9	11.1	0.010	8.4	LOS A	0.1	0.7	0.30	0.59	51.8
8	T1	4	25.0	0.028	37.4	LOS D	0.3	2.9	0.86	0.62	36.3
9	R2	4	25.0	0.028	43.3	LOS D	0.3	2.9	0.86	0.62	35.6
Approach		18	17.6	0.028	23.4	LOS C	0.3	2.9	0.56	0.61	42.9
West: SH1											
10	L2	4	25.0	0.376	28.5	LOS C	10.4	77.5	0.75	0.65	42.2
11	T1	631	7.5	0.446	23.1	LOS C	11.8	87.8	0.77	0.66	43.6
12	R2	221	7.1	0.569	43.9	LOS D	9.8	72.9	0.94	0.82	34.8
Approach		856	7.5	0.569	28.5	LOS C	11.8	87.8	0.81	0.70	40.9
All Vehicles		1560	10.9	0.586	32.2	LOS C	11.8	93.3	0.85	0.73	39.3

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

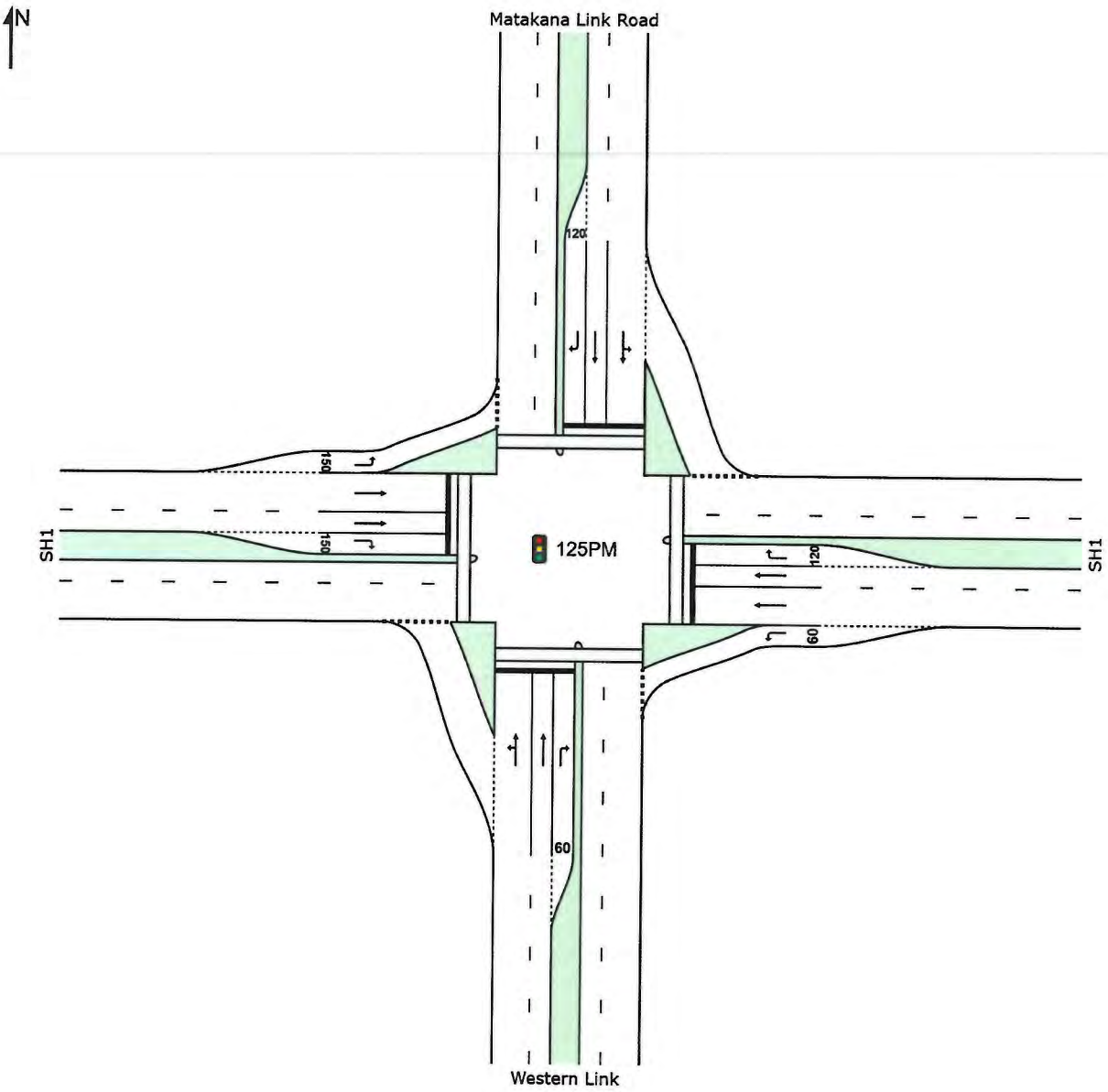
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	38.8	LOS D	0.1	0.1	0.88	0.88
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	23.9	LOS C	0.1	0.1	0.69	0.69
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		211	37.8	LOS D			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 125PM [125 SH1/ Western Link/ MLR]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



Organisation: COMMUTE TRANSPORTATION | Created: Tuesday, 22 January 2019 4:08:40 PM
Project: C:\Users\Modelling\COMMUTE TRANSPORTATON CONSULTANTS LTD\Projects 800 - Documents\J00829 Supporting Growth IPAA \ITAs\Warkworth\Traffic Modelling\SIDRA\Final ITA\Warkworth PM 2046 Full Build Out v3b.sip7

MOVEMENT SUMMARY

Site: 125PM [125 SH1/ Western Link/ MLR]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Western Link											
1	L2	535	10.2	0.726	22.7	LOS C	19.9	149.7	0.84	0.91	43.9
2	T1	392	3.8	0.726	33.8	LOS C	19.9	149.7	0.94	0.89	38.1
3	R2	83	2.5	0.217	41.3	LOS D	3.4	24.3	0.87	0.75	35.8
Approach		1009	7.1	0.726	28.5	LOS C	19.9	149.7	0.88	0.89	40.7
East: SH1											
4	L2	34	6.3	0.033	11.2	LOS B	0.5	4.0	0.38	0.63	49.9
5	T1	198	23.4	0.329	40.3	LOS D	4.5	38.1	0.92	0.73	36.3
6	R2	237	11.6	0.552	41.5	LOS D	10.2	78.7	0.92	0.82	35.5
Approach		468	16.2	0.552	38.8	LOS D	10.2	78.7	0.88	0.77	36.6
North: Matakana Link Road											
7	L2	307	6.8	0.717	25.7	LOS C	12.6	92.6	0.92	0.89	42.8
8	T1	425	3.2	0.717	33.6	LOS C	12.6	92.6	0.96	0.88	38.2
9	R2	308	4.8	0.818	52.2	LOS D	15.9	115.9	1.00	0.94	32.4
Approach		1041	4.8	0.818	36.8	LOS D	15.9	115.9	0.96	0.90	37.4
West: SH1											
10	L2	629	3.7	0.600	17.5	LOS B	16.8	121.5	0.69	0.83	46.1
11	T1	264	14.7	0.418	40.9	LOS D	6.1	48.4	0.94	0.75	36.0
12	R2	356	10.7	0.824	50.3	LOS D	18.3	139.9	1.00	0.94	32.8
Approach		1249	8.0	0.824	31.8	LOS C	18.3	139.9	0.83	0.85	39.2
All Vehicles		3768	7.9	0.824	33.2	LOS C	19.9	149.7	0.89	0.86	38.7

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

Movement Performance - Pedestrians

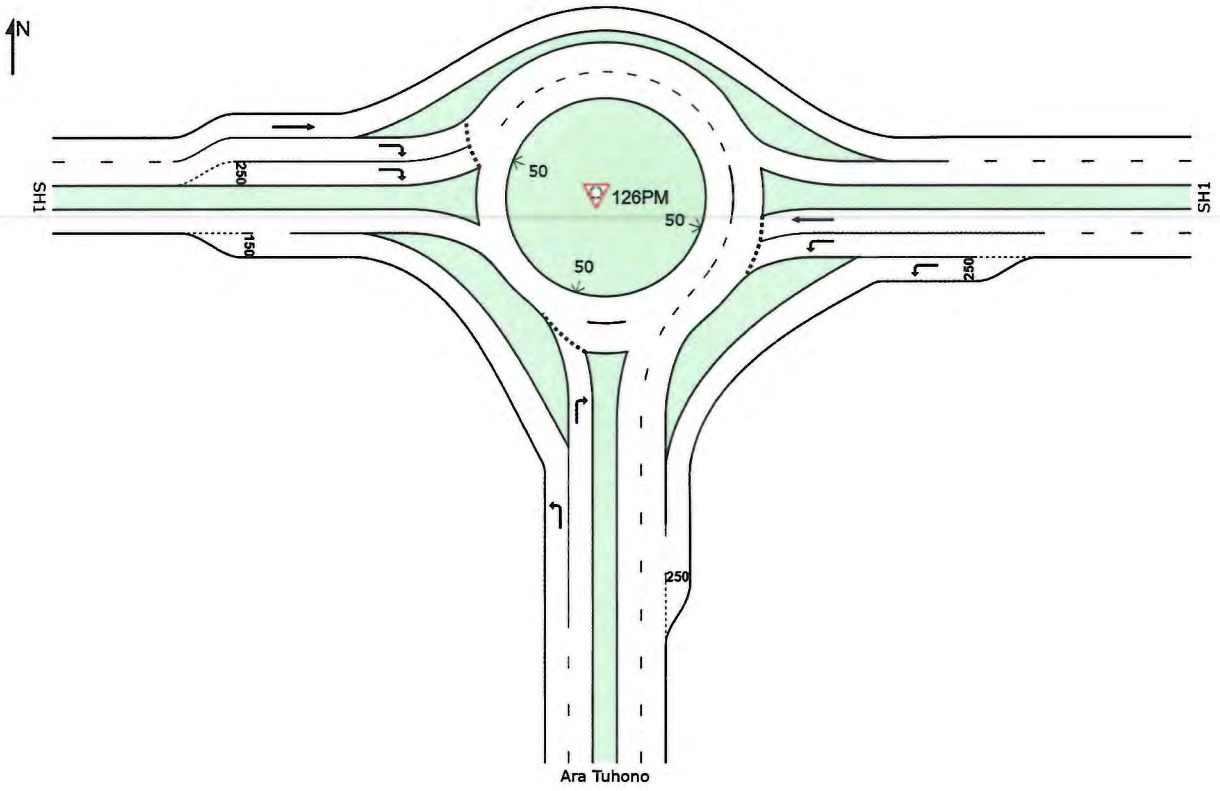
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		211	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 126PM [126 Ara Tuhono/ SH1]

2046 PM Peak Hour - Full Build Out
Roundabout



Organisation: COMMUTE TRANSPORTATION | Created: Tuesday, 22 January 2019 4:08:37 PM
Project: C:\Users\Modelling\COMMUTE TRANSPORTATON CONSULTANTS LTD\Projects 800 - Documents\J00829 Supporting Growth IPAA \ITAs\Warkworth\Traffic Modelling\SIDRA\Final ITA\Warkworth PM 2046 Full Build Out v3b.sip7

MOVEMENT SUMMARY

Site: 126PM [126 Ara Tuhono/ SH1]

2046 PM Peak Hour - Full Build Out
Roundabout

Movement Performance - Vehicles

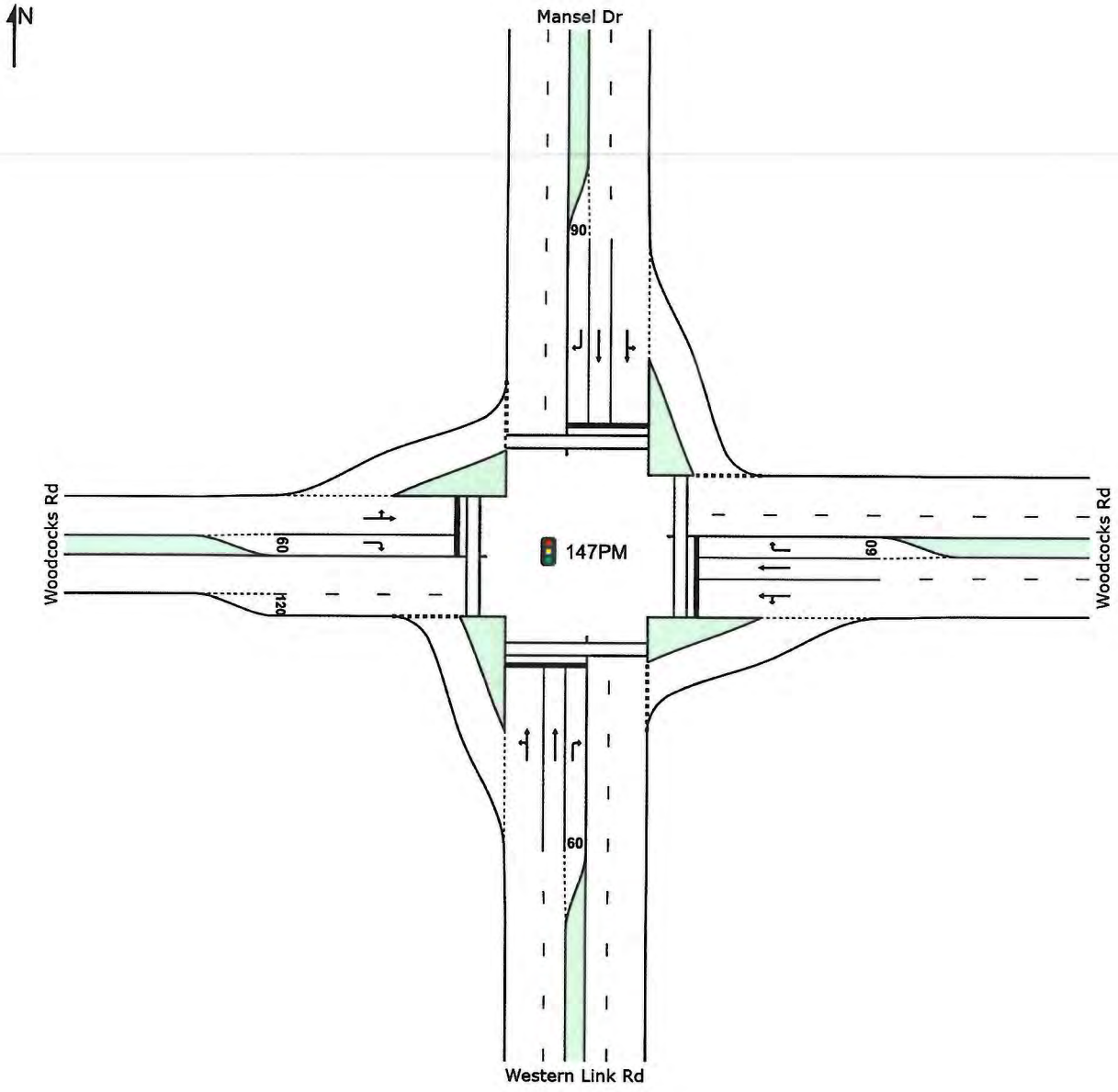
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ara Tuhono											
1	L2	872	1.3	0.457	2.5	LOS A	0.0	0.0	0.00	0.32	58.5
3	R2	707	1.5	0.706	16.3	LOS B	8.9	62.9	0.96	1.02	51.5
Approach		1579	1.4	0.706	8.7	LOS A	8.9	62.9	0.43	0.63	55.0
East: SH1											
4	L2	449	5.9	0.155	3.2	LOS A	0.9	6.4	0.25	0.40	57.2
5	T1	598	17.3	0.504	4.4	LOS A	3.8	30.3	0.80	0.48	56.0
Approach		1047	12.4	0.504	3.9	LOS A	3.8	30.3	0.56	0.45	56.5
West: SH1											
11	T1	527	16.8	0.289	2.3	LOS A	0.0	0.0	0.00	0.22	61.3
12	R2	884	2.3	0.483	13.7	LOS B	4.9	35.0	0.96	0.86	52.4
Approach		1412	7.7	0.483	9.4	LOS A	4.9	35.0	0.60	0.62	55.3
All Vehicles		4038	6.4	0.706	7.7	LOS A	8.9	62.9	0.52	0.58	55.5

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

SITE LAYOUT

Site: 147PM [147 Woodcocks/ Western Link/ Mansel]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 147PM [147 Woodcocks/ Western Link/ Mansel]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Western Link Rd											
1	L2	62	1.7	0.786	45.8	LOS D	18.5	134.8	0.99	0.99	31.9
2	T1	677	5.3	0.786	42.0	LOS D	18.5	134.8	0.99	0.97	31.8
3	R2	29	25.0	0.117	44.3	LOS D	1.3	10.7	0.89	0.71	31.3
Approach		768	5.8	0.786	42.4	LOS D	18.5	134.8	0.99	0.96	31.8
East: Woodcocks Rd											
4	L2	45	14.0	0.217	23.3	LOS C	4.2	31.1	0.72	0.67	39.4
5	T1	299	5.6	0.310	24.3	LOS C	6.9	50.5	0.77	0.67	37.4
6	R2	109	24.0	0.767	58.7	LOS E	5.8	49.1	1.00	0.92	27.9
Approach		454	10.9	0.767	32.5	LOS C	6.9	50.5	0.82	0.73	34.7
North: Mansel Dr											
7	L2	198	16.0	0.752	38.3	LOS D	16.7	127.7	0.95	1.02	33.7
8	T1	587	6.8	0.752	37.9	LOS D	16.7	127.7	0.97	0.96	32.8
9	R2	226	3.7	0.782	52.7	LOS D	11.6	83.5	1.00	0.91	29.1
Approach		1012	7.9	0.782	41.3	LOS D	16.7	127.7	0.98	0.96	32.1
West: Woodcocks Rd											
10	L2	359	3.2	0.687	25.5	LOS C	17.3	125.8	0.84	0.93	38.0
11	T1	274	5.4	0.687	21.0	LOS C	17.3	125.8	0.84	0.93	37.9
12	R2	51	2.1	0.307	52.6	LOS D	2.4	17.3	0.97	0.74	29.3
Approach		683	4.0	0.687	25.7	LOS C	17.3	125.8	0.85	0.92	37.1
All Vehicles		2917	6.9	0.786	36.6	LOS D	18.5	134.8	0.93	0.91	33.4

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

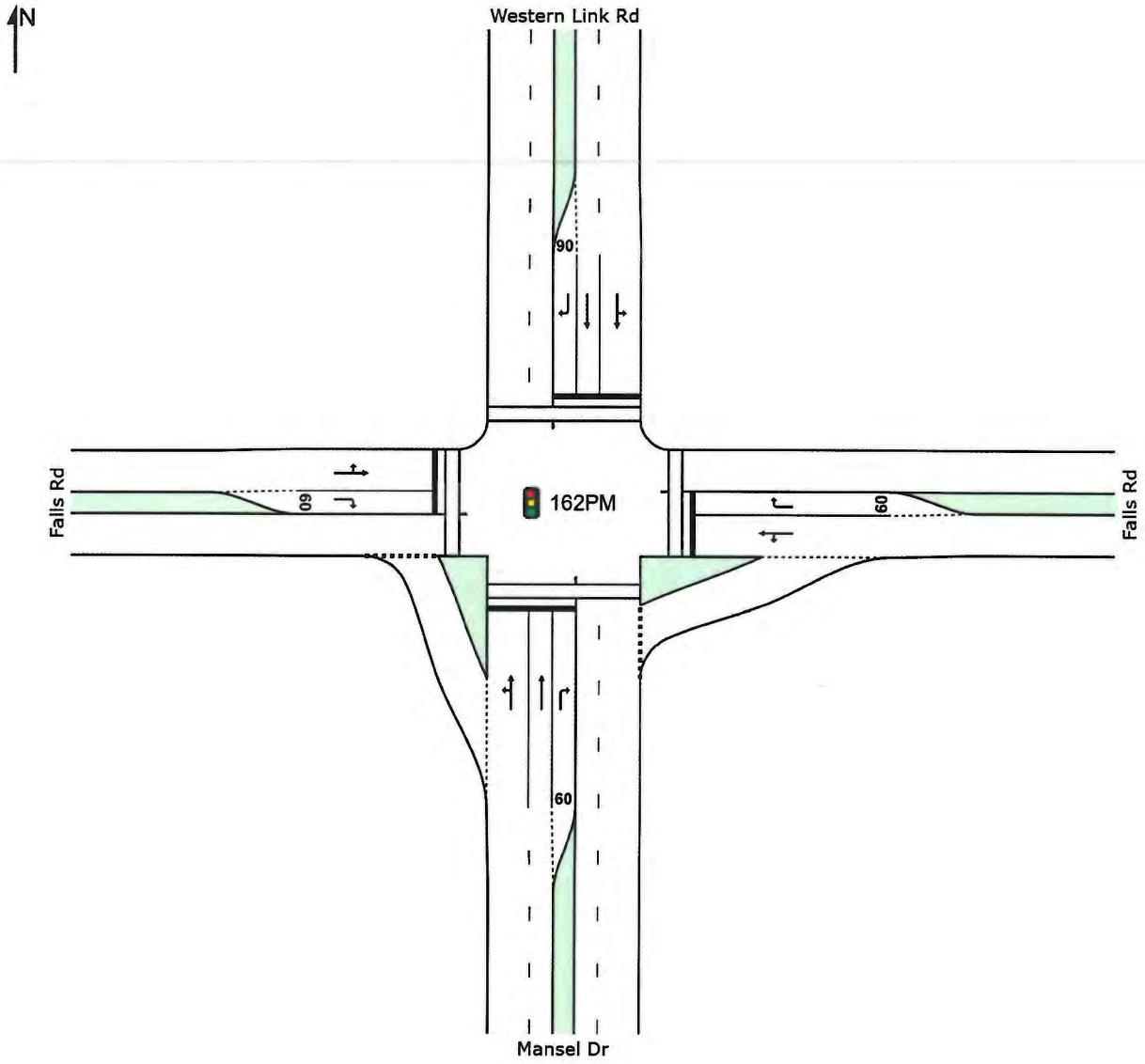
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	36.2	LOS D	0.1	0.1	0.85	0.85
P2	East Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	36.2	LOS D	0.1	0.1	0.85	0.85
P4	West Full Crossing	53	41.5	LOS E	0.1	0.1	0.91	0.91
All Pedestrians		211	39.5	LOS D			0.89	0.89

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 162PM [162 Falls/ Western Link/ Mansel]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



Organisation: COMMUTE TRANSPORTATION | Created: Tuesday, 22 January 2019 4:08:49 PM
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MOVEMENT SUMMARY

Site: 162PM [162 Falls/ Western Link/ Mansel]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mansel Dr											
1	L2	180	1.2	0.624	30.8	LOS C	17.4	127.1	0.84	0.90	36.3
2	T1	732	7.5	0.624	27.1	LOS C	17.4	127.1	0.85	0.82	36.2
3	R2	238	5.3	0.554	41.0	LOS D	10.3	75.7	0.93	0.81	32.2
Approach		1149	6.0	0.624	30.6	LOS C	17.4	127.1	0.87	0.83	35.3
East: Falls Rd											
4	L2	247	10.2	0.448	17.5	LOS B	9.7	72.0	0.74	0.73	41.1
5	T1	111	1.0	0.448	13.0	LOS B	9.7	72.0	0.74	0.73	41.1
6	R2	28	7.4	0.134	48.2	LOS D	1.3	9.5	0.93	0.71	30.3
Approach		386	7.4	0.448	18.5	LOS B	9.7	72.0	0.76	0.73	40.0
North: Western Link Rd											
7	L2	6	16.7	0.538	38.5	LOS D	12.2	92.2	0.91	0.77	33.8
8	T1	554	8.6	0.538	33.9	LOS C	12.2	92.2	0.91	0.77	34.2
9	R2	168	0.6	0.607	48.8	LOS D	8.0	56.0	0.98	0.81	30.1
Approach		728	6.8	0.607	37.4	LOS D	12.2	92.2	0.93	0.78	33.1
West: Falls Rd											
10	L2	129	1.6	0.629	49.0	LOS D	8.9	63.0	0.99	0.82	30.1
11	T1	58	1.8	0.629	44.4	LOS D	8.9	63.0	0.99	0.82	30.3
12	R2	136	1.6	0.616	51.8	LOS D	6.6	46.9	1.00	0.81	29.4
Approach		323	1.6	0.629	49.4	LOS D	8.9	63.0	0.99	0.82	29.9
All Vehicles		2587	5.9	0.629	33.0	LOS C	17.4	127.1	0.88	0.80	34.5

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

Movement Performance - Pedestrians

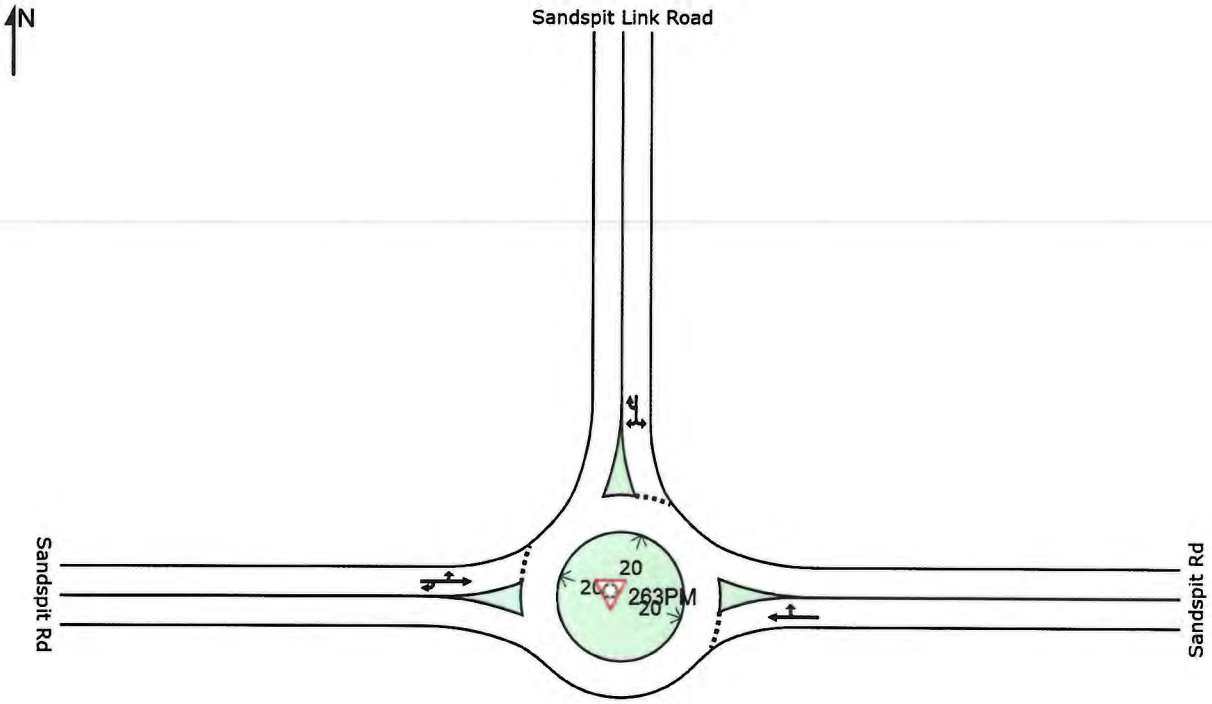
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	36.2	LOS D	0.1	0.1	0.85	0.85
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	28.9	LOS C	0.1	0.1	0.76	0.76
All Pedestrians		211	38.4	LOS D			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SITE LAYOUT

Site: 263PM [263 Sandspit/ SLR]

2046 PM Peak Hour - Full Build Out
Roundabout



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MOVEMENT SUMMARY

Site: 263PM [263 Sandspit/ SLR]

2046 PM Peak Hour - Full Build Out
Roundabout

Movement Performance - Vehicles

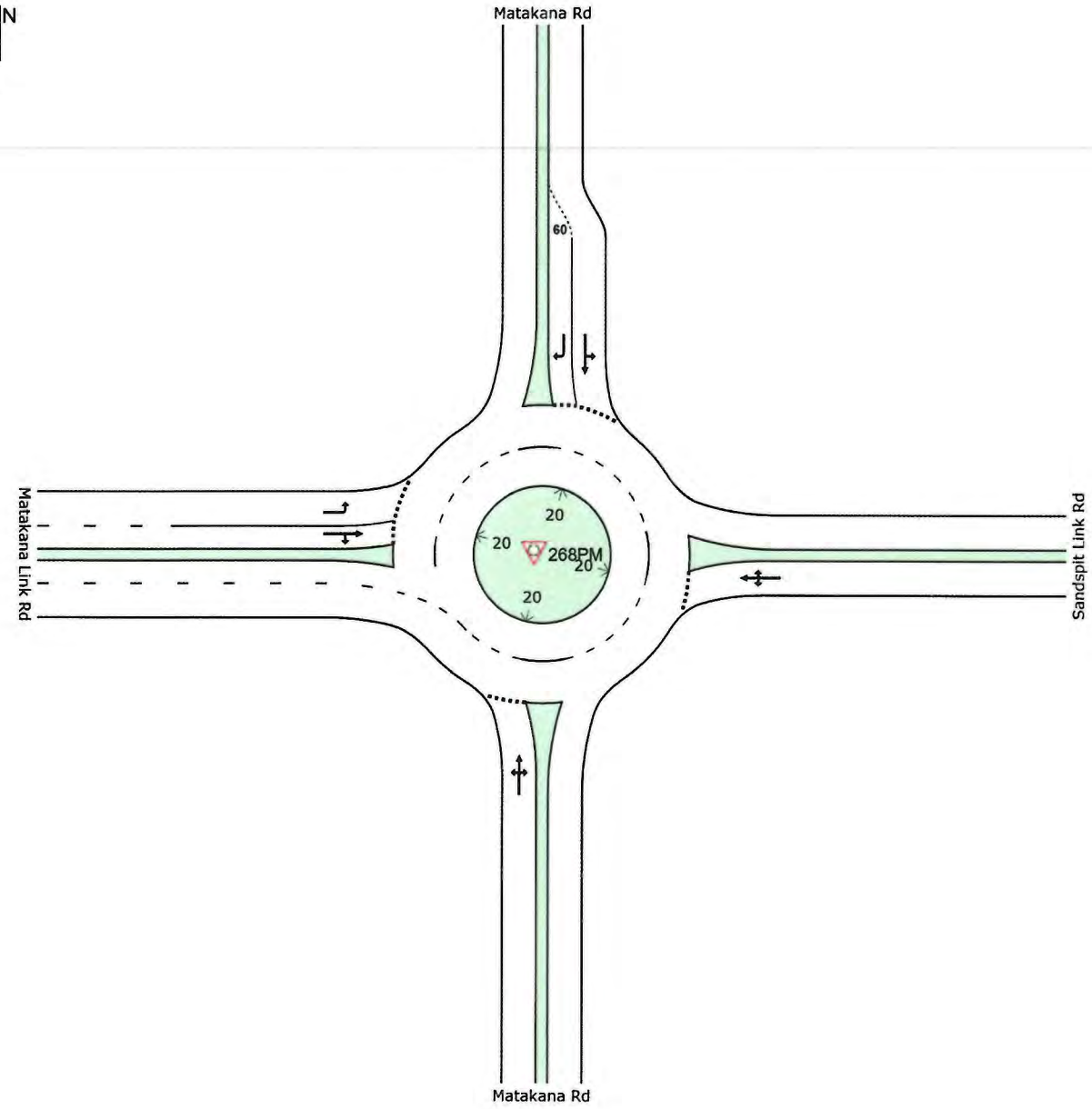
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
East: Sandspit Rd											
5	T1	320	12.5	0.402	3.9	LOS A	3.3	25.6	0.33	0.48	48.6
6	R2	219	15.9	0.402	8.5	LOS A	3.3	25.6	0.33	0.48	51.5
Approach		539	13.9	0.402	5.8	LOS A	3.3	25.6	0.33	0.48	49.7
North: Sandspit Link Road											
7	L2	320	4.3	0.451	7.6	LOS A	3.3	24.5	0.77	0.81	51.9
9	R2	3	33.3	0.451	13.7	LOS B	3.3	24.5	0.77	0.81	51.9
9u	U	58	18.2	0.451	15.1	LOS B	3.3	24.5	0.77	0.81	53.4
Approach		381	6.6	0.451	8.8	LOS A	3.3	24.5	0.77	0.81	52.1
West: Sandspit Rd											
10	L2	1	0.0	0.462	4.9	LOS A	3.3	23.8	0.60	0.56	49.2
11	T1	493	5.3	0.462	5.0	LOS A	3.3	23.8	0.60	0.56	47.1
12u	U	3	0.0	0.462	11.2	LOS B	3.3	23.8	0.60	0.56	51.1
Approach		497	5.3	0.462	5.0	LOS A	3.3	23.8	0.60	0.56	47.1
All Vehicles		1417	8.9	0.462	6.3	LOS A	3.3	25.6	0.54	0.60	49.4

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

SITE LAYOUT

Site: 268PM [268 Matakana/ MLR/ SLR]

2046 PM Peak Hour - Full Build Out
Roundabout



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MOVEMENT SUMMARY

Site: 268PM [268 Matakana/ MLR/ SLR]

2046 PM Peak Hour - Full Build Out
Roundabout

Movement Performance - Vehicles

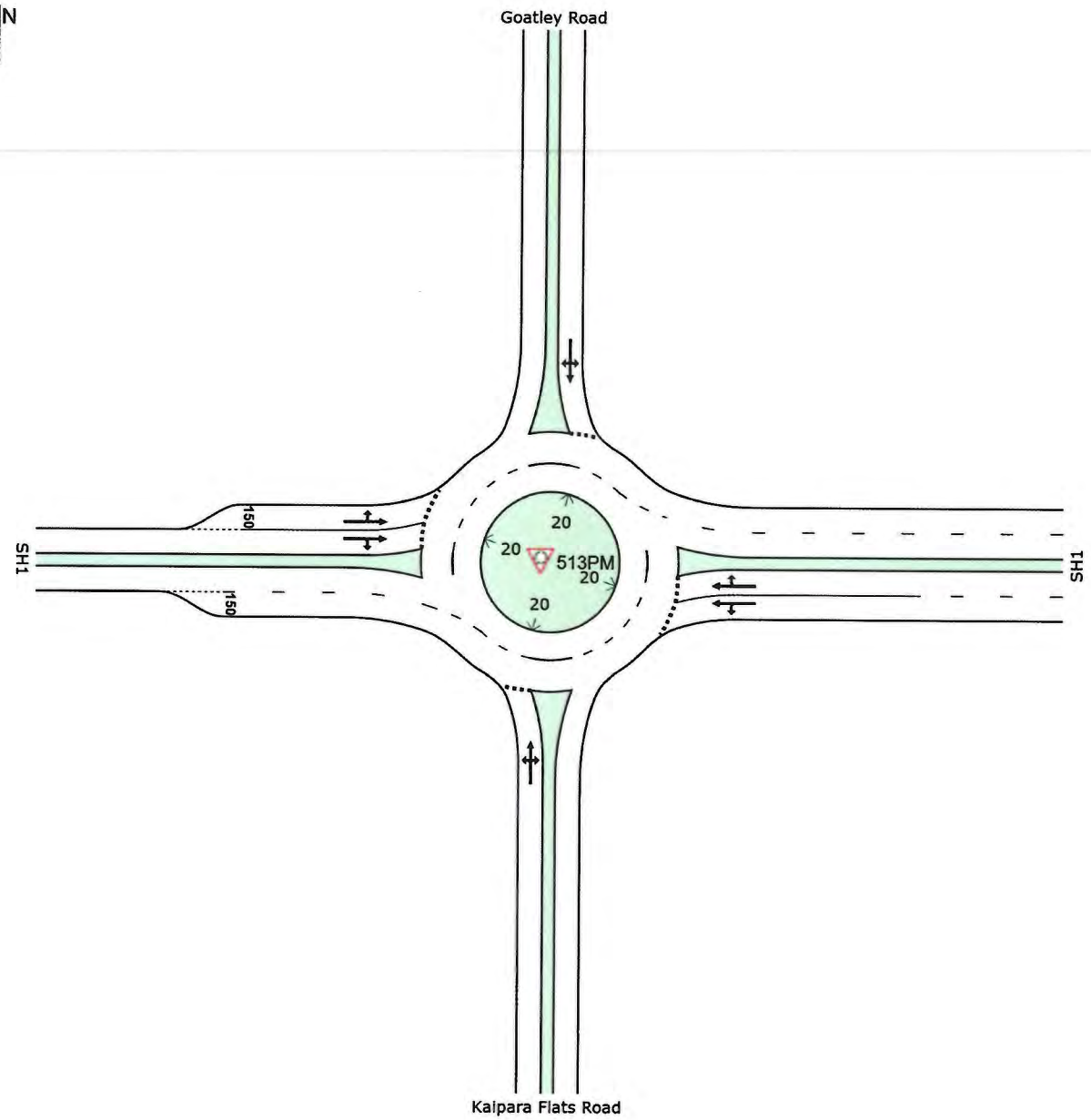
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Matakana Rd											
1	L2	139	6.1	0.355	4.6	LOS A	1.6	12.0	0.48	0.57	46.5
2	T1	167	13.2	0.355	4.5	LOS A	1.6	12.0	0.48	0.57	47.9
3	R2	44	0.0	0.355	9.0	LOS A	1.6	12.0	0.48	0.57	48.1
Approach		351	8.7	0.355	5.1	LOS A	1.6	12.0	0.48	0.57	47.4
East: Sandspit Link Rd											
4	L2	65	1.6	0.403	5.4	LOS A	1.9	14.8	0.60	0.68	46.2
5	T1	244	22.0	0.403	5.7	LOS A	1.9	14.8	0.60	0.68	47.5
6	R2	20	0.0	0.403	9.9	LOS A	1.9	14.8	0.60	0.68	47.8
Approach		329	16.6	0.403	5.9	LOS A	1.9	14.8	0.60	0.68	47.2
North: Matakana Rd											
7	L2	40	39.5	0.369	7.6	LOS A	2.2	18.5	0.73	0.75	45.5
8	T1	260	21.5	0.369	6.7	LOS A	2.2	18.5	0.73	0.75	47.1
9	R2	163	0.0	0.220	11.1	LOS B	1.2	8.1	0.67	0.82	45.3
Approach		463	15.5	0.369	8.3	LOS A	2.2	18.5	0.71	0.77	46.3
West: Matakana Link Rd											
10	L2	377	6.4	0.354	4.2	LOS A	1.6	11.9	0.38	0.52	47.0
11	T1	431	3.7	0.548	3.7	LOS A	3.4	24.0	0.44	0.53	47.4
12	R2	324	0.0	0.548	8.3	LOS A	3.4	24.0	0.44	0.53	47.6
Approach		1132	3.5	0.548	5.2	LOS A	3.4	24.0	0.42	0.53	47.3
All Vehicles		2275	8.7	0.548	5.9	LOS A	3.4	24.0	0.52	0.60	47.1

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

SITE LAYOUT

Site: 513PM [513 SH1/ Goatley/ Kaipara Flats]

2046 PM Peak Hour - Full Build Out
Roundabout



MOVEMENT SUMMARY

Site: 513PM [513 SH1/ Goatley/ Kaipara Flats]

2046 PM Peak Hour - Full Build Out
Roundabout

Movement Performance - Vehicles

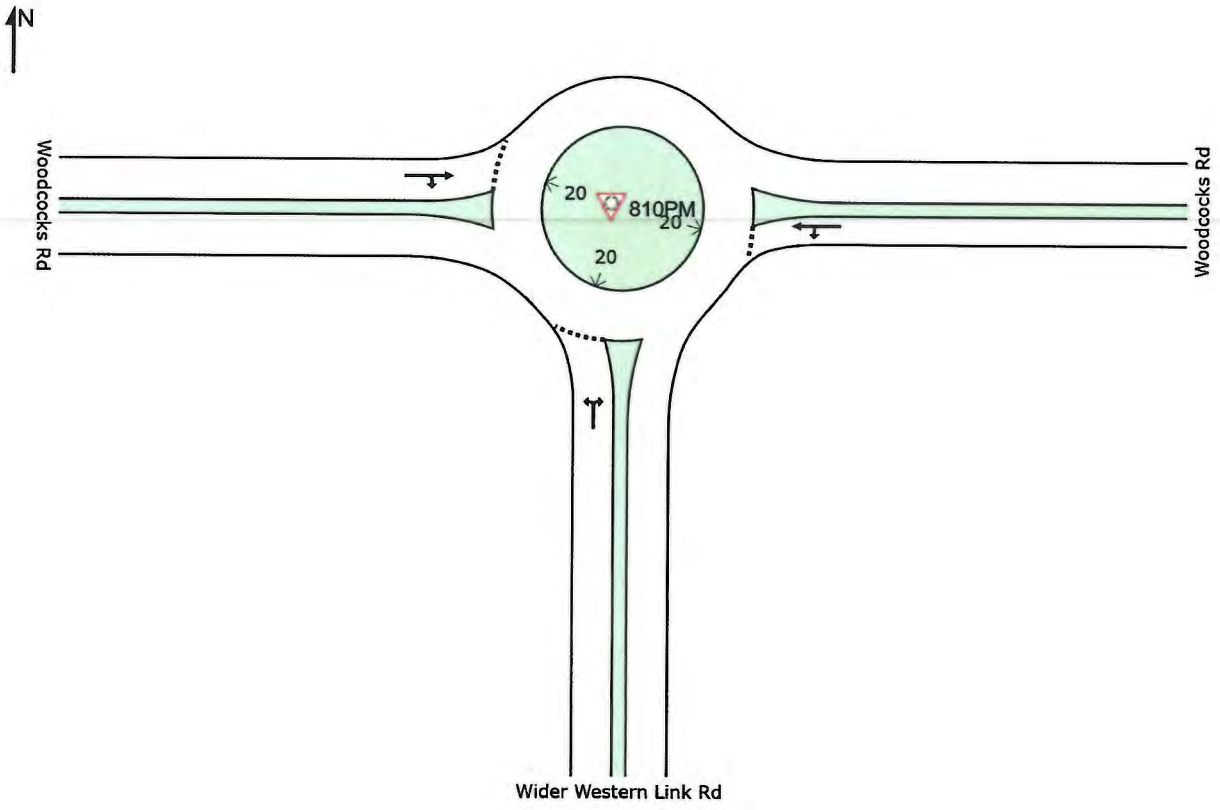
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Kaipara Flats Road											
1	L2	20	15.8	0.191	9.3	LOS A	0.8	6.9	0.77	0.89	43.1
2	T1	8	12.5	0.191	9.1	LOS A	0.8	6.9	0.77	0.89	44.1
3	R2	48	21.7	0.191	14.1	LOS B	0.8	6.9	0.77	0.89	44.1
Approach		77	19.2	0.191	12.3	LOS B	0.8	6.9	0.77	0.89	43.8
East: SH1											
4	L2	42	27.5	0.600	5.2	LOS A	4.7	35.2	0.59	0.50	45.9
5	T1	1320	6.8	0.646	4.4	LOS A	5.6	41.5	0.60	0.51	47.1
6	R2	107	12.7	0.646	9.0	LOS A	5.6	41.5	0.61	0.51	47.1
Approach		1469	7.8	0.646	4.7	LOS A	5.6	41.5	0.60	0.51	47.1
North: Goatley Road											
7	L2	109	14.4	0.500	10.3	LOS B	2.6	21.2	0.79	0.97	43.0
8	T1	44	16.7	0.500	10.4	LOS B	2.6	21.2	0.79	0.97	44.1
9	R2	85	32.1	0.500	15.9	LOS B	2.6	21.2	0.79	0.97	43.9
Approach		239	21.1	0.500	12.4	LOS B	2.6	21.2	0.79	0.97	43.5
West: SH1											
10	L2	18	70.6	0.542	5.3	LOS A	4.0	29.6	0.47	0.44	45.9
11	T1	1259	6.5	0.542	3.9	LOS A	4.0	29.6	0.48	0.45	47.6
12	R2	66	9.5	0.542	8.6	LOS A	3.9	28.9	0.48	0.47	47.6
Approach		1343	7.5	0.542	4.2	LOS A	4.0	29.6	0.48	0.45	47.6
All Vehicles		3128	9.0	0.646	5.2	LOS A	5.6	41.5	0.57	0.53	46.9

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

SITE LAYOUT

Site: 810PM [810 Woodcocks/ Wider Western Link]

2046 PM Peak Hour - Full Build Out
Roundabout



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MOVEMENT SUMMARY

Site: 810PM [810 Woodcocks/ Wider Western Link]

2046 PM Peak Hour - Full Build Out
Roundabout

Movement Performance - Vehicles

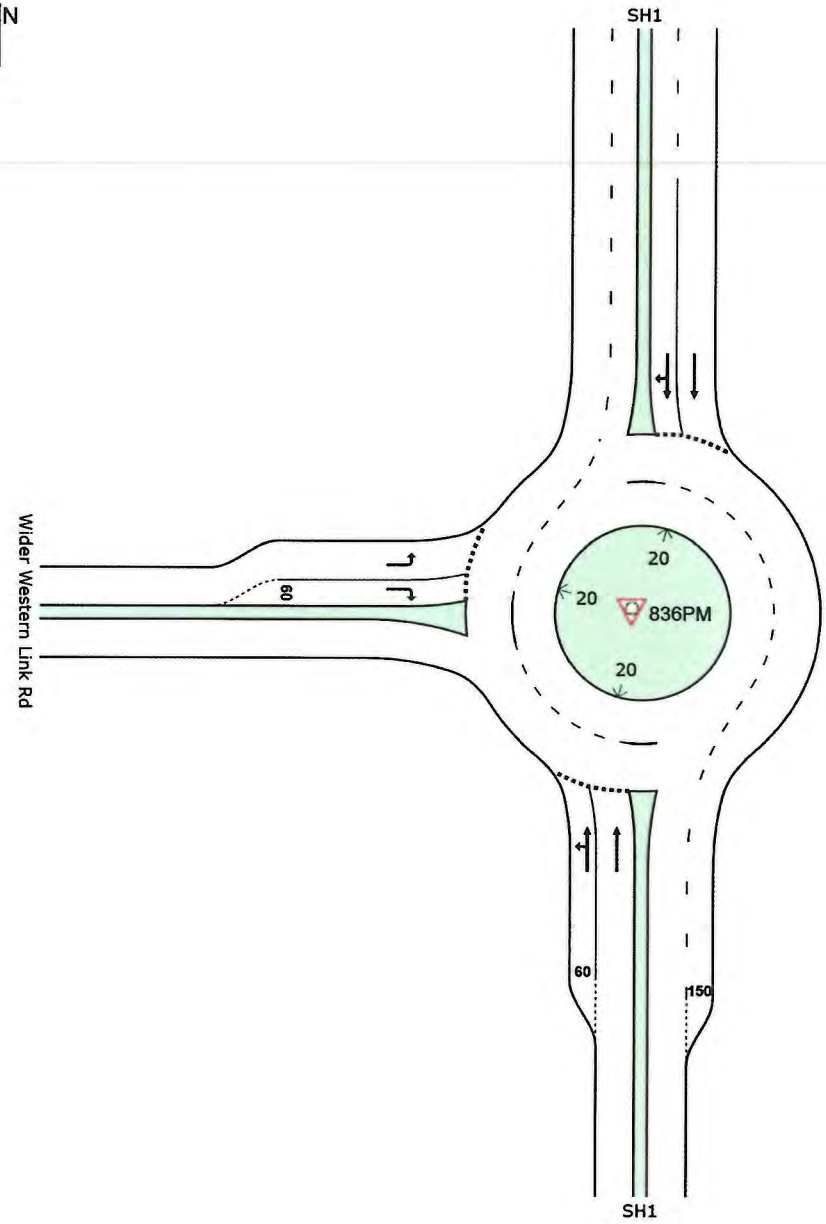
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wider Western Link Rd											
1	L2	111	7.6	0.450	3.5	LOS A	2.3	16.5	0.31	0.60	45.3
3	R2	506	2.5	0.450	7.8	LOS A	2.3	16.5	0.31	0.60	46.6
Approach		617	3.4	0.450	7.1	LOS A	2.3	16.5	0.31	0.60	46.3
East: Woodcocks Rd											
4	L2	291	3.6	0.349	3.7	LOS A	2.4	17.6	0.41	0.45	47.0
5	T1	154	6.8	0.349	3.7	LOS A	2.4	17.6	0.41	0.45	48.2
Approach		444	4.7	0.349	3.7	LOS A	2.4	17.6	0.41	0.45	47.4
West: Woodcocks Rd											
11	T1	147	7.9	0.274	4.6	LOS A	1.3	9.3	0.49	0.63	46.7
12	R2	146	4.3	0.274	9.0	LOS A	1.3	9.3	0.49	0.63	46.8
Approach		294	6.1	0.274	6.8	LOS A	1.3	9.3	0.49	0.63	46.7
All Vehicles		1355	4.4	0.450	5.9	LOS A	2.4	17.6	0.38	0.56	46.8

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

SITE LAYOUT

Site: 836PM [836 SH1/ Wider Western Link]

2046 PM Peak Hour - Full Build Out
Roundabout



MOVEMENT SUMMARY

Site: 836PM [836 SH1/ Wider Western Link]

2046 PM Peak Hour - Full Build Out
Roundabout

Movement Performance - Vehicles

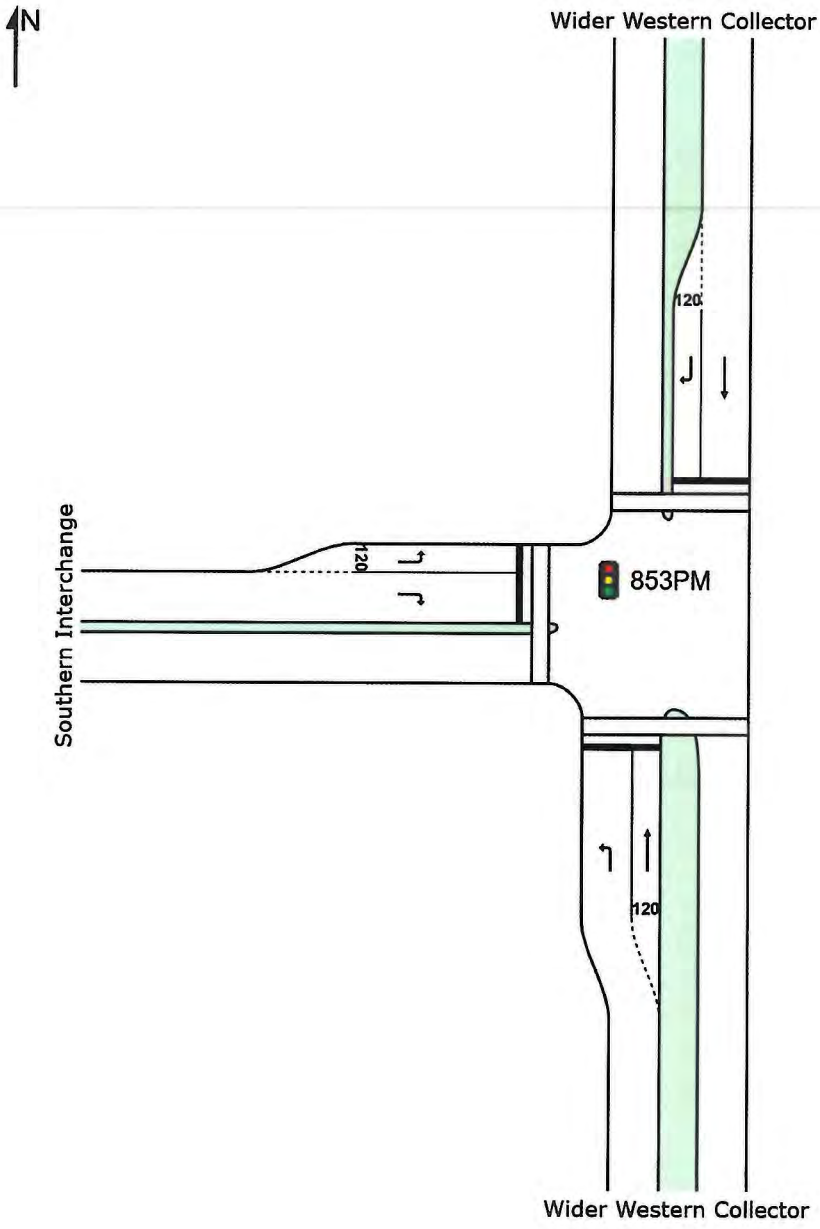
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: SH1											
1	L2	93	5.7	0.455	5.4	LOS A	2.5	18.1	0.56	0.58	46.0
2	T1	843	4.9	0.455	5.0	LOS A	2.5	18.1	0.56	0.59	47.2
Approach		936	4.9	0.455	5.1	LOS A	2.5	18.1	0.56	0.59	47.1
North: SH1											
8	T1	648	7.3	0.450	3.3	LOS A	2.5	18.7	0.29	0.41	47.8
9	R2	469	8.5	0.450	7.8	LOS A	2.5	18.7	0.30	0.56	46.6
Approach		1118	7.8	0.450	5.2	LOS A	2.5	18.7	0.29	0.47	47.3
West: Wider Western Link Rd											
10	L2	436	7.0	0.461	5.6	LOS A	2.2	16.5	0.62	0.77	46.1
12	R2	120	1.8	0.194	10.0	LOS A	0.7	4.6	0.54	0.83	45.3
Approach		556	5.9	0.461	6.5	LOS A	2.2	16.5	0.60	0.78	45.9
All Vehicles		2609	6.4	0.461	5.4	LOS A	2.5	18.7	0.46	0.58	46.9

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

SITE LAYOUT

Site: 853PM [853 Wider Western Collector/ Southern Interchange]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated



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MOVEMENT SUMMARY

Site: 853PM [853 Wider Western Collector/ Southern Interchange]

2046 PM Peak Hour - Full Build Out
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wider Western Collector											
1	L2	242	14.3	0.249	18.2	LOS B	6.3	49.7	0.58	0.71	39.6
2	T1	231	3.7	0.672	42.8	LOS D	10.9	78.6	0.99	0.84	31.6
Approach		473	9.1	0.672	30.2	LOS C	10.9	78.6	0.78	0.78	35.2
North: Wider Western Collector											
8	T1	279	2.3	0.404	14.9	LOS B	6.5	46.3	0.82	0.68	41.6
9	R2	183	4.6	0.679	50.3	LOS D	8.9	64.8	1.00	0.85	29.7
Approach		462	3.2	0.679	28.9	LOS C	8.9	64.8	0.89	0.75	35.9
West: Southern Interchange											
10	L2	355	5.6	0.397	21.3	LOS C	10.7	78.7	0.67	0.76	38.4
12	R2	373	9.6	0.657	37.7	LOS D	16.0	121.1	0.93	0.84	33.0
Approach		727	7.7	0.657	29.7	LOS C	16.0	121.1	0.80	0.80	35.4
All Vehicles		1662	6.8	0.679	29.6	LOS C	16.0	121.1	0.82	0.78	35.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	44.3	LOS E	0.1	0.1	0.94	0.94
PD	Diagonal Crossing	53	44.3	LOS E	0.1	0.0	0.94	0.94
All Pedestrians		211	44.3	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Attachment E – Transport Network Implementation Plan

Table 18: Transport Network Implementation Plan Stage 1 – Warkworth North

Land Use	Structure Plan Transport Network			
	Item	Network Role/ Mode		
		Road	PT	Active
Stage 1 2,100 dwellings • Includes Warkworth North development/ Stubbs Farm • New small centre near Woodcocks Road/ Falls Road intersection 1,500 jobs • New industrial land near Western Link Road (northern section) and SH1	**New** – Western Link Road (northern section) between SH1 and Falls Road (four-lane). Construction could be potentially staged so that two lanes are constructed initially.	✓	✓	✓
	New – Western Link Road (southern section) between Woodcocks Road and SH1 (four-lane). Construction could be potentially staged so that two lanes are constructed initially.	✓	✓	✓
	New – Western Link Road/ Falls Road Signalised Intersection	✓	✓	✓
	New – Western Link Road/ Woodcocks Road Signalised Intersection	✓	✓	✓
	New – SH1/ Western Link Road/ South-eastern Collector Signalised Intersection	✓	✓	✓
	New – Interim Northern Bus Station inc. Park and Ride		✓	
	New – Shared Path along Mahurangi River between SH1 and Mansel Drive			✓
	Upgrade – SH1/ Goatley Road intersection to roundabout	✓	✓	
	Upgrade – SH1/ Western Link Road/ Matakana Link Road signalised intersection (new southern leg) and to accommodate active modes	✓	✓	✓
	Upgrade – Mansel Drive between Falls Road and Woodcocks Road to urban arterial standard including footpaths and separated cycle facilities (four-lane). If sections of Western Link Road to the north and south of Mansel Drive are staged, four-laning of Mansel Drive could occur at a later time.	✓	✓	✓
	Upgrade – Increased bus frequencies (995) (depending on passenger demand).		✓	

Table 19: Transport Network Implementation Plan Stage 2 – Warkworth South

Land Use	Structure Plan Transport Network			
	Item	Network Role		
		Road	PT	Active
Stage 2 3,900 dwellings • New small centre on Wider Western Link Road • THAB zone adjacent to small centre 3,300 jobs • New industrial land at southern end of Western Link Road and to east of Puhoi to Warkworth motorway	**New** – Ara Tūhono Warkworth Southern Interchange (south facing ramps)	✓	✓	
	New – Wider Western Link Road between SH1 and Woodcocks Road (two-lane) inc. connection to Warkworth Southern Interchange	✓	✓	✓
	New – SH1/ Wider Western Link Road Roundabout	✓	✓	✓
	New – Wider Western Link Road/ Southern Interchange Signalised Intersection	✓	✓	✓
	New – Wider Western Link Road/ Woodcocks Road Roundabout	✓	✓	✓
	New – Park and Ride near Warkworth Southern Interchange		✓	
	New – Southern Bus Station within small centre (Warkworth South)		✓	
	New – Warkworth Loop Bus Route (999) connecting to new Southern Bus Station		✓	
	Upgrade – Existing SH1 between northern and southern extents of urban area to urban arterial standard including footpaths and separated cycle facilities (retain existing number of lanes however localised widening may be required at intersections. Four lanes may be required between Wider Western Link Road and Western Link Road. Includes facility on SH1 over Mahurangi River between Hill Street and Whitaker Road for active modes.	✓	✓	✓
	Upgrade – Woodcocks Road between SH1 and western extent of urban area to urban arterial standard including footpaths and separated cycle facilities (retain existing number of lanes however localised widening may be required at intersections)	✓	✓	✓
	Upgrade – SH1/ Hill Street Intersection (design subject to separate business case workstream)	✓	✓	✓
	Upgrade – Key collector road cycle improvements and upgrade to urban standard inc. Elizabeth Street, Whitaker Road, Hill Street/ Falls Road (between SH1 and Mansel Drive), McKinney Road (whole length), Wilson Road (between McKinney Road and Pulham Road), Pulham Road (whole length) and Alnwick Street (between Neville Street and Pulham Road inc gap connection for 999 bus route)	✓	✓	✓
	Upgrade – SH1/ McKinney Road Signalised Intersection	✓	✓	✓
	Upgrade – Extend and improve frequency of existing bus routes to new Southern Bus Station (996, 997 and 998) and shorten higher frequency bus route to only serve new Southern Bus Station (995)		✓	

Table 20: Transport Network Implementation Plan Stage 3 – Warkworth North-east

Land Use	Structure Plan Transport Network			
	Item	Role		
		Road	PT	Active
Stage 3 1,300 dwellings 600 jobs • New small centre near Matakana Road/ Matakana Link Road intersection	**New** – Sandspit Link Road between Matakana Road and Sandspit Road (two-lane)	✓	✓	✓
	New – Sandspit Road/ Sandspit Link Road Roundabout	✓	✓	✓
	Upgrade – Matakana Road between SH1 and northern extent of urban area to urban arterial standard including footpaths and separated cycle facilities (retain existing number of lanes however localised widening may be required at intersections)	✓	✓	✓
	Upgrade – Sandspit Road between SH1 and northern extent of urban area to urban arterial standard including footpaths and separated cycle facilities (retain existing number of lanes however localised widening may be required at intersections)	✓	✓	✓
	Upgrade – Matakana Road/ Matakana Link Road/ Sandspit Link Road intersection (new eastern leg)	✓	✓	✓

Supporting Growth

Warkworth Structure Plan

Integrated Transport Assessment Addendum

Version 1.2

4 July 2019

TE TUPU NGĀTAHI Supporting Growth

NZ TRANSPORT AGENCY WAKA KOTAHI

Document Status

Responsibility	Name
Author	Mike Nixon
Reviewer	
Approver	

Revision Status

Version	Date	Reason for Issue
1.2	4 July 2019	

Disclaimer

This is a draft document for review by specified persons at Auckland Transport and the New Zealand Transport Agency. This draft will subsequently be updated following consideration of the comments from the persons at Auckland Transport and the New Zealand Transport Agency. This document is therefore still in a draft form and is subject to change. The document should not be disclosed in response to requests under the Official Information Act 1982 or Local Government Official Information and Meetings Act 1987 without seeking legal advice.

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Acronyms

Acronym/Term	Description
AC	Auckland Council
AT	Auckland Transport
ATAP	AT Alignment Project
AUP: OP	Auckland Unitary Plan: Operative in Part
BCR	Benefit Cost Ratio
CAPEX	Capital Expenditure
CCO	Council Controlled Organisation
DBC	Detailed Business Case
FTN	Frequent Transport Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
GPS 2018	Government Policy Statement on Land Transport 2018-2021
HOV	High Occupancy Vehicle
IBC	Indicative Business Case
KPI	Key Performance Indicator
MCA	Multi Criteria Assessment
NAL	North Auckland Line
NOR	Notice of Requirement
OIM	Owner Interface Manager
OPEX	Operating Expenditure
PBC	Programme Business Case
PT	Public Transport
RPTP	Regional Public Transport Plan
RTN	Rapid Transit Network
RUB	Rural Urban Boundary
SEA	Significant Ecological Area
SOI	Statement of Intent
PBC	Supporting Growth Programme Business Case
SH	State highway
Te Tupu Ngātahi	Te Tupu Ngātahi (the Supporting Growth Alliance)
TFUG	Transport for Future Urban Growth
The Transport Agency	New Zealand Transport Agency
Vpd	Vehicles per day

1 Introduction

This addendum ITA report should be read in conjunction with the draft Integrated Transport Assessment prepared by the Supporting Growth Alliance ('SGA') dated 18 February 2019 (the 'draft ITA')

The draft ITA was prepared as a specialist report to accompany the draft Warkworth Structure Plan. During February and March 2019, the draft Warkworth Structure Plan was released for public feedback. The consultation included drop-in days at the Warkworth Town Hall, an event stand and sausage sizzle outside the Warkworth New World supermarket, and a number of community group meetings. A total of 219 pieces of feedback on the draft plan were received, many of which related to the transport network. A summary of the consultation initiatives, and details on the feedback received, are provided in the Auckland Council feedback report[1].

This addendum ITA report has been prepared to address the resultant changes to the Warkworth Structure Plan and to what degree this affects the transport assessments undertaken in the draft ITA.

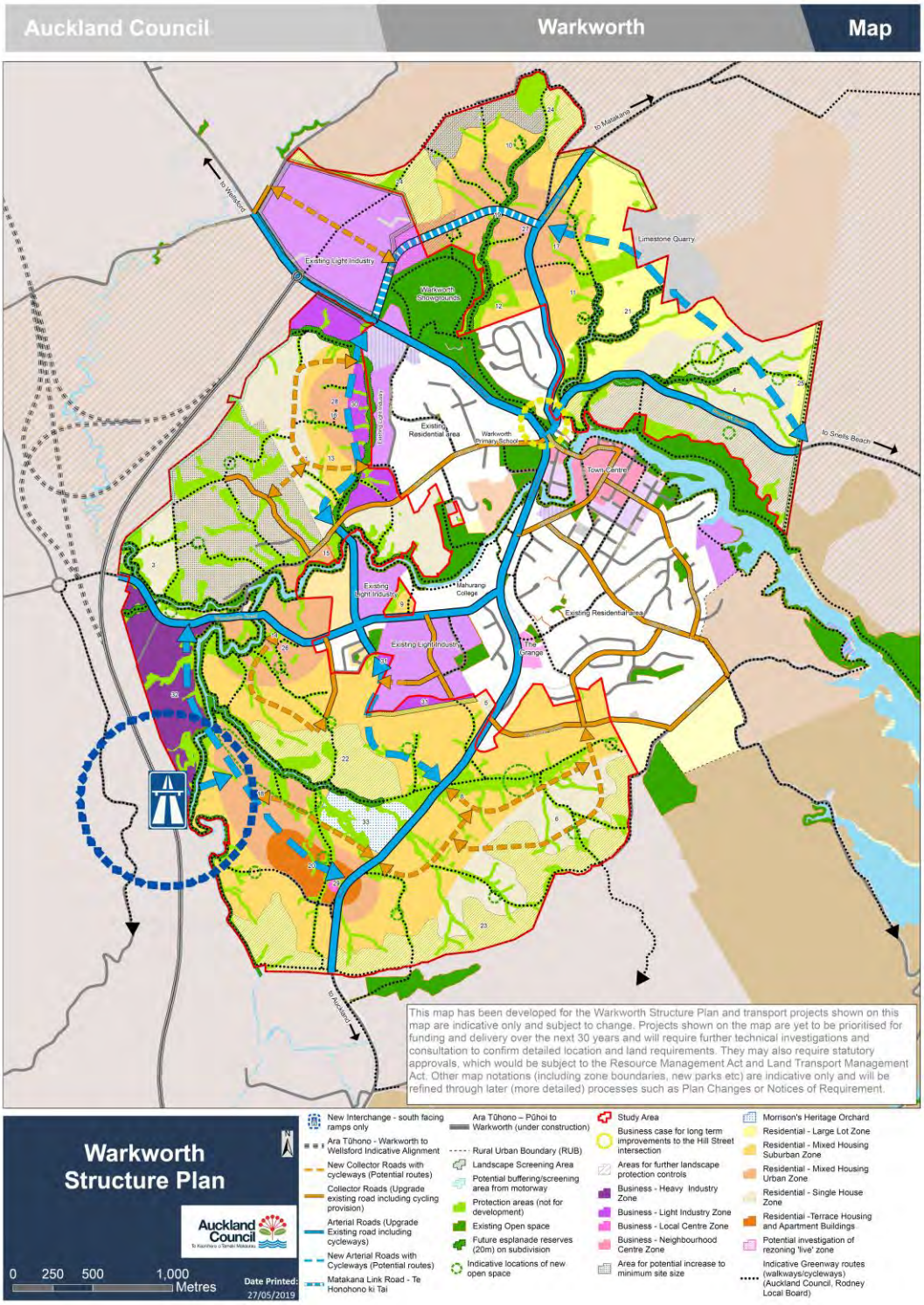
[1] https://www.aucklandcouncil.govt.nz/have-your-say/topics-you-can-have-your-say-on/warkworth-structure-plan/Documents/draft-warkworth-structure-plan-response-to-feedback.pdf

2 Updated Structure Plan

2.1 Final Structure Plan Map

The final Structure Plan Map is attached in Figure 1. A larger scale version is attached in Appendix 1.

Figure 1: Final Structure Plan Map



The business and residential land use patterns have generally been retained as per the draft Structure Plan however the most significant change is the land to the north-east of the SH1 (south)/ Western Link Road intersection which has changed from business to residential zoning. This has been changed in response to feedback that the steeper topography of this land is better suited to residential development rather than industrial development.

In addition, the following transport network changes have been incorporated:

- The indicative Sandspit Link Road alignment has been moved south to minimise encroachment on the quarry;
- The indicative collector road to the south of the Wider Western Link Road (an extension to Valerie Close) has been removed and replaced with a new collector to the north of the Wider Western Link Road (to better suit potential school sites at this location). It is noted that the new collector road alignment will require traffic calming to support proposed schools, as well as discouraging through-traffic between the southern interchange and SH1;
- The indicative Morrison Road 'collector road' connection to the Western Link Road has been removed and replaced with a connection via Gumfield Drive. The Morrison Road connection was removed to prevent industrial zoned land being accessed via residential areas (to reduce truck movements through residential areas), and
- Indicative walking and cycling greenways routes (funded by Council and/or Local Board) have been added.

Collector roads remain as indicative alignments and these are proposed to be funded by developers as part of their individual subdivisions and developments. The alignments have flexibility to change as developers better understand land development constraints. It is also expected that existing collector roads, where they front development sites, will also be upgraded by developers.

However existing collector roads, through established areas of Warkworth, may also require upgrades (footpath, cycle facilities etc) and in these cases, are likely to be the responsibility of AT and the Rodney Local Board. In these instances, additional funding mechanisms may be required to facilitate these upgrades.

Other transport infrastructure such as arterial roads and interchanges, public transport routes and major walking and cycling routes are unchanged from the draft Structure Plan. These major works are expected to be solely funded by AT and NZTA, or co-funded with developers.

2.2 Dwelling and Employment Numbers

The changes to dwelling and employment numbers are summarised in Table 1. The updated yield table is shown in Appendix 2.

Table 1: Changes to Dwelling and Employment Numbers

	Draft Structure Plan	Final Structure Plan
Dwellings	7,255	7,464
Employment Numbers	5,394	4,992

As shown, there is a slight increase in dwelling numbers (+209 dwellings or +3%) and a decrease in employment (-402 dwellings or -7.5%).

The higher residential numbers have largely occurred as a result of:

- Greater residential density proposed north of Matakana Link Road (Warkworth Land Company)
- Grater residential density at the northern end of the Western Link Road (Turnstone Capital), and
- The previously noted conversion of business zoned land to residential zoned land to the north-east of the SH1 (South)/ Western Link Road intersection (Morrison).

The decrease in employment numbers has largely occurred as a result of the reduced business zoned land (conversion to residential zoned land).

From a transport planning perspective, if there are opportunities to develop further business activity within the Structure Plan area, this is supported in order to mitigate the effects of residents within Warkworth making longer distance trips to major employment areas to the south.

3 Updated Transport Network Assessment

The changes to dwelling and employment numbers outlined in the previous section are not considered to change the intersection assessments or conclusions of the draft ITA, given the changes are relatively small, and the generated traffic movements from these changes will be dispersed over the wider Warkworth Structure Plan area.

It is understood that the Matakana Link Road (MLR) team at Auckland Transport (AT), as part of a separate process, has undertaken sensitivity testing of increased residential density on the Warkworth Land Company site and their assessments remain unchanged also.

Since the development of the draft ITA, further assessment has been undertaken at the Hill Street intersection (subject to a separate AT/ NZTA workstream). While a preferred intersection option has not yet been selected, it has been advised that regardless of which option is selected, there will not be a significant difference in vehicle capacity between options. As such, the SATURN modelling undertaken for the draft IBC and draft ITA, which conservatively assumed no increase in vehicle capacity at the intersection, is still considered appropriate to understand the effects on the wider Warkworth road network at this time.

4 Development Staging and Recommended Transport Upgrades

The staging of land release in Warkworth is proposed to remain as per the Future Urban Land Supply Strategy (FULSS), namely:

- Stage 1 – Warkworth North;
- Stage 2 – Warkworth South, and
- Stage 3 – Warkworth North-east.

While feedback requested Warkworth North-east be moved forward to align with Warkworth North in the staging, this would have brought forward several transport upgrades, namely:

- Matakana Road upgrade;
- Sandspit Road upgrade;
- Sandspit Link Road, and
- SH1/ Hill Street upgrade.

Given the cost implications of bringing these transport upgrades forward, it was recommended that the original FULSS staging should remain.

5 Requirements for Next Stage Transport Assessments

The draft ITA was a macro level assessment developed to a level of detail appropriate for structure planning. Further refinements to the draft ITA or new assessments will need to be undertaken to support future Plan Change or Notice of Requirement processes, such that these processes require a greater level of detail than provided by the draft ITA. In this respect, the draft ITA forms the basis of an ongoing feedback loop between transport planning (being led by SGA through the business case and subsequent route protection processes), and land use planning (being led by Council through structure plans and subsequent plan changes).

As shown in Table 2, the following issues and opportunities have been identified for further investigation within future ITA reports.

Table 2: Issues/ Opportunities for Investigation in Future ITAs

Issue	Comments
Land use changes	Through the Structure Planning and subsequent Plan Change processes, there is potential for further refinements to land uses within Warkworth. Future assessments will need to address the aim of Warkworth to be self-sufficient, substantiate any changes to land use, and account for the effects of these changes. This may include: • Refinements to the location, size and type of residential and business zoned land; and • The potential to provide for further intensification and/or employment around identified rapid and frequent public transport corridors to maximise land use-transport integration, and the opportunities to enhance modal shift and manage travel demand.
Further consideration of local employment to manage travel demand and provide mode-shift opportunities	From a transport planning perspective, provision for further local employment that should be considered as part of a travel demand management strategy alongside other opportunities such as provision for active modes.
Future Plan Change Guidance	The ITA has developed a draft proposed network required to support the Structure Plan. Further refinement to the network (see below) through future ITAs will be necessary to support Plan Changes. These future ITAs should also provide an evidence base to adopt and 'follow through' on the network design principles and access strategies identified in the draft ITA and IBC. Provisions may include: • Indicative road alignments and road widths; • Transport infrastructure thresholds/triggers, including funding and delivery mechanisms (see below); • Potential transport and urban form controls – e.g. further guidance on block size/structure and intersection density, frontage/access controls, bespoke parking provisions, and • Consideration of active mode infrastructure and other opportunities to encourage mode shift from private vehicles.

Issue	Comments
Collector road funding and implementation risks	There are considered to be significant risks associated with sections of collector roads that fall beyond the responsibility of a single developer where roads need to cross significant infrastructure corridors, streams/floodplains, 'hold out' sites, and other third-party land. In addition, existing collector roads through established areas are not expected to be upgraded by developers. Future ITAs will need to give direction to the Council's Finance and Plans and Places teams to enable the development of an appropriate funding and delivery model to ensure that these connections can be equitably funded and delivered. The information required will include: • Identification of the specific sections of collector road which need to cross significant infrastructure corridors, streams/floodplains, and known 'hold out' sites; and • Costing and benefit area analysis for each section of the collector road network to assist Council in the design of a funding mechanism.
Further assessment and design development of network 'hot spots'	Several high-level approaches to site-specific issues have been identified through this ITA where to date the IBC has not provided guidance. Through subsequent ITAs and/or the DBC process, further/more refined assessment and design development of transport infrastructure will be required to confirm the approaches identified in this ITA are feasible. These items include: • SH1/ Goatley Road/ Kaipara Flats Road intersection upgrade to provide connectivity to live-zoned industrial land; • Safety assessment of weave movements between on SH1 between Ara Tuhono and Western Link Road; • Assessment of road network incorporating preferred Hill Street intersection upgrade (not available at this time), and • The location of the proposed SH1 southern interchange and confirmation of workability in relation to SEA, topography and ground conditions.
General design detail	Additional design detail is required across the board, particularly at key intersections. For the transport infrastructure to be route protected by SGA, this will need to occur through the DBC and subsequent NoR process.
Further development of the secondary active mode network and greenways	The draft ITA that the active mode network be accommodated primarily on the collector road network, and identifies further opportunities for greenways planning. There will be opportunities through the Plan Change process and future Local Board greenways planning to further refine these networks.
Further development of Station Access and Park-and-Ride strategy	The ITA outlines a high-level Station Access and Park-and-Ride strategy at section 6.8.3 in lieu of IBC guidance on the matter. Subsequent ITAs and/or the DBC process will need to provide additional detail on the size, access, configuration, demand profile, and pricing of facilities.

It should be noted that the majority of transport infrastructure identified in this ITA is not currently funded and therefore there is potential for the delivery of this infrastructure to lag behind proposed Plan Change processes. There will need to be consideration in any Plan Change provisions to encourage landowners/ developers to seek the same transport and land use outcomes as identified in the draft IBC and this ITA. This may require collaborative design processes and alternative funding mechanisms to deliver planned transport infrastructure.

There is a need however to consider that if further changes to the relationship between residential and business zones changes i.e. proposed conversion of business zoned land to residential, then further review and ITA revisions may be required.

6 Conclusions

Following a review of the final Structure Plan, the following is concluded:

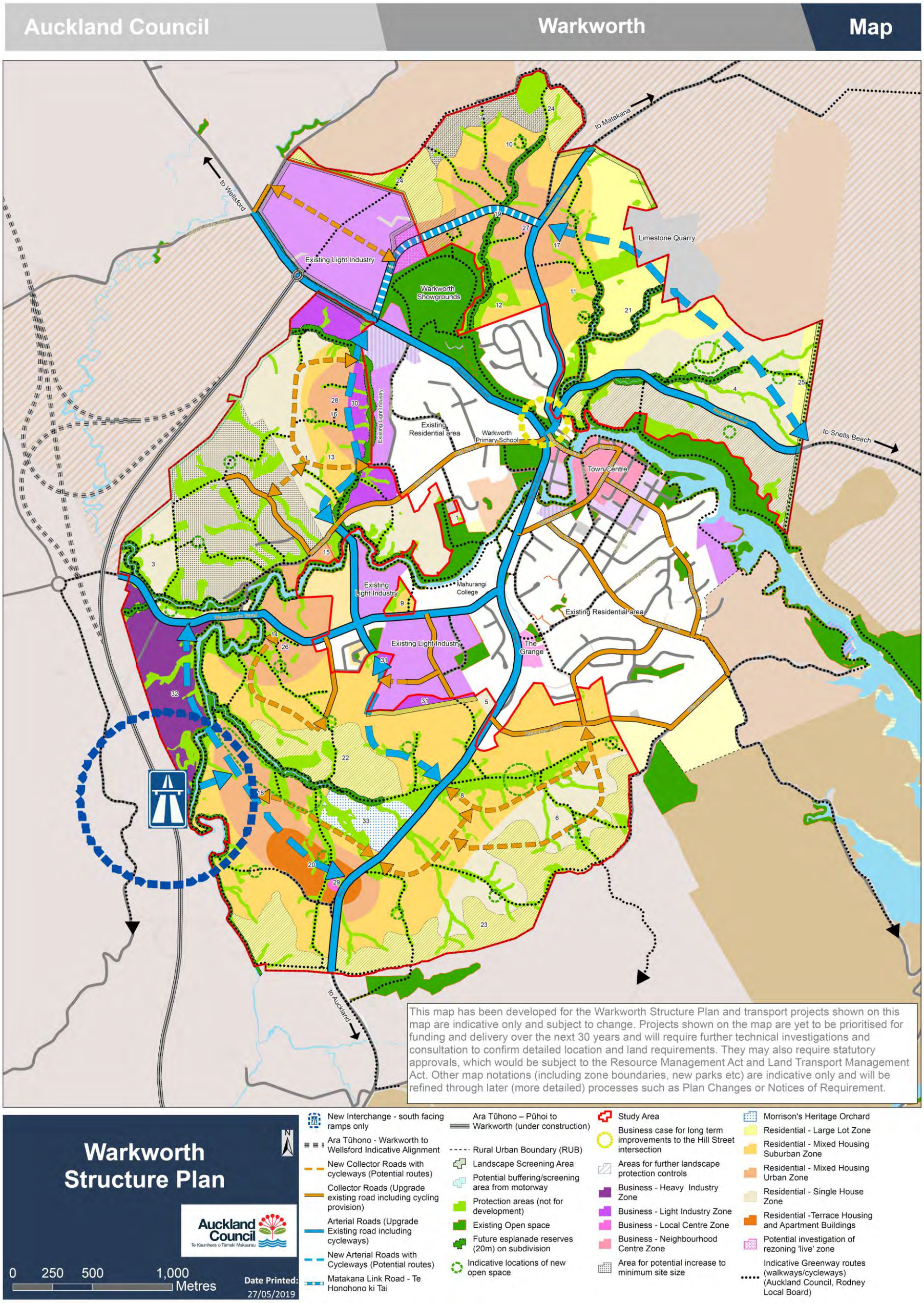
- The transport network is essentially the same as outlined in the draft ITA with some minor changes to the collector road network;
- The dwelling and employment numbers are similar to those outlined in the draft ITA (+3% dwellings and -7.5% jobs);
- The assessment of the transport network and intersection modelling outlined in the draft ITA is considered to still be appropriate given the relatively small changes to dwelling and employment numbers, and the retention of the arterial road network, public transport network and walking and cycling network, and
- The staging of transport infrastructure is proposed to remain in alignment with the FULSS land release staging (as detailed in the draft ITA).

Overall, the findings and conclusions of the draft ITA are still considered appropriate for the changes proposed in the final Structure Plan.

It is recommended that further opportunities to contribute to Warkworth's aim to be self-sufficient (by maintaining and improving the ratio of employment to residential dwellings), manage travel demand, and encourage active and public transport modes, should be an ongoing consideration in any future ITAs both within existing and future urban areas.

Appendix 1. Final Structure Plan Map

Figure 2: Final Structure Plan Map (A3)



Appendix 2. Final Dwelling and Employment Yields

Table 3: Final Dwelling and Employment Yields

Area label	Area (m2)	Area (ha)	Area not for development* (ha)	% of Area not for develop ment	Net Area after areas not for development removed (m^2)	Area for roads (m^2) (30%)	Area for other Uses** (m^2) (15%) *Except industrial land*	Total Roads/Other area (m^2)	Net developable area (m^2)	*% Net developable (of gross)*	Zoning (full name)	Zoning	Residential? (True/False - for job yield calculation)	THAB - dwellings	Mixed Housing Urban - dwellings	Mixed Housing Suburban - dwellings	Single House - dwellings	Large Lot - dwellings	Neighbour-hood Centre - dwellings	Local Centre - dwellings	TOTAL dwellings	Future Urban Land Supply Strategy sequence	Dwellings From 2022	Dwellings 2028-32	Dwellings 2033-37	Local Centre - jobs	Neighbour-hood Centre - jobs	Light Industry - jobs	Heavy Industry - jobs	Resi-dential - jobs	TOTAL Jobs	Jobs From 2022	Jobs 2028-32	Jobs 2033-37
1	540,386	54.0	8.1	15%	459,587	137,876	68,938	206,814	252,773	*47%*	Residential - Single House Zone	SH	TRUE	-	-	-	421	-	-	-	421	2022	421	-	-	-	-	-	-	211	211	211	-	-
2	793,460	79.3	24.7	31%	546,805	164,042	82,021	246,062	300,743	*38%*	Residential - Single House Zone***	SH	TRUE	-	-	-	200	-	-	-	200	2022	200	-	-	-	-	-	-	100	100	100	-	-
3	237,730	23.8	13.0	55%	107,637	32,291	16,146	48,437	59,200	*25%*	Residential - Single House Zone	SH	TRUE	-	-	-	99	-	-	-	99	2022	99	-	-	-	-	-	-	49	49	49	-	-
4	851,762	85.2	16.1	19%	690,480	207,144	103,572	310,716	379,764	*45%*	Residential - Single House Zone	SH	TRUE	-	-	-	633	-	-	-	633	2033	-	-	633	-	-	-	-	316	316	-	-	316
5	11,625	1.2	0.0	0%	11,625	3,487	1,744	5,231	6,394	*55%*	Residential - Single House Zone	SH	TRUE	-	-	-	11	-	-	-	11	2028	-	11	-	-	-	-	-	5	5	-	5	-
6	401,144	40.1	7.2	18%	329,317	98,795	49,398	148,193	181,124	*45%*	Residential - Single House Zone	SH	TRUE	-	-	-	302	-	-	-	302	2028	-	302	-	-	-	-	-	151	151	-	151	-
7	120,258	12.0	0.6	5%	113,938	34,181	17,091	51,272	62,666	*52%*	Residential - Single House Zone****	SH	TRUE	-	-	-	63	-	-	-	63	2022	63	-	-	-	-	-	-	31	31	31	-	-
8	2,024,994	202.5	48.7	24%	1,538,256	461,477	230,738	692,215	846,041	*42%*	Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	2,417	-	-	-	-	2,417	2028	-	2,417	-	-	-	-	-	1,209	1,209	-	1,209	-
9	26,151	2.6	1.0	38%	16,104	4,831	2,416	7,247	8,857	*34%*	Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	25	-	-	-	-	25	2022	25	-	-	-	-	-	-	13	13	13	-	-
10	215,623	21.6	3.2	15%	183,263	54,979	27,490	82,469	100,795	*47%*	Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	288	-	-	-	-	288	2022	288	-	-	-	-	-	-	144	144	144	-	-
11	193,889	19.4	4.1	21%	152,601	45,780	22,890	68,670	83,931	*43%*	Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	240	-	-	-	-	240	2033	-	-	240	-	-	-	-	120	120	-	-	120
12	89,848	9.0	5.0	56%	39,585	11,875	5,938	17,813	21,771	*24%*	Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	62	-	-	-	-	62	2022	62	-	-	-	-	-	-	31	31	31	-	-
13	130,196	13.0	2.1	16%	109,230	32,769	16,384	49,153	60,076	*46%*	Residential - Mixed Housing Suburban Zone	MHS	TRUE	-	-	172	-	-	-	-	172	2022	172	-	-	-	-	-	-	86	86	86	-	-
14	334,718	33.5	14.3	43%	191,466	57,440	28,720	86,160	105,306	*31%*	Residential - Mixed Housing Urban Zone	MHU	TRUE	-	351	-	-	-	-	-	351	2028	-	351	-	-	-	-	-	176	176	-	176	-
15	55,260	5.5	3.2	58%	23,411	7,023	3,512	10,535	12,876	*23%*	Residential - Mixed Housing Urban Zone	MHU	TRUE	-	43	-	-	-	-	-	43	2022	43	-	-	-	-	-	-	21	21	21	-	-
16	117,576	11.8	1.3	11%	104,952	31,486	15,743	47,228	57,723	*49%*	Residential - Mixed Housing Urban Zone	MHU	TRUE	-	192	-	-	-	-	-	192	2022	192	-	-	-	-	-	-	96	96	96	-	-
17	134,485	13.4	2.3	17%	111,521	33,456	16,728	50,185	61,337	*46%*	Residential - Mixed Housing Urban Zone	MHU	TRUE	-	204	-	-	-	-	-	204	2033	-	-	204	-	-	-	-	102	102	-	-	102
18	375,536	37.6	6.8	18%	307,725	92,317	46,159	138,476	169,249	*45%*	Residential - Mixed Housing Urban Zone	MHU	TRUE	-	564	-	-	-	-	-	564	2028	-	564	-	-	-	-	-	282	282	-	282	-
19	418,527	41.9	11.3	27%	306,009	91,803	45,901	137,704	168,305	*40%*	Residential - Mixed Housing Urban Zone	MHU	TRUE	-	561	-	-	-	-	-	561	2022	561	-	-	-	-	-	-	281	281	281	-	-
20	152,244	15.2	2.9	19%	123,468	37,040	18,520	55,560	67,907	*45%*	Residential -Terrace Housing and Apartment	THAB	TRUE	377	-	-	-	-	-	-	377	2028	-	377	-	-	-	-	-	189	189	-	189	-
21	668,722	66.9	19.1	29%	477,475	143,243	71,621	214,864	262,611	*39%*	Residential - Large Lot Zone	LL	TRUE	-	-	-	-	66	-	-	66	2033	-	-	66	-	-	-	-	33	33	-	-	33
22	281,723	28.2	6.1	22%	220,778	66,233	33,117	99,350	121,428	*43%*	Residential - Large Lot Zone	LL	TRUE	-	-	-	-	30	-	-	30	2028	-	30	-	-	-	-	-	15	15	-	15	-
23	654,979	65.5	6.5	10%	589,878	176,964	88,482	265,445	324,433	*50%*	Residential - Large Lot Zone	LL	TRUE	-	-	-	-	81	-	-	81	2028	-	81	-	-	-	-	-	41	41	-	41	-
24	235,583	23.6	6.6	28%	169,722	50,917	25,458	76,375	93,347	*40%*	Residential - Large Lot Zone	LL	TRUE	-	-	-	-	23	-	-	23	2022	23	-	-	-	-	-	-	12	12	12	-	-
25	80,489	8.0	1.0	13%	70,250	21,075	10,537	31,612	38,637	*48%*	Residential - Large Lot Zone	LL	TRUE	-	-	-	-	10	-	-	10	2033	-	-	10	-	-	-	-	5	5	-	-	5
26	3,000	0.3	0.0	0%	2,997	899	449	1,348	1,648	*55%*	Business - Neighbourhood Centre Zone	NHC	FALSE	-	-	-	-	-	5	-	5	2028	-	5	-	-	10	-	-	-	10	-	10	-
27	3,000	0.3	0.0	0%	3,000	900	450	1,350	1,650	*55%*	Business - Neighbourhood Centre Zone	NHC	FALSE	-	-	-	-	-	5	-	5	2022	5	-	-	-	10	-	-	-	10	10	-	-
28	3,000	0.3	0.0	0%	3,000	900	450	1,350	1,650	*55%*	Business - Neighbourhood Centre Zone	NHC	FALSE	-	-	-	-	-	5	-	5	2022	5	-	-	-	10	-	-	-	10	10	-	-
29	10,387	1.0	0.4	42%	6,057	1,817	909	2,726	3,332	*32%*	Business - Local Centre Zone	LC	FALSE	-	-	-	-	-	-	11	11	2028	-	-	-	19	-	-	-	-	19	-	-	-
30	245,378	24.5	7.3	30%	172,616	51,785	-	51,785	120,831	*49%*	Business - Light Industry Zone	LIZ	FALSE	-	-	-	-	-	-	-	-	2022	-	-	-	-	-	447	-	-	447	447	-	-
31	28,576	2.9	0.1	2%	27,987	8,396	-	8,396	19,591	*69%*	Business - Light Industry Zone	LIZ	FALSE	-	-	-	-	-	-	-	-	2028	-	-	-	-	-	72	-	-	72	-	72	-
32	374,330	37.4	10.2	27%	272,579	81,774	-	81,774	190,805	*51%*	Business - Heavy Industry Zone	HIZ	FALSE	-	-	-	-	-	-	-	-	2028	-	-	-	-	-	-	706	-	706	-	706	-
33	163,335	16.3	7.0	43%	93,258	-	-	-	93,258	*57%*	Morison's Orchard	ORCH	FALSE	-	-	-	-	-	-	-	-	2028	-	-	-	-	-	-	-	-	-	-	-	-
	9,977,914	998	240	24%	7,576,575	2,244,995	1,051,520	3,296,516	4,280,060	43%				377	1,916	3,204	1,729	210	16	11	7,464		2,161	4,139	1,153	19	29	520	706	3,718	4,992	1,541	2,855	576

Formula inputs	
Site sizes (m^2)	
THAB	180
MHU	300
MHS	350
SH	600
LL	4,000
NHC	300
LC	300
Jobs (per ha):	
NHC	58
LC	58
HIZ	37
LIZ	37
RES	0.5 per dwelling

TOTAL AREAS	Gross Area	%	*Dwellings*	%	*Jobs*	%
THAB	15	*2%*	377	*5%*		
MHU	144	*14%*	1,916	*26%*		
MHS	268	*27%*	3,204	*43%*		
SH	296	*30%*	1,729	*23%*		
LL	192	*19%*	210	*3%*	3,718	*74%*
LIZ	27	*3%*	-	*0%*	520	*10%*
HIZ	37	*4%*	-	*0%*	706	*14%*
NHC	1	*0%*	16	*0%*	29	*1%*
LC	1	*0%*	11	*0%*	19	*0%*
ORCH	16	*2%*	-	*0%*	0	*0%*
TOTAL	**998**	***100%***	**7,464**	***100%***	**4,992**	***100%***

*Areas not for development include:
Flood plains
Streams^ (10m buffer)
Wetlands
Significant Ecological Areas mapped in Auckland Unitary Plan
Covenanted bush
Historic heriage - extent of place
Existing open space
Future esplanade reserves
Existing roads

^Streams = permanent, intermittent, and transitional

**Other uses include:
Parks
Schools
Community facilities
etc

***The larger site size overlay is over a part of this area (1,500m^2 has been used as a proxy)

****The larger site size overlay is over this area (1,000m^2 has been used as a proxy)