

Auckland Unitary Plan – Rural Urban Boundary

Discussion Paper – Transport Issues



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1. Introduction

1.1. Purpose of this Paper

The purpose of this transport discussion paper is to provide transport advice to the process of setting the Rural Urban Boundary (RUB) in the Unitary Plan. In particular, the paper seeks to ensure that setting the RUB is consistent with the strategic direction outlined in a number of key transport planning documents. The paper identifies key transport principles as derived from relevant strategic documents, outlines how those principles can guide urban shape and then applies the principles to the greenfield areas of investigation to generate recommendations for setting the RUB.

This paper sets out the process for consideration of transport in identifying areas for future urban activities as defined by the location of the RUB. This has included using the guidance in the proposed Regional Policy Statement in the Draft Unitary Plan, the transport principles of the Auckland Plan and the key principles of Auckland Transport's Integrated Transport Programme as an input to setting the RUB. This paper includes initial work undertaken to analyse future transport demands and develop conceptual transport networks for the greenfield areas.

The analysis contained in this paper is one of a number of technical, political, public and stakeholder inputs that will inform the final decision on the location of the RUB and associated future urban areas.

Further technical analysis will be undertaken in response to key issues raised in submissions ahead of the Unitary Plan hearings in 2014.

1.2. The Rural Urban Boundary

Statistics New Zealand 'high growth scenario' projections for Auckland, suggest the population will increase over the next thirty years by another million people. This growth creates the need to plan for more housing, employment and infrastructure.

The Auckland Plan sets a 30-year goal of providing for 70% of new homes to be built within the 2010 Metropolitan Urban Limit (MUL). At the same time, the Auckland Plan provides flexibility so that up to 40% of new homes can be built outside the MUL. The RUB is a tool to help ensure that at all times there is sufficient land coming on stream over the next 30 years to meet Auckland's housing needs while providing certainty over which rural areas will stay rural. Significant additional land for employment will also be located within the RUB.

The table below shows how residential and employment growth could be located in Auckland over the next 30 years:

Auckland-wide additional household and employment requirements		
Location	Additional Dwellings	Additional Employment
In existing urban core (70%)	280,000	190,000
Outside existing urban core (up to 40%)	160,000	110,000
Greenfield areas for investigation	90,000	61,000
Satellite towns	20,000	14,000
Rural and coastal towns	10,000	7,000
Rural villages and general rural	20,000	14,000
Pipeline	20,000	14,000

This paper relates to transport advice for setting the RUB in the greenfield areas of investigation, to provide for 90,000 additional dwellings and 61,000 additional jobs. In some locations this incorporates pipeline areas currently outside the MUL, and satellite towns.

The RUB has been investigated in three clusters that consist of four main areas:

- Northern Cluster
 - Warkworth
 - Silverdale
- Western Cluster
 - Kumeu/Huapai/Whenuapai/Riverhead (“the Northwest”)
- Southern Cluster
 - Drury/Karaka/Paerata/Pukekohe (“the South”)

The clusters are shown in the map below:



Figure 1 - Greenfield Areas of Investigation clusters

Land that is currently zoned rural but falls inside the RUB in the Unitary Plan will be rezoned to the “Future Urban Zone”, to minimise further subdivision that would compromise developing a cohesive urban form. A structure plan is required for land to be rezoned from Future Urban to a “live zone” that enables development to occur. The process of land development inside the RUB is indicated in the diagram below:

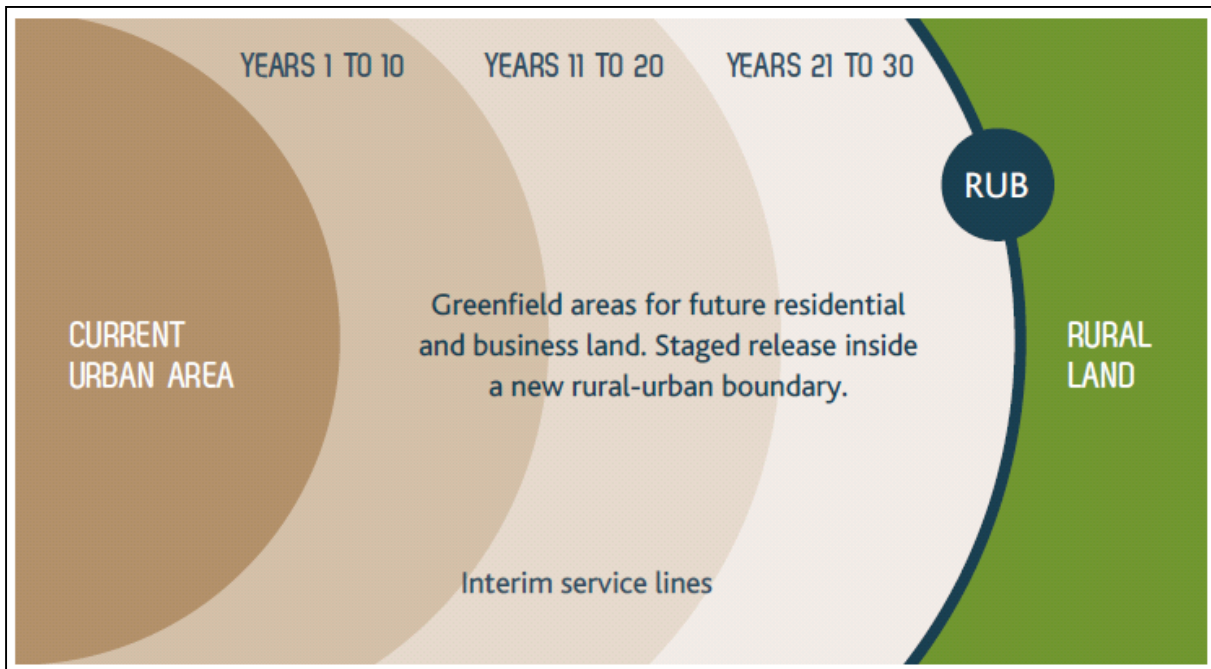


Figure 2 - Schematic of the Rural Urban Boundary

The Auckland Plan development strategy¹ suggests that almost all development of the greenfield areas of investigation will occur in the second and third decades of the plan (i.e. post 2020).

1.3. Estimated Growth in Greenfield Areas of Investigation

Technical analysis supporting the Auckland Plan’s development strategy provided some initial allocation of growth across the different greenfield areas of investigation. At a broad level, the growth for the greenfield areas of investigation (both dwelling and employment growth) is shown in the table below:

Greenfield Area	Additional dwellings and jobs by 2040
Warkworth	3,500 dwellings and 2,500 jobs
Silverdale	Up to 12,000 dwellings and 8,000 jobs
Northwest	Up to 20,000 dwellings and 8,000 jobs
South	Up to 55,000 dwellings and 35,000 jobs

The Auckland Plan envisages Pukekohe growing to a size of around 50,000 people and Warkworth to a size of 20,000 people as the two main ‘satellite centres’ outside the main Auckland metropolitan area.

In addition to the planned growth in the greenfield areas of investigation, in some locations (particularly in the Northwest) there is significant greenfield development more advanced in the planning process. This land is typically referred to as ‘pipeline’ capacity. ‘Pipeline’ areas are relevant when considering the transport implications of growth. The projected number of additional dwellings and jobs in ‘pipeline’ land near each greenfield cluster is shown in the table below²:

Pipeline Area	Additional dwellings and jobs by 2040
Warkworth	Up to 700 dwellings and 30 jobs
Silverdale	Up to 3,300 dwellings and 8,000 jobs
Northwest	Up to 14,000 dwellings and 10,600 jobs
South	Up to 2,600 dwellings and 600 jobs

¹ Auckland Plan figure D7, pages 56-57.

² Source: Auckland Plan ‘Summary of all Scenarios’ spreadsheet.

In summary, there is very significant growth planned in the three clusters, comprised of 'pipeline' land, growth of existing satellite towns and (most significantly) the new greenfield areas of investigation.

1.4. Process of Setting the RUB

1.4.1. *Draft Unitary Plan*

In March 2013 Council made public a Draft Unitary Plan (DUP) for public consideration. The DUP identified areas in Warkworth, Silverdale, Whenuapai/Kumeu/Riverhead ("the Northwest") and Drury/Karaka/Pukekohe ("the South") as potential future development areas. Three alternative options for a RUB in the South were provided in the DUP which built on feedback from earlier consultation in the South in late 2012. The notified version of the Unitary Plan has a preferred RUB included for submission and finalisation.

Transport is one of a number of considerations that have been taken into account in setting the RUB. Other considerations include environmental constraints, non-transport infrastructure (e.g. water supply and wastewater disposal), cultural heritage, existing land-use patterns, geotechnical constraints and landscape analysis. There has also been extensive public and stakeholder consultation undertaken.

Many transport related comments were included in public feedback on the RUB options shown in the DUP. The most frequently mentioned matter was opposition to a possible bridge between Karaka and Weymouth (although a number of submissions did support the bridge and some provided detailed information in relation to the project and development of the areas it would serve). Other transport related feedback on the RUB options in the DUP generally highlighted either support for areas with good access to existing transport infrastructure (such as around the rail corridor in the south) or general concerns that the RUB options all proposed significant urban expansion which would be difficult to provide with transport options in a cost-effective way.

1.4.2. *Transport Input to RUB Location*

Transport input into the RUB's location has been an interactive and iterative process. As detailed further later in this paper, a different approach was taken in the south compared to the other greenfield areas. This approach included an additional round of public consultation in late 2012 as well as the creation of different RUB options and scenarios for the south. In Warkworth, Silverdale and the Northwest only one option for each area was included in the DUP for public consultation and then that single option was subsequently updated as further analysis and feedback from consultation became available.

The different approach to setting the RUB in the south compared to other greenfield areas is reflected in a different type of transport analysis in the south. As discussed further below, transport has a more significant impact on the RUB's location in the south than in other greenfield areas. Therefore the additional step of analysing the three different scenarios for the southern RUB included in the DUP as well as the RUB option workshopped with Council's Auckland Plan Committee as at 8 July 2013 (referred to as the 'preferred option') has been undertaken.

1.4.3. *Conceptual Transport Networks*

This paper includes preliminary conceptual transport networks, which were developed by relevant transport and land use planning experts from Auckland Council, Auckland Transport and the New Zealand Transport Agency (NZTA). These networks indicate how the development of the future urban areas inside the RUB could be supported by transport investments and also fed back into advice about the RUB's preferred location from a transport perspective. The conceptual networks were used as an input to transport modelling and costing sections of this paper.

The process followed in developing the preliminary, conceptual transport network proposals in this paper was:

1. In May and June 2013 preliminary, conceptual transport options to support the RUB areas were developed with reference to the RUB areas shown in the DUP.
2. In June and July 2013 the RUB areas were further refined with regard to the transport analysis and further advice on environmental opportunities and constraints.
3. In August 2013 the RUB land areas developed by staff in June and July, plus the associated household and employment allocations, were used to refine conceptual transport networks, and as inputs to the modelling and costing work that informed the final RUB decisions.

Seven different maps were created in this process: one each for Warkworth, Silverdale and Whenuapai/Kumeu/Huapai and four for the southern greenfield area of investigation (one for each of the three land-use scenarios in the DUP and then one for the preferred RUB option).

Strategic routes, primary arterials and secondary arterials are shown on the conceptual network maps in section 3 of this report. The lines are solid where a road currently exists in this location and dashed where a new connection would need to be constructed. It is likely that nearly all existing roads would need to be upgraded from their current state (generally rural roads) to fulfil their future role as urban arterials.

- Purple routes are secondary arterials. It is generally anticipated that these roads would be one lane of traffic in each direction with cycle lanes along some of the roads. In some locations bus priority lanes may be required.
- Black routes are primary arterials. It is generally anticipated that these roads would be two lanes of traffic in each direction in urban areas and one lane each way in rural areas. Cycle lanes may be provided along some sections, as well as bus lanes if required. Where these arterials pass through town centres or other areas of higher urban density it is anticipated that the placemaking function of the routes would be given a high priority.
- Red routes indicate strategic corridors. Generally these will be constructed to a motorway or expressway standard with access only possible at interchange points. A distinction is made between proposed routes and more conceptual routes.

A separate map showing key public transport routes and infrastructure has also been prepared. The focus here is to highlight how effective public transport planning may affect the desirable location of the RUB. For example, locations where logical frequent bus routes intersect with each other become places highly accessible by public transport and potentially suitable for the location of centres or higher intensity residential development.

It is important to emphasise that the maps identify a conceptual transport network only. Further planning of land use and assessment of matters such as growth rates, staging of development, sequencing of projects, constructability issues (environment /physical constraints) and funding sources will be required to determine the final network. This is envisaged through a high level process such as a structure plan for each greenfield area.

1.4.4. Structure of this Paper

The transport analysis in this paper assumes that the future urban areas inside the RUB will be built-out by 2041 and that the household and employment numbers allocated to particular future urban areas will arise within those areas. With regard to these assumptions, this paper:

1. Sets out relevant transport principles with which to assess proposed transport networks in the greenfield areas within the RUB;
2. Describes each greenfield area of investigation in turn, outlining:
 - a. The scale of growth proposed for the area
 - b. The RUB options as outlined in the DUP and then refined in response to further analysis and public feedback

- c. The current transport situation for each area as well as key transport constraints and opportunities
 - d. The conceptual transport networks for each area
- 3. Provides preliminary modelling and costing information of the RUB, including comparisons of the different southern options
- 4. Comments on how applying the relevant transport principles impacts on the RUB's location from a transport perspective, in particular commenting on the relative merits of the RUB options in the south, where more than one option was proposed in the March DUP
- 5. Identifies next steps to be taken in further developing and analysing the proposed, conceptual transport networks inside the RUB to support the Unitary Plan hearings and future structure planning.

This paper is an input to the overall section 32 report prepared in support of the RUB's location in the notified Unitary Plan. Many other factors have also been considered in the location of the RUB.

2. Guiding Principles

The Draft Unitary Plan (DUP) identifies Council's region-wide approach to transport in a Resource Management Act (RMA) framework, setting objectives and policies both in the Regional Policy Statement and the Auckland-wide objectives and policies. The DUP is a critical document in giving effect to the Auckland Plan's vision of making Auckland the world's most liveable city.

Auckland Transport has set out its high level, strategic approach to managing transport over the next thirty years in the Integrated Transport Programme (ITP). This document provides important direction to how transport will be approached in Auckland over the next 30 years.

Further, Government is a major transport investor, developer and operator. It has set out its expectations for transport in the 2012 Government Policy Statement (GPS) on transport. The GPS has a key focus on enabling economic growth and improved productivity through moving people and freight more efficiently, while also improving safety within and between major population centres. This key focus of the GPS has influenced the principles guiding this report.

2.1. Draft Unitary Plan Principles

2.1.1. Regional Policy Statement

The DUP includes in its Regional Policy Statement section a number of key objectives relevant to setting the RUB from a transport perspective. Section 2.3 of the DUP, which sits within the Plan's Regional Policy Statement, outlines the high-level objectives relating to transport and other infrastructure which are given effect to throughout the Plan.

Section 2.3.2 of the DUP relates to infrastructure generally, with relevant objectives to transport infrastructure being:

- A high-quality service and resilient infrastructure that contributes to a sustainable and liveable Auckland.
- The benefits of infrastructure and associated networks which service the wider community, Auckland or New Zealand are recognised, including:
 - the essential services provided by infrastructure networks, which provide for the functioning of communities, businesses and industry
 - enabling economic growth
 - providing for public health and the well-being of people and communities
 - contributing to a well functioning and liveable Auckland
 - protecting the quality of the natural environment
 - enabling interaction and communication.
- Development, operation, maintenance, and upgrading of infrastructure is enabled, while managing any adverse effects it may have on:
 - areas with significant landscape, cultural and historic heritage, and natural ecological and biodiversity values
 - the health, safety and amenity of communities.
- Infrastructure planning and development is integrated and co-ordinated with land use and development to support residential and business growth.
- Auckland's significant infrastructure is protected from reverse sensitivity effects.

Section 2.3.3 relates specifically to transport, and outlines the following key high level transport objectives:

- An efficient, integrated transport system necessary to support Auckland's population and economic growth and facilitate the quality, compact form of growth and associated land use.
- The benefits of transport infrastructure while managing the potential adverse effects of this infrastructure on the health, safety and amenity of communities are recognised.

- Travel demand is managed by providing attractive and efficient travel choices that offer an acceptable level of mobility and accessibility.

The DUP’s Regional Policy Statement principles recognise the critical role of transport infrastructure in supporting development and economic growth as well as the careful need to balance the provision of that infrastructure against the potential adverse impacts of transport on the environment, health and safety and amenity values.

2.1.2. Auckland-Wide Objectives

Section 3.1.1 of the DUP outlines a number of further Auckland-wide objectives and policies which relate to network utilities, energy and transport. The three objectives outlined in this section are:

- Safe, efficient and secure development, operation and upgrading of infrastructure is enabled, to service the needs of existing and planned development, while managing adverse effects.
- Resilient infrastructure and a continuous supply of service is provided.
- The amenity of urban areas is maintained and enhanced by managing the adverse visual effects of above ground infrastructure and electricity generation facilities.

Consistent with the Regional Policy Statement objectives, the key focus of the DUP is balancing the benefits to society that arise from the provision of infrastructure such as transport against the potential adverse effects of that infrastructure.

2.2. Auckland Plan Principles

The over-arching goal of the Auckland Plan make Auckland the world’s most liveable city. The outcomes and transformational shifts considered necessary to achieve this goal are shown in the table below:

AUCKLAND'S VISION						
THE WORLD'S MOST LIVEABLE CITY						
OUTCOMES: WHAT THE VISION MEANS IN 2040						
A fair, safe and healthy Auckland	A green Auckland	An Auckland of prosperity and opportunity	A well connected and accessible Auckland	A beautiful Auckland that is loved by its people	A culturally rich and creative Auckland	A Māori identity that is Auckland's point of difference in the world
TRANSFORMATIONAL SHIFTS: TO ACHIEVE THE VISION						
Dramatically accelerate the prospects of Auckland's children and young people	Strongly commit to environmental action and green growth	Move to outstanding public transport within one network	Radically improve the quality of urban living	Substantially raise living standards for all Aucklanders and focus on those most in need	Significantly lift Māori social and economic well-being	

Figure 3 - Auckland Plan Outcomes and Transformations

The Auckland Plan also contains six key principles to guide how to achieve the transformations listed above. These principles are outlined below:

- Work collaboratively on the priorities identified in the Auckland Plan. Recognise the interdependence of projects, programmes and initiatives.
- Acknowledge the special place of mana whenua and enable their participation in decision-making. Build lasting, reciprocal relationships with Auckland’s Māori.

- Ensure that our short-term decisions enhance our long-term prospects, and build our resilience to changing local and global conditions that may impact on the economic, environmental, social and cultural well-being of Auckland.
- Consider the needs of all groups in the community, to ensure that all Aucklanders can participate equally.
- Act prudently and commit to projects and initiatives that achieve the best value result without compromising quality or affordability; or stifling creativity and innovation. Focus on achieving long-term benefits and intergenerational equity.
- Make Auckland both a quality and affordable place, including affordable housing, transport and other costs of living, and doing business, so that people have the choice to live, work and invest here.

The role of transport in the development of new urban areas has potential connections to each transformational shift considered necessary to achieve the Auckland Plan vision. These potential contributions are summarised below.

Transformational Shift	Relevant considerations for transport in the greenfield areas
<i>Dramatically accelerate the prospects of Auckland's children and young people:</i>	<ul style="list-style-type: none"> • Transport in the greenfield areas should minimise health and safety risks for children and young people • High quality walking and cycling options should be provided that are safe for use by children and young people
<i>Strongly commit to environmental action and green growth:</i>	<ul style="list-style-type: none"> • The greenfield areas should promote the use of environmentally friendly transport options (walking, cycling, public transport) • The greenfield areas should encourage short trip lengths to minimise the environmental impacts of travel (CO₂ emissions, air pollution etc.) • The greenfield areas should minimise reliance upon potentially environmentally destructive transport projects
<i>Move to outstanding public transport within one network:</i>	<ul style="list-style-type: none"> • The greenfield areas should be shaped around high quality public transport (especially rapid transit) • The timing of release for land in the greenfield areas should be integrated with the timing of major public transport (especially rapid transit) projects and other transport infrastructure required to service the area • The urban form and function of the greenfield areas should promote the use of public transport (higher intensity activities around rapid transit stations) • Industrial areas should have easy access to the strategic roading network • The greenfield areas should develop in a way that supports the transport projects (especially large public transport projects) outlined in the Auckland Plan • The greenfield areas should develop in a way that minimises increased congestion across the transport network
<i>Radically improve the quality of living</i>	<ul style="list-style-type: none"> • The greenfield areas should be shaped and designed in a way that is friendly to pedestrians and cyclists • The greenfield areas should minimise the need for transport projects which would damage the quality of existing urban areas (requiring new motorways, significant road widening etc.) • The form of greenfield areas should integrate with rapid transit to facilitate the development of quality transit-oriented developments which are attractive locations to live, work and visit
<i>Substantially raise living standards for all Aucklanders</i>	<ul style="list-style-type: none"> • The greenfield areas should minimise the cost of transport for households

Transformational Shift	Relevant considerations for transport in the greenfield areas
<i>and focus on those most in need</i>	<ul style="list-style-type: none"> The greenfield areas should integrate with transport projects which boost productivity and ease of access to markets
<i>Significantly lift Maori social and economic well-being</i>	<ul style="list-style-type: none"> Transport projects in the greenfield areas should avoid or minimise any adverse effects on Maori values Transport should support the development (or other) aspirations held by Maori Access to work, goods and services in areas with high Maori populations or where Maori communities are located should be assessed for improvement

Directive 10.4 of the Auckland Plan highlights that greenfield areas should be located and developed as sustainable liveable neighbourhoods in a way that:

- demonstrates the most efficient use of land
- protects and enhances biodiversity, air quality, water quality, and heritage values
- provides community facilities, open space, infrastructure (including transport, communications, power and water utilities) in a timely and efficient manner
- provides opportunities for walking and cycling, and public transport, and a well-connected street network
- provides a broad range of housing choice to cater for the diversity of housing needs in Auckland
- provides or supports local employment opportunities avoids risks from natural hazards
- demonstrates high-quality design with high environmental performance.

The transport chapter of the Auckland Plan contains a list of key requirements to ensure the transport system supports the Plan's transformational shifts as well as the land-use directives of the Plan's development strategy. These are included below:

- Use a single system approach in the planning, design, management and development of our transport system (motorways, state highways, arterial and local roads, freight, rail, bus and ferry services, walking and cycling, ports and airports).
- Use travel demand management techniques, such as travel plans for schools and businesses, to manage the growth in demand for private vehicle travel and improve the way existing infrastructure networks operate, before providing additional capacity to the transport system.
- Achieve the appropriate balance between movement and place, considering capacity (incorporating the safe movement of people and goods), and character (recognising the role of road/street in the urban setting and types of buildings/landscape present or planned), and acknowledging the role of transport to assist in place-shaping.
- Ensure that long-term land use and activities drive long-term transport functionality, (taking into account the existing and proposed transport network), and that transport investment aligns with growth as envisaged in this Plan.
- Optimise existing and proposed transport investment.
- Establish corridor management plans that account for place-shaping.
- Recognise existing community investment and the need to enable connectivity between and within communities.
- Align community expectations in urban areas with urban levels of service, particularly with realistic expectations around levels of congestion.
- Align community expectations in rural areas with rural levels of service, particularly acknowledging limited opportunities for alternatives to motor vehicle travel.
- Ensure that transport is sustainable in the long term, minimises negative impacts on people's health and the built and natural environment, and reduces our dependence on fossil fuels.
- Improve the capability of the transport system to withstand adverse events.

2.3. Integrated Transport Programme Principles

The Integrated Transport Programme (ITP), prepared by Auckland Transport, identifies the key transport challenges facing Auckland over the next 30 years and proposes two major strategies to meet the priorities in the Auckland Plan. These are the:

- Management of transport as One System
- Development of a transport programme to 2041 (using a four staged intervention process)

The One System approach provides for the management and planning of transport networks with land use development as outlined in the Auckland Plan. The four-stage intervention process to guide the development of the transport programme is also relevant to considering the transport implications of development in the greenfield areas of investigation.

In order to derive the greatest benefit from transport investment and to meet the transport targets and outcomes for Auckland, a four-stage intervention process has been developed to enable the ITP to prioritise the phasing of Auckland's 30 year transport programme.

1. *Operate, maintain and renew infrastructure optimally:* Existing assets need to be maintained, repaired and renewed to minimise whole of life costs to avoid increased costs over the longer term and unacceptable risks associated with inadequacy of transport assets and services. Projects in this category relate to the day to day operation of the network and public transport services, renewal of assets to restore levels of service management plans and maintenance activities.
2. *Make better use of networks:* Experience with managing the transport system suggests the best returns from investment can often be achieved through optimal management and use of existing assets. Examples of network optimisation activities include: safety schemes; changes to clearways, introduction of transit and bus lanes and other parking management measures; "tuning" traffic signalling systems; speed limit reviews and minor upgrades to existing arterial roads and local roads.
3. *Manage demand efficiently and safely:* Transport demand management refers to measures which change travel behaviour such as pricing, taxes, use of speed and red light cameras, parking charges, statutory planning controls that are not based on infrastructure solutions but on policies, regulatory levers and incentives.
4. *Invest in new infrastructure, services and technology:* Major transport improvements will be crucial to meet increasing demand associated with growth, and to maintain good levels of service for freight and commercial vehicles. The ITP maintains the Auckland Plan's priorities for major network improvements which are the: completion of the Western Ring Route, upgrade of public transport infrastructure and introduction of electrified rail services; the City Rail Link, AMETI, MMEWS (the multi-modal east-west study), and the Additional Waitemata Harbour Crossing.

Supporting the intervention process outlined above, initial analysis of Auckland's 30 year transport programme highlights the critical importance of optimising existing networks and supporting new infrastructure with policies and other actions that manage demand effectively.

Memorandum



2.4. Rural Urban Boundary Principles

The Auckland Plan’s general principles (outlined earlier in this section) and key requirements of the transport system to support the strategic direction of the DUP, the Auckland Plan and the ITP have been summarised into four key principles to guide the process setting the RUB. This process is shown in the table below:

Draft Unitary Plan	Auckland Plan	Integrated Transport Programme	RUB Transport Principle
<ul style="list-style-type: none"> • A high-quality service and resilient infrastructure that contributes to a sustainable and liveable Auckland • The benefits of infrastructure and associated networks are recognised • Development, operation, maintenance, and upgrading of infrastructure is enabled, while managing adverse effects • Auckland’s significant infrastructure is protected from reverse sensitivity effects • An efficient, integrated transport system • Safe, efficient and secure development, operation and upgrading of infrastructure, to service the needs of existing and planned development, while managing adverse effects 	<ul style="list-style-type: none"> • Substantially raise living standards for all Aucklanders and focus on those most in need • Provision of transport infrastructure in a timely and efficient manner • Use a single system approach in the planning, design, management and development of our transport • Optimise existing and proposed transport investment • Use travel demand management techniques, such as travel plans for schools and businesses, to manage the growth in demand for private vehicle travel and improve the way existing infrastructure networks operate, before providing additional capacity to the transport system • Ensure that long-term land use and activities drive long-term transport functionality, (taking into account the existing and proposed transport network), and that transport investment aligns with growth 	<ul style="list-style-type: none"> • Management of transport as one system • Staged development of a transport programme • Operate, maintain and renew existing infrastructure • Make better use of existing networks • Manage demand efficiently and safely • Invest in new infrastructure as a final step 	<p>Enable efficient and cost-effective provision of transport infrastructure</p>

Draft Unitary Plan	Auckland Plan	Integrated Transport Programme	RUB Transport Principle
<ul style="list-style-type: none"> An efficient, integrated transport system 	<ul style="list-style-type: none"> Recognise existing community investment and the need to enable connectivity between and within communities Improve the capability of the transport system to withstand adverse events 		
<ul style="list-style-type: none"> The benefits of infrastructure and associated networks are recognised Travel demand is managed by providing attractive and efficient travel choices that offer an acceptable level of mobility and accessibility 	<ul style="list-style-type: none"> Strongly commit to environmental action and green growth Move to outstanding public transport within one network Providing opportunities for walking, cycling and public transport and a well-connected street network Use a single system approach in the planning, design, management and development of our transport system Ensure that transport is sustainable in the long term, minimises negative impacts on people's health and the built and natural environment, and reduces our dependence on fossil fuels 	<ul style="list-style-type: none"> Management of transport as one system Staged development of a transport programme 	<p>Enable a modal shift toward public transport, walking and cycling</p>
<ul style="list-style-type: none"> A high-quality service and resilient infrastructure that contributes to a sustainable and liveable Auckland The benefits of infrastructure and associated networks are recognised Development, operation, maintenance, and upgrading of infrastructure is enabled, while managing adverse effects Infrastructure planning and development is integrated and co-ordinated with land use and development to support residential and business growth 	<ul style="list-style-type: none"> Substantially raise living standards for all Aucklanders and focus on those most in need Significantly lift Maori social and economic well-being Provision of transport infrastructure in a timely and efficient manner Use a single system approach in the planning, design, management and development of our transport system Ensure that long-term land use and activities drive long-term transport functionality, (taking into account the existing and proposed transport network), and that transport investment aligns with growth as envisaged in this Plan Achieve the appropriate balance between 	<ul style="list-style-type: none"> Management of transport as one system Staged development of a transport programme 	<p>Enable the efficient movement of freight</p>

Draft Unitary Plan	Auckland Plan	Integrated Transport Programme	RUB Transport Principle
<ul style="list-style-type: none"> • Auckland’s significant infrastructure is protected from reverse sensitivity effects • An efficient, integrated transport system 	<p>movement and place, considering capacity, and character, and acknowledging the role of transport to assist in place-shaping</p>		
<ul style="list-style-type: none"> • The benefits of infrastructure and associated networks are recognised • Infrastructure planning and development is integrated and co-ordinated with land use and development to support residential and business growth • Auckland’s significant infrastructure is protected from reverse sensitivity effects • Safe, efficient and secure development, operation and upgrading of infrastructure, to service the needs of existing and planned development, while managing adverse effects 	<ul style="list-style-type: none"> • Dramatically accelerate the prospects of Auckland’s children and young people • Strongly commit to environmental action and green growth • Radically improve the quality of living • Substantially raise living standards for all Aucklanders and focus on those most in need • Significantly lift Maori social and economic well-being • Providing opportunities for walking, cycling and public transport and a well-connected street network • Establish corridor management plans that account for place-shaping. • Recognise existing community investment and the need to enable connectivity between and within communities • Achieve the appropriate balance between movement and place, considering capacity (incorporating the safe movement of people and goods), and character (recognising the role of road/street in the urban setting and types of buildings/landscape present or planned), and acknowledging the role of transport to assist in place-shaping 	<ul style="list-style-type: none"> • Management of transport as one system • Staged development of a transport programme 	<p>Enable place-making and good urban form outcomes</p>

Memorandum

Each 'RUB Transport Principle' can influence the location of the RUB in a number of different ways. The table below indicates how each principle is applied to setting the RUB – with the results of this application being detailed further in section 5 of this paper, which outlines analysis and recommendations.

Key Principles to Guide Setting the RUB	
Principle	Application
<i>Enabling efficient and cost-effective provision of transport infrastructure.</i>	<ul style="list-style-type: none"> • Areas closer to existing or currently planned infrastructure (railways, motorways, major arterial roads etc.) are preferred. • Areas closer to the existing urban area are preferred as they generally place a lower burden on the transport network (e.g. shorter trips) and require less additional infrastructure spend. • Areas with multiple options for transport connections and/or a variety of different potential transport responses are preferred. • Areas that can be adequately served by comparatively less transport expenditure are preferred.
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	<ul style="list-style-type: none"> • Areas close to existing or planned rapid transit (rail & busway) are preferred. • Areas that could support an effective future public transport route (e.g. development along a particular corridor) are preferred. • Areas likely to be suitable for higher density development that supports frequent public transport services are preferred. • Reasonably flat areas that may encourage walking and cycling are preferred.
<i>Enabling the efficient movement of freight</i>	<ul style="list-style-type: none"> • Areas near existing motorways and rail are preferred (for industrial activity). • Areas developed should not be dependent upon a large number of new motorway interchanges, as this may degrade performance of the freight network. • Areas developed should not be dependent upon the freight network for local trips.
<i>Enabling placemaking and good urban form outcomes</i>	<ul style="list-style-type: none"> • Areas that minimise heavy traffic flows (especially truck movements) through centres or residential areas are preferred. • Areas that urbanise should be of a sufficient size to provide for a number of every day amenities and services (e.g. avoiding a large number of small development 'pockets') • Reasonably flat areas able to support a connected 'grid' street network are preferred. • Areas which avoid natural constraints (topography, water bodies) are preferred to allow a permeable, interconnected transport network to be developed.

3. The Greenfield Areas of Investigation

3.1. Introduction

This section of the report describes each of the four greenfield areas of investigation in turn: Warkworth, Silverdale, the Northwest and the South. For each area the following information is included:

- The scale of growth as outlined in the Auckland Plan's development strategy
- The RUB included in the DUP for consultation in March 2013 (including three different RUB scenarios for the south)
- The updated/preferred RUB option as presented at a workshop of the Council's Auckland Plan Committee on 8 July, 2013
- A description of the current transport situation, noting key existing infrastructure and currently planned projects for each area
- A discussion about the important transport constraints and opportunities for each area
- A description of a conceptual transport network for each area

Analysis and recommendations for each greenfield area are included in section 5.

3.2. Warkworth

3.2.1. Scale of Growth

The Auckland Plan designates Warkworth as a "satellite centre" with a population of 20,000 people by 2040 – a significant increase on the current population of around 3,500 people. Legacy structure planning for Warkworth noted where growth could occur up to a population of around 8,000 people and the RUB investigations are looking at the best locations for land to house the further 12,000 people (or around 3,500 dwellings).

3.2.2. Options for Locating Growth

The DUP included an 'indicative' RUB for Warkworth, as shown below:

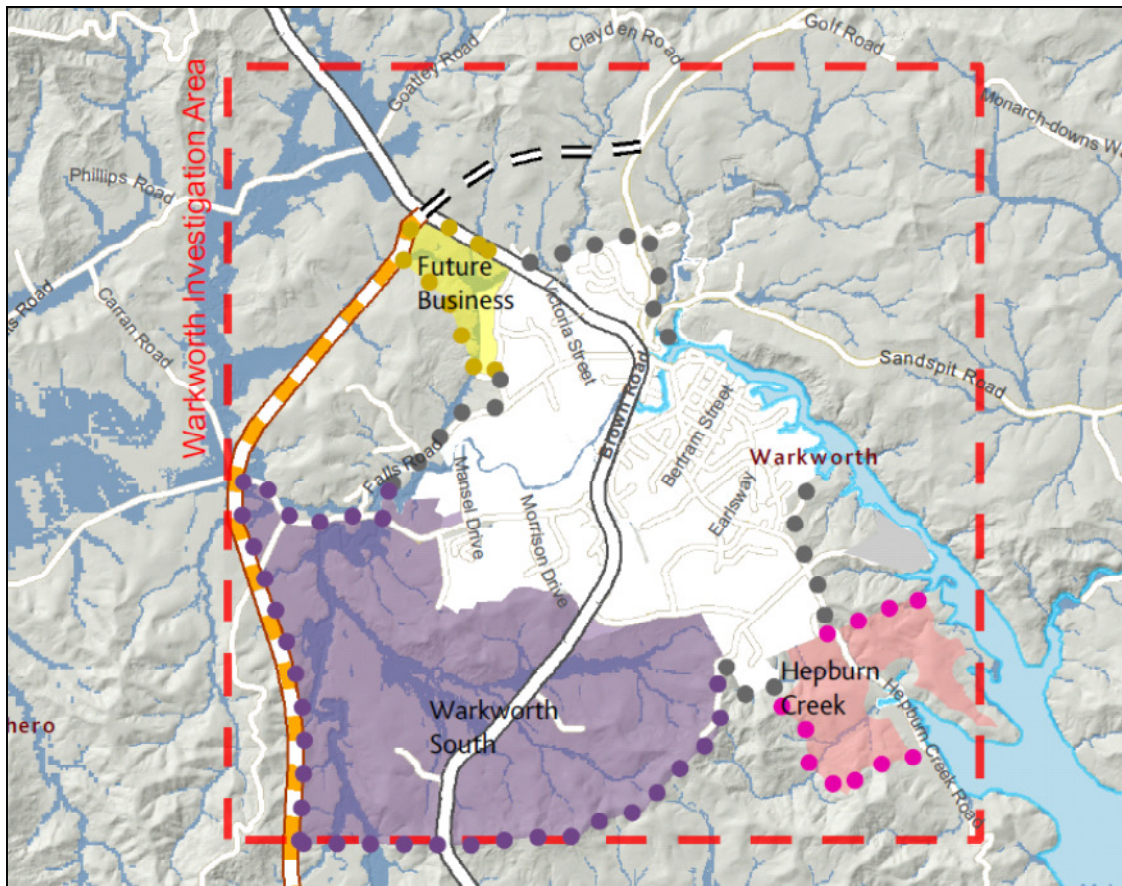


Figure 4 - Warkworth growth options in the Draft Unitary Plan

Since the map above was developed further analysis of RUB options for Warkworth led to the following amendments:

- The area denoted “Hepburn Creek” is no longer proposed to be inside the RUB.
- An area north of Warkworth is to be included in the RUB
- Some of the area between the western edge of Warkworth and the proposed Puhoi-Warkworth motorway is no longer inside the RUB

These amendments are shown below:

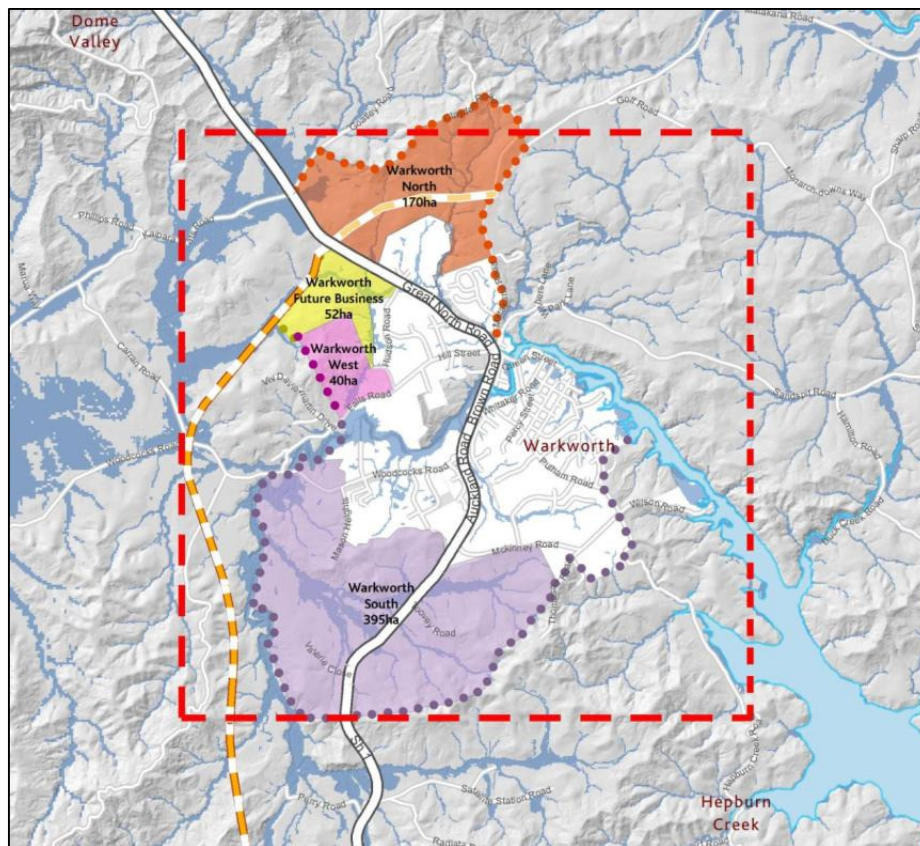


Figure 5 - Updated RUB Map for Warkworth (as at 8 July 2013)

3.2.3. Transport Situation

Compared to all other greenfield areas of investigation, Warkworth is quite isolated from the rest of metropolitan Auckland. Warkworth is also not located on the rail system (rail is approximately 11 km west of Warkworth). Warkworth currently does not have any public transport services, aside from an 'on demand' local shuttle bus linking with the eastern beaches, although a 'Local Network' bus service to Silverdale is included in the draft Regional Public Transport Plan for commencement during the next three years.

Currently, State Highway 1 (SH1) provides the main connection to the north and south. There are severe constraints on the roading network in some places (e.g. Hill Street intersection). SH1 through Warkworth divides the town and has very poor pedestrian facilities (no footpaths along much of its length). During holiday periods in particular (but not exclusively) SH1 can become extremely congested along its approaches to Warkworth.

A motorway extension from Puhoi to Warkworth is proposed by NZTA as one of the Roads of National Significance. The project has a likely completion date as early as 2019 and travels to the west of Warkworth, linking with existing SH1 just south of Kaipara Flats Road. An interchange is proposed at Puhoi as part of this project, enabling traffic on the existing SH1 to connect to the proposed motorway. Investigation of further extending the motorway from Warkworth to Wellsford is less advanced, with no currently preferred alignment, and faces significant topographical and geotechnical challenges.

Auckland Transport and NZTA are investigating further transport connections to the northern end of the Puhoi to Warkworth motorway, such as extension through to Matakana and potentially Sandspit roads. This would enable traffic travelling between Auckland and the eastern beaches to avoid diverting back into Warkworth town centre.

Preliminary transport modelling (undertaken prior to splitting the ART3 zones and before inclusion of the new networks shown later in this report) provides an indicative analysis of the destination of outbound trips during the morning peak period in 2041. The modelling results for Warkworth are shown below:

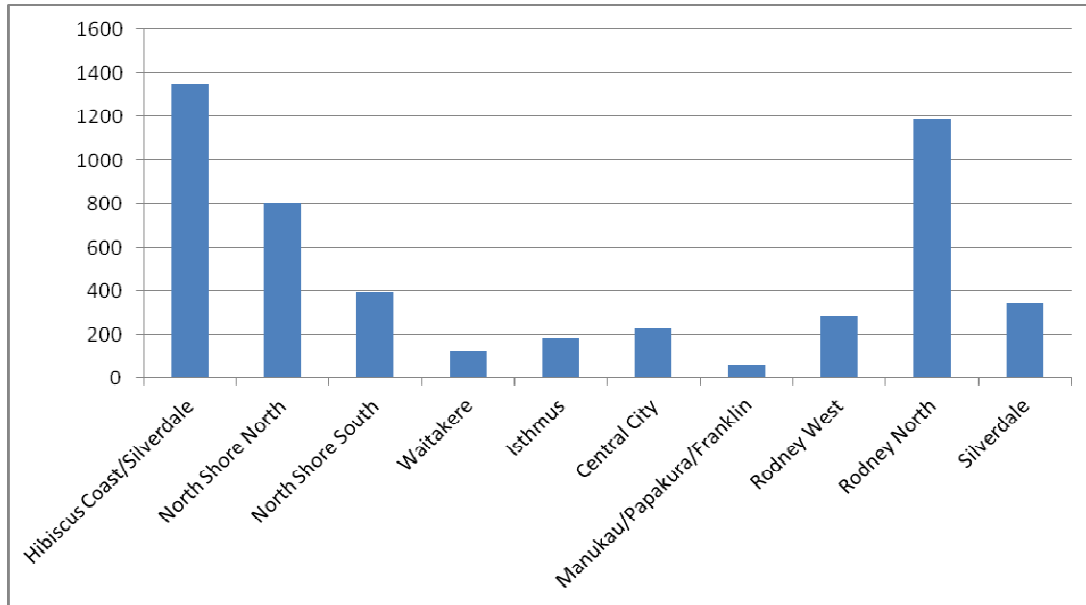


Figure 6 - Destination Sectors of Outbound AM peak trips from Warkworth in 2041

The preliminary modelling results suggest that the vast majority of outbound trips from Warkworth are to other areas north of the Auckland Harbour Bridge: particularly the Hibiscus Coast/Silverdale and other parts of Rodney North (i.e. areas outside Warkworth but north of Orewa). At the time this modelling was undertaken there was no public transport service included in the model between Warkworth and other parts of Auckland, meaning all the outbound trips are made by car.

3.2.4. Transport Constraints and Opportunities

Construction of the Puhoi-Warkworth motorway changes the level of accessibility in Warkworth so that the part of Warkworth 'closest' to Auckland is actually the northern area rather than the southern area.

Another significant effect of the Puhoi-Warkworth motorway is to remove much of the through traffic from the existing SH1 route, although in the longer term significant internal traffic will be generated within Warkworth which will use this route. The current SH1 divides Warkworth and has poor provision for pedestrians in some sections. Much of the employment and key community infrastructure (e.g. schools) is located west of SH1 but most of the population located east of SH1. Reducing the impact of the current SH1 on Warkworth will be a significant benefit of the new motorway – enabling higher quality urban outcomes.

Warkworth will remain relatively isolated and difficult to efficiently serve with public transport compared to growth in other greenfield areas. The terrain around the basin of the existing Warkworth town may also make it difficult to 'stitch together' the newer parts of Warkworth with the existing town in a way that encourages walking and cycling. Careful structure planning will be required for Warkworth to grow in a way that supports the guiding principles of the Auckland Plan.

3.2.5. Conceptual Transport Network

A conceptual transport network for Warkworth is shown below. This conceptual network was developed by experts in land use and transport planning from Auckland Council, Auckland Transport and NZTA.

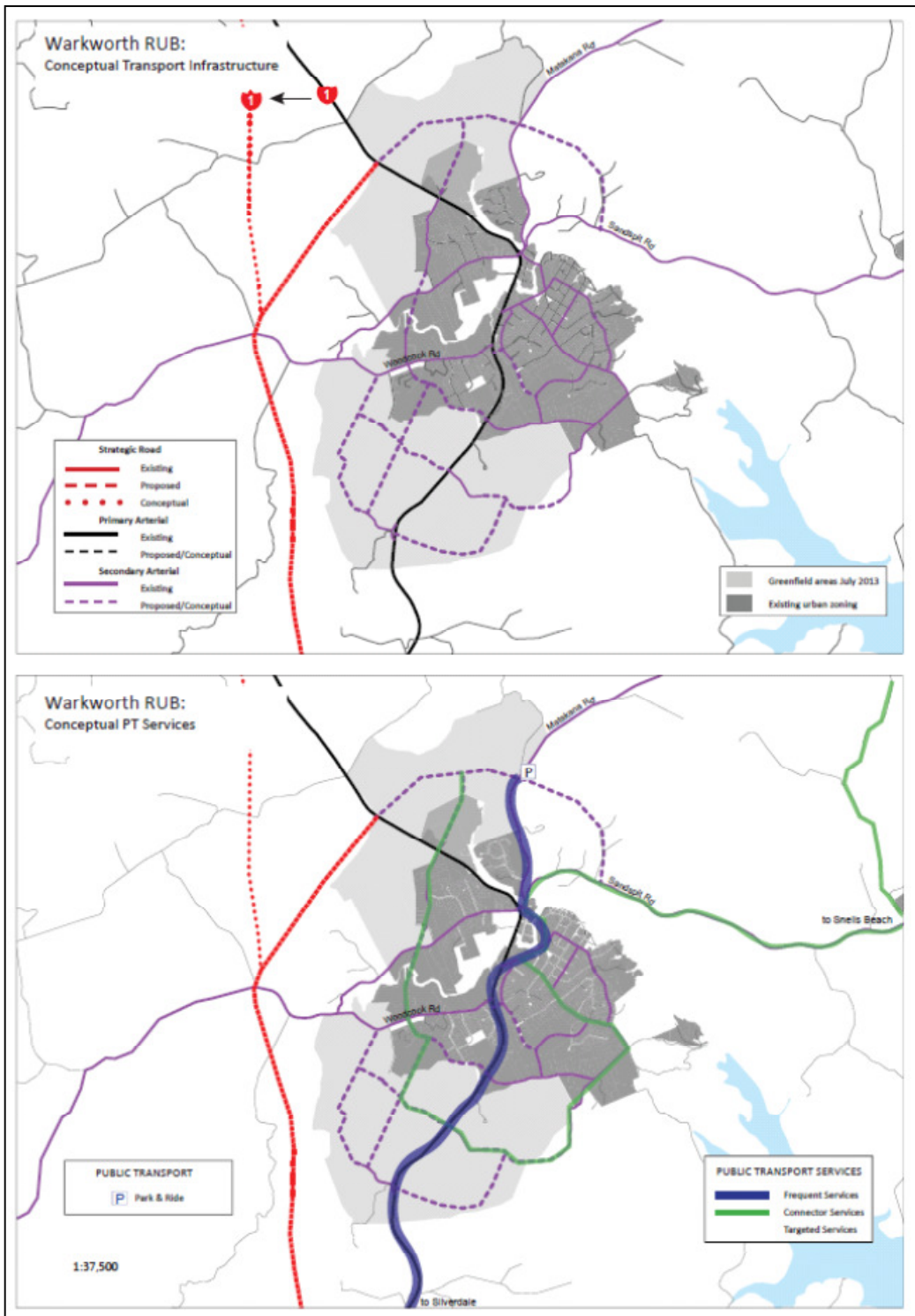


Figure 7 - Conceptual Transport Network for Warkworth

Key features of the network are:

- Realignment of SH1 to the west of Warkworth, significantly reducing traffic travelling north / south on the local road network. This is part of the Puhoi-Wellsford Road of National Significance project. The alignment of the Warkworth to Wellsford motorway/expressway extension is very conceptual at this stage, along with how this route connects back into the existing road network north of Warkworth.

- A proposal to extend an arterial road from approximately the northern end of the SH1 motorway extension to Matakana Road and potentially through to Sandspit Road. This new link is intended to provide adequate road capacity for trips that are seeking to get to east coast beaches via Matakana Road, and to ensure the currently congested Matakana Road, Sandspit Road, Hill Street intersections do not become overloaded as dwelling numbers increase. This link is currently being investigated by Auckland Transport and NZTA.
- The Warkworth Western Collector Road is completed, linking Hudson Road, Maunsell Drive and McKinney Road.

As noted above, Warkworth's relatively isolated location and relatively small size (compared with Pukekohe, for example) means that it is unlikely public transport will have as great a role to play in serving Warkworth's transport needs compared to other greenfield areas. A possible frequent bus route linking Warkworth with Silverdale is shown above. This route is likely to be supported by local circulator services.

3.3. Silverdale

3.3.1. Scale of Growth

The Auckland Plan highlights a greenfield area of investigation to the southwest of Silverdale. The intention is for around 12,000 additional dwellings and 8,000 additional jobs to be located in this greenfield area of investigation over the next 30 years.

3.3.2. Options for Locating Growth

The Draft Unitary Plan includes an 'indicative' RUB for Silverdale, as shown below.

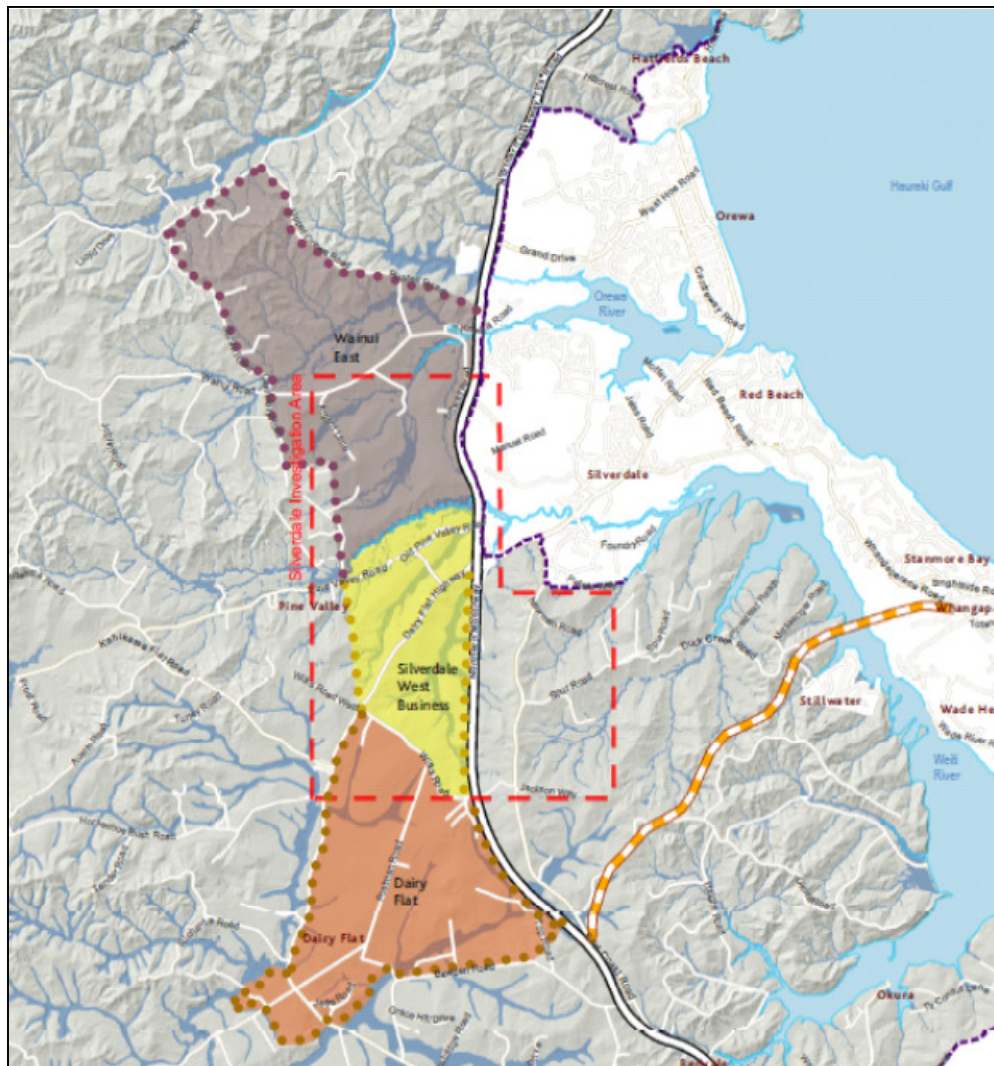


Figure 8 - Draft Unitary Plan Silverdale RUB Map

Since the map above was developed, further analysis of the RUB options for Silverdale has occurred, which led to the following amendments:

- The northern part of the area denoted “Wainui East” is no longer proposed to be included in the RUB
- Extension of the RUB southwards to include land in “Dairy Flat”
- Land around the North Shore aerodrome has been removed from the RUB
- The area proposed for business activity now excludes the area around Pine Valley Road
- The Silverdale area generally may be appropriate for a greater amount of development than 12,000 additional dwellings and 8,000 additional jobs

The updated RUB map for the Silverdale greenfield area of investigation, which was presented to the Council’s Auckland Plan Committee workshop on 8 July 2013, is shown below:

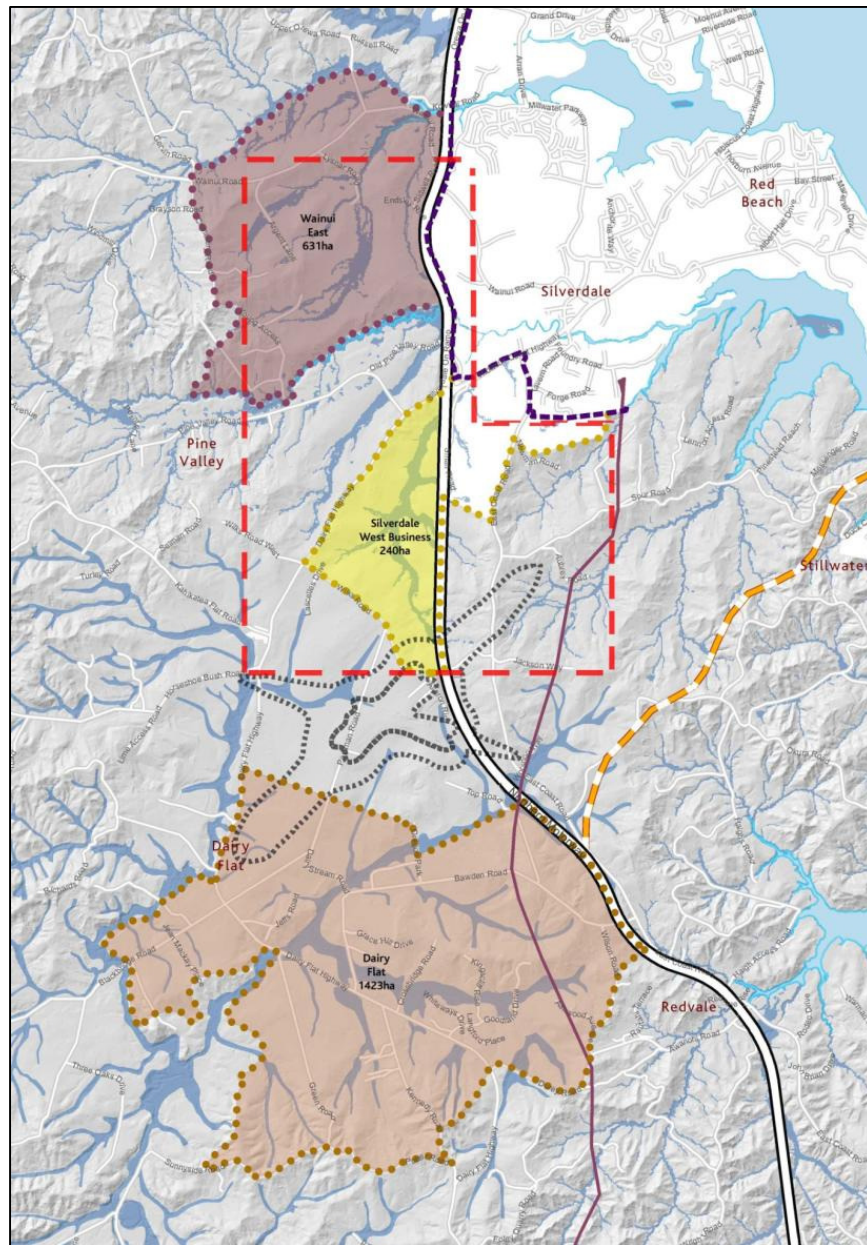


Figure 9 - Updated Silverdale RUB Map (as at 8 July 2013)

3.3.3. Transport Situation

The Silverdale greenfield area of investigation will effectively form an extension to the southwest of the existing Hibiscus Coast urban area that encompasses Orewa, Silverdale, Red Beach and the Whangaparaoa Peninsula. These areas are separate from the rest of Auckland's urban area, with transport connections being mainly via State Highway 1 (the Northern Motorway), Dairy Flat Highway (formerly SH17 and before that SH1) and East Coast Road.

Currently, public transport services connect the Hibiscus Coast area with downtown Auckland, with buses mainly operating along Dairy Flat Highway although some express services operate along the Northern Motorway. Significant constraints on the transport network exist at the Silverdale motorway interchange and along the Hibiscus Coast Highway – especially between the Silverdale interchange and Whangaparaoa Road. Congestion at peak times also occurs along Whangaparaoa Road itself. South of Albany, the Northern Motorway experiences significant congestion.

Penlink, a direct link between the Whangaparaoa Peninsula and SH1 that would bypass Silverdale, is projected to begin construction before 2020 and is considered critical in unlocking future growth in the broader Hibiscus Coast area. Shorter term transport upgrades include a recently opened connection from Silverdale North/Millwater through to Orewa and south-facing motorway ramps at Wainui Road. These two projects enable the full build-out of Silverdale North/Millwater.

In the longer term, the Northern Busway (which currently terminates at Constellation Drive) is proposed to be extended first to Albany and then to Silverdale. Widening of SH1 between Albany and Orewa may also be required.

Preliminary transport modelling (undertaken prior to splitting the ART3 zones and before inclusion of the new networks) provides an indicative analysis of the destination of outbound trips during the morning peak period in 2041. The modelling results for Silverdale are shown below:

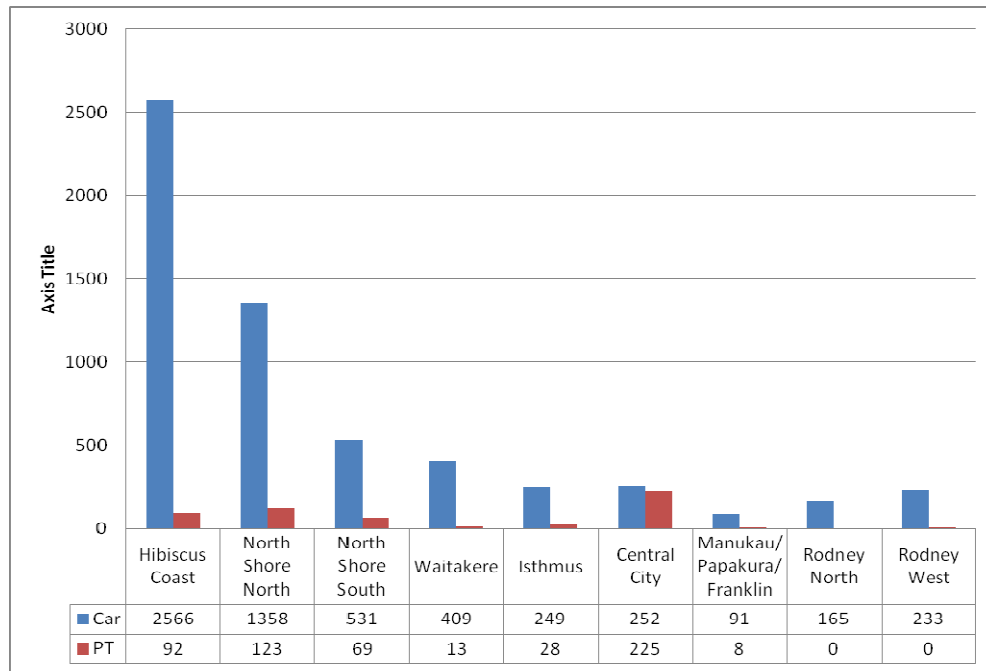


Figure 10 - Destination of Outbound AM Peak Trips in 2041

The preliminary modelling results suggest that the vast majority of outbound trips from Silverdale are to other areas north of the Auckland Harbour Bridge: particularly the Hibiscus Coast and the northern part of the North Shore (mostly the Albany and North Harbour employment areas). The city centre is the destination for the greatest number of public transport trips.

3.3.4. Transport Constraints and Opportunities

A significant transport consideration in the development of the Silverdale greenfield area of investigation is the severe congestion on the Northern Motorway (particularly from the Greville Road interchange south) during peak times. While there is a large, and growing, amount of employment available in and around Albany, further development of local employment in the Silverdale greenfield area of investigation will be critical to ensure congestion problems on the Northern Motorway (which transport modelling suggests will not be fundamentally altered through the construction of an additional harbour crossing) are not significantly exacerbated by development. The timely extension of the Northern Busway northwards will also be important to provide an attractive public transport option for people who are travelling towards the city centre.

While Dairy Flat Highway has unused capacity, ultimately its southern end feeds through Albany Village and then adjoins the emerging Metropolitan Centre of Albany. Too much additional traffic along this route may also exacerbate existing traffic problems in the Albany area and undermine

attempts to better link Massey University with the centre of Albany. Ensuring good motorway access from the Dairy Flat area (so that people use the motorway rather than Dairy Flat Highway if they're travelling south), providing a high quality public transport alternative to driving and enabling significant employment growth in the Silverdale area will be important responses to this constraint.

The construction of Penlink, including a revision of how Penlink connects to the Northern Motorway to a full-diamond interchange, will provide improved access to the motorway from the Dairy Flat area as well as easing pressure on the transport network through Silverdale and to the north of this interchange. Overloading of this interchange is possible as it will serve both the Whangaparaoa Peninsula via Penlink and also the development of Dairy Flat.

3.3.5. Conceptual Transport Network

A conceptual transport network for Silverdale is shown below:

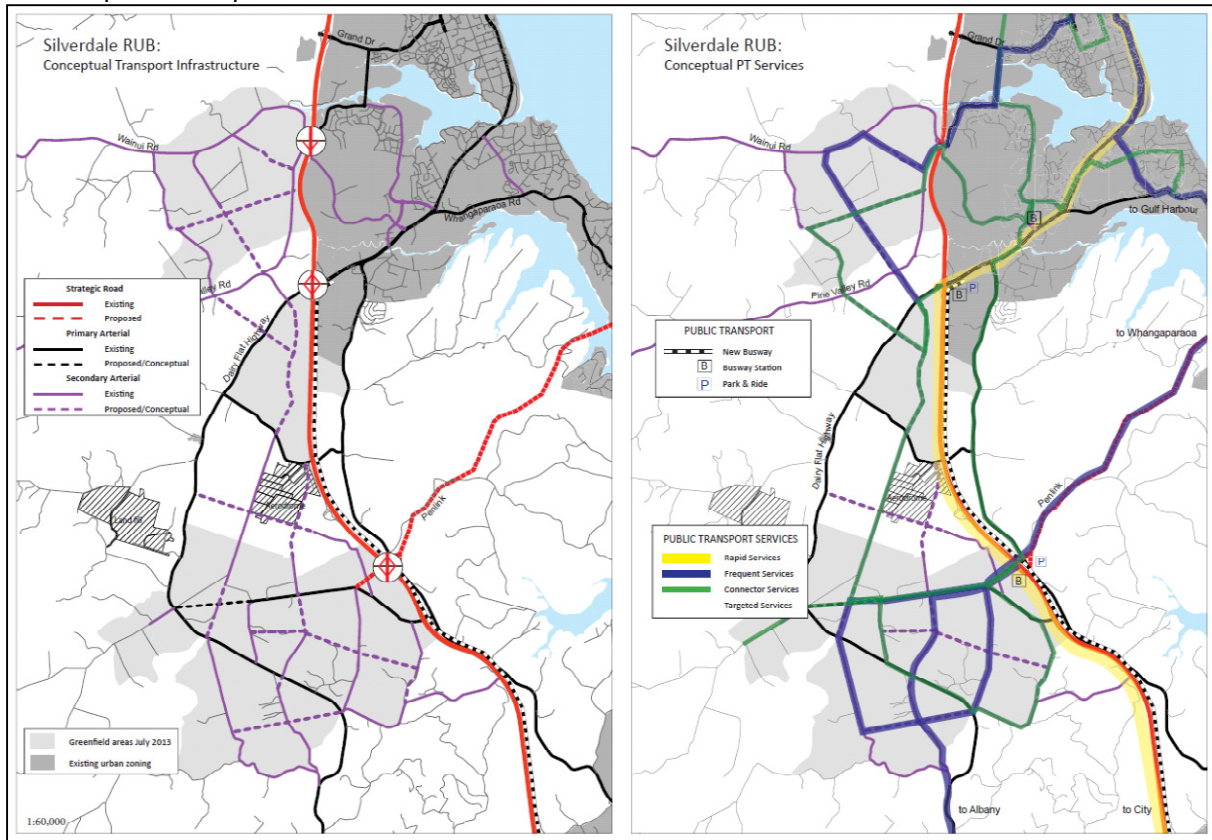


Figure 11 - Conceptual Transport Network for Silverdale

Key features of the network are:

- The Northern Busway is extended to Silverdale and supported by two bus interchanges at Dairy Flat and Silverdale before extending to Orewa along the existing Hibiscus Coast Highway with some bus priority measures provided. Further investigation is required to determine whether the busway's alignment – its location on the conceptual network map is indicative only.
- Penlink is connected to SH1 by way of a full diamond interchange. Penlink connects with Bawden Road through to Dairy Flat Highway as a primary arterial. Provision for buses to cross SH1 in a way unaffected by congestion (either through a separate crossing or bus lanes across the interchange) will be important here – especially if the bus interchange is east of SH1.
- To manage pressure on the motorway interchange at Silverdale it is important to provide a strong bus travel option and to provide efficient options to cross from the east to the west urban areas at other points. To the south there are three east/west links that do not link to the motorway and to the north the Wainui Road overpass becomes an important link as new arterial roads are joined to it.

- The Dairy Flat Highway – Hibiscus Coast Highway (former SH17) between Albany and Orewa becomes an important integrator of this area. Later work to determine its relative place and movement functions will be critical for assessing the functioning of the wider network.
- East Coast Road between Awanohi Road and the Hibiscus Coast Highway will also play an important role as a north – south link through an area where land use is relatively rural. The Awanohi, Bawden and Wilks Roads provide good access to East Coast Road and will help keep local trips off the motorway.
- A connected grid of secondary arterials throughout the new Dairy Flat centre are intended to enable a compact urban form that is well connected and promotes the use of public transport, walking and cycling.

Many of the necessary future arterial roads in the Silverdale area already exist – although as rural roads that will clearly need significant upgrading to perform an urban arterial function. The new roads proposed link up routes that exist in a way that creates a general ‘grid’ of arterial routes that is permeable and enables the efficient and legible operation of public transport services. A Dairy Flat town centre would be located where two of the frequent bus services intersect and at peak times would also be served by a direct bus to the Northern Busway extension and onto Albany and the city centre, enabling a high level of accessibility by public transport to and from this location.

3.4. Whenuapai/Kumeu/Riverhead (the “Northwest”)

3.4.1. Scale of Growth

The Auckland Plan highlights a greenfield area of investigation to the northwest of Westgate and Hobsonville, encompassing Kumeu/Huapai and Riverhead. The intention is for around 20,000 additional dwellings and 8,000 additional jobs to be located in this greenfield area of investigation over the next 30 years.

3.4.2. Options for Locating Growth

The DUP includes an ‘indicative’ RUB for Whenuapai/Kumeu/Riverhead (the “Northwest”), as is shown below:

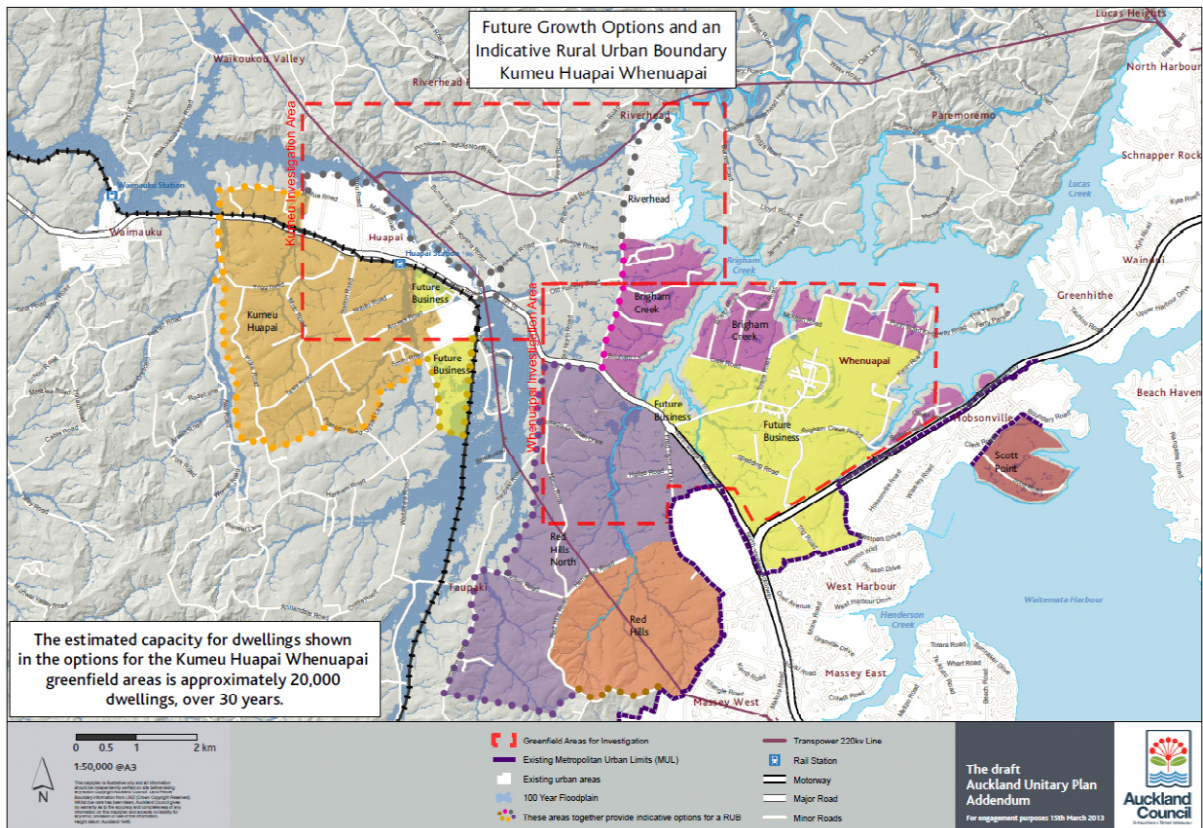


Figure 12 - Draft Unitary Plan Northwest RUB Map

Since the map above was developed, further analysis has occurred in regards to RUB options for the Northwest, leading to the following amendments:

- Riverhead is to grow more to the west rather than the south
- Kumeu/Huapai is to grow southwards to a lesser extent
- There is a reduction of the Red Hills North area around Taupaki
- Land to the northeast of Kumeu/Huapai is now proposed for inclusion in the RUB

The updated RUB map for the northwest greenfield area of investigation, which was presented to the Council's Auckland Plan Committee workshop on 8 July 2013, is shown below:

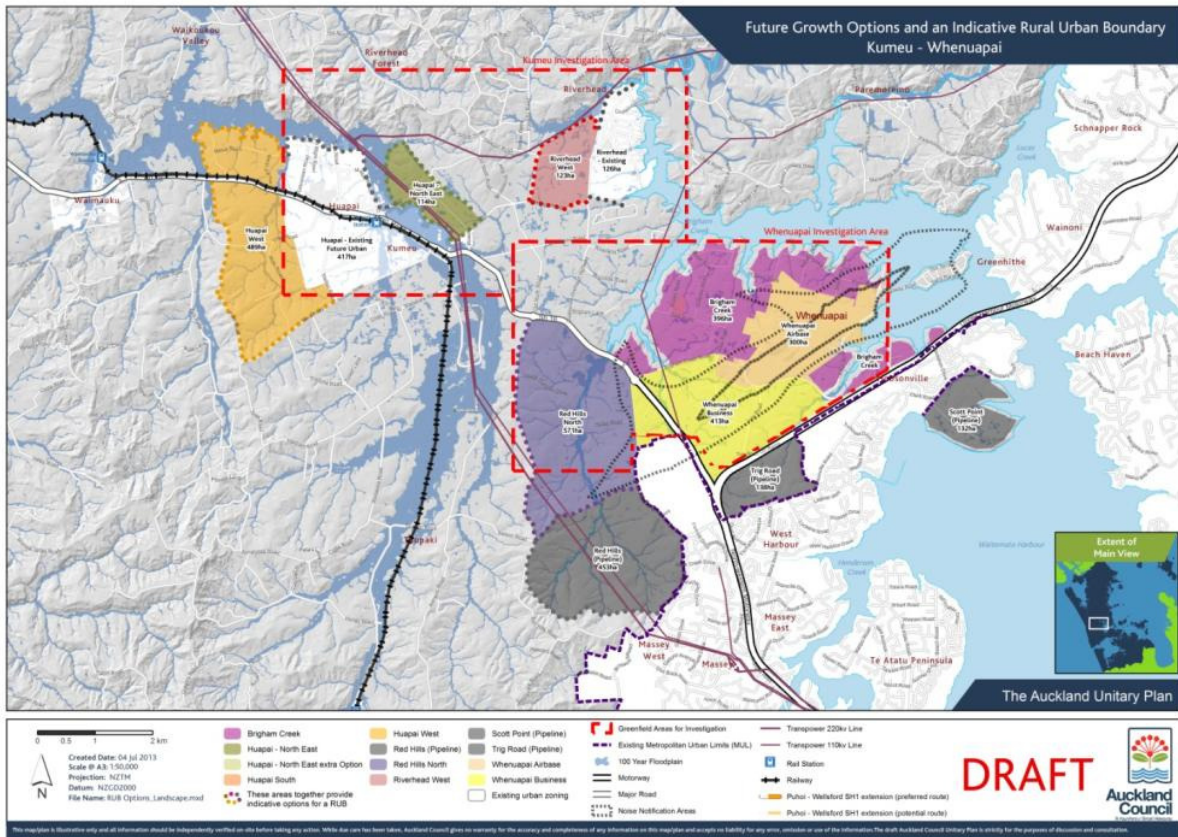


Figure 13 - Updated RUB Map for Northwest Area (as at 8 July 2013)

3.4.3. Transport Situation

The Northwest greenfield area of investigation will extend the Auckland urban area to the north and west of the current Metropolitan Urban Limits, which are generally formed by State Highway 18 (SH18) and Fred Taylor Drive (formerly SH16). In addition to this growth, Kumeu/Huapai is anticipated to grow significantly in size. Riverhead is also anticipated to grow. Kumeu/Huapai and Riverhead are both expected to remain separate towns, although much larger than their current form (especially Kumeu/Huapai).

Transport connections with the rest of Auckland are primarily provided through State Highway 16 (SH16 – the Northwest Motorway) and SH18 (the Upper Harbour motorway). The North Auckland Railway Line passes through the greenfield area of investigation, particularly around Kumeu/Huapai. Passenger services are currently provided to Waitakere Station, however once rail electrification is completed passenger train services will only be provided as far west as Swanson.

Currently, public transport services connect Kumeu/Huapai (and Helensville further to the northwest) with Auckland along SH16. A number of bus routes connect Westgate with Henderson and central Auckland while one service operates along SH18 and connects to the Northern Busway at Constellation Station. Ferry services, with relatively limited timetables at peak times only, operate from Hobsonville and West Harbour. Significant constraints on the transport network occur in the peak direction along SH16. The recently constructed SH18 motorway is comparatively free of congestion.

A number of transport projects are proposed in the northwest or have some impact on the northwest. The most significant of these projects is the completion of the Western Ring Route, which involves construction of the Waterview Connection project and the widening of SH16 between St Lukes and Westgate (including raising of the causeway between Waterview and

Rosebank Road). Completion of the Western Ring Route has a number of components likely to be constructed at various stages through to around 2020.

As part of completing the Western Ring Route, bus infrastructure provision along SH16 will be upgraded significantly, with bus shoulder lanes provided as part of the Waterview to Te Atatu upgrade project. Public transport infrastructure along SH16, in the form of bus stations at Te Atatu and Lincoln road interchanges and at Westgate will also be provided to enable implementation of Auckland Transport’s new bus network.

Development of Westgate/Massey North centre and the Hobsonville corridor also involves construction of a number of new pieces of transport infrastructure. This includes Northside Drive between Fred Taylor Drive and the Trig Road interchange, as well as significant changes to Hobsonville Road.

In the longer term, a busway from Waterview to Constellation via Westgate, travelling along both SH16 and SH18 is proposed. Investigation is currently underway to determine the phasing of this project, especially in relation to the costs and benefits of a full offline busway compared to bus shoulder lanes.

Preliminary transport modelling (undertaken prior to splitting the ART3 zones and before inclusion of the new networks) provides an indicative analysis of the destination of outbound trips during the morning peak period in 2041. The modelling results for the northwest area are shown below:

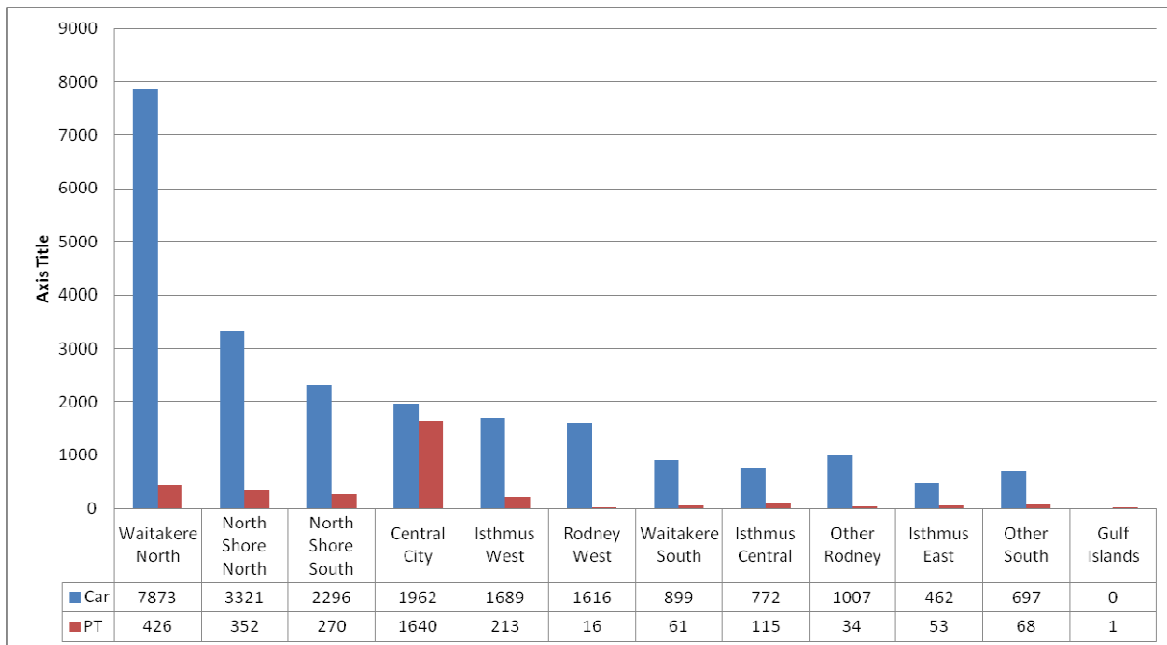


Figure 14 - Destinations of Outbound AM Peak trips from northwest greenfield area in 2041

The preliminary modelling results suggest that the largest destination for outbound trips from the northwest area is the surrounding Waitakere North area (including Westgate, Lincoln Road and Henderson employment areas). The next most significant destination is the North Shore, highlighting the importance of the SH18 corridor and then the central city and isthmus. The city centre is the destination for the greatest number of public transport trips.

3.4.4. Transport Constraints and Opportunities

Compared to other greenfield areas of investigation, the northwest has a high level of accessibility to other parts of Auckland – to the isthmus and city centre along SH16 and to the North Shore along SH18 in particular. The area is a similar distance to the city centre as Albany or Papatoetoe, much closer than any other greenfield area of investigation.

The current and likely future congestion along SH16 (even with the planned widening) is an important consideration for the growth of the northwest area. Historically, the Waitakere City area had a comparatively low level of local employment compared to other parts of Auckland and therefore a high outflow of trips to the North Shore, isthmus and beyond. Providing significant local employment and ensuring high quality public transport choices are available will be critical as extra capacity on SH16 beyond what is currently planned is likely to be extremely difficult to provide.

SH18 could be a constraint in terms of increased congestion, particularly at interchanges such as Brigham Creek interchange which is expected to reach capacity based on growth in the northwest. Further analysis of required upgrades to ease capacity constraints at the interchanges along SH18 will be required.

The potential for the North Auckland Railway Line to provide passenger services will require further analysis as the northwest area grows. At this stage it appears unlikely the railway line will play a significant role in providing public transport for the growth area, due to a number of factors:

- SH16 takes a significantly more direct route from the northwest to the isthmus and city centre, the destination points for a lot of public transport demand.
- An existing tunnel between Swanson and Waitakere would need to be enlarged to enable electrification beyond Swanson. Double-tracking of the railway line west of Swanson (also potentially including duplicating the rail tunnel) may be necessary to enable high passenger train frequencies.
- The proposed electrification extension from Papakura to Pukekohe would retire the diesel train fleet from use on Auckland's passenger rail network, reducing the cost-effectiveness of operating a diesel shuttle train between Kumeu/Huapai (or beyond) and Swanson.
- The railway line through the greenfield area of investigation is generally located within the 100 year floodplain, which has led to the RUB options not providing for significant development in locations such as Taupaki.

As the potential public transport role of the North Auckland Railway Line is limited, it will be essential to improve public transport infrastructure along SH16 (including northwest of Westgate) and SH18 in a timely manner to support growth in the northwest area.

As discussed further below there is potential to extend the Northwest Motorway from its current terminus at Brigham Creek Road to a point closer to Kumeu/Huapai. In the longer term the potential conflict between the operation of SH16 through Kumeu/Huapai and the growth of the area will need to be addressed. Bypass options have been examined in the past, with a bypass to the north considered to be challenging as a result of the Kumeu River floodplain. Bypass routes to the south would potentially conflict with the growth of the northwest. Resolving this issue will be of critical importance to enable development in the northwest greenfield area.

3.4.5. Conceptual Transport Network

A conceptual transport network for the Northwest is shown below.

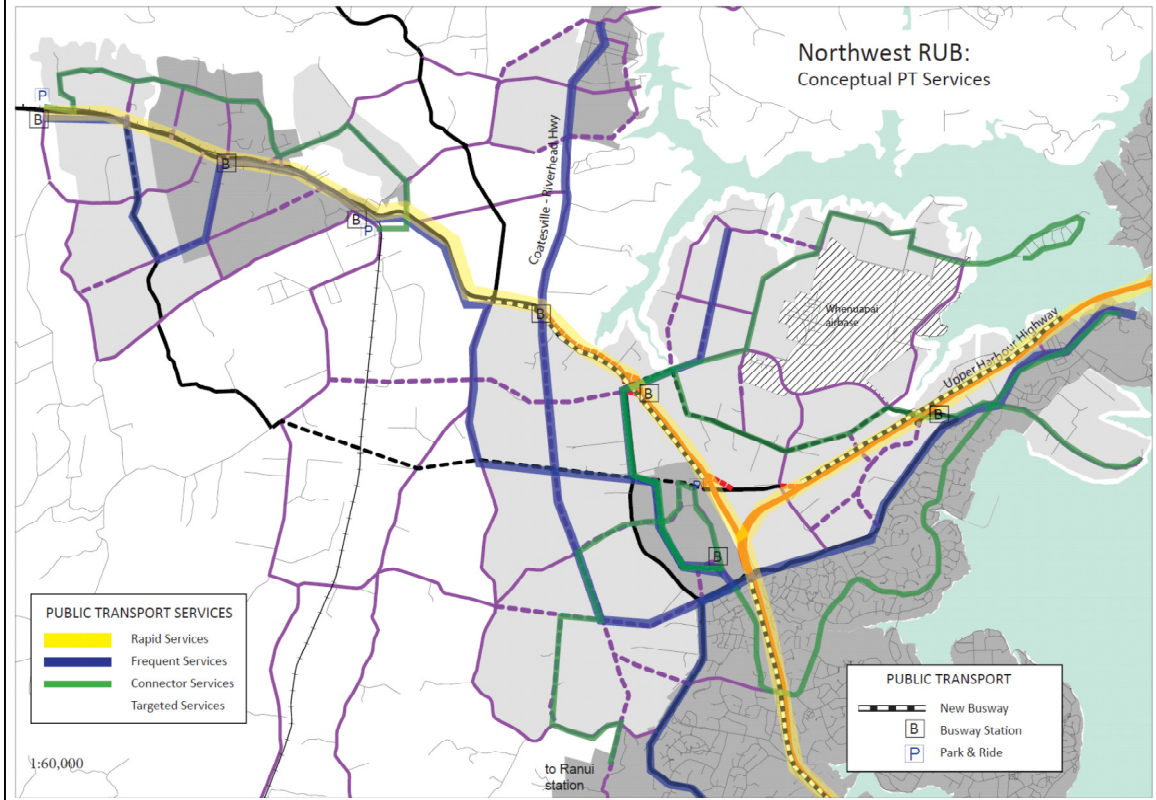
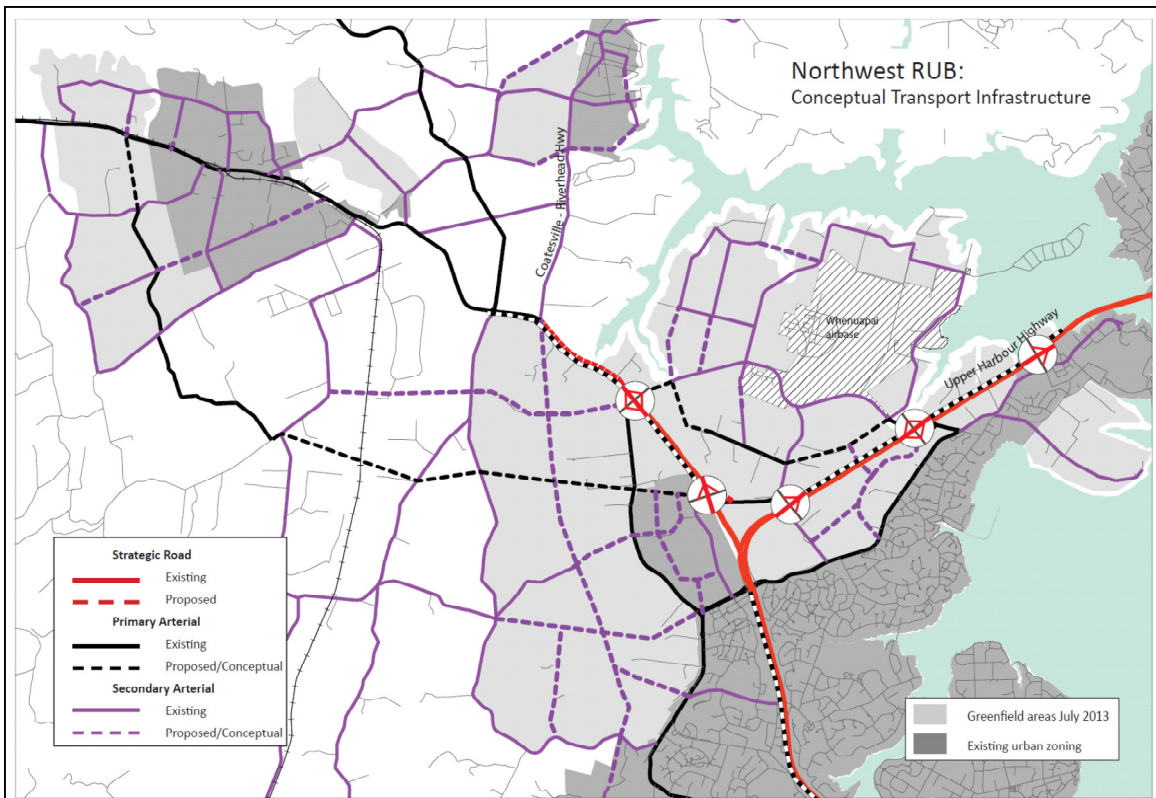


Figure 15 - Conceptual Transport Network for Northwest Area

Key features of the network are:

- Link SH16 and SH18 from Albany to Kumeu via north facing motorway ramps on SH16 at Northside Drive.
- Focus on bus rapid transport rather than rail with the SH16 busway extended to Kumeu and a busway constructed along SH18 providing for trips to/from the North Shore.
- A grid network of arterial routes, particularly providing for local trips, including alternatives to SH16 for Kumeu/Huapai to Westgate/Henderson trips.
- Completion of the Waitakere Western Bypass project between Ranui and Red Hills providing a quality north-south alternative to Don Buck Road.
- Extension of Northwest Motorway from Brigham Creek Road to Coatesville-Riverhead Highway intersection.

Some of the necessary future arterial roads in the northwest already exist – although as rural roads that will clearly need significant upgrading to perform an urban arterial function. The new roads proposed link up routes that exist in a way that creates a general ‘grid’ of arterial routes that is permeable and enables the efficient and legible operation of public transport services.

3.5. Southern Area

3.5.1. Scale of Growth

The Auckland Plan requires provision of approximately an additional 55,000 dwellings and 35,000 jobs in the southern greenfield area of investigation. This includes growth around Pukekohe but excludes growth within Pukekohe and also excludes later stages of growth in Hingaia.

3.5.2. Options for Locating Growth

Due to the significant size of the southern greenfield area there are a greater number of different options for the RUB’s location than in Warkworth, Silverdale or the northwest. Different options are possible not only as a ‘fine grained’ scale of setting the RUB’s exact location, but also at a high level of making key decisions around which broad areas should and should not be urbanised.

The Draft Unitary Plan highlighted a number of different options for areas that could be included in the RUB. A number of these options were consulted upon in November/December 2012, with the output of that consultation being the addition of further areas for consideration as to whether they should be inside the RUB or not.

The areas highlighted as “Core” were considered as areas most suitable for urbanisation and were included in the November/December 2012 consultation and the DUP. These areas are also common to all different scenarios which show a combination of RUB options to provide sufficient capacity to meet the Auckland Plan growth allocation requirements. The ‘Karakā North’, ‘Whangapouri’, ‘Paerata North’ and ‘Pukekohe North East’ areas were highlighted as potential areas for urbanisation over and above the core to enable growth in the south to meet the required capacity. Subsequent to the 2012 consultation, four additional areas were added for further consideration: ‘Karakā West’, ‘Pukekohe West’, ‘Pukekohe South East’ and ‘Ramarama South business’.

The Drury South Plan Change area was noted on the RUB options map, but highlighted that this area is subject to a separate plan change process. An alternative location for business activity on the western side of the Southern Motorway was noted in all RUB options.

Different options for the RUB’s location in the south are shown below:

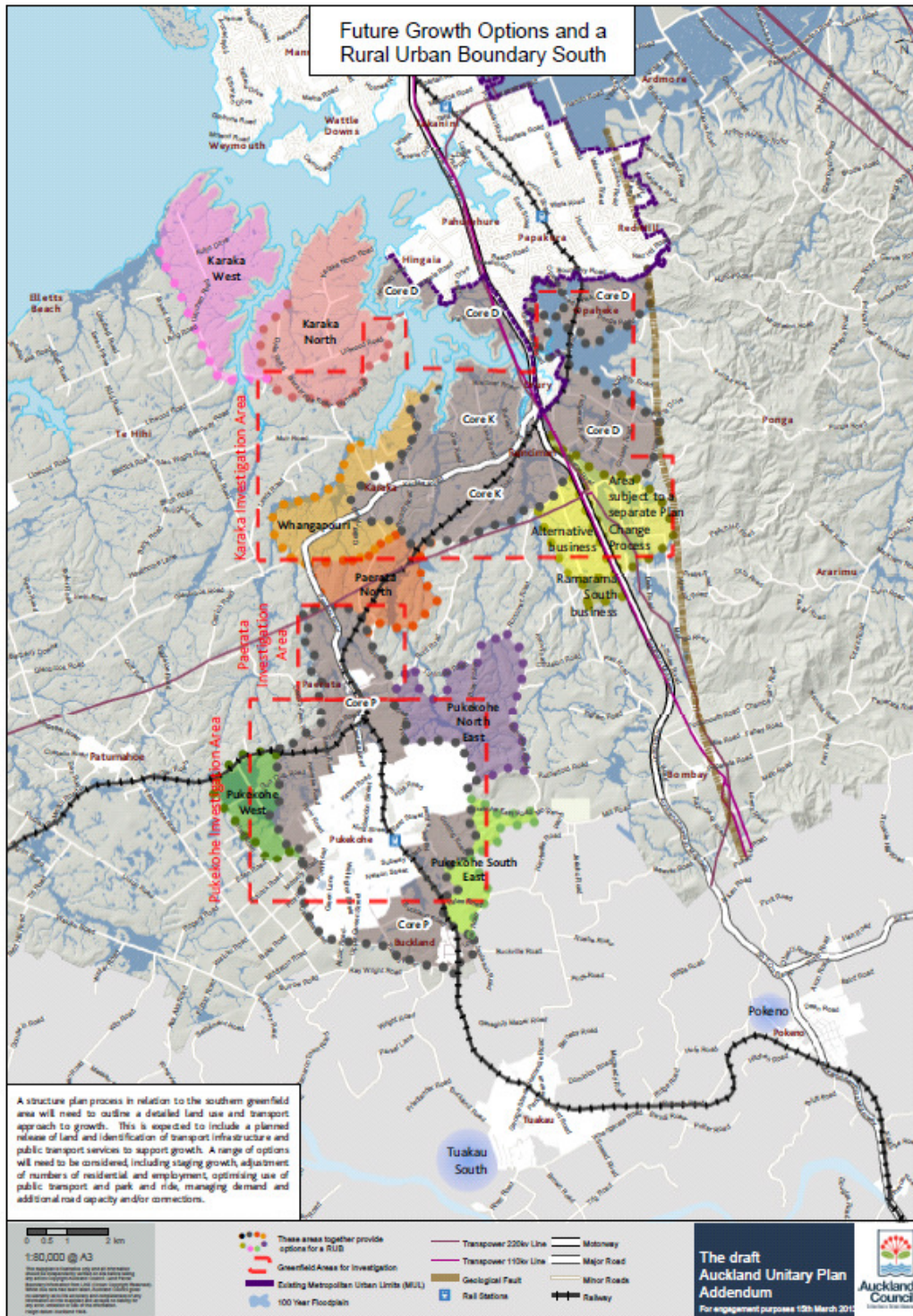


Figure 16 - Draft Unitary Plan RUB Options for Southern Greenfield Area

Because a combination of areas will be required to meet the 55,000 dwellings and 35,000 jobs growth capacity for the south, three 'scenarios' were created which combine a number of different RUB options in the south. These scenarios are shown below:

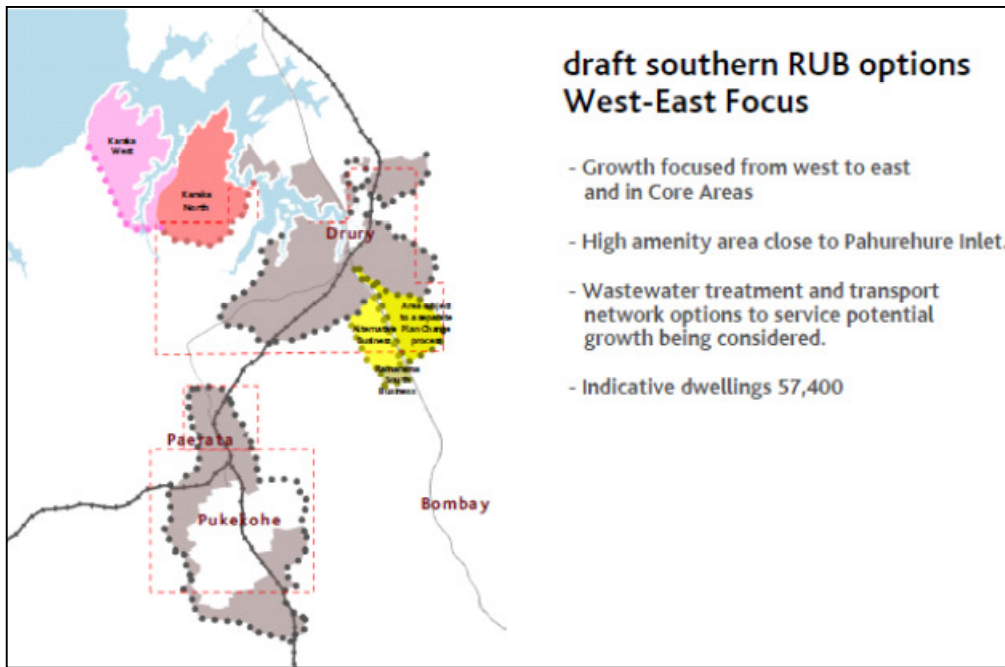


Figure 17 - West-East Focus Scenario

The 'West-East Focus' scenario includes the core areas plus both the Karaka West and Karaka North options.

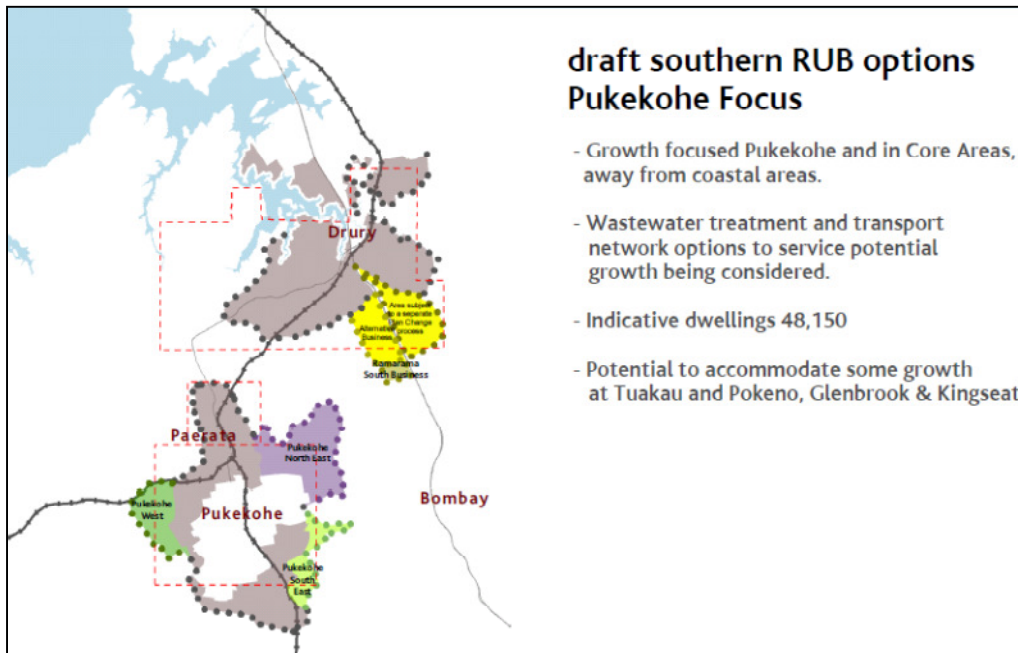


Figure 18 - Pukekohe Focus Scenario

The 'Pukekohe Focus' scenario includes the core areas plus growth to the west, northeast and southeast of Pukekohe. It does not include either Karaka West or Karaka North areas which would remain rural.

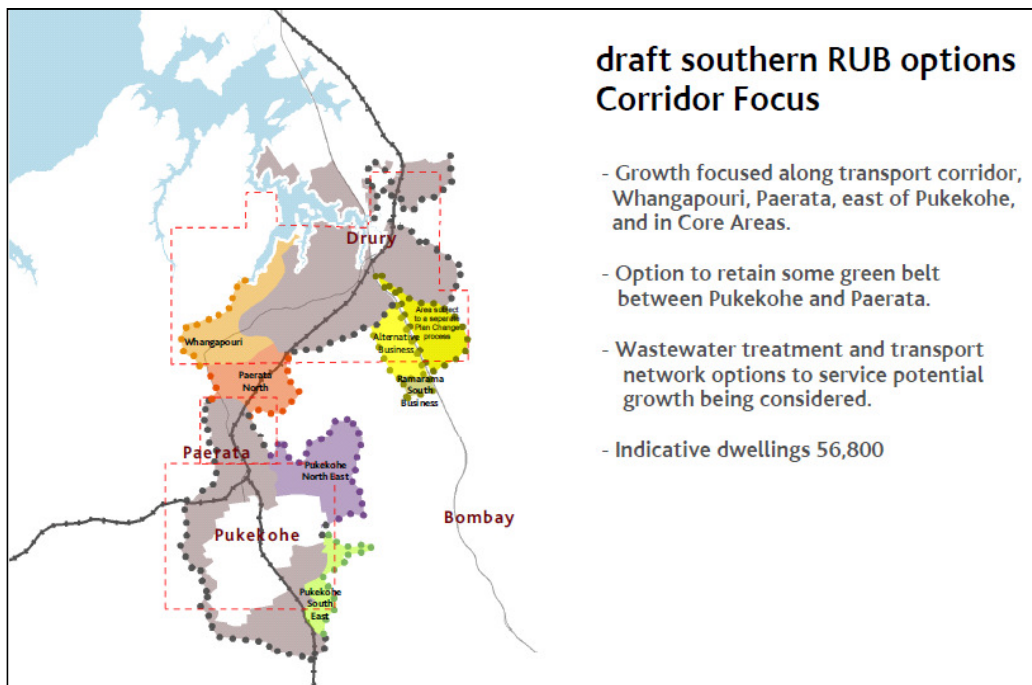


Figure 19 - Corridor Focus Scenario

The Corridor Focus option is fairly similar to the Pukekohe Focus option, except that it does not include urbanising west of the Pukekohe core, instead bringing the areas of Paerata North and Whangapouri inside the RUB.

The sheer scale of growth proposed in the southern area of investigation will require significant investment in transport infrastructure, no matter where the RUB is set. However, a variety of factors will influence the extent to which the RUB's location supports the key principles. These factors also help set the context for further work to determine what the preferred transport response to growth in the southern area will be.

3.5.3. Transport Situation

The Southern greenfield area of investigation will extend the Auckland urban area to the south and significantly grow the size of Pukekohe. A number of additional areas may be urbanised, depending on the scenario (or mix of scenarios) used to determine the RUB.

Transport connections with the rest of Auckland are primarily provided through SH1 (the Southern Motorway) and the North Island Main Trunk Railway Line, which passes right through the greenfield area of investigation. Most passenger rail services currently terminate at Papakura, although about 40 services per day on weekdays continue to Pukekohe. State Highway 22 (Karaka Road and Paerata Road) connects Drury to Pukekohe. Along with Pukekohe East Road, State Highway 22 acts as the prime connection between Pukekohe and the Auckland metropolitan area.

Significant congestion occurs in the peak direction along SH1, further to the north of the greenfield area of investigation – especially around the Takanini interchange and south of the connection between State Highway 20 (SH20) and SH1 at Manukau in the southbound direction during the PM peak period. There are also pockets of congestion within Pukekohe. State Highway 22 (SH22) is also a relatively unsafe road, although works are underway at the intersection with Glenbrook Road to improve safety in the short-term.

Preliminary transport modelling (undertaken prior to splitting the ART3 zones and before inclusion of the new networks) provides an indicative analysis of the destination of outbound trips during the morning peak period in 2041. The modelling results for the southern greenfield area are shown below:

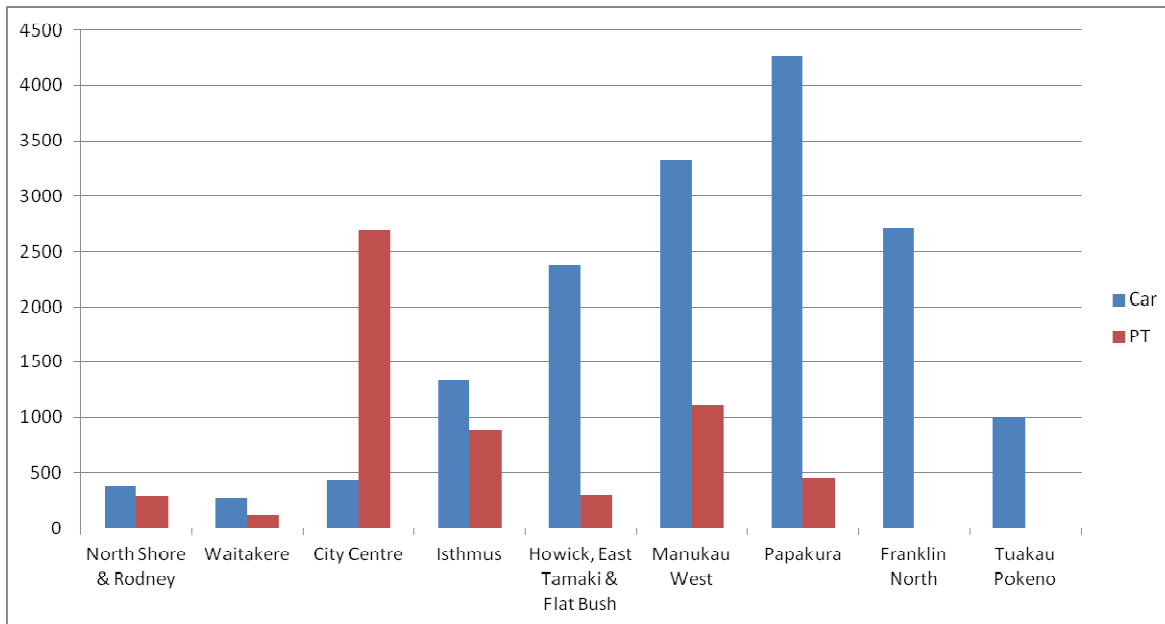


Figure 20 - Destinations of Outbound AM Peak Trips from Southern RUB in 2041

The preliminary modelling results suggest that the bulk of outbound car trips from the south are travelling to relatively nearby destinations in Papakura, Manukau West (which includes Manukau City and the Airport), employment areas at East Tamaki and other parts of Franklin North. The city centre is the destination for the greatest number of public transport trips.

A number of transport projects are proposed in the south or have some impact on the southern greenfield area. These include:

3.5.3.1. Public Transport Projects:

- Electrification of the rail network as far south as Papakura is currently underway and will be accompanied by the purchase of 57 new electric multiple unit (EMU) trains. Infrastructure works involve a major rebuild of Papakura station and will be completed by early 2014. The first EMU will be operational on the Auckland rail network in 2014 with all units delivered and operational by the end of 2015.
- Extending rail electrification to Pukekohe has been brought forward for consideration by Auckland Transport. Although the project is not yet approved, it is identified in the Auckland Plan as a first decade project. Auckland Transport is currently considering whether the project can be brought forward for completion by 2015 as an extension of the overall electrification project.
- Auckland's bus network will change significantly by 2016 to implement a new bus network focused around integration with rail to a greater extent and on creating a network of frequent services.
- The City Rail Link project will enable higher frequency trains to be operated across Auckland's rail network, including along the southern railway line. It is proposed for completion by 2022 in the Auckland Plan.
- Rail to Auckland Airport connecting to the existing rail network at Onehunga and Manukau is proposed for completion between 2020 and 2030 in the Auckland Plan. This project potentially provides direct rail access from the southern greenfield area to the Airport.
- Triple tracking the NIMT railway line is an important project to provide for rail freight and reduce conflicts between passenger and freight trains. Stages of this project are proposed in the near future (as part of electrification) between Otahuhu and Wiri, while further sections are included in the Auckland Plan but have no definite timetable for completion or confirmed funding.

3.5.3.2. *Roading Projects:*

- NZTA's *Auckland State Highways Future Directions* document outlines a strategy for the state highway network over the next 30 years and lists a series of projects to be undertaken over the short, medium and longer term. In the southern area these projects include:
 - Three laning SH1 southbound between Hill Road and Takanini as a short term project
 - Four laning SH1 southbound between SH20 and Hill Road as a medium term project
 - Upgrading the Takanini motorway interchange and widening the northbound motorway as a medium term project
 - Three laning SH1 southbound between Takanini and Papakura as a medium-term project
 - Six laning SH1 between Papakura and Drury as a long term project
 - Upgrading the Drury interchange as a long term project
- Transport announcements by Central Government in June 2013 note that priority will be given to widening SH1 between Manukau and Papakura in a much shorter timeframe than had previously been envisaged.
- The Mill Road corridor will provide a connection from Drury through to Redoubt Road to the east of SH1. The project is proposed to connect future growth areas and provides an alternative route to SH1 and Great South Road. The construction of the project is proposed to begin around 2022 and be completed in a staged manner.
- Pukekohe Eastern Arterial provides a direct connection between Pukekohe East Road and Manukau Road.

3.5.4. *Transport Constraints and Opportunities*

While the southern greenfield area of investigation is relatively distant from Auckland's city centre, the southern part of Auckland is relatively rich in employment with major centres at Manukau and Papakura and other large employment areas in East Tamaki and around the Airport.

The current and likely future congestion along SH1 (even with planned widening) is an important consideration for the growth of the southern area. The Pahurehure Inlet of the Manukau Harbour provides a significant geographic constraint for connecting this area to the rest of Auckland, funnelling all traffic west of SH1 through either the Drury interchange with SH1 or the Papakura interchange with SH1. While the Mill Road corridor project is intended to provide an alternative 'north-south' route to SH1, it is important to consider that Mill Road is to the east of SH1 while most growth is proposed in areas to the west of SH1.

Within the southern greenfield area, SH22 (Paerata Road and Karaka Road) serves a regional connector function, linking Pukekohe and many towns/villages further to the southeast, as well as the Glenbrook steel mill, with urban Auckland. As the greenfield area develops over time, SH22 will need to change its function as traffic volumes grow and the area on both sides of SH22 transitions from rural to urban. Resolving the conflicts between through-traffic and placemaking along this stretch of road is a key consideration for the southern greenfield area.

Depending on the RUB options selected, some areas are potentially very isolated from public transport infrastructure and/or dependent upon motorway interchanges and access routes which are already, or certainly will become, highly capacity constrained. For example, the growth of Hingaia and Papakura itself will utilise the capacity of the Papakura interchange and Hingaia Road. Furthermore, adding an additional east-west road corridor through Hingaia is likely to be extremely difficult given the environmental constraints along its northern coast and the extent of development which has already occurred. These factors make the Karaka North and Karaka West (in particular) options highly dependent upon external access for employment and services, either through a very difficult connection to SH1 or a new north-south connection over the Pahurehure Inlet.

Some areas highlighted as potential RUB options (particularly the Pukekohe northeast area) may be very challenging to provide with transport infrastructure which supports the key transport RUB principles – because of those areas' natural hilly topography. Providing a connected grid street

network, minimising the construction of new infrastructure spend and enabling land-use development intensity which supports public transport, walking and cycling is less likely in areas with a steep topography.

The very close proximity of the Auckland-Waikato regional boundary presents a potential transport constraint as there cannot be the same level of surety about alignment between land-use planning and transport infrastructure development across regional boundaries as there is in Auckland.

The North Island Main Trunk (NIMT) railway line passes right through the greenfield area of investigation and follows the fastest route to major employment locations further north. The line is double-tracked, electrified to Papakura (by the end of 2013) with the extension of electrification to Pukekohe programmed as a first decade Auckland Plan project currently under investigation. The railway line can provide a high-capacity, high-speed public transport option for people living and working in the southern greenfield area.

Significant development of the greenfield area, including the addition of a number of train stations to serve the area, may create the need for significant improvements to the rail network further north – including additional tracks to provide for express services and to enable the continued operation of freight trains. A third track along the NIMT between Papakura and the city centre is proposed in the Auckland Plan, likely to be implemented progressively over the next 30 years. Reliable operation of express and local train service patterns may require four tracks in some locations.

SH1 passes through the area, providing good access for people and freight trying to get north or south. Importantly, SH1's potentially negative impacts on the urban form of the southern greenfield area are limited where RUB options focus more around the rail corridor. This contrasts with other greenfield areas where existing or proposed motorways may pass through the heart of these areas requiring significant attention to mitigating potential adverse noise, pollution and community severance issues. The Ramarama interchange is currently relatively under-utilised, meaning that potential exists for this interchange to be used for business development in the area as well as better linkages between the main areas identified for investigation and the western side of the interchange to be created.

The Mill Road corridor project and proposed widening of State Highway 1 to six lanes provides improved roading capacity in the eastern part of the investigation area.

3.5.5. Previous Strategic Transport Studies

In 2006 the *Southern Sector Strategic Transport Study* was completed. The study set the groundwork for the transport networks in Auckland's southern sector (the area within Auckland covered by the former Manukau, Papakura and Franklin councils) to accommodate the growth predicted to occur, based on the 1999 Regional Growth Strategy and the sector agreements which followed that strategy.

The study primarily looked at roading matters as other strategic studies being prepared by ARTA covered public transport, while walking and cycling were considered more of a local transport consideration than at a high strategic level. The study analysed three broad options for the Southern Sector. These are shown in the map below:

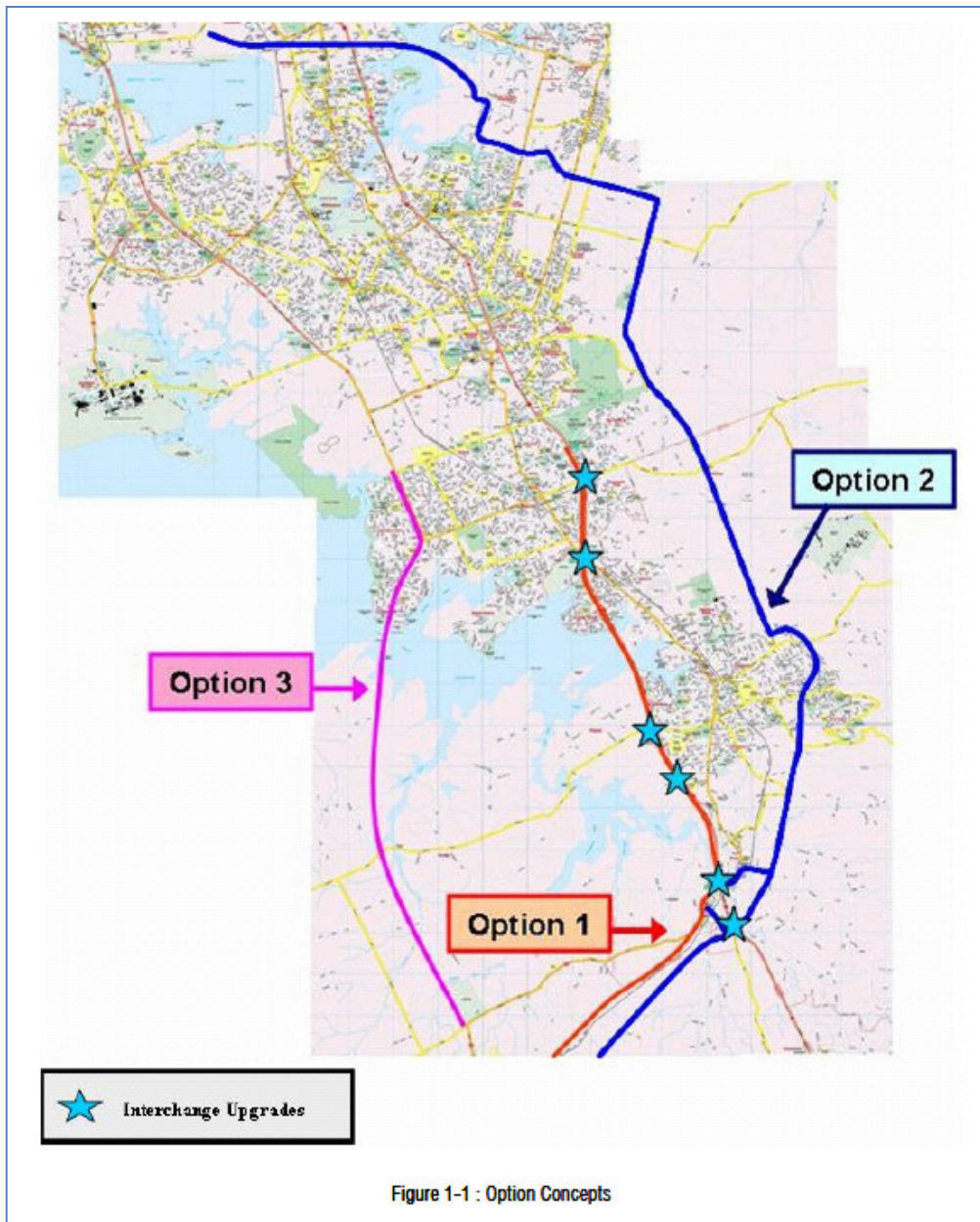


Figure 21 - Corridor options in 2006 Strategic Transport Study

The main findings of the study, in relation to roading, are outlined below:

- The traffic modelling indicates that the Southern Motorway will come under increased pressure and should be upgraded as a matter of priority. Widening to three lanes per direction will be required south from Manurewa, first to Takanini and as far as Drury by about 2021. Interchange upgrades should be pursued at Papakura and Drury, with possible additional interchanges at Alfriston Road and Quarry Road, with the latter influencing the need for an upgrade at Drury;
- The Mill Road route between Drury, Papakura and Manukau/Flatbush will need to be upgraded. The form of the upgrade should be examined further as part of a corridor study. This link is likely to be needed in addition to the above works proposed on the Southern Motorway. The link can be developed in a way which is supportive of passenger transport;
- The opportunity to implement the Weymouth – Karaka Link would provide a significant new regional link and improve network resilience but it should only be progressed if there are changes to current (i.e. 1999 Regional Growth Strategy) land use strategies.

- The need for the increased capacity will be deferred by the proposed upgrade of the Southern Motorway which will be needed within the short term.
- An upgrade of the SH22 route from Drury to Pukekohe is needed, either in the form of providing a new four lane route alongside the railway corridor, as previously proposed or by providing a link from any new motorway interchange at Quarry Road across to the railway corridor. The decision regarding the relative merits of these two broad options needs to be taken in the context of the conclusions of the suggested Mill Road corridor study, which will determine whether that route terminates at Drury or Quarry Road. Under current (2006) land use assumptions, the provision of such an improved SH22 route will defer the need for a Weymouth – Karaka route.

Further findings of the study in relation to public transport recommended rapid transit connections to Drury and Pukekohe, between Manukau and the Airport and between Flat Bush and Manukau. Further public transport improvements were recommended throughout the southern area, with the Mill Road and Great South Road corridors being highlighted as a particular route which should give priority to public transport. Walking and cycling, as well as travel demand management, measures and policies were strongly recommended by the study.

The RUB options in the south highlight a different set of land-use assumptions to those used in the Southern Strategic Study, particularly in relation to the amount of growth to the west of SH1 in the southern greenfield area.

3.5.6. Strategic Transport Corridor Options

At a regional scale, there are a number of different options for the location of strategic transport corridors. The options shown below build on the work of the 2006 Southern Strategic Study. While it is likely that some of the options will perform better than others in the period being assessed – to 2040 – it is possible that beyond this period all of the strategic corridors will be required.

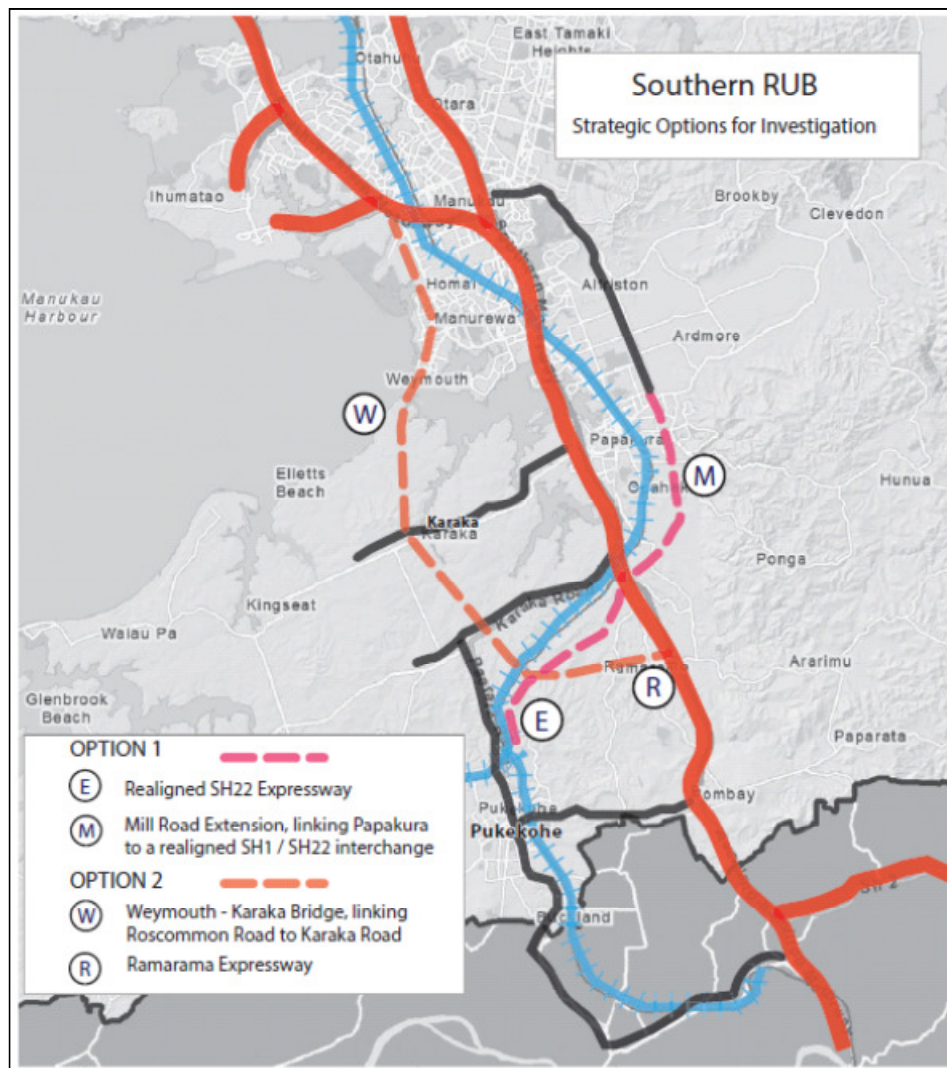


Figure 22 - Strategic Transport Corridor options for Southern Greenfield Area

The strategic transport corridors shown above are assumed to include the following:

Strategic Transport Corridor	Description and Discussion
Southern Motorway (SH1)	<ul style="list-style-type: none"> Widening to six lanes as far south as Drury is assumed in all land-use scenarios. Transport announcements by Central Government in June 2013 suggest that motorway widening from Manukau to Papakura is likely to be fast-tracked for completion by 2020.
North Island Main Trunk (NIMT) Line	<ul style="list-style-type: none"> Electrification to Pukekohe is assumed in all land-use scenarios. Future-proofing for a third or fourth track along the NIMT both within the greenfield area and further north is likely to be necessary to enable the provision of freight services, high frequency passenger services and express passenger services.
Mill Road and Realigned SH22 Expressway (Option 1)	<ul style="list-style-type: none"> The northern section of this corridor is comprised of the Mill Road corridor project, which extends up to Redoubt Road and provides a primary arterial north-south corridor east of SH1. Continuing this corridor over SH1 at a new interchange just south of Drury (the existing Drury interchange could be closed in this scenario) onto an expressway which skirts the southern

Strategic Transport Corridor	Description and Discussion
	<p>edge of the RUB and continues southwest to the northern edge of Pukekohe provides a high-speed and high-capacity transport connection that will ease pressure on the existing SH22 and make best use of the investment planned on the Mill Road corridor.</p> <ul style="list-style-type: none"> • A key strength of this option is that it can be constructed in an incremental manner, building on the rollout of the Mill Road Corridor north-to-south, utilising an upgraded existing SH22 during earlier stages of development and taking advantage of capacity enhancements on SH1 in the short to medium term. • A weakness of this option is that most growth is located west of SH1 and traffic will need to cross the Pahurehure Inlet bottleneck either on SH1 or east of SH1 on the Mill Road Corridor.
Karakā-Weymouth Connection (Option 2)	<ul style="list-style-type: none"> • A new bridge between the Karakā West RUB option and the Weymouth peninsula is seen at this stage as the only feasible alignment for an additional north-south crossing of the Pahurehure Inlet west of SH1. The possibility of such a connection has been recognised for many decades, with many properties on the western side of Weymouth Road being set back some distance from the road to allow future widening. However, the area has built up substantially as a residential area with schools and other facilities along Weymouth Road. • North of the bridge, significant road improvements would be required around the intersection of Roscommon, Weymouth and Mahia roads. Widening of Roscommon Road is also likely to be required – potentially right through to the motorway interchange with SH20. Duplication of Weymouth Road to a four lane arterial is also likely to be necessary given the traffic volumes projected by the Southern Strategic Study (and these volumes were based on lower population growth projections). • South of the bridge, a new expressway is required to link the bridge with the arterial road network further south. • A key strength of this option is that it provides additional capacity across the Pahurehure Inlet to the west of SH1, consistent with the location of most greenfield development being west of SH1. It also provides resilience in the transport network. • A key weakness of this option is the difficulty of constructing it in an incremental manner. Approaches to the north and south of the new bridge are only likely to be justifiable if the bridge itself is built. Similarly, as soon as the bridge is built the approach roads from the north and south will be required. • Another weakness is that the section of road to the north of the bridge passes through an existing residential community. Significantly higher traffic volumes are likely to have a detrimental effect on that community and the existing development is likely to place constraints on providing a strategic transport route through the Weymouth peninsula unless extremely expensive tunnelling is undertaken.
Ramarama Expressway	<ul style="list-style-type: none"> • Extending a Karakā-Weymouth link from just north of Glenbrook Road right through to the Ramarama interchange via a Ramarama expressway is seen as one way of further

Strategic Transport Corridor	Description and Discussion
	<p>reducing pressure on SH1 and extending the 'ladder' structure of Auckland's motorway network one step further south.</p> <ul style="list-style-type: none"> • The Ramarama expressway, especially if combined with a Karaka-Weymouth connection, creates enhanced resiliency of Auckland's strategic roading network and reduces pressure on SH1.

Important transport considerations for setting the RUB in the south in relation to development in the Karaka West area (and the Karaka North area to a lesser extent), are

- The likely greater number of trips outside these areas to employment and other activities due to small scale, lack of access to rail;
- The greater likelihood that a Karaka-Weymouth Connection would be required;
- The greater likelihood that people living in other parts of the south would wish to use a Karaka-Weymouth bridge rather than use public transport or seek local employment.

Given the difficulty in constructing this connection and its approach roads in an incremental manner, this situation makes the 'West-East' Scenario reliant upon a very large scale transport investment that is not envisaged in either the Auckland Plan or the Integrated Transport Programme.

3.5.7. Conceptual Transport Networks:

As discussed earlier in this section, unlike other greenfield areas in the south there were three land-use scenarios included in the Draft Unitary Plan for public feedback. Conceptual transport networks for each land-use scenario were created for comparative purposes – so that analysis (both qualitative and quantitative) of the three networks could input into decisions made about the RUB's preferred location.

3.5.7.1. Common Elements to all Transport Networks:

Within the core areas (Drury East, Karaka South and around Pukekohe) the transport network is generally similar for each land-use scenario. This network focuses around a well connected grid street network, supporting a best practice transit oriented development around a new train station in Karaka South and utilising the Mill Road corridor.

Conceptual networks for all three land-use scenario rely on:

- Rapid transit electric rail services to Pukekohe.
- Significant improvement to bus service levels.
- Changing the existing SH22 route from Drury to Pukekohe into an urban arterial and upgrading the Pukekohe East Road link into Pukekohe from Bombay.
- Extending Mill Road through Papakura to Drury, on the east side of SH1.
- Ensuring efficient road access to the employment areas in Drury South from SH1 plus efficient local road links.

New train stations at Drury, Paerata and Karaka South are common to all three land-use scenarios. All options also include a significantly enhanced bus service – particularly for local trips within the greenfield area and as feeder services to the various train stations.

3.5.7.2. West-East Focus Scenario:

Reflecting the discussion above, a conceptual transport network for the 'West-East' land-use scenario is shown below:

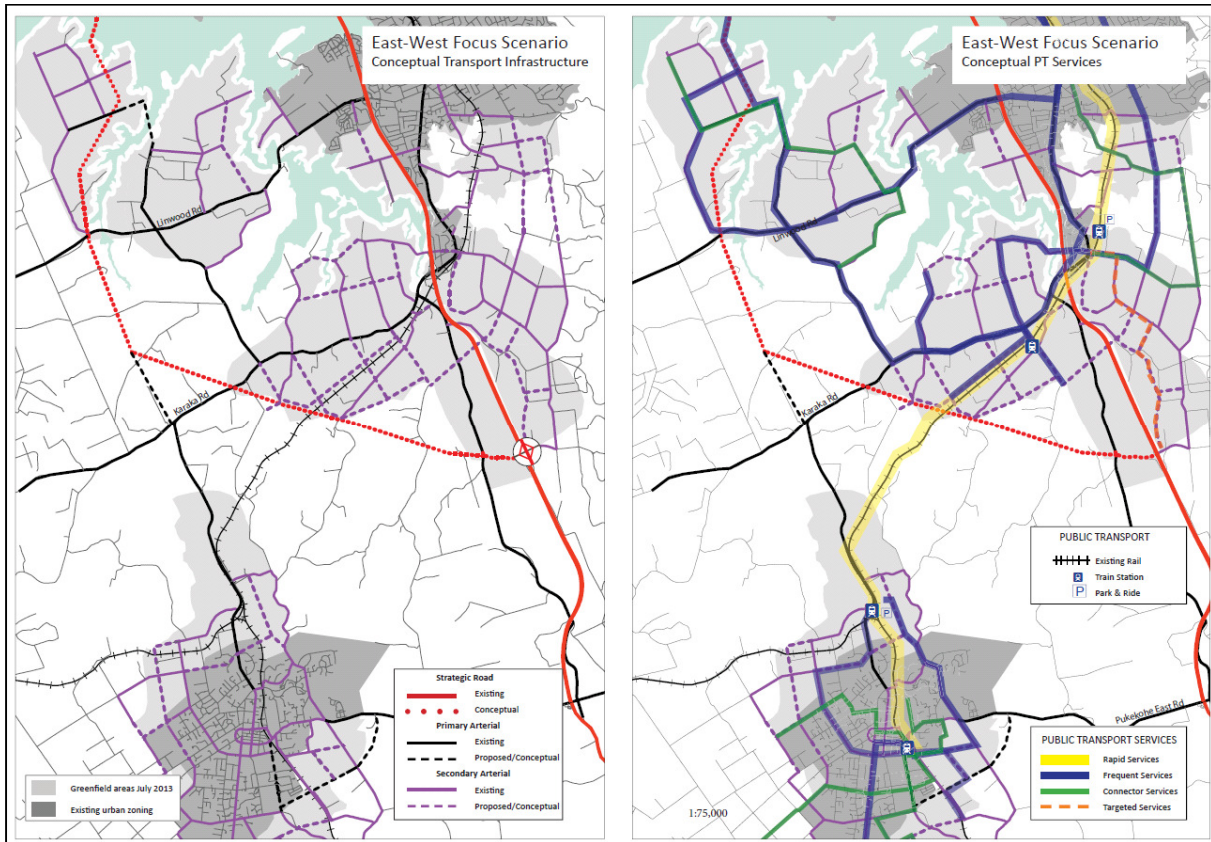


Figure 23 - Conceptual Transport Network for East-West Focus Scenario

The conceptual transport network for the West-East Focus land use scenario relies heavily on a new bridge link from Weymouth to Karaka, and associated road developments on Weymouth Road, Roscommon Road and in Karaka. The significant expansion of the movement capability of Roscommon Road and Weymouth Road and associated impact on the existing residential and business areas are not shown but would be required. A new expressway is proposed from the Ramarama SH1 intersection to the Weymouth – Karaka Bridge; while this might not be needed to support the RUB it could be viewed as a potential strategic link between SH1 and SH20, providing network resilience and further connectivity to the international airport. That route also provides connectivity between Weymouth, Karaka and the employment zone at Drury South.

Urban development of Karaka North and West is assumed to be reliant on the Weymouth – Karaka Bridge being in place. If the bridge is not in place traffic pressure on the already congested Papakura SH1 interchange will be very significant. Given the cost and difficulty of putting in the bridge and associated approach roads this scenario is likely to involve early build-out of Pukekohe and Drury, with Karaka North and West being the last areas built. Alternative options for providing additional north-south capacity to the west of SH1 should be investigated further, but at this stage no alternative to a Karaka-Weymouth link appears feasible.

Another feature of note is a new connection between the Karaka West and Karaka North peninsulas. This bridge is considered necessary to ensure that the two peninsulas (both significant in size and capable of around 10,000 dwellings of capacity) are well connected and form – to as great an extent possible given their geography – a single urban unit. It is notable that providing the peninsulas with a connected street network is challenging, as is avoiding a transport network reliant upon a single spine road running up the middle of the peninsulas.

In the 'West East Scenario', it is assumed that the Mill Road corridor would not need to perform a primary arterial function as the key parallel route to SH1, because the Karaka-Weymouth connection and associated Ramarama Expressway can perform this function.

3.5.7.3. Pukekohe Focus Scenario:

A conceptual transport network for the Pukekohe Focus scenario is shown below:

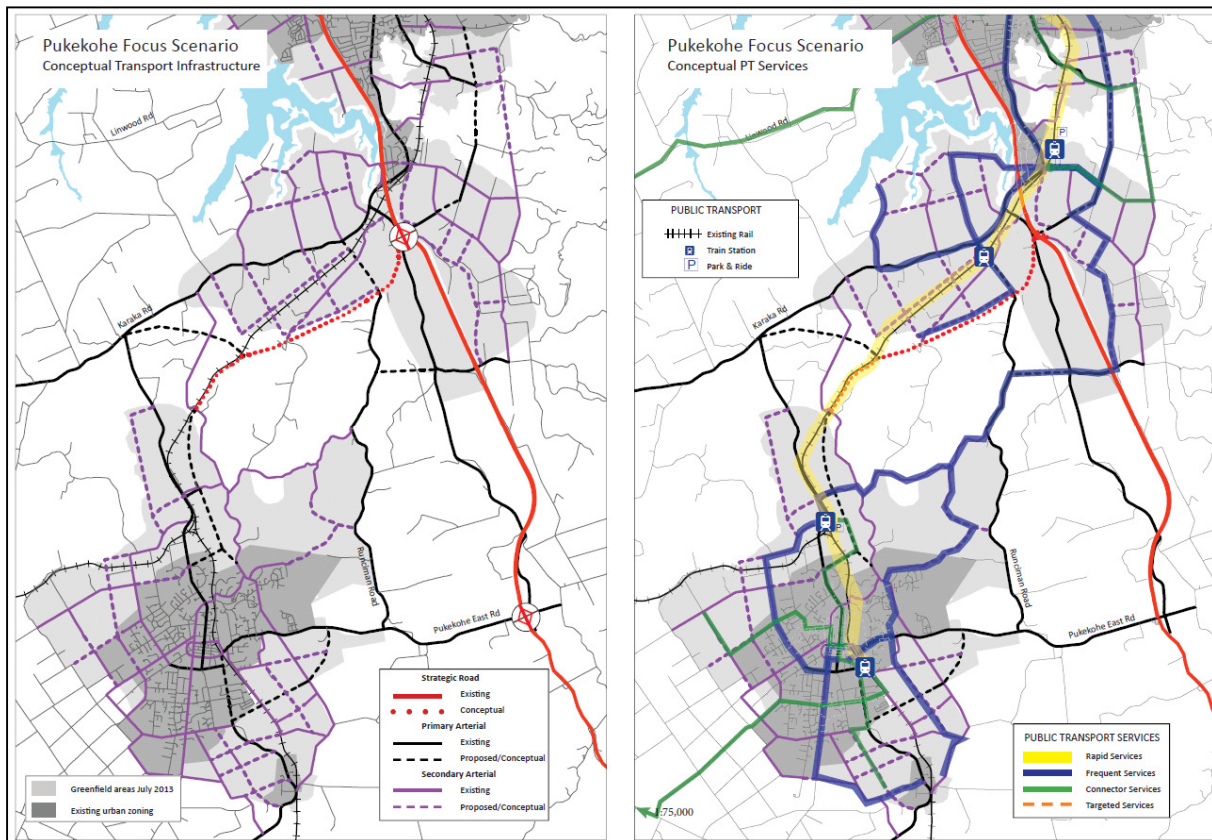


Figure 24 - Conceptual Transport Network for Pukekohe Focus Scenario

The conceptual transport network for the Pukekohe land-use scenario utilises the Mill Road-Realigned SH22 strategic transport option (Option 1) as described above. This involves closing the Drury motorway interchange and moving that full diamond interchange south, with a new expressway from the new interchange running along the south edge of the greenfield area. The existing SH22 route from the existing Drury SH1 interchange to the western edge of the core RUB could then be developed with a place-making focus more than a movement focus. An efficient link between the expressway and the Mill Road extension across SH1 would be important in this scenario.

A primary arterial connection from Glenbrook Road to the realigned SH22 expressway is seen as important for freight movements – particularly as the Glenbrook steel mill area has the potential to grow as a heavy industrial area with a broader range of industrial activities.

Providing a connected street network in the Pukekohe North East option is challenging due to the topography of this area. Pukekohe North East is also relatively isolated from public transport infrastructure and would be reliant upon a major upgrade of Runciman Road – potentially a very challenging and expensive project due to its existing rural geometry, width and function.

3.5.7.4. Corridor Focus Scenario:

A conceptual transport network for the Pukekohe Focus scenario is shown below:

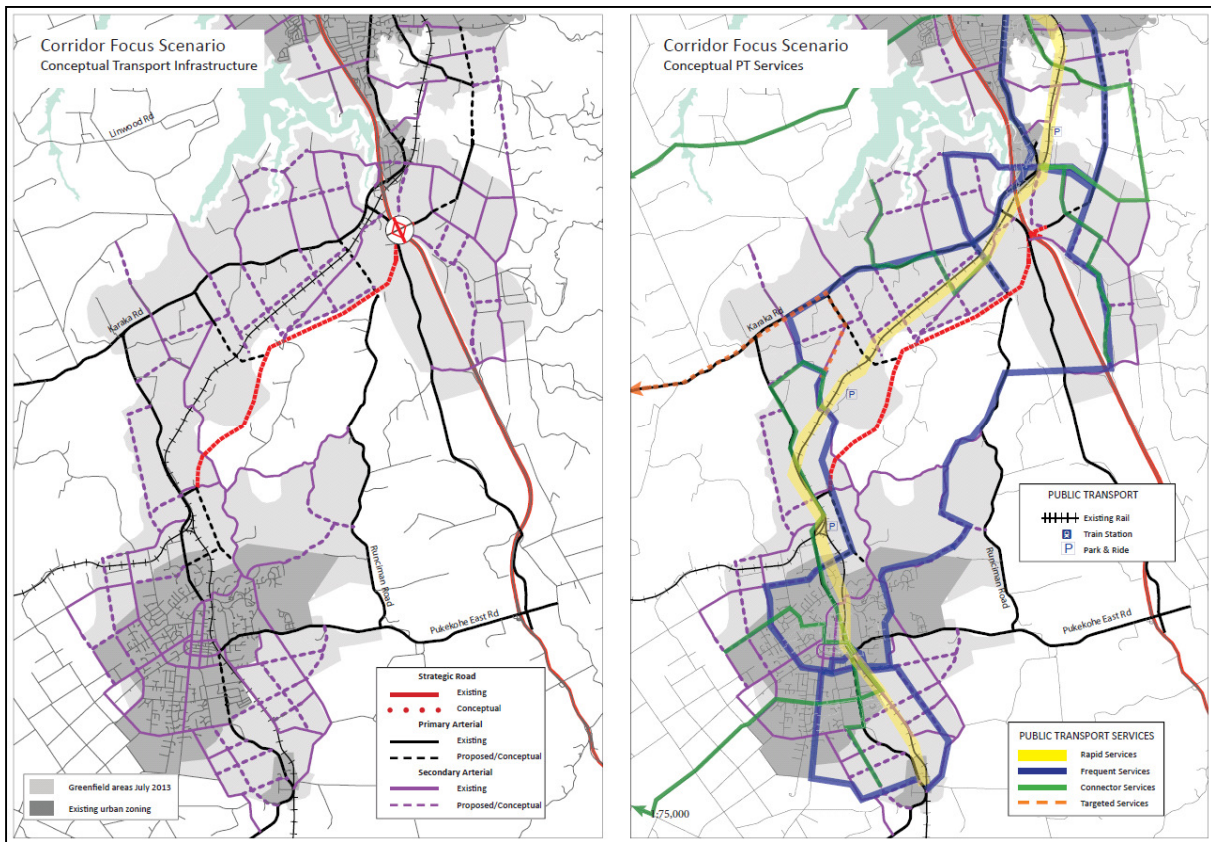


Figure 25 - Conceptual Transport Network for Corridor Focus Scenario

The 'Corridor Focus' land use scenario's conceptual transport network is very similar to that of the Pukekohe Focus scenario. The main differences relate to the extension of the connected arterial network into the Whangapouri and Paerata North areas, the addition of a train station in the Paerata North area and the realignment of the Glenbrook Road to expressway connection to better avoid passing through a potential transit-oriented development around the Paerata North train station.

3.5.8. Preferred Southern RUB

Since the three land-use scenarios for the southern greenfield area were included in the addendum to the DUP, further technical work has been undertaken, including preparation of a Pukekohe Spatial Development Framework. Feedback on the DUP and the additional technical analysis (including transport input) has led to the development of a preferred option for the RUB in the south. The preferred RUB option taken to a July 8 councillor workshop is shown below:

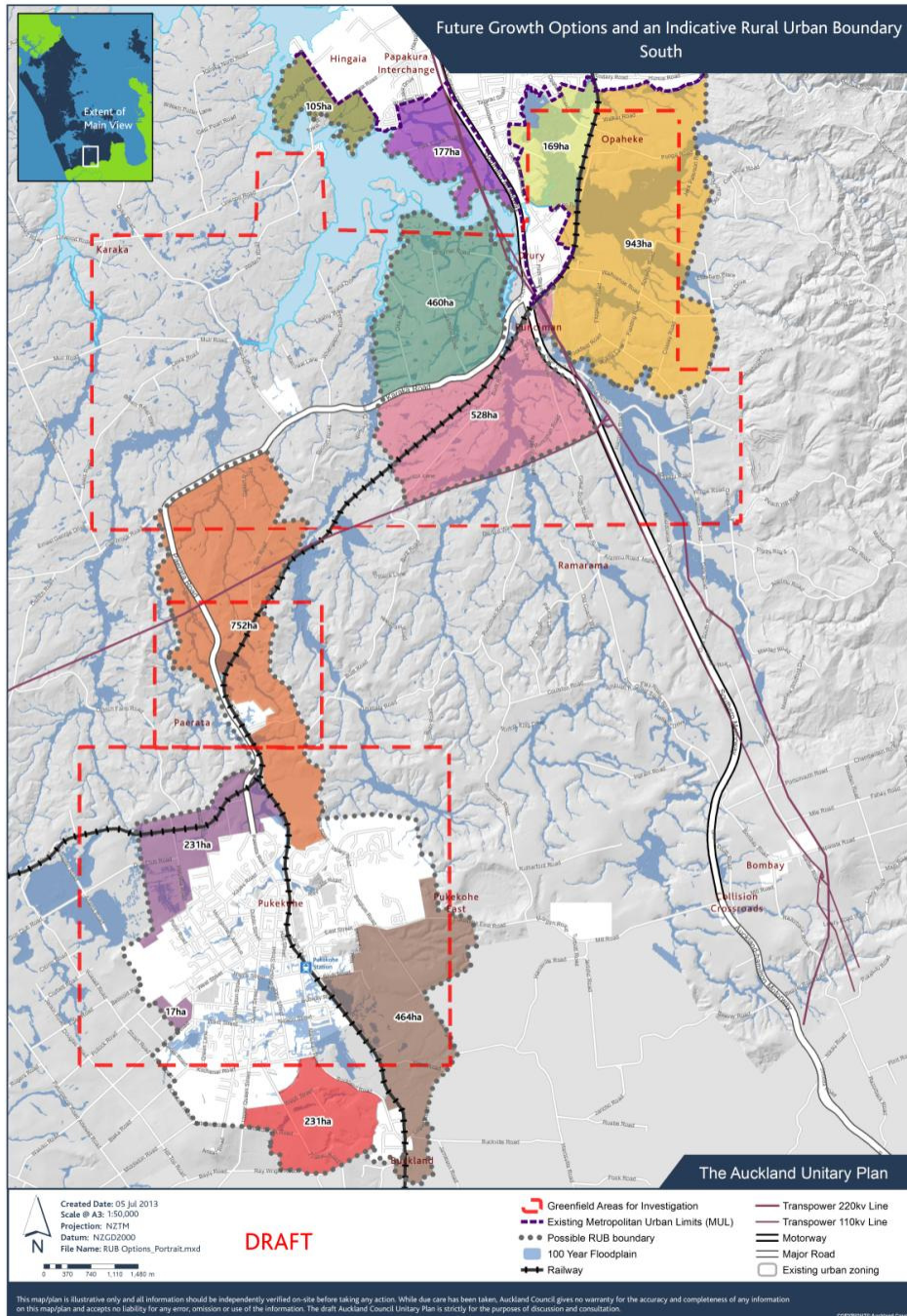


Figure 26 - Preferred RUB Location for Southern Greenfield Area (as at 8 July 2013)

The preferred option for the Southern RUB is most similar to the ‘Corridor Focus’ scenario, although with a gap between urbanised areas at Karaka South and Paerata North provided to enable Pukekohe to remain as a satellite and also to minimise environmental pressure on the Pahurehure Inlet.

The conceptual transport network for the preferred Southern RUB is an adapted version of the conceptual network developed for the ‘Corridor Focus’ scenario. It is shown below:

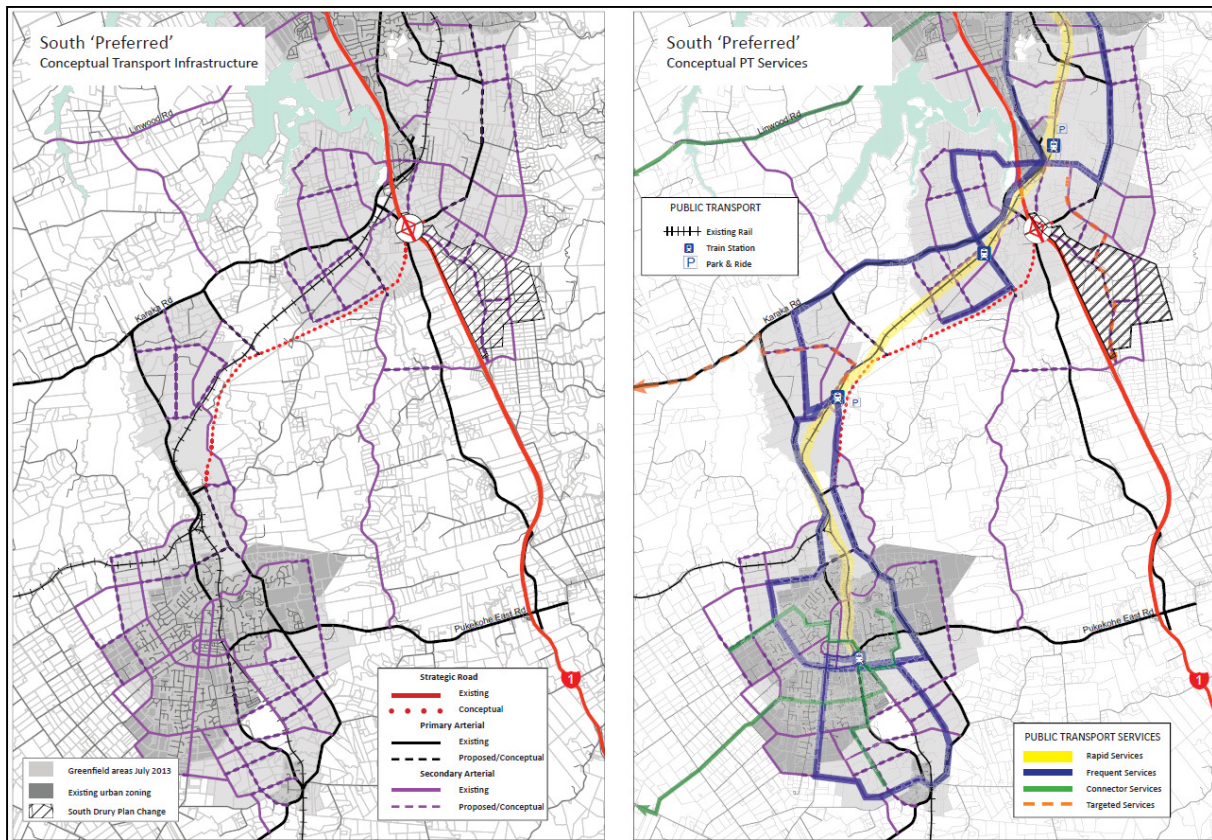


Figure 27 - Conceptual Transport Network for Preferred Southern RUB

The main changes from the conceptual transport network that supported the 'Corridor Focus' scenario are:

- Removal of additional links in areas now outside the RUB (e.g. Pukekohe Northeast and between Karaka South and Paerata North)
- Strengthening of a north-south corridor in the eastern side of Pukekohe to provide good access to the expressway and reduce pressure on central Pukekohe streets
- Removal of Paerata Station as the RUB reduces the station's catchment and the Pukekohe Spatial Development Framework has highlighted area as suitable for industrial activity rather than higher intensity residential.
- Removal of Buckland Station as it is likely to be difficult to justify expenditure on the station and operating costs until land-use in the Waikato region is known to a greater extent.
- Downgrading Runciman Road from Primary Arterial to Secondary Arterial due to exclusion of Pukekohe Northeast from RUB.

4. Preliminary Modelling and Costing

4.1. Introduction

This section describes some preliminary outputs of costing and modelling work undertaken to support decisions in relation to the RUB's location. The results are by necessity very preliminary as detailed structure planning, including the preparation of Integrated Transport Assessments, will be undertaken to provide a comprehensive analysis of both the timing and nature of development and the details of necessary upgrades to the transport network to cater for this growth.

4.2. Application of Modelling and Costing

The modelling and costing outputs included in the section provide information to assist in the analysis of how RUB options contribute to achieving the overarching transport principles for greenfield areas outlined in section 2 of this report. It is important to note that the modelling outputs are one of a number of factors taken into consideration in the analysis. The modelling results are based on preliminary inputs and therefore are complemented by qualitative analysis.

The table below highlights how the key principles translate into different modelling outputs.

Principle	Quantitative Measurements	Source of measurement
<i>Enabling efficient and cost-effective provision of transport infrastructure.</i>	Capital expenditure required for new/upgraded infrastructure for each scenario.	NZTA/AT calculating pro-rata cost based on Council supplied network.
	Average vehicle speed and trip time for each scenario.	ART3
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	PT patronage for each scenario.	ART3
	Walk & cycle modeshare for each scenario.	ART3
<i>Enabling the efficient movement of freight</i>	Travel reliability & congestion levels on freight network in each scenario.	ART3
<i>Enabling placemaking and good urban form outcomes</i>	Private vehicle km travelled for each scenario.	ART3

4.3. ART3 Modelling

The ART3 strategic transport model has been utilised to provide quantitative outputs in the assessment of the RUB. As noted in earlier sections of this report, it is in the south that different RUB options have potentially the greatest impact on the transport network leading to the technical analysis focusing on the south.

To enable the ART3 model to be able to provide useful information for setting the RUB, two key updates to the model were required.

- New modelling zones in the greenfield areas were created so that different RUB options could be more effectively tested against each other. Previously, ART3 zones in the greenfield areas were very large (because of the area's existing rural characteristics) and therefore modelling outputs were generally unresponsive to different RUB options.
- Conceptual transport networks were created as an input to the ART3 model in the greenfield areas. Previously the model only included the rural road network in these areas which was, understandably, overwhelmed by the level of growth.

In the Southern Greenfield Area, where three RUB scenarios were developed as part of the Draft Unitary Plan, land-use allocation into the new ART3 zones was undertaken for each scenario. For

other greenfield areas, where the DUP only included one suggested RUB option, land-use inputs to the ART3 model were based on the preferred RUB option as at 8 July 2013.

This approach has created four different scenarios for testing in the ART3 transport model. Each scenario has both a land-use (the location of population and employment growth) and transport network (the location and scale of transport infrastructure and public transport services) elements to it. The four scenarios are:

Scenario	Description
Scenario 1	Land-use and transport network relating to July 8 RUB in Warkworth, Silverdale and the Northwest and the Draft Unitary Plan's 'West-East Focus' scenario in the south.
Scenario 2	Land-use and transport network relating to July 8 RUB in Warkworth, Silverdale and the Northwest and the Draft Unitary Plan's 'Pukekohe Focus' scenario in the south.
Scenario 3	Land-use and transport network relating to July 8 RUB in Warkworth, Silverdale and the Northwest and the Draft Unitary Plan's 'Corridor Focus' scenario in the south.
Scenario 4	Land-use and transport network relating to July 8 RUB in Warkworth, Silverdale and the Northwest and preferred RUB in the south.

4.4. Modelling Outputs

As noted above, the modelling outputs reflect preliminary analysis of the land-use inputs associated with the four different scenarios as well as the different conceptual networks developed for each greenfield area. Analysis has been undertaken at a region-wide scale with all results relating to the situation across the whole of Auckland, because it is important to gain an understanding of how different RUB options may impact upon transport outputs regionally. All modelling outputs refer to the situation in 2041.

4.4.1. Principle 1: Enabling efficient and cost-effective provision of transport infrastructure

Key modelling outputs to support this principle relate to average vehicle speed and trip time for each scenario, as a measure for network efficiency. Average travel speed and average vehicle trip time for each scenario and a comparison with 2006 outputs, are shown in the two figures below:

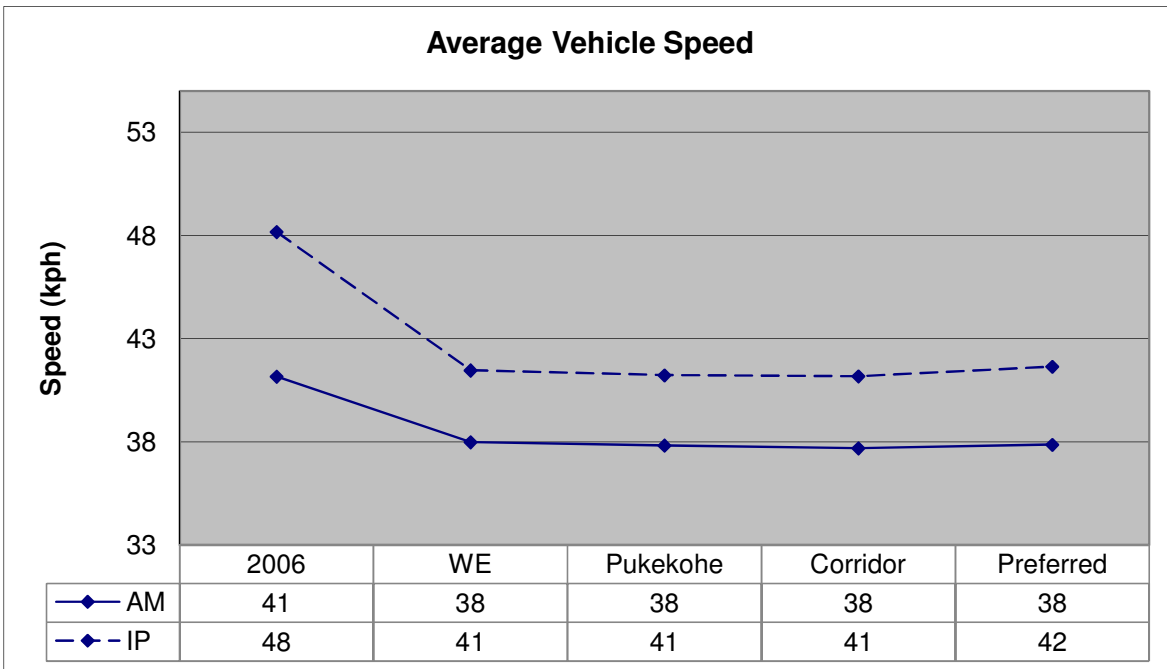


Figure 28 - Average Vehicle Speed for Each Scenario

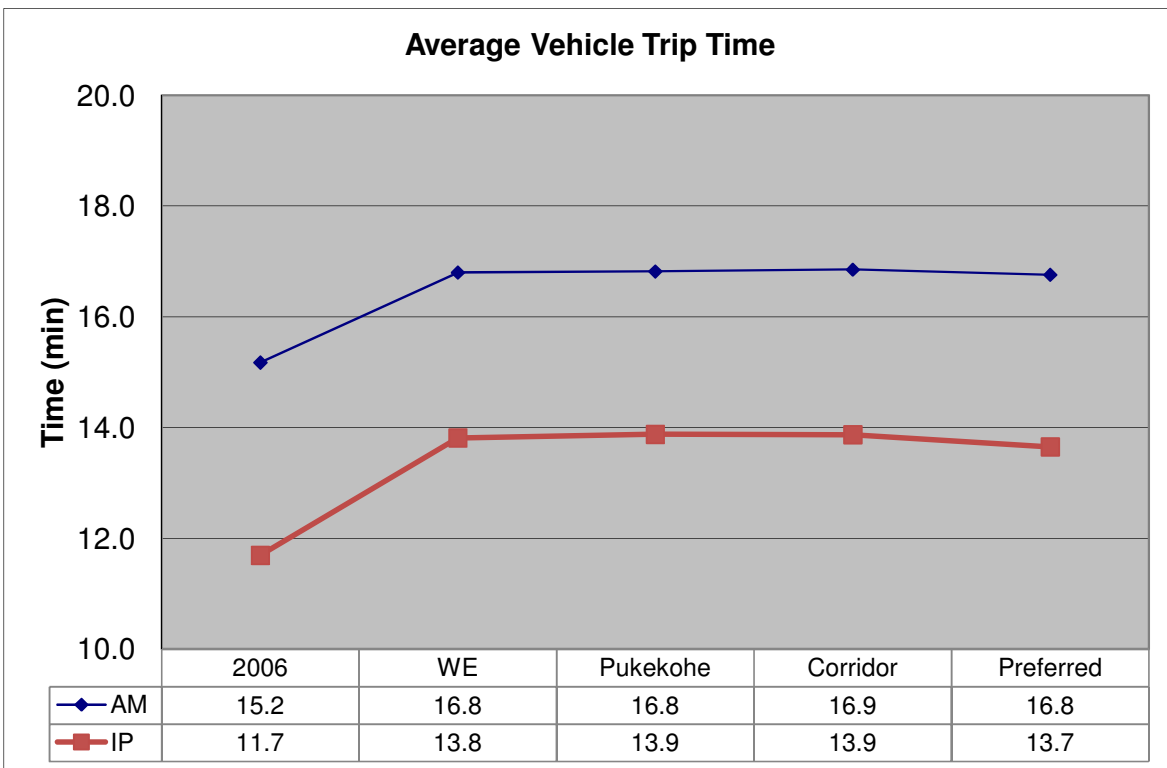


Figure 29 - Average Vehicle Trip Time for Each Scenario

The above results suggest that each scenario performs at a similar level – especially in the AM peak. The preferred scenario performs slightly better than other scenarios during the inter-peak (IP) period.

4.4.2. Principle 2: Enabling a modal shift to public transport, walking and cycling

Key modelling outputs to support this principle relate to public transport trips as well as public transport, walking and cycling modeshare. It is noted that the ART3 model generates active

(walking and cycling) modeshare arbitrarily based on the classification of zones and therefore the outputs should be taken only as a very broad guide.

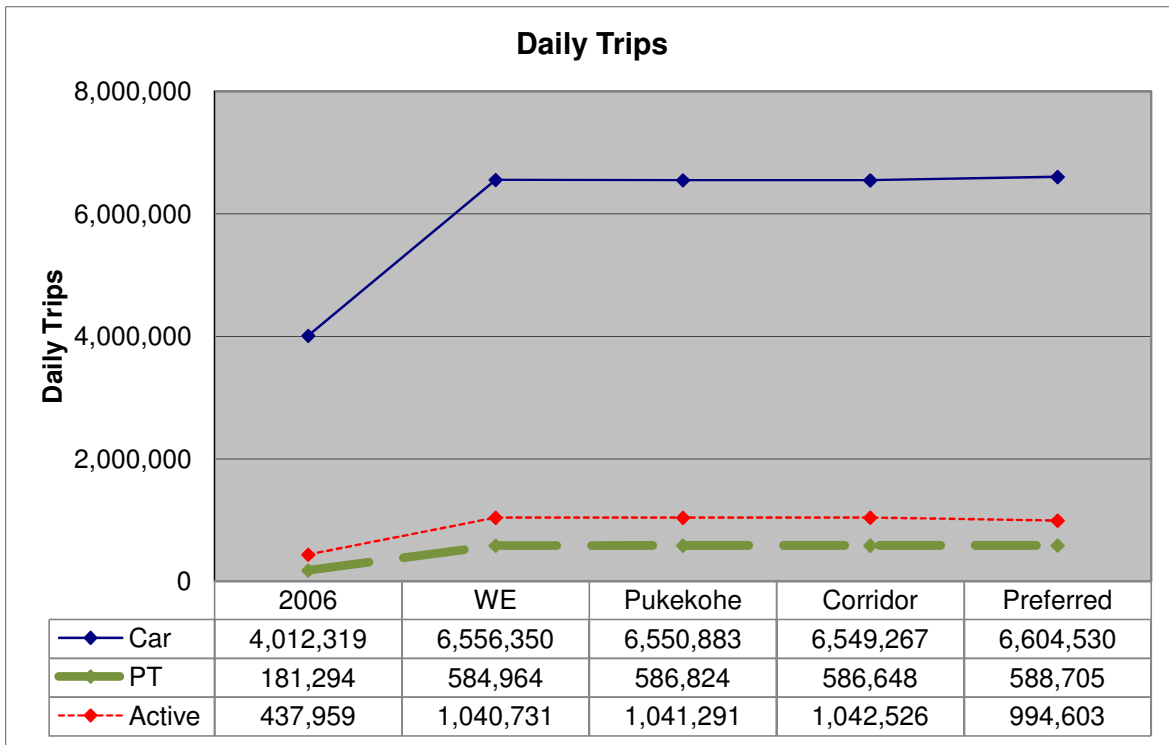


Figure 30 - Daily Trips by Mode for Each Scenario

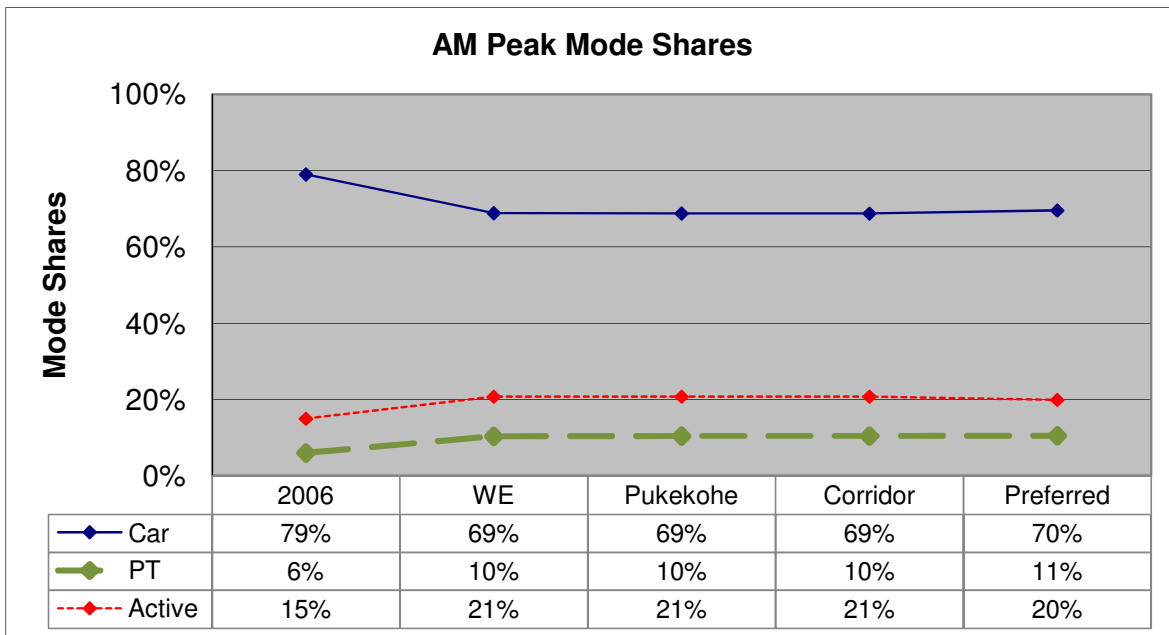


Figure 31 - AM Peak Modeshare for Each Scenario

The preferred scenario generates the highest level of public transport use and the highest level of public transport modeshare during the AM peak period. The West-East focus scenario has the lowest public transport patronage. As noted above, the lower level of active transport for the preferred scenario may relate to the classification of zones in the ART3 model rather than reflecting likely outcomes. This will be explored further in later modelling.

4.4.3. Principle 3: Enabling the efficient movement of freight

Average speed and the percentage of travel on the freight network that is in congested conditions are important modelling outputs when considering how the different scenarios contribute to achieving the principle of enabling the efficient movement of freight. Inter-peak conditions are also very important for considering freight travel as many movements occur outside the peak period.

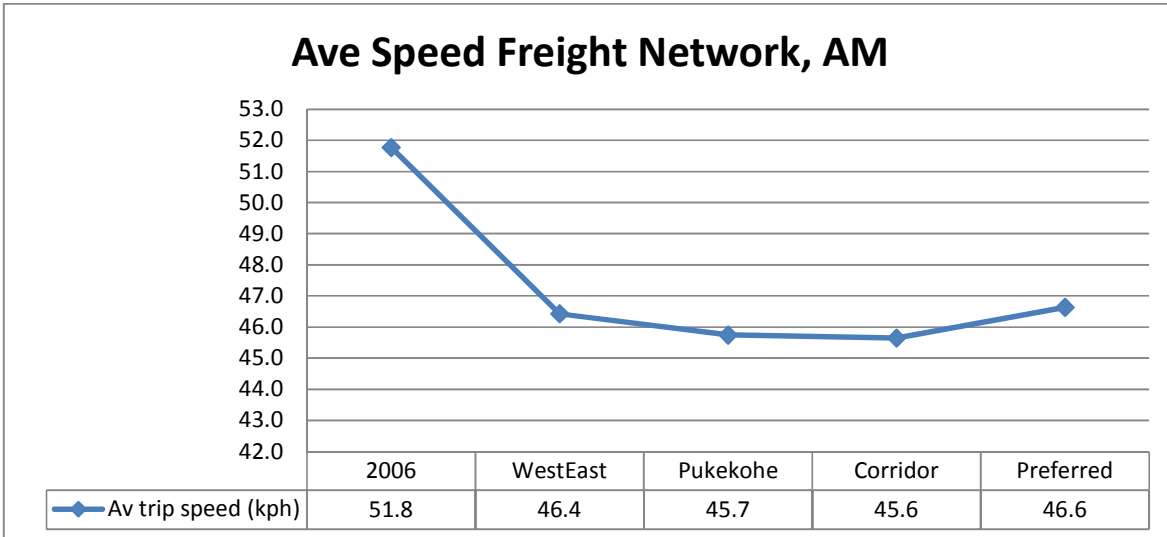


Figure 32 - Average Travel Speed on Freight Network (AM Peak) for each Scenario

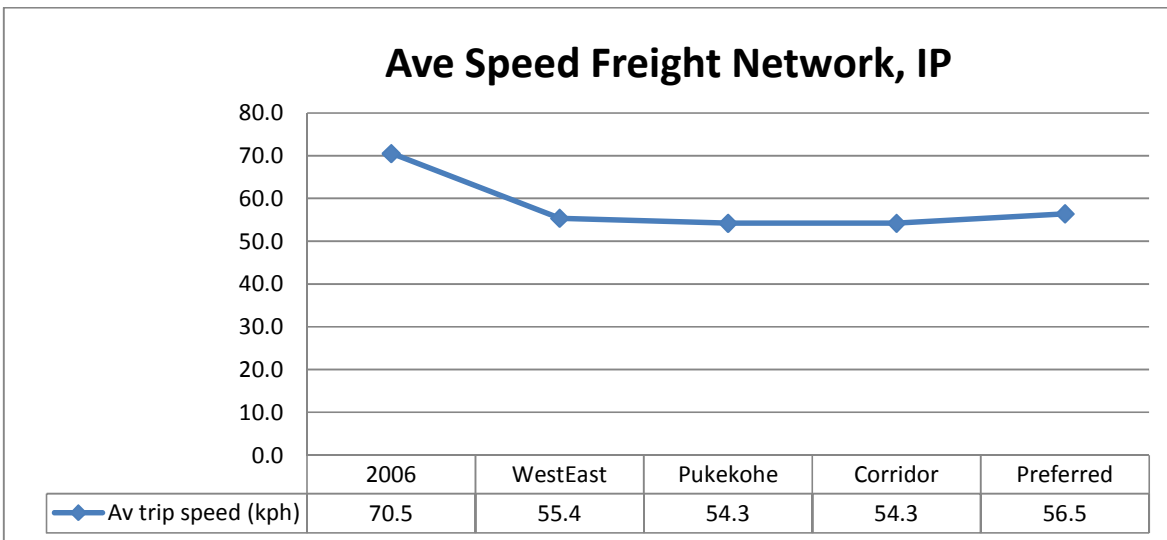


Figure 33 - Average Travel Speed on Freight Network (Interpeak) for each Scenario

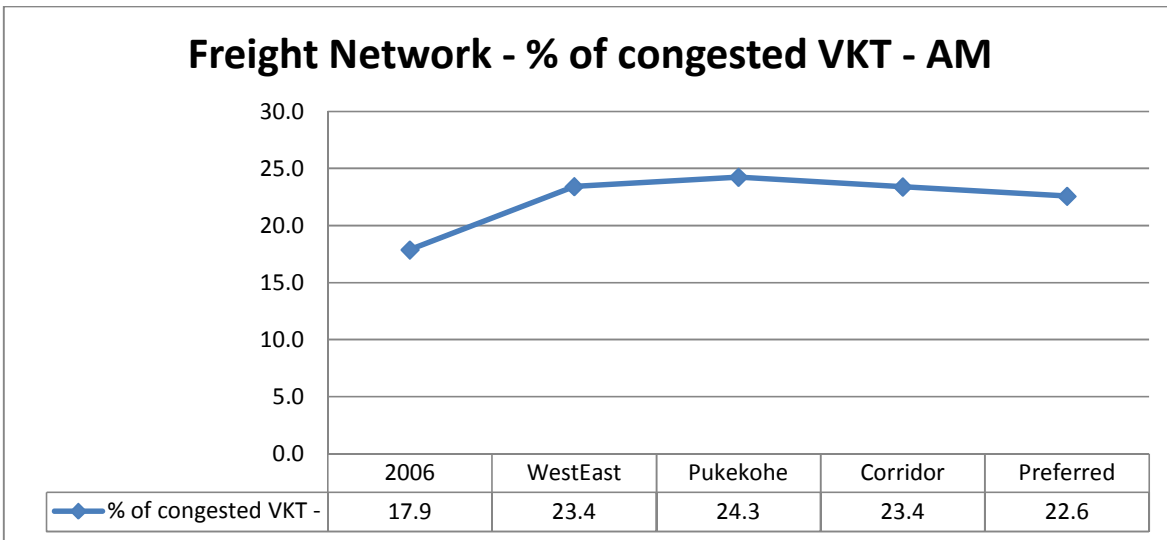


Figure 34 - Percentage of Vehicle km Travelled in Congestion (AM Peak) for each Scenario

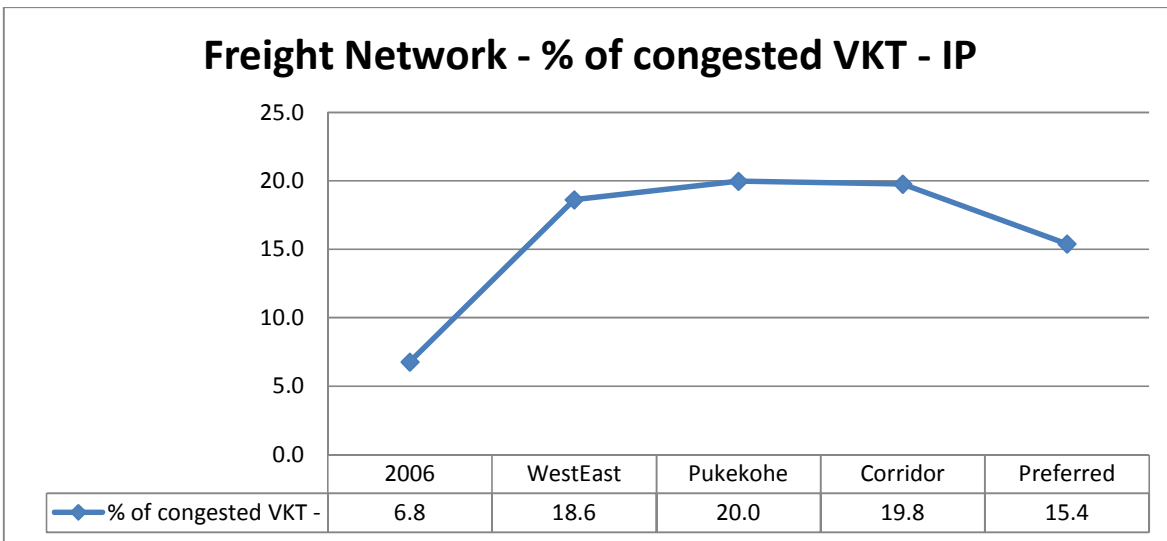


Figure 35 - Percentage of Vehicle km travelled in Congestion (interpeak) for each Scenario

These outputs suggest that the preferred option provides best for the efficient movement of freight, although the differences between the scenarios are relatively marginal.

4.4.4. Principle 4: Enabling placemaking and good urban form outcomes

This principle is least related to modelling outputs, although average trip distance and total distances travelled can reflect whether good urban form outcomes are likely – with a lower level likely to correspond with better urban form outcomes as lower figures would suggest a greater level of local employment and services. Higher amounts of travel and longer trips may also have an adverse effect on achieving good urban form outcomes due to the need for wider roads and reflecting the potential adverse amenity effects of higher traffic volumes.

Modelling outputs showing average trip length and comparing the total vehicle kilometres travelled are shown below.

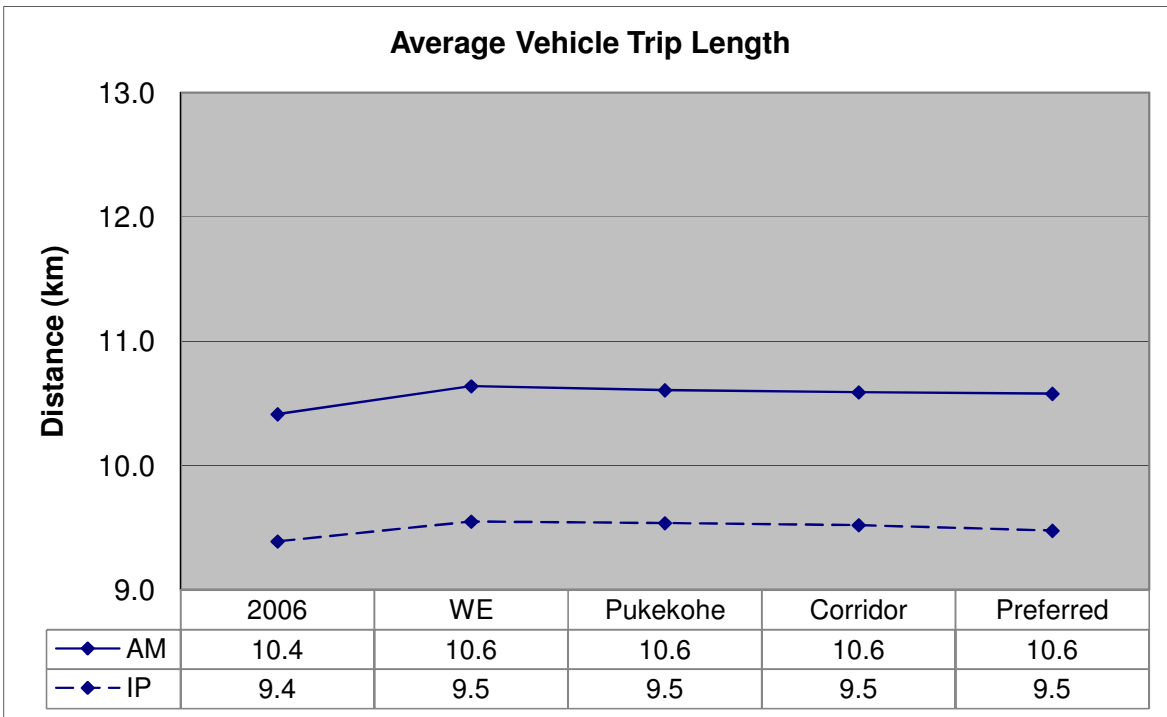


Figure 36 - Average Vehicle Trip Length for each Scenario

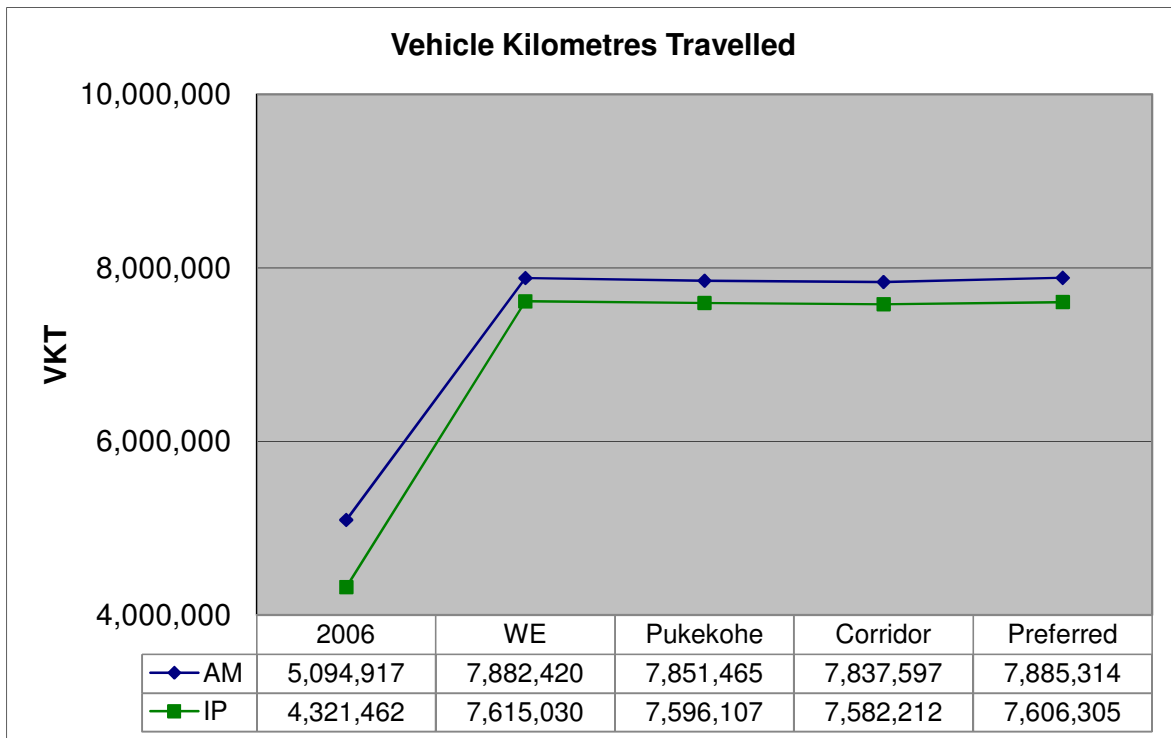


Figure 37 - Vehicle km Travelled for each scenario

These outputs indicate that there is not much difference between the different scenarios and that qualitative analysis is likely to be better placed to inform how different scenarios contribute to placemaking and good urban form.

4.5. Costing

Within each RUB area there will need to be significant investment in new and existing transport infrastructure to support growth. This investment falls into four main categories:

1. Projects included in the Auckland Plan which are relevant to each greenfield area. Examples include Puhoi-Warkworth, Penlink, Northern Busway extension, rail electrification to Pukekohe etc.) These projects were considered by the Auckland Plan as necessary to provide for the overall growth of Auckland's population over the next 30 years, taking into account (at a strategic level) the transport impacts of growth in the greenfield areas. The cost of these projects is not included in the analysis outlined in this section.
2. Construction of the conceptual transport networks outlined in section 3 of this report (over and above Auckland Plan projects). These projects generally consist of arterial roads and public transport infrastructure necessary to support development of each greenfield area. In the southern greenfield area, strategic level projects for each scenario as outlined in section 3.5.6 are included in this category as the scale of growth in the south means that additional strategic transport infrastructure beyond what is included in the Auckland Plan is considered necessary to enable such growth to occur. This section focuses on these costs.
3. Construction of non-arterial local roads within each development area. These roads are generally constructed by developers as part of the development process and have not been included in the cost estimates provided in this section.
4. In addition to the three categories above, there may be a need for further transport investment in regional/strategic level transport infrastructure outside the greenfield areas that is not included in the Auckland Plan project list. Subject to further analysis of detailed modelling outputs, it may be necessary for additional capacity to be added to important transport connections outside the greenfield areas. One potential example is additional tracks on the North Island Main Trunk railway line to enable greater use of express trains to serve people in the southern greenfield area and ensure sufficient capacity is available for passengers further north. These costs have not been included in the cost estimates provided in this section.

Initial cost estimates have been provided by Auckland Transport and NZTA for the purposes of giving Auckland Council an indicative cost for the proposed road networks within the RUB areas. This is done solely as part of the section 32 analysis for the upcoming Unitary Plan notification and not for actual project funding purposes.

The costing simply estimates the likely capital cost of the roading and public transport infrastructure based on typical typologies and costs from similar networks elsewhere in the region. No geotechnical or feasibility assessments have been undertaken to determine whether additional construction costs are required and no land requirement or effects assessment has been made. It is important to note that AT and NZTA have also not been able to undertake a detailed analysis of network performance or identified consequential additional improvements (or recommended changes in land use types or intensities to avoid expensive additional infrastructure), so this costing material should be considered an initial assessment and for comparison purposes only. The costs have been determined on a per kilometre basis for each road typology, plus individual costs for certain items of infrastructure (such as bridges, rail stations or major intersections).

As noted above, it is also important to note that the costs highlighted exclude projects which are already identified in the Auckland Plan (e.g. Puhoi-Warkworth, Penlink, busway projects etc.) as well as costs associated with the likely upgrading of existing infrastructure outside the greenfield areas themselves (where these possible projects are not already identified in the Auckland Plan). As such, the cost estimates should be used to understand the likely infrastructure costs of the proposed road network, but it should not be assumed that the network is completely sufficient to adequately this scale of development or that the networks presented are confirmed as new projects in any future programme. The cost of providing the non-arterial road network – which is typically funded and constructed by developers – has also not been included in the cost estimates.

Both AT and NZTA have participated in good faith in the identification and costing of a proposed road network, but wish to highlight that further work is required before the network can be considered to be sufficient or the costs robust. This further work will also help identify any issues relating to the phasing or sequencing of any network development.

The initial assessment has resulted in the following cost estimates:

Greenfield Area	Scenario	Indicative cost of transport infrastructure
Warkworth	8 July 2013 version	\$350-500 million
Silverdale	8 July 2013 version	\$610-770 million
Northwest	8 July 2013 version	\$1-1.3 billion
South	West East Focus	\$2.4-2.7 billion
	Corridor Focus	\$1.8-2.1 billion
	Pukekohe Focus	\$1.9-2.2 billion
	8 July 2013 'Preferred'	\$1.8-2.1 billion

Further details of the methodology used to determine the indicative cost of transport infrastructure and caveats associated with these figures is included in a memo from Auckland Transport attached as **Appendix One** to this report.

5. Analysis and Recommendations

5.1. Introduction

Development of a preferred RUB in the greenfield areas of investigation has progressed throughout 2012 and 2013. Transport advice has been provided throughout this process, to ensure that key transport principles have been taken into consideration in setting the RUB. As detailed earlier in this report, it is the southern area where different RUB options potentially have the greatest impact on the transport network and the need for different transport responses. Therefore, a greater level of focus on analysing the merits of different RUB options from a transport perspective has occurred in the southern area.

This section of the paper outlines the methodology for analysis and then undertakes an analysis of how the RUB's location in each greenfield area of investigation can best give effect to the key guiding principles outlined in section 2.

5.2. Methodology for Analysis

The purpose of this paper is to make recommendations to ensure that the transport principles of relevant strategic document are taken into consideration in the setting of the RUB. Key transport criteria used to assess different RUB options have been derived from the principles outlined in section 2 of this report. Some criteria lend themselves to being measured in a quantitative manner whereas others require more qualitative analysis.

The key transport principles for the greenfield areas and how they can be applied to setting the RUB was outlined in section 2 of this paper and is also included below:

Key Principles to Guide Setting the RUB	
Principle	Application
<i>Enabling efficient and cost-effective provision of transport infrastructure.</i>	<ul style="list-style-type: none"> • Areas closer to existing or currently planned infrastructure (railways, motorways, major arterial roads etc.) are preferred. • Areas closer to the existing urban area are preferred as they generally place a lower burden on the transport network (e.g. shorter trips) and require less additional infrastructure spend. • Areas with multiple options for transport connections and/or a variety of different potential transport responses are preferred. • Areas that can be adequately served by comparatively less transport expenditure are preferred.
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	<ul style="list-style-type: none"> • Areas close to existing or planned rapid transit (rail & busway) are preferred. • Areas that could support an effective future public transport route (e.g. development along a particular corridor) are preferred. • Areas likely to be suitable for higher density development that supports frequent public transport services are preferred. • Reasonably flat areas that may encourage walking and cycling are preferred.
<i>Enabling the efficient movement of freight</i>	<ul style="list-style-type: none"> • Areas near existing motorways are preferred (for industrial activity). • Areas developed should not be dependent upon a large number of new motorway interchanges, as this will degrade performance of the freight network. • Areas developed should not be dependent upon the freight network for local trips.
<i>Enabling placemaking and</i>	<ul style="list-style-type: none"> • Areas that minimise heavy traffic flows (especially truck movements) through centres or residential areas are

Key Principles to Guide Setting the RUB	
Principle	Application
<i>good urban form outcomes</i>	<p>preferred.</p> <ul style="list-style-type: none"> • Avoid areas reliant upon transport infrastructure that may create significant adverse environmental effects. • Areas that urbanise should be of a sufficient size to provide for a number of every day amenities and services (e.g. avoiding a large number of small development ‘pockets’) • Reasonably flat areas able to support a connected ‘grid’ street network are preferred.

For each greenfield area, the following parts of this section provide analysis and then recommendations in relation to the RUB’s location to give effect to each of the four principles from a transport perspective. These need to be considered along with non-transport factors in decision-making on the RUB or in planning for land use and transport.

5.3. Warkworth Analysis

The different options for locating the RUB around Warkworth are relatively limited. Transport is likely to be a relatively minor consideration in the exact setting of the RUB in Warkworth, with other environmental factors providing detailed guidance for setting the RUB.

Analysis and recommendations for Warkworth are suggested below:

Principle	Analysis	Recommendations:
<i>Enabling efficient and cost-effective provision of transport infrastructure.</i>	<ul style="list-style-type: none"> • The Puhoi-Warkworth motorway will make the northern part of Warkworth very accessible and traffic generated from development here will not have to pass through Warkworth to access the motorway. • The designation for the Puhoi-Warkworth motorway is not yet finalised and the motorway alignment could change through the designation process into areas inside the RUB, making construction more expensive and challenging. • A large amount of development to the south of Warkworth may create pressure for an additional motorway interchange, which if constructed may be expensive to construct. • Access to the Hepburn Creek area is poor and improvements would be extremely difficult due to the terrain and environmental constraints of the area. • The cost of providing Warkworth with transport infrastructure is comparatively high on a per dwelling basis. 	<ul style="list-style-type: none"> • Focus Warkworth’s development more to the north than is shown in the DUP. • Use natural boundaries where possible to define the western edge of the RUB, rather than the proposed alignment of the Puhoi-Warkworth motorway. • Less development to the south of Warkworth than shown in the DUP. • The Hepburn Creek area should not be included in the RUB. • Minimise the extent of growth in Warkworth if possible.
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	<ul style="list-style-type: none"> • Warkworth is relatively isolated and not near existing railway or busway infrastructure meaning that achieving a modal shift to public transport may be more challenging than other greenfield areas. 	<ul style="list-style-type: none"> • Minimise the extent of growth in Warkworth if possible. • The Hepburn Creek area should not be included in the RUB.

Principle	Analysis	Recommendations:
	<ul style="list-style-type: none"> The Hepburn Creek area is isolated and unlikely to promote walking or cycling or be easily served by public transport. 	
<i>Enabling the efficient movement of freight</i>	<ul style="list-style-type: none"> The Puhoi-Warkworth motorway will make the northern part of Warkworth very accessible, particularly for freight vehicles. 	<ul style="list-style-type: none"> Focus Warkworth's development more to the north than is shown in the DUP. Industrial land should be located in close proximity to the northern end of the Puhoi-Warkworth motorway.
<i>Enabling placemaking and good urban form outcomes</i>	<ul style="list-style-type: none"> The Hepburn Creek area is isolated and located in hilly terrain that will be difficult to serve with a connected street network. The Puhoi-Warkworth motorway will make the northern part of Warkworth the main access point. This means that some traffic may need to travel north through existing Warkworth to go to Auckland, minimising the extent to which the motorway will remove traffic from the existing SH1. 	<ul style="list-style-type: none"> The Hepburn Creek area should not be included in the RUB. Focus development more in the northern part of Warkworth than shown in the DUP. Less development to the south of Warkworth than shown in the DUP.

The updated RUB option for Warkworth reflects the recommendations in the table above to a greater extent than the RUB option shown in the March Draft Unitary Plan, particularly in relation to the following changes:

- The Hepburn Creek area is no longer shown as being inside the RUB.
- The updated RUB option focuses development more to the north of Warkworth, including the location of industrial land next to the northern end of the Puhoi-Warkworth motorway.
- The RUB to the west of Warkworth generally no longer follows the proposed motorway alignment
- The amount of land for urbanisation in the south of Warkworth has been reduced.

Minimising growth of Warkworth to an even greater extent, particularly to the south of the existing town, may support the transport principles even more than the changes from the RUB in the DUP. This is because Warkworth is isolated from public transport infrastructure and has a relatively high level of required transport expenditure per dwelling compared to other greenfield areas. Significant development south of Warkworth is also less likely to benefit from accessibility improvements from the Puhoi-Warkworth motorway.

5.4. Silverdale Analysis

The different options for locating the RUB around Silverdale are relatively limited, particularly as there are geotechnical stability concerns to the west of the areas highlighted in the DUP. Furthermore, there is a strong desire to retain a greenbelt between Albany and Silverdale and to avoid development east of State Highway 1 because of environmental constraints in the Weiti and Okura river catchments. Transport is likely to be a relatively minor consideration in the exact setting of the RUB in Silverdale, with other environmental factors providing detailed guidance for setting the RUB.

Analysis and recommendations for Silverdale and how they give effect to each principle is shown in the table below.

Principle	Analysis:	Recommendations:
<i>Enabling efficient and cost-effective provision of transport infrastructure.</i>	<ul style="list-style-type: none"> • The northern part of the “Wainui East” area (northwest corner of the DUP’s RUB) is very hilly terrain which means that constructing sufficient transport infrastructure would be costly and challenging. • A revised Penlink interchange and associated potential busway station provides a high level of access to the motorway and public transport in the southern Dairy Flat area. • Traffic generated by development in this greenfield area has the potential to add to severe congestion on SH1 and key motorway interchanges. Providing local employment and encouraging the use of public transport, walking and cycling will be critically important to minimise peak time car travel from this area heading south. 	<ul style="list-style-type: none"> • The northern part of the “Wainui East” area should not be included in the RUB. • It is appropriate for the RUB to shift southwards around the revised Penlink interchange. • Ensure the provision of land suitable for local employment • Focus development around areas with good access to the future Northern Busway extension.
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	<ul style="list-style-type: none"> • The northern part of the “Wainui East” area (northwest corner of the DUP’s RUB) is very hilly terrain which means that it would be difficult to achieve sufficient development densities to support public transport use in this area. • Areas immediately west of possible busway stations at the Penlink and Silverdale interchanges will have particularly good access to high quality public transport. • Creating a significant town centre at Dairy Flat can provide local employment and services within walking/cycling distance. 	<ul style="list-style-type: none"> • The northern part of the “Wainui East” area should not be included in the RUB. • Land within walking distance of possible future busway stations at the Penlink and Silverdale interchanges should be included in the RUB. • The RUB should enable a significant town centre to be created at Dairy Flat rather than a long corridor of development along SH1.
<i>Enabling the efficient movement of freight</i>	<ul style="list-style-type: none"> • Motorway interchanges at Silverdale and where Penlink joins SH1 will be areas with best access to SH1 and are therefore the most suitable locations for land extensive business activities. • Traffic generated by development in this greenfield area has the potential to overwhelm the key freight route of SH1 and its motorway interchanges. Providing local employment and encouraging the use of public transport, walking and cycling will be critically important to minimise peak time car travel from this area heading south. 	<ul style="list-style-type: none"> • Industrial land should be located in close proximity to the Silverdale and Penlink interchanges. • Ensure the provision of land suitable for local employment and focus development around areas with good access to the future Northern Busway extension.
<i>Enabling placemaking and good urban form outcomes</i>	<ul style="list-style-type: none"> • The northern part of the “Wainui East” area (northwest corner of the DUP’s RUB) is very hilly terrain which means it would be very difficult to create a connected street network. • Creating a significant town centre at 	<ul style="list-style-type: none"> • The northern part of the “Wainui East” area should not be included in the RUB. • The RUB should enable a significant town centre to be created at Dairy Flat rather

Principle	Analysis:	Recommendations:
	<p>Dairy Flat can sufficient size to provide for a number of every day amenities and services and areas of higher density development.</p> <ul style="list-style-type: none"> Enabling residential development around the North Shore aerodrome is likely to generate adverse amenity outcomes for residents and lead to reverse sensitivity issues for the ongoing operation of the aerodrome. 	<p>than a long corridor of development along SH1.</p> <ul style="list-style-type: none"> The RUB should avoid enabling residential development in areas close to the North Shore aerodrome.

The updated RUB option for Silverdale reflects the recommendations in the table above to a greater extent than the RUB option shown in the March Draft Unitary Plan, particularly in relation to the following changes:

- The northern part of the “Wainui East” area (northwest corner of the DUP’s RUB) is no longer shown as being inside the RUB.
- The updated RUB option provides for a greater amount of development around the Penlink interchange and the possible future busway station in that area.
- The updated RUB option creates a significant town centre at Dairy Flat.
- Residential development in areas around the North Shore aerodrome is discouraged by the updated RUB.

Extending the RUB to enable more development to the northwest of the Silverdale interchange would be preferable to better support public transport investment and encourage use of public transport services to a greater extent.

5.5. Northwest Analysis

The different options for locating the RUB in the northwest are relatively limited, particularly due to the floodplain generated by the Kumeu River and hilly terrain to both the north and southwest of the greenfield area of investigation. Furthermore, there is a strong community desire to retain separation between Kumeu/Huapai, Riverhead and metropolitan Auckland, reinforced by the Kumeu River floodplain and the existence of an important concentration of productive rural activity between Kumeu and Riverhead.

Transport is likely to be a relatively minor consideration in the exact setting of the RUB in the northwest, with other environmental factors providing detailed guidance for setting the RUB.

Analysis and recommendations for the northwest and how they give effect to each principle is shown in the table below.

Principle	Analysis:	Recommendations:
<p><i>Enabling efficient and cost-effective provision of transport infrastructure.</i></p>	<ul style="list-style-type: none"> Significant expansion of Riverhead may create pressure for the construction of a costly bridge across Brigham Creek to connect into Whenuapai. Riverhead is relatively isolated and accessed via a road that passes through a rural area making it difficult for development to contribute towards the cost of upgrading that road. The area in close proximity to Westgate has good access to a major significant public transport hub, SH16 and SH18. 	<ul style="list-style-type: none"> Reduce the extent to which the RUB allows for Riverhead to grow from what is shown in the DUP. Focus expansion of the RUB in the area around Westgate and places with good access to SH16 and SH18 and future busways along these motorways. Ensure the RUB includes significant areas of land

Principle	Analysis:	Recommendations:
	<ul style="list-style-type: none"> • SH16 is likely to continue to experience congestion at peak times even after the Western Ring Route is completed. Providing local employment and encouraging the use of public transport, walking and cycling will be critically important to minimise peak time car travel from this area heading to and from the isthmus. • Significant growth of Kumeu/Huapai may create pressure for a major bypass around the town which could be expensive and difficult to construct due to environmental constraints. 	<p>suitable for employment activities.</p> <ul style="list-style-type: none"> • Reduce the extent to which the RUB allows for Kumeu/Huapai to grow from what is shown in the DUP.
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	<ul style="list-style-type: none"> • Riverhead and Kumeu/Huapai are more distant from planned major public transport infrastructure and are therefore more likely to be car dependent than development closer to Westgate. Shifting the focus of growth to areas nearer Westgate is more likely to achieve a modal shift to public transport. • Areas closer to Westgate are more likely to promote walking and cycling as transport options as they are closer to likely destinations of Westgate and business land at Whenuapai. 	<ul style="list-style-type: none"> • Reduce the extent to which the RUB allows for Riverhead and Kumeu/Huapai to grow from what is shown in the DUP. • Ensure areas relatively close to Westgate (e.g. Red Hills North) remain inside the RUB.
<i>Enabling the efficient movement of freight</i>	<ul style="list-style-type: none"> • Areas in close proximity to both SH16 and SH18 have best access to the motorway network and are therefore most suitable for the location of business land. Land between the motorways and the Whenuapai airbase is particularly suitable to minimise conflict with the operation of the airbase. • The motorway network (especially SH16) is likely to continue to experience congestion at peak times even after the Western Ring Route is completed. Providing local employment and encouraging the use of public transport, walking and cycling will be critically important to minimise peak time car travel from this area heading to and from the isthmus. 	<ul style="list-style-type: none"> • Industrial land should be located in close proximity to SH16 and SH18 interchanges and near the Whenuapai airbase. • Ensure the provision of land suitable for local employment and focus development around areas with good access to the future SH16 and SH18 busways.
<i>Enabling placemaking and good urban form outcomes</i>	<ul style="list-style-type: none"> • Focusing growth around Westgate will support an emerging metropolitan centre and provide that centre with a residential catchment. • Enabling residential development around the Whenuapai airbase is likely to generate adverse amenity outcomes for residents and lead to reverse sensitivity issues for the ongoing operation of the airbase. 	<ul style="list-style-type: none"> • Ensure areas relatively close to Westgate (e.g. Red Hills North) remain inside the RUB. • The RUB should avoid enabling residential development in areas close to the Whenuapai air base.

The updated RUB option for the northwest reflects some of the recommendations in the table above to a greater extent than the RUB option shown in the March Draft Unitary Plan, particularly in relation to the following changes:

- Riverhead is expanded to a lesser extent than in the DUP and is more of a distinct centre rather than a long north-south corridor.
- The growth of Kumeu/Huapai has been redirected away from the south and more to the northeast, focusing development more around the town centre and closer to a possible future busway extension along SH16 between Westgate and Kumeu/Huapai.

Focusing development to an even greater extent around Westgate and less around Riverhead and Kumeu/Huapai would support the transport principles to an even greater extent as Westgate will contain significant employment and has excellent public transport accessibility. There is also a risk that Kumeu/Huapai will be large enough to generate significant traffic flows, but not yet large enough to have significant local employment, services and to justify the extension of busway standard infrastructure from Westgate to Kumeu/Huapai.

5.6. Southern Area Analysis

There are a wide variety of different options for locating the RUB in the south. Furthermore, transport is a greater consideration in the location of the RUB in the south than in other greenfield areas because different RUB options have significantly different transport implications.

There are a number of other constraints which will influence the location of the RUB in the southern greenfield area. Particularly significant constraints include:

- The need to minimise adverse impacts on the Pahurehure Inlet as this is a very environmentally sensitive part of the Manukau Harbour.
- Topographical constraints including very hilly terrain further to the east of the greenfield area, around the Pukekohe northeast area and between that area and the Ramarama motorway interchange.
- Elite soils, particularly to the west and southwest of Pukekohe.
- The Auckland/Waikato regional boundary, particularly in the area southeast of Pukekohe.

A different approach is taken to analysis of the Southern Area as the March DUP included three distinct land-use scenarios rather than the single scenario for other greenfield areas which has been subsequently refined. The analysis below looks at how each scenario, including the preferred scenario, performs compared to the four key principles. The focus of the tables below is on the extent to which the different scenarios are different from each other (i.e. areas beyond the 'core').

5.6.1. *West-East Focus Scenario*

Principle:	Analysis:
<i>Enabling efficient and cost-effective provision of transport infrastructure.</i>	<ul style="list-style-type: none"> • This scenario, particularly its Karaka West component, is dependent upon the provision of a transport connection to Weymouth which would be very costly to construct. A potentially costly connection between the Karaka West and Karaka North peninsulas may also be required. Both of these connections carry considerable consenting risk. • This scenario has the highest indicative cost of providing transport infrastructure – approximately \$500 million more costly than other southern RUB scenarios. • The transport infrastructure required to enable development in this scenario (i.e. a Karaka-Weymouth link) cannot easily be constructed in a staged and incremental manner and is not

Principle:	Analysis:
	<p>currently in any strategic transport documents.</p> <ul style="list-style-type: none"> • There is likely to be fewer potential transport responses to development in this scenario compared to other scenarios • This scenario includes significant areas inside the RUB which are isolated from existing transport infrastructure. • This scenario creates a series of 'pockets' of urban development which are separated from each other to a greater extent than other scenarios, which is likely to lead to longer and more external trips. • This scenario does not include the Pukekohe North East area, which is difficult to provide with transport in a cost-effective way.
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	<ul style="list-style-type: none"> • The Karaka West and Karaka North components of this scenario are relatively distant from public transport infrastructure (e.g. the NIMT railway line) and therefore less likely to contribute to modal shift to public transport. • This scenario creates a series of 'pockets' of urban development which are separated from each other to a greater extent than other scenarios which makes walking and cycling less viable options. • This scenario does not include the Pukekohe North East area, which is difficult to develop in a way that justifies the provision of frequent public transport services.
<i>Enabling the efficient movement of freight</i>	<ul style="list-style-type: none"> • The location of industrial land in this scenario (most likely around the Drury interchange, at Paerata and south of Pukekohe) is similar to other scenarios. • If constructed, the Karaka-Weymouth Bridge would be a useful freight route (especially providing access to and from the Airport and the Wiri industrial area).
<i>Enabling placemaking and good urban form outcomes</i>	<ul style="list-style-type: none"> • This scenario creates a series of 'pockets' of urban development which are separated from each other to a greater extent than other scenarios, potentially making the provision of local services and employment more difficult. • This scenario is reliant upon a Karaka-Weymouth bridge, which could generate significant adverse environmental effects on the Pahurehure Inlet and significant adverse amenity effects in the Weymouth/Clendon area. • This scenario does not include the Pukekohe North East area, which is difficult to provide with a connected street network.

5.6.2. Pukekohe Focus Scenario

Principle:	Analysis:
<i>Enabling efficient and cost-effective provision of transport infrastructure.</i>	<ul style="list-style-type: none"> • This scenario is focused around existing transport infrastructure (SH1, SH22 and the North Island Main Trunk railway line) and therefore makes relatively good use of existing infrastructure. • The transport infrastructure required to enable development in this scenario (e.g. rail improvements, SH1 widening, SH22 upgrade, future expressway and Mill Road corridor project) can generally be constructed in a staged and incremental manner. • There is generally a wide variety of different ways in which the area could be provided with transport infrastructure (e.g. either of the two strategic options outlined in Figure 22 could be adapted to this scenario). • This scenario includes the Pukekohe North East area, which is difficult to provide with transport in a cost-effective way.

Principle:	Analysis:
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	<ul style="list-style-type: none"> • This scenario enables Pukekohe to grow into a significant 'city sized' centre supporting higher density development, becoming the hub of an effective transport network and supporting walking and cycling. • This scenario includes the Pukekohe North East area, which is difficult to develop in a way that justifies the provision of frequent public transport services.
<i>Enabling the efficient movement of freight</i>	<ul style="list-style-type: none"> • The location of industrial land in this scenario (most likely around the Drury interchange, at Paerata and south of Pukekohe) is similar to other scenarios. • If constructed, the Karaka-Weymouth Bridge would be a useful freight route (especially providing access to and from the Airport and the Wiri industrial area). This option does not preclude a Karaka-Weymouth bridge, but does not require it to enable any development (as compared to the East-West scenario).
<i>Enabling placemaking and good urban form outcomes</i>	<ul style="list-style-type: none"> • This scenario enables Pukekohe to grow into a significant 'city sized' centre supporting higher density development, local service and local employment. • This scenario is not as dependent upon a Karaka-Weymouth bridge as the East West scenario. The bridge could generate significant adverse environmental effects on the Pahurehure Inlet and significant adverse amenity effects in the Weymouth/Clendon area. • This scenario includes the Pukekohe North East area, which is difficult to provide with a connected street network.

5.6.3. Corridor Focus Scenario

Principle:	Analysis:
<i>Enabling efficient and cost-effective provision of transport infrastructure.</i>	<ul style="list-style-type: none"> • This scenario is the most focused around existing transport infrastructure (SH1, SH22 and the North Island Main Trunk railway line) and therefore the scenario which makes comparatively best use of existing infrastructure. • The transport infrastructure required to enable development in this scenario (e.g. rail improvements, SH1 widening, SH22 upgrade, future expressway and Mill Road corridor project) can generally be constructed in a staged and incremental manner. • There is generally a wide variety of different ways in which the area could be provided with transport infrastructure (e.g. either of the two strategic options outlined in Figure 22 could be adapted to this scenario). • This scenario includes the Pukekohe North East area, which is difficult to provide with transport in a cost-effective way.
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	<ul style="list-style-type: none"> • This scenario enables Pukekohe to grow into a significant 'city sized' centre supporting higher density development, becoming the hub of an effective transport network and supporting walking and cycling. • This scenario may be reliant upon too many train stations south of Papakura, which could adversely impact upon the performance of the passenger rail network. • This scenario includes the Pukekohe North East area, which is difficult to develop in a way that justifies the provision of frequent public transport services.
<i>Enabling the efficient movement of freight</i>	<ul style="list-style-type: none"> • The location of industrial land in this scenario (most likely around the Drury interchange, at Paerata and south of Pukekohe) is

Principle:	Analysis:
	<p>similar to other scenarios.</p> <ul style="list-style-type: none"> • If constructed, the Karaka-Weymouth Bridge would be a useful freight route (especially providing access to and from the Airport and the Wiri industrial area). This option does not preclude a Karaka-Weymouth bridge, but does not require it to enable any development (as compared to the East-West scenario).
<i>Enabling placemaking and good urban form outcomes</i>	<ul style="list-style-type: none"> • This scenario enables Pukekohe to grow into a significant 'city sized' centre supporting higher density development, local service and local employment. • This scenario is not as dependent upon a Karaka-Weymouth bridge as the East West scenario. The bridge could generate significant adverse environmental effects on the Pahurehure Inlet and significant adverse amenity effects in the Weymouth/Clendon area. • This scenario includes the Pukekohe North East area, which is difficult to provide with a connected street network. • This scenario does not provide for a 'greenbelt' between Pukekohe and metropolitan Auckland and therefore is technically inconsistent with Pukekohe being a 'satellite centre'.

5.6.4. Preferred Scenario

Principle:	Analysis:
<i>Enabling efficient and cost-effective provision of transport infrastructure.</i>	<ul style="list-style-type: none"> • This scenario is focused around existing transport infrastructure (SH1, SH22 and the North Island Main Trunk railway line) and makes comparatively good use of existing infrastructure. • The transport infrastructure required to enable development in this scenario (e.g. rail improvements, SH1 widening, SH22 upgrade, future expressway and Mill Road corridor project) can generally be constructed in a staged and incremental manner. • There is generally a wide variety of options for how the area could be provided with transport infrastructure (e.g. either of the two strategic options outlined in Figure 22 could be adapted to this scenario). • This scenario excludes the Pukekohe North East area, which is difficult to provide with transport in a cost-effective way.
<i>Enabling a modal shift towards public transport, walking and cycling.</i>	<ul style="list-style-type: none"> • This scenario enables Pukekohe to grow into a significant 'city sized' centre supporting higher density development, becoming the hub of an effective transport network and supporting walking and cycling. • This scenario excludes the Karaka North and Karaka West areas which are relatively distant from public transport infrastructure (e.g. the NIMT railway line) and therefore less likely to contribute to modal shift to public transport. • This scenario only urbanises one side of the rail corridor in the Paerata North area, which reduces the potential catchment of that station and may undermine its justification. • This scenario excludes the Pukekohe North East area, which is difficult to develop in a way that justifies the provision of frequent public transport services.
<i>Enabling the efficient movement of freight</i>	<ul style="list-style-type: none"> • The location of industrial land in this scenario (most likely around the Drury interchange, at Paerata and south of Pukekohe) is similar to other scenarios. It is noted that the Drury South Industrial Park is subject to a separate plan change process. • If constructed, the Karaka-Weymouth Bridge would be a useful

Principle:	Analysis:
	freight route (especially providing access to and from the Airport and the Wiri industrial area). This option does not preclude a Karaka-Weymouth bridge, but does not require it to enable any development (as compared to the East-West scenario). <ul style="list-style-type: none"> • Modelling outputs show this scenario leads to the lowest levels of congestion on the freight network and the highest average travel speeds.
<i>Enabling placemaking and good urban form outcomes</i>	<ul style="list-style-type: none"> • This scenario enables Pukekohe to grow into a significant 'city sized' centre supporting higher density development, local service and local employment. • This scenario is not as dependent upon a Karaka-Weymouth bridge as the East West scenario. The bridge could generate significant adverse environmental effects on the Pahurehure Inlet and significant adverse amenity effects in the Weymouth/Clendon area. • This scenario excludes the Pukekohe North East area, which is difficult to provide with a connected street network.

Overall the preferred scenario is most consistent with the transport principles guiding the analysis. Key reasons for the preferred scenario performing best include:

- Exclusion of Karaka West and Karaka North areas supports the principles because of the following:
 - The areas are relatively distant from existing major transport infrastructure,
 - The areas would create relatively small 'pockets' of urban development,
 - The areas are dependent upon significant transport infrastructure investment to enable their development and are dependent upon a single piece of transport infrastructure
 - The areas are less likely to contribute to modal shift to public transport, walking and cycling
 - The areas would struggle to be provided with transport infrastructure in a staged and incremental manner (i.e. they require a lot of transport infrastructure to be built at the same time to enable their development)
- Exclusion of the hilly Pukekohe North East area supports the principles because of the following:
 - The area is difficult to provide with transport infrastructure in a cost effective way
 - The area may be difficult to provide with public transport services
 - The area is unlikely to support walking and cycling due to its terrain
 - The area is difficult to provide with a connected street network
- Focusing growth around Pukekohe and Drury/Opapeke/Karaka South supports the principles because of the following:
 - Larger clusters of development are likely to support higher densities and therefore promote modal shift to public transport, walking and cycling
 - Larger clusters of development will support a wider variety of local services and employment, limiting the extent to which external trips are required
 - The RUB's location in this scenario potentially enables 'best practice' transit oriented developments at Pukekohe, Paerata North and Karaka South stations, supporting modal shift and the urban form envisaged by the Auckland Plan.
 - This scenario makes best use of the existing railway alignment, which is a significant piece of existing regional transport infrastructure.

Furthermore, as outlined in section 4 above, the preferred scenario generally performs slightly better in modelled outputs than the other scenarios. Its conceptual transport network also has a lower cost than the West-East scenario's conceptual transport network by approximately \$500 million.

6. Next Steps

6.1. Introduction

This paper has been prepared to support the section 32 analysis for setting the RUB in the main greenfield areas of investigation. Due to the RUB's location evolving over the time this paper has been in preparation, emphasis has been placed on a 'principles led' approach leading to a number of recommendations – which capture feedback provided to the RUB project team, Auckland Council management and elected members.

There are two main areas where further transport analysis in the greenfield areas will be required in coming months and years:

- To support the RUB throughout the Unitary Plan hearings in 2014. Feedback on the DUP has highlighted transport as a matter likely to be raised in submissions on the notified Unitary Plan – particularly in relation to the shape of the southern greenfields area. Submissions on the notified Unitary Plan will highlight main areas of contention and analysis will be targeted to those areas.
- To support structure planning through full integrated transport assessments of the greenfield areas of investigation. Detailed investigation of the transport requirements to enable development will also be an ongoing process.

The conceptual transport networks developed in this paper are only the start of the process of determining what transport infrastructure and services will be required in the greenfield areas over the next 30 years. Initial modelling and costing of the conceptual networks has highlighted a number of locations where refinement of the conceptual networks is warranted.

6.2. Unitary Plan Hearings

Submissions on the notified Unitary Plan will highlight aspects of the RUB which are of greatest contention and debate. Feedback on the DUP highlighted that transport was considered a key issue in setting the RUB – particularly in the southern greenfield area. It is anticipated that similar submissions will be received on the notified Unitary Plan. In addition, in some locations (e.g. Dairy Flat/Silverdale) the RUB in the notified Unitary Plan will be significantly different to what was shown in the DUP and therefore may lead to a significant number of responses.

As noted in section 4 of this paper, transport modelling and costing analysis has been undertaken at a broad strategic level to inform how different RUB options perform against the defined principles – but not to a level of detail that can confirm the detailed cost of growth or the impact on the transport network that this growth will have. A more comprehensive analysis, identifying additional network infrastructure and upgrades, both within the new RUB areas and elsewhere in the network, will need to be undertaken to support the Unitary Plan hearings.

Undertaking more detailed analysis will require interrogation of modelling outputs, fine tuning the conceptual networks to respond to the outputs and testing to identify critical junctions or corridors and determine necessary upgrades. It is important to note that whilst an adequate local network may be able to be developed, this may require unforeseen additional improvements elsewhere in the region due to the additional demands placed on that network (e.g. unforeseen additional vehicles on the state highways or more passengers on trains). The current costing analysis does not include upgrades to the existing network outside the greenfield areas of investigation.

Costing work will also require further refinement to provide greater levels of certainty; especially where the cost of providing transport infrastructure is one of the matters relied upon in the determination of the RUB's location. Undertaking more detailed costing work can be a very intensive exercise so is most efficiently undertaken in response to key relevant submissions on the notified Unitary Plan.

6.3. Structure Planning

Land currently zoned rural which is brought inside the RUB by the Unitary Plan will be rezoned to a Future Urban zone. This zone does not provide for development immediately, with structure planning required before land within the Future Urban zone can be rezoned to a 'live zone'. The Unitary Plan details the requirements of a structure plan, which includes preparation of an integrated transport assessment in accordance with Auckland Transport's guidelines for such assessments.

To ensure that the greenfield areas develop in a manner that is consistent with the strategic direction provided by the Unitary Plan and the Auckland Plan it will be necessary to develop a high-level strategy for the timing and phasing of land release. The conceptual transport networks prepared as part of this paper relate to the complete 'build out' of the greenfield areas and have not yet given consideration to what elements would be built sooner or later throughout the next 30 years. Refining the phasing and staging of developing transport networks within the greenfield areas, as part of developing a broad planning framework for these areas, will be a critical consideration that has not yet been explored in detail.

**Attachment One – Costing Memo from Auckland
Transport**

Memorandum

To: Joshua Arbury, Auckland Council
From: Daniel Newcombe, Auckland Transport
CC: Tim Conder, NZTA; Angelene Burn, NZTA; Christina Robertson, AT; Scott Macarthur, AT; Nik Vorster, AT
Date: 22 August 2013
Subject: Estimated transport costs relating to Unitary Plan proposed Rural Urban Boundary areas

This memo summarises a range of indicative costs for the proposed road networks within the new Rural Urban Boundary (RUB) areas for the Unitary Plan.

Within each RUB area, and for any area to perform, there will need to be significant investment on new and existing transport infrastructure, to achieve a system to support it in line with the strategic direction given through the Auckland Plan.

The initial cost estimates within this memo have been provided by Auckland Transport and the New Zealand Transport Agency for the purposes of giving Auckland Council an indicative cost for the proposed road networks within the RUB areas. This is done solely as part of the section 32 analysis for the upcoming Unitary Plan notification and not for actual project funding purposes.

The costing simply estimates a range for the likely capital cost of the roading infrastructure based on typical typologies and costs from similar networks and similar infrastructural components within the networks elsewhere in the region. No geotechnical, environmental or feasibility assessments have been undertaken to determine whether additional construction costs are required and no land requirement or effects assessment has been made. This work should not be relied upon or used for any baseline analysis.

It is important to note that AT and NZTA have not undertaken a detailed analysis of network performance or identified consequential additional improvements (or recommended changes in land use types or intensities to avoid expensive additional infrastructure), so this costing material should only be considered an initial assessment and for comparison purposes only. The costs have been determined on a per kilometre basis for each road typology, plus individual costs for certain items of infrastructure (such as bridges, rail stations or major intersections). This exercise has not factored in the whole of life costs for ongoing maintenance, renewal or operational nor does it capture the economic or social benefits or opportunity value of one option over another in a short, medium or long term situation.

A more comprehensive network analysis, which more accurately identifies additional network infrastructure, upgrades and sequencing – both within the new RUB areas or, importantly, elsewhere in the network – will require greater interrogation of the results of modelling and consequently will need to be undertaken in the coming months ahead of any Unitary Plan hearing. Ideally, several options would be developed and tested repeatedly, to identify critical junctions or corridors and determine necessary upgrades as they interact with other complementary network services.

It is important to note that whilst an adequate local network may be able to be developed, this may require unforeseen additional improvements elsewhere in the region due to the additional demands placed on that network (e.g. unforeseen additional vehicles on the State Highway or more passengers on trains), and these costs have not been yet able to be calculated.

As such, the cost estimates should be used as a method to understand the likely infrastructure costs of the proposed road network (as it relates to RUB options) but it should not be assumed that the network is

completely sufficient to adequately this scale of development or that the networks presented are confirmed as new projects in any existing future strategy or programme.

Both AT and NZTA have participated in good faith in the identification and costing of a proposed road network, but wish to highlight that further and more thorough work is required before the network can be considered to be sufficient or the costs robust. This further work will also help identify any issues relating to the phasing or sequencing of any network development as a key contributor to achieving the outcomes sought by the Auckland Plan. The costing exercise has not considered approaches such as the inclusion of special housing areas within the RUB areas.

The initial assessment has resulted in the following cost estimates:

RUB area	Estimated cost (\$millions)	Comments
Northwest (Whenuapai/Kumeu/Riverhead)	\$1,000-1,300	Two sections were identified that will require major civil works but the scale of the cost has not been able to be calculated.
Northern (Silverdale)	\$610-770	Several sections were identified that will require major civil works but the scale of the cost has not been able to be calculated. The construction of Penlink (including any interchanges) has been excluded from the costing due to it being a separate project included in the current RLTS.
Northern (Warkworth)	\$350-500	Two sections were identified that will require major civil works but the scale of the cost has not been able to be calculated.
Southern (preferred option)	\$1,800-2,100	Several sections were identified that will require major civil works but the scale of the cost has not been able to be calculated. The costs associated with rail track duplication, electrification and additional rolling stock to allow the desired rail service frequency has not been included.
Southern (corridor option)	\$1,800-2,100	Several sections were identified that will require major civil works but the scale of the cost has not been able to be calculated. The costs associated with rail track duplication, electrification and additional rolling stock to allow the desired rail service frequency has not been included.
Southern (Pukekohe option)	\$1,900-2,200	Several sections were identified that will require major civil works but the scale of the cost has not been able to be calculated. The costs associated with rail track duplication, electrification and additional rolling stock to allow the desired rail service frequency has not been included.

RUB area	Estimated cost (\$millions)	Comments
Southern (East-West option)	\$2,400-2,700	Several sections were identified that will require major civil works but the scale of the cost has not been able to be calculated. This is particularly case with the Weymouth crossing, which is likely to require significant and expensive coastal works. The costs associated with rail track duplication, electrification and additional rolling stock to allow the desired rail service frequency has not been included.

I hope the information contained in this memo is sufficient for the current requirements of the section 32 report. Please contact me if you have any queries regarding the descriptions or figures in this memo.