

Light Rail Transit for Auckland



Briefing Note

To: NZ Transport Agency
From: Auckland Transport
Subject: Light Rail Transit (LRT) Update
Date: 28 November 2017

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Introduction

The purpose of this briefing note is to provide the Transport Agency a summary of the work undertaken to date by Auckland Transport in developing Light Rail Transit (LRT).

A considerable amount of investigation and design work has been completed for a number of corridors, including LRT as the reference case solution from the Airport to the City; initial economic analysis and modelling for the North-Western corridor (noting the Minister's preference for LRT) and initial corridor analysis for the Airport to Botany corridor. Extension and design of the Northern corridor (Bus Rapid Transit – BRT) is already underway by AT and the NZ Transport Agency (Transport Agency).

The briefing note provides context to the problem definition and benefits of the Light Rail Project (the Project), a summary of the history and the work to date, recent improvements to delivering passenger transport in Auckland and potential next steps forward.

It is important to ensure that the LRT solutions on the corridors identified are integrated into the single Auckland public transport system, and as proven over the last seven to ten years – reflected in the patronage growth achieved – a customer-centric and service design approach that meets customer needs and expectations is critical.

This paper specifically focuses on the work undertaken in preparation for LRT, with context provided of how LRT fits within the public transport system. For clarity of terminology, LRT is considered a mass rapid transit (MRT) solution internationally. Within the Auckland Regional Public Transport Plan 2015 (RPTP), the definition of the public transport system consists of four integrated service types or layers:

- Rapid Transit Network (RTN) – high frequency operated on own right-of-way
- Frequent Transit Network (FTN) – high frequency in shared corridor with mode priority
- Connector / Local Services – local community services and feeder services to the RTN and FTN at interchanges (hub-and-spoke model)
- Targeted Services – peak-only, on-demand, shared-ride, school-only

Due to the high frequency of service and customer amenity, LRT will contribute to both the RTN and FTN service layers, RTN where the LRT corridor operates in its own right-of-way and FTN where it shares the corridor but has traffic signal priority.

AT has identified LRT as a key lever to:

- address the growing and urgent congestion and accessibility problems in Auckland
- attract patronage – from a customer-centric and service design perspective LRT offers best patronage uptake as part of the Auckland public transport network
- network integration and capacity for future requirements
- to improve urban amenity
- encourage and lead development opportunities and value uplift
- provide better access to jobs and education

- ensure an environmentally sustainable public transport system for Auckland
- contribute to the reduction of Auckland's carbon emissions
- attract third-party investment
- support Auckland being a more modern, connected, progressive, globally competitive city.

Auckland is facing unprecedented growth and development, bringing with it pressure for new, affordable housing, access to jobs and travel options. The population of Auckland makes up 33.5 per cent of New Zealand's 4.83 million inhabitants and the current Auckland population of 1.5 million is forecast to grow by over one million over the next 30 years, reaching two million people by 2020. According to Statistics NZ, current population growth is above projections, with the city having to accommodate over 820 new residents a week.

LRT investigations commenced in 2014 when the need for a step change in public transport provision on the spines of the network was identified through a number of AT studies on City Centre access issues. Earlier work had identified that in addition to the improvements already planned and committed to by AT, the introduction of a mass rapid transit (MRT) solution was particularly critical in the City Centre in order to keep it moving and to address congestion on the main approaches to the City Centre through its restricted Central Isthmus.

An integrated AT Project Team was established to progress the work required to understand the timing and sequencing of further MRT corridors to address the problem. LRT was developed as the reference case for this and over the last three years AT has progressed the reference design, procurement methodologies, stakeholder engagement plan, consenting and property strategies and business case planning. The project scope has included the City Centre and isthmus areas, preliminary work on the area between Mt Roskill and the Airport, and broad analysis into a range of MRT options, while taking into account emerging technologies as part of the modal options analysis.

Investment in LRT on the route between the Airport and the City Centre can be considered a "transformational investment" given its capacity to transform a number of areas along the route by encouraging investment around permanent transport infrastructure and enabling housing development through improved accessibility. The proposed route will traverse a number of lower socio-economic areas, including some with dense clusters of social housing, and others that have intensive housing development areas planned – supported by Auckland Unitary Plan changes.

The delivery of LRT networks internationally has been shown to enhance urban development outcomes such as agglomeration and housing intensification around transport infrastructure. It is important to recognise other aspects of the network, such as the heavy rail RTN spine and Connector / Local feeder services, to ensure LRT functions as part of an integrated system and maximises the opportunities of a multimodal network.

This project creates the unique opportunity in Auckland to purpose design the new LRT corridors from a customer and service led approach as a key enabler for better access to work places as well as to social infrastructure such as education, healthcare and leisure facilities, as part of the wider Auckland public transport system. An integrated approach to transport, housing and social infrastructure could generate significant benefits for the people of Auckland and indeed New Zealand.

Executive Summary

- AT is the Road Controlling Authority for Auckland, with responsibility for the Auckland transport system with the exception of the state highways, the Northern Busway (under the control of the Transport Agency) and roads under the control of Auckland Airport Limited (AIAL). AT is also responsible for the operation of the public transport system, which includes the operation of passenger rail, bus and ferry networks, as well as the joint operation of Auckland Transport Operations Centre with the Transport Agency to manage the systems interface and to provide a connected and seamless transport system for Auckland.
- AT has, with the Transport Agency and Ministry of Transport through the Auckland Transport Alignment Project (ATAP), identified congestion and accessibility problems in Auckland as a result of unprecedented growth and development, bringing with it pressure for new housing, access to jobs and travel options. The population of Auckland makes up 33.5 per cent of New Zealand's total population and Auckland is forecast to grow by over one million in the next 30 years, reaching two million people by 2020.
- For Auckland to continue to thrive as a globally competitive city and continue to attract investment, it is critical that investment in high capacity transport solutions be planned and delivered to relieve congestion, improve urban amenity, provide access to jobs, education and health.
- AT has invested, with its partners and funders the Auckland Council and the Transport Agency, in a number of projects, network changes, service improvements and technologies to enhance and provide continual improvement to our public transport customers through a customer centric approach to transforming the Auckland public transport system. A customer centric and service design approach has been used to attract patronage growth to public transport – the same approach would be taken with LRT solutions.
- Phase 1 of the Auckland public transport network development over the last seven to ten years has seen a seven per cent compounding growth per annum in customer usage, increasing from ~50 million boardings per annum in 2007 to over 90 million boardings in 2017. Phase 1 will be complete in mid-2018 when the North Auckland New Network is implemented.
- New Zealand (and predominantly Auckland) is ranked third in the world for public transport use growth between 2001 and 2014 by the International Association of Public Transport (UITP) in its 2017 biennial global public transport survey.
- Phase 1 of the customer centric transformation of Auckland public transport has included:
 - Launch of single Auckland public transport customer brand – AT Metro

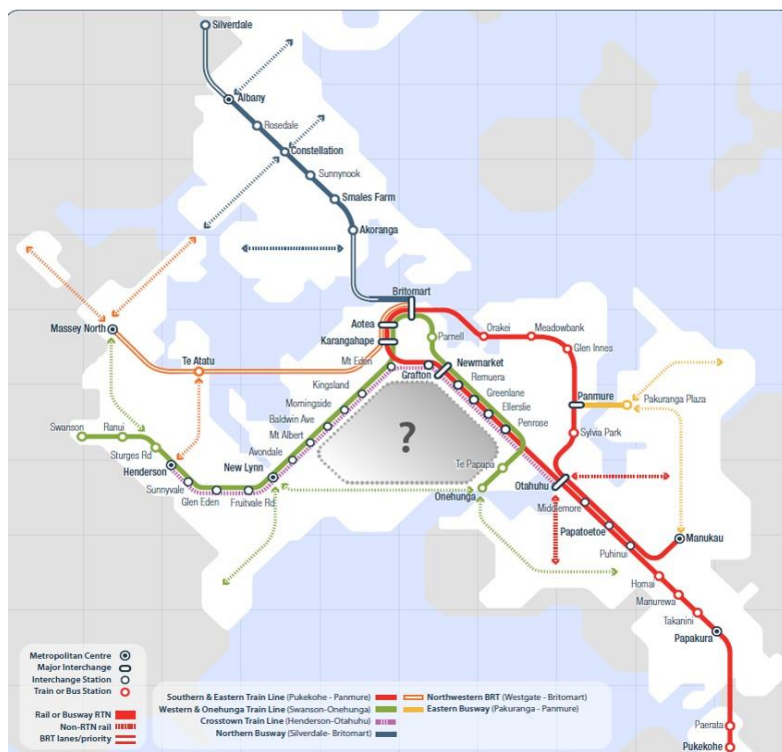
- New Network - a complete redesign of the entire Auckland bus network and timetables to deliver to international best practice principles a hub-and-spoke single holistic public transport service network across all modes of bus / train / ferry, including creating 30 bus based FTN services
- Enhanced service capacity and frequency across bus / train / ferry
- Customer journey experience mapping and targeted improvements including network-wide Customer Service Centres
- Mobile and technology real-time customer interface improvements including launch of AT Mobile, a digital journey planner and pre-cursor to potential Mobility as a Service (MaaS)
- Enhanced vehicles and on-board customer experience:
 - o new Electric Multiple Unit (EMU) trains (57 initial order plus a further 15 ordered in November 2017 due to passenger growth beyond forecast)
 - o bus fleet age and emission standard improvements including double decker fleet
- Bus / train / ferry service performance enhancements including reliability and punctuality
- City Rail Link planning, design enabling and initial delivery prior to the formation in July 2017 of City Rail Link Limited (CRL)
- Passenger Rail Services Contract review and extension
- Regulation of bus and ferry services through new performance based contracts
- New bus/train interchanges, stations, bus lanes and terminus points in city and Isthmus
- Integrated ticketing and fares:
 - o HOP Smart card rollout (91% market penetration)
 - o zonal integrated bus / train fares
- Digital advertising and customer experience enhancements
- Phase 2 of the Auckland public transport transformation seeks to build on the momentum of Phase 1 with key projects including
 - RTN heavy rail network improvements to reinforce this critical rapid transit spine and secure maximum benefits from the CRL investment
 - RTN projects such as to the north-west and from the Airport to Manukau and Botany
 - MRT enhancements in urban areas as part of the RTN / FTN utilising LRT and similar technologies
 - FTN improvements for bus based corridors including full bus lane priority
 - First-and-final-leg solutions to efficiently get people to the spines of the public transport system

- Shared mobility solutions seeking to provide practical alternatives to the private vehicle and support or compliment public transport; include rideshare, vehicle sharing, cycle hire
- Active transport access to public transport including walking and cycling enablers
- Enhancing the singular customer experience for shared mobility in Auckland including improving existing digital and non-digital customer channels and enhancing AT Mobile towards a Mobility as a Service (MaaS) solution
- Trials and investigations of new technology including autonomous buses
- AT commenced LRT investigations in 2014 when the need for a step change in public transport provision was identified through a number of AT studies on City Centre access issues and network spines. Earlier work which supported the City Rail Link investment decisions had identified that in addition to the improvements already planned and committed to by AT for passenger transport, further investment was required. The introduction of further MRT corridors is critical in the City Centre in order to keep it moving and to address congestion on the main approaches to the centre.
- The importance of the City Centre economic productivity necessitates a reduction in passenger and freight travel times. LRT will provide greater passenger movement options while freeing up road space for freight and small service vehicles.
- Access requirements for passengers to and from AIAL has also been identified as a key economic improvement tool.
- Operational capacity in the City Centre means access by bus is becoming increasingly constrained and unreliable which will restrict Auckland's economic growth and have detrimental effects on the vibrancy, urban amenity and environment of the City Centre
- Enhancing the public transport system with LRT should be delivered over time and integrated with the existing network, but with an early start being required on the most heavily used access corridor to and through the City Centre in order to:
 - address the growing bus operational and capacity problems (notably Symonds Street)
 - complementing the heavy rail network, including the CRL (when complete)
 - strengthen the transformation of the urban form for Auckland set out in the Auckland Plan
 - overcome major construction difficulties that will arise in later years - the inevitable disruption to the roads and public transport network during implementation will be much harder to manage when the remaining capacity on the roads has been taken up by increased traffic and the necessary additional bus services
 - ensure that core economic destinations are adequately served by appropriate public transport as soon as possible
 - bolster Auckland's role as an event and visitor destination
 - signal unmistakably the commitment that Auckland will have a modern, competitive world class centre - a message that will reinforce its attractiveness as a place to live, study and do business.

- AT and the Transport Agency's analysis supports MRT improvements over the next 30 years comprising initially an Airport to City Centre route, enhanced Northern corridor and a North-Western route to the City Centre, followed by connections from the Airport to Botany and further Isthmus corridors.
- A joint-client led and delivered project for the LRT corridors is proposed between AT and the Transport Agency, commencing with urgent business case confirmation and delivery of the Airport to City Centre route, northern corridor improvements and North-Western corridor business case and delivery.
- A procurement strategy will also need to be complete for the initial corridors across design, construction, maintenance and operations of both the infrastructure and rolling stock. While a customer centric service design approach is needed, it is important to link design and construction potentially for infrastructure and design, build and maintenance for rolling stock. Operations can be procured separately, noting that the service delivery and customer service must be integrated with the broader management of the Auckland public transport service system.
- Any procurement strategy will also need to consider the interface with urban development, Transit Orientated Development (TOD) and growth development partnerships and alliances.
- It should be noted that the programme in this briefing paper (Appendix 1) is indicative and does not consider acceleration of aspects of the project that may be enabled with legislation or otherwise. It does however, provide a "best case" scenario in the current environment.
- AT and the Transport Agency have completed a Programme Business Case to address access issues to Auckland Airport. The business case identifies a number of short term improvements that are to be implemented within a three-year period, with a longer term view to implement a new LRT corridor commencing in the first decade of ATAP and continuing from the Airport to Botany.
- AT released a draft Indicative Business Case on the North-Western corridor from the city to Westgate in October 2017, which will be finalised in December 2017. The route was identified as a first decade priority as part of the ATAP Strategic Public Transport Network.

1. History

- The seminal City Centre Future Access Study (CCFAS), in 2012 demonstrated that while the CRL was an essential investment, no option existed that would fully address all movements and that bus numbers would be a future problem that needed to be further investigated.

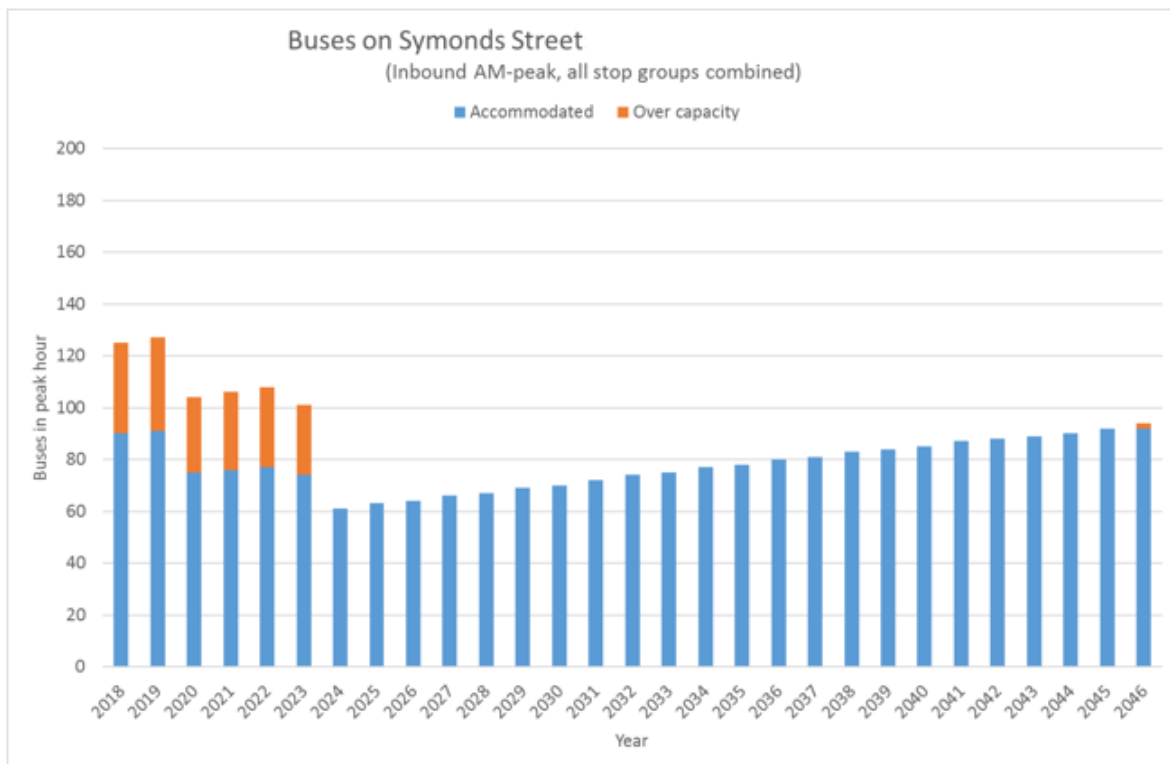


Rapid Transit Network showing the public transport 'void' in the central Isthmus

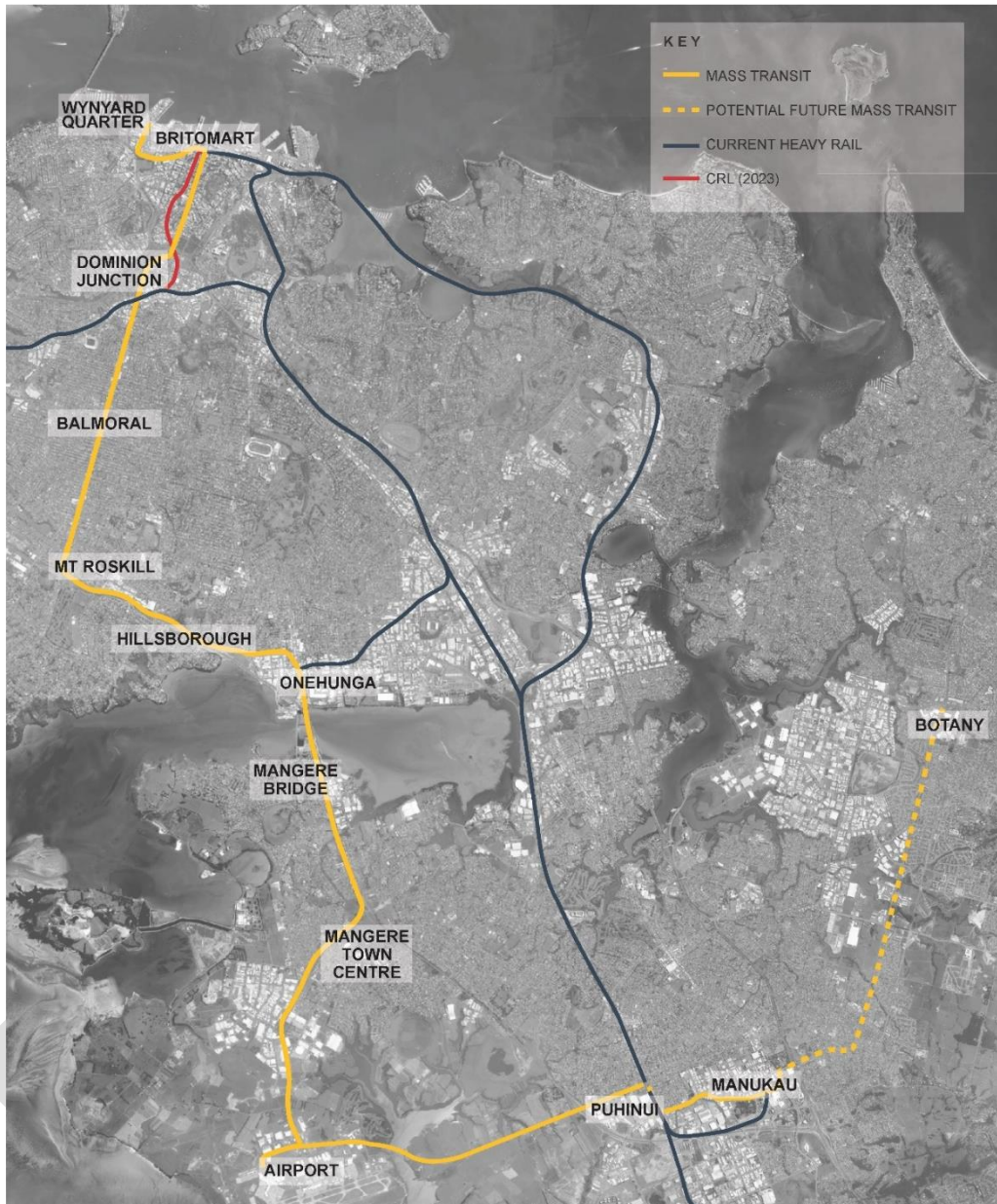
- CCFAS identified that the City Rail Link (CRL) would help achieve the transformation of Auckland, by driving a major shift towards greater use of public transport and an increase in the density of residential and business development in the City Centre, and along the rail corridors.
- However, the CRL would not provide the complete response to managing the constraints of the system. CRL optimises the carrying capacity of the Auckland passenger rail network, particularly improving travel times and thus congestion points in the West, Manukau and the East but will not address access from the North or the Central and Southern Isthmus. Critical locations such as the university campuses and the Wynyard Quarter cannot be served effectively by metro rail.
- An investigation into LRT commenced in 2014 when version review of the City Centre Future Access Study (Two) (CCFAS2) identified a four-line LRT network (based on the historic Auckland tram lines) on the Central Isthmus as a potential way to address the imminent challenges on the road-based transport system, including bus capacity issues on Symonds Street (see graph below). The work that followed was the development of a strategic case and further studies. Current analysis indicates the Isthmus stage of the MRT network is needed by 2024, followed by the Airport connection to meet increased public transport demand.
- The AT and Transport Agency boards discounted heavy rail to the Airport in mid-2016 due to poor value for money, which was supported by the Auckland Transport Alignment Project (ATAP) and confirmed to AIAL.
- In 2016, further work was carried out on assessing central access issues through the Central Access Study (CAS) and the Central Access Plan Programme Business Case

(CAP PBC). It was this study that identified the need for a Central Isthmus MRT network intervention by 2024.

- The joint programme business case was approved by both AT and Transport Agency boards, and confirmed the critical need for an MRT solution.
- In August 2016 ATAP confirmed the need for MRT investment for the Airport to City Centre corridor with implementation early in the second decade (2028-2038). The ATAP report recommended allocating \$500m for MRT route protection and early stages of construction in the first decade and noted a funding gap for priority projects.
- The 2017 ATAP refresh has identified that MRT for this corridor is required in the first decade (2018-2028) and has indicated a cost impact of \$1.2 billion in order to complete isthmus mass rapid transit within this timeframe.



Capacity of the bus system in the City Centre from CAP PBC



Light Rail Transit Network showing the Airport to City route and the potential future route from the Airport to Botany

- In March 2017, the AT and the Transport Agency boards each passed resolutions agreeing “in principle, that in the medium to long term, there will be a staged, integrated transition from bus to light rail transit [LRT] along the preferred ‘Airport to City’ route, based on demand and capacity” and agreeing that “a business case for route protection for the ‘Airport to City’ route, including a plan identifying the triggers for transition steps, will be progressed with urgency to future-proof options for both advanced bus and light rail”
- AT has been progressing the scope of a business case for route protection with the Transport Agency, which is programmed to be completed by first quarter 2019 and currently includes a transition study to understand the implications of the transition between modes.

- Should a decision be made to progress directly to LRT, the business case scope, timeframe and requirements would need to be reconsidered as the transition study would no longer be necessary.
- AT has been working on an Indicative Business Case on the North-Western corridor from the city to Westgate, which will be finalised in December 2017. The route was identified as a first decade priority as part of the ATAP Strategic Public Transport Network.
- AT and the Transport Agency have completed a Programme Business Case to address access issues to Auckland Airport. The business case identifies a number of short term improvements that are to be implemented within a three-year period, with a longer term view to improve the mass rapid transit network capacity from the Airport to Botany.

2. Public Transport Investment and Delivery

AT specialises in the design, procurement, delivery and subsequent operation of complex infrastructure, roading and public transport projects in the Auckland region. As a Council Controlled Organisation, AT has close working relationships with the Mayor's Office, the Auckland Council family, the Crown, the Transport Agency and the public of Auckland.

AT has carried out a number of city centre and regional initiatives and projects in recent years to optimise public transport services, increase the capacity and resilience of the network and maximise the usage and efficiency of transport assets.

The organisation has carried out large procurements and delivery projects across Auckland's transport system and across the project value-chain, covering initial customer-centric design and consultation, a service-led approach to major projects, design, consenting and construction of infrastructure and delivery of operational services and supporting customer services and engagement. The delivery of LRT as part of the integrated transport system will provide for ongoing and continued improvement to the provision of public transport for our customers.

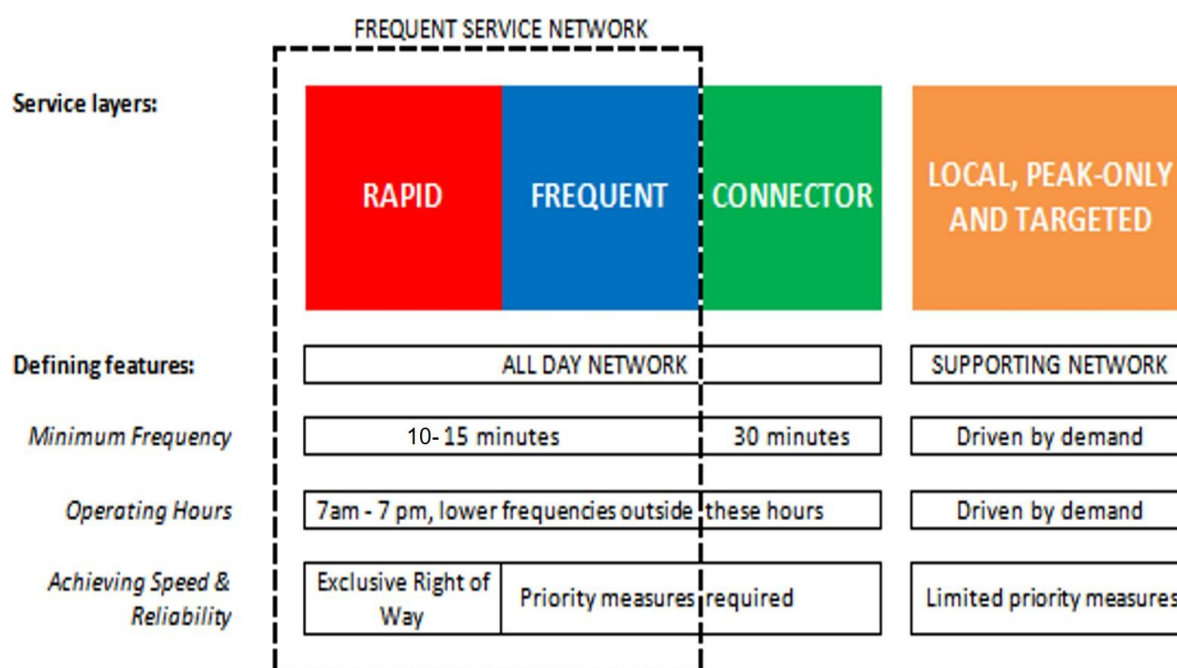
Through a customer-centric design approach, AT has significantly increased patronage over the last seven years at a rate of +7% user growth per annum compounded from ~60 million boardings per annum in 2010 to over 90 million in 2017, as well as the widespread use of AT services and products.

The following projects and services can provide the Minister with assurance that AT is well placed to deliver the integration of LRT into the network and subsequently manage the operation of the system on the local road network.

- **Electric Multiple Unit (EMU) trains**
 - \$500m contract including Wiri depot and 57 new trains that were integrated into an upgraded (by KiwiRail) Auckland network, which required new stations, brand new electrification and a new state of the art signalling system
 - Maintenance Contract is 12 years with a value in excess of \$100m

- Due to train patronage exceeding forecasts, a further 15 EMUs were procured in November 2017 for delivery into service from mid-2019
- **City Rail Link**
 - The largest rail infrastructure project to be undertaken in New Zealand in recent times
 - 3.45km twin-tunnel underground rail link up to 32m below the City Centre transforming the downtown Britomart Transport Centre into a two-way through-station that better connects the Auckland rail network
 - Planning and design, plus initial enabling works undertaken by AT prior to formation of City Rail Link Limited (CRL)
- **Rail- Bus integration**
 - The New Network was designed to integrate buses with the rail network, utilising capacity from electric trains and the CRL
 - Buses from rail served areas will no longer run to the city, removing many buses from the City Centre streets
 - Only trunk bus routes from non-rail served areas will continue to the City Centre (i.e. Isthmus, North Shore, and Northwest)
- **New Service Performance based Contracts across bus / train / ferry**
- **Bus Fleet Improvements**
 - 43% increase in corridor capacity with improved cost recovery
 - 85 Double Deckers in fleet
 - Enhanced capacity and quality and reduced average age and emissions of single-decker bus fleet
 - New electric buses in service from February 2018
 - Electric bus roadmap: procure only electric buses from 2025 with a target of full electric bus fleet from 2040 onwards
- **Urban Busways and arterial bus lanes**
 - 40km increase in bus lanes over three years
 - 5-10 year roadmap to implement bus priority on 30 Frequent Transit Network routes
 - Fanshawe St busway: extension of Northern Busway corridor to Britomart terminal.
 - Wellesley St busway: double bus lanes and eight-bay bus stops in each direction to cater for 14 Double Deckers every 120 seconds
- **New Interchanges and Stations**
 - Otahuhu bus / train interchange
 - Manukau bus/ train interchange
 - Downtown bus termination split into two independent terminals: Britomart East and Britomart West (design and planning)
 - Lower Albert St converted to terminus for North and Northwest buses: planned capacity to accommodate up to 11 double deckers every 120 seconds
 - New Learning Quarter (university precinct) bus terminal (planning)
 - New Wynyard Quarter bus terminal (design and planning)

- **Integrated Ticketing and Fares:**
 - HOP smartcard integrated ticketing completed 2014
 - Bus / train zonal integrated fares completed August 2016
- **New Network**
 - A complete redesign of the entire Auckland bus network and timetabling system to deliver to international best practice principles
 - Hub-and-spoke network design across four-tiered service layers forming one network
 - Includes timetabling interfaces with rail and ferry services
 - Optimised for City Centre bus capacity and efficiency
- The Auckland public transport New Network is a four-tiered integrated service network:



- Rapid Transit Network (RTN) – part of the spine of the public transport system, includes heavy rail corridors, BRT, LRT and other forms of MRT; operates high frequency in its own dedicated right-of-way
- Frequent Transit Network (FTN) – with the RTN forms the spine of the public transport system; on key arterials where dedicated right-of-way is not possible or warranted; operates high frequency in a shared corridor with other modes but with priority in the corridor (e.g. bus lanes or LRT dedicated lanes) and traffic signal priority; can be bus based or LRT
- Connector & Local Services – local community services and hub-and-spoke feeder services to the RTN and FTN to get people to the spine
- Targeted Services – supporting the above all day network; include peak only services and first-and-final-leg services

3. Mass Rapid Transit Network Context

AT has been investigating LRT since 2014, with other options and emerging technologies and is testing those against LRT as the reference case for a Mass Rapid Transit Network solution in line with the ATAP Strategic Public Transport Network recommendations.

3.1 Auckland Transport Alignment Project (ATAP)

ATAP was developed by the NZ Government and Auckland Council to establish a joint strategic approach for the development of Auckland's transport system.

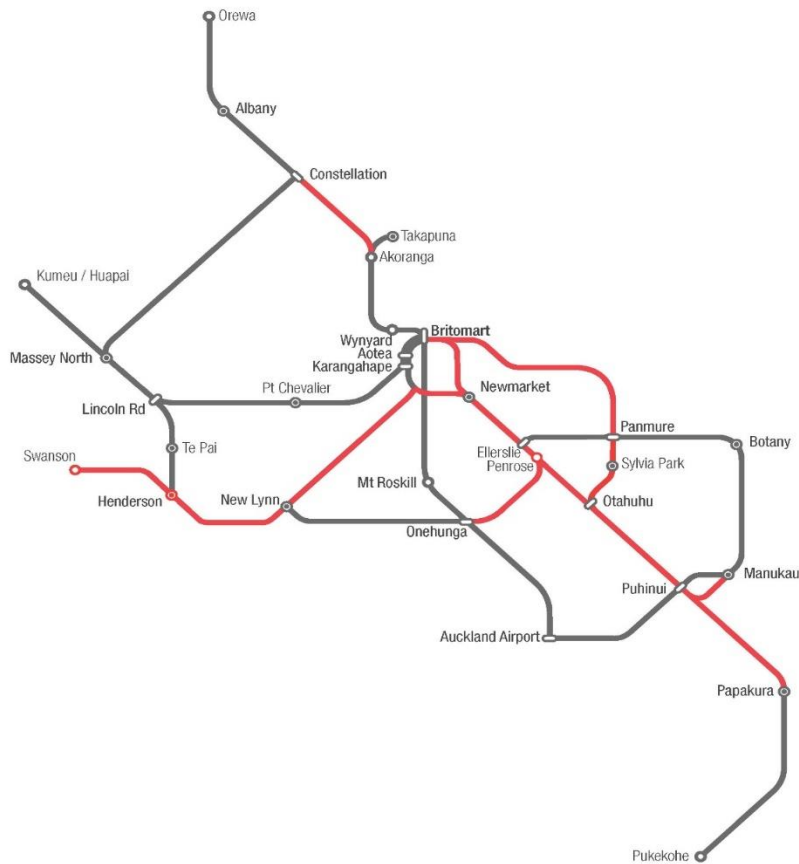
The final report (2016) identified six key major interventions areas:

- Supporting greenfield growth
- Addressing motorway capacity constraints
- Strengthening central area access
- Improving Airport access
- Enabling rail passenger and freight growth
- Shifting to a greater focus on influencing travel demand

ATAP noted that bus efficiency improvements are limited and can only help cope with increased demand in the short term. It recommended a MRT solution from the Airport to City Centre in the medium term, with route protection as an early priority.

The ATAP refresh in mid-2017 identified some major investments to be brought forward as medium term priorities, in particular, corridors seeing the greatest increases in demand and those serving the fast growing and strategically important City Centre and Airport.

The updated report recommended the completion of the isthmus MRT network corridor (city to Mt Roskill) within the first decade, with the mode and detailed timing to be determined through the business case process.



ATAP Strategic Public Transport Network

3.2 Airport Access Option

AT and the Transport Agency have completed a Programme Business Case to address access issues to Auckland Airport. The business case identifies a number of short term improvements that are to be implemented within a three-year period, with a longer term view to improve the MRT capacity from the Airport to Botany.

It recommends a programme that combines behaviour change, improved network management and increased capacity provision, focussing on improving the transport links connecting directly to the Auckland Airport and the interventions required in the wider network to enable this.

The problems that the business case addresses include:

- Realistic travel choices are limited and all choices are subject to congestion affecting reliability & timeliness
- Low frequency and limited priority means journey times are too slow and unreliable for business travellers
- The small number of bus routes reaches only a small proportion of employees and travellers (targeted to increase over the next two to three years)

- The bus service span doesn't meet the needs of shift employees

The three year programme business case sees the initial year one interventions for Airport access take effect from December 2017 with an increase to 15-minute frequency of the 380 bus between Manukau Station – Papatoetoe Station – Airport – Onehunga Station from 10 December 2017, improved customer information and wayfinding, improved Airport forecourt customer amenity for bus users, improved bus right-of-way through the Airport and priority at SH20B intersection. A MaaS pilot will also be launched on transport options for the Airport led by the Transport Agency in December.

Year three targets further improvements, including additional bus routes and higher frequency services, Puhinui Station upgrade and an improved high frequency public transport service between Puhinui Station and the Airport replacing the Papatoetoe Station connection with the 380 bus route.

3.3 North Western Corridor

AT has been working on an Indicative Business Case for the North-Western corridor from the city to Westgate. The route was identified as a first decade priority as part of the ATAP Strategic Public Transport Network and the business case recommended a staged busway as the preferred option.

The MRT corridor helps meet the needs of a major Auckland growth area – the north-west – and assists in compensating for the imbalance in future population and employment. The north-west is expecting an increase in population from about 45,000 in 2013 to some 90,000 in 2046 while employment is expected to increase from 9,000 to 50,000 over the same time period (an improved ratio, but greater total shortfall).

The deficiencies of existing public transport facilities are:

- There are no public transport interchanges along SH16, meaning that buses seeking to pick up or drop off passengers, including for transfers between services, must leave the motorway to use on-street bus stops. Alternatively, buses do not leave the motorway and run directly to the City Centre, resulting in a highly inefficient service with high numbers of partially full buses arriving in the space-constrained City Centre. The proposed service network with interchanges on SH16 has already been designed in anticipation of the new interchanges.
- There are bus shoulder lanes along SH16 between Waterview and Lincoln Road. These do not provide continuous priority through ramps and interchanges, meaning that buses must merge into mixed traffic at these points.

The preferred option in the event of a staged approach was a bus-based solution with a range of infrastructure types along the corridor with careful staging to target sections of the corridor where the greatest problems occur and which could therefore provide higher benefits first. In the event of a non-staged approach, light rail can be more readily considered, which also necessitates the widening of the causeway between Te Atatu and Waterview. It is noted that the Ministerial direction is for a LRT solution to this corridor.



NWRTC recommended staging

4. Airport to City Centre Corridor - Light Rail Reference Case

4.1 Background

Considerable progress has been made to date in investigating LRT, as it has been developed as the base reference case for an MRT solution for Auckland.

An LRT business case for route protection is being progressed by AT and the Transport Agency to protect the preferred route. The business case uses LRT as a reference case for the work however there is also consideration of emerging technologies as part of the options evaluation work to support the business case. The case covers the route designation, and will consider the wider network implications and interfaces with the transport system as a whole.

The scope of the business case currently includes a study on the transition between the current bus service options to LRT.

The need for an MRT solution is well evidenced through a number of studies, and analysis has been undertaken to identify a possible LRT solution for the medium to long-term (see Appendix 1).

4.2 Project Objectives

The introduction of a high capacity LRT option is required to achieve the following objectives for a rapidly growing Auckland:

- Improve transport access into and around the City Centre to address current problems provide a transport system that is best able to satisfy the immediate needs and the long term, rapidly growing customer demand in the City Centre and approaches
- Improve the efficiency and resilience of the transport network of the City Centre:
 - improve journey time, frequency and reliability of transport access into and within the City Centre and City fringe
 - improve the linkages and service of key destinations, particularly those not served by the CRL, notably the university campuses and the Wynyard Quarter
 - maximise the benefits of existing and proposed investment in transport (including CRL)
 - release the capacity constraints around the City Centre's most important approach routes and nodes
- Significantly contribute to lifting and shaping Auckland's economic growth:
 - support economic development opportunities including serving and stimulating the development of areas of potential higher activity in the City Centre, City fringe and in areas between the City Centre and the Airport
 - enable a more productive and efficient city
 - provide the greatest amount of benefit for cost
- Provide a sustainable transport solution that minimises environmental impacts:
 - limit visual, air quality and noise effects associated with the growth in public transport
 - contribute to the country's carbon emission targets
 - take account of 'whole of life' sustainability impacts
- Contribute positively to a liveable, vibrant and safe city:
 - enhance the attractiveness of the City Centre, City Fringe and surrounding areas as an outstanding place to live, work and visit
 - protect our cultural and historic heritage for future generations
 - help safeguard the city and community against rising transport costs
 - reduce surface transport congestion

4.3 Problem Statements and Benefits Identified to Date

Problems

- **Problem One:** Insufficient bus capacity in the City Centre constrains reliable public transport access which hinders economic development and adversely affects urban amenity
- **Problem Two:** Limitations on sufficient, reliable and timely access to the Airport and City Centre from the Central Isthmus and Mangere [and people travelling between the Airport and City Centre] leads to poor journey experience and reduced employment accessibility and liveability

Benefits:

- **Benefit One:** Improved potential for economic growth in Auckland, particularly in the high productivity areas of the City Centre and Airport.
- **Benefit Two:** Improved overall network performance through better network reliability, capacity, efficiency and flexibility across different transport modes for people and goods.
- **Benefit Three:** Increase in Auckland's prosperity and liveability; including land use outcomes through improved public transport accessibility, a vibrant city centre and reliable travel times to, from and between the Airport and City Centre.

4.4 Key points

- Mass Rapid Transit (MRT):
 - is a public transport, place-making, and city transformation solution that unlocks the City Centre and relieves bus congestion
 - provides reliable, frequent service and access to jobs for all areas between the City Centre and the Airport
 - provides connectivity to the Airport for workers and passengers
 - enables opportunities such as housing and jobs for areas along the route
- The integration of capital works and PT network operations and control is critical; the LRT corridor development should be customer-centred and service design led, not infrastructure led
- The entire urban network is fundamental to the success of the project, including full consideration and understanding of network implications and effects on other services beyond the corridor
- Integration with property development and value uplift/capture requires a local developer/commercial focus with transport.
- There are possibilities to progress project elements such as early enabling works, particularly the structures and contractual agreements to ensure a project commitment is signalled and other opportunities to escalate the construction programme including potentially enabling legislation.

4.5 Progress to date - Procurement

Given the number of project elements (i.e. utilities, infrastructure, systems / communications, stabling facilities and vehicles) and project scale in terms of cost and multiple interface complexity; the procurement and delivery approach needs careful planning and strategic advice from the market experienced in LRT procurement processes and contract packaging to match international LRT procurements.

It is anticipated that a joint client partnership is established between AT and the Transport Agency.

Briefing Note

Procurement Model	Advantages	Disadvantages	Comment
Public Private Partnership (PPP)	<ul style="list-style-type: none"> Used if Private Financing is required for upfront capital and costs can be spread over a concession period. Potential for design and construction better integrated with operations and maintenance. Can include infrastructure and rolling stock delivery, maintenance and also operations (turnkey) or infrastructure only. Can include Whole of Life risks to the procurement due to the maintenance needs over the project concession period. Can use a shared risk profile. 	<ul style="list-style-type: none"> Risk allocation with respect to the revenue streams (ie patronage revenue, vs Availability Payment). May limit contractors due to the need to bring financing capability - linked to "revenue risk model". Significant legal, commercial and technical documentation requirements. Historically recorded as potentially adding 10-15% to project costs. Longer procurement phase. Project refinancing costs during the concession period. Handback conditions (at end of Concession period) and remaining design life need to be very carefully managed 	<p>Used when finance by owning organisation is limited.</p> <p>Can provide whole of life across both infrastructure and rolling stock provision, and whole of operations integration and risk also.</p>
Design, Build, Operate, Maintain (DBOM)	<ul style="list-style-type: none"> As above, but no private financing. Usually includes infrastructure only but can include rolling stock provision and maintenance, and potentially operations Flexibility to separate rolling 	<ul style="list-style-type: none"> Delivery agency takes all the revenue risk. Project needs to be fully funded to pay for the milestone payments during D&C period to match CAPEX, with regular payments for OPEX. Handback conditions (at end of concession period) and remaining design life need to be very carefully managed Need to incentivise the 	<p>This model used if there is real, and readily recoverable, return on investment.</p>

	stock from infrastructure delivery.	Proponent to grow revenue (ie patronage) and other KPIs focused on patronage.	
Design and Construct (D&C) for infrastructure with separate rolling stock D&C (and maintenance) and potentially separate operations	<ul style="list-style-type: none"> • Possibly the lowest initial project costs to get the project up and running, but possibly not the best whole of life outcomes. • Could be faster to get construction going. • Flexibility of rolling stock provider. • Flexibility of operations provision. 	<ul style="list-style-type: none"> • Project needs to be fully funded to pay for the milestone payments during D&C period to match CAPEX, with regular payments for OPEX. • May not adequately include, or integrate, Operational and Maintenance requirements. • Whole of life costs may be higher due to lack of commercial incentive on D&C to factor OPEX issues. • Significant project scoping and interface issues to manage. • Need an Operator. 	Need to consider how the LRT supplier, operator and maintainer is procured, but must be integrated with rest of Auckland PT service and customer provision.
Partnership Model i.e. Alliance	<ul style="list-style-type: none"> • Project risks shared • Possibly more collaborative approach to delivery. • Potentially less contractual issues between delivery partners. Can be helpful if an agency does not have appropriate resources for delivery. 	<ul style="list-style-type: none"> • How to incentive the private sector partner • Time taken to find and secure partner. • Need to understand what the risk allocation is at the “partnership” level. That is, what each party brings? • Client no longer the lead organisation as now shared. 	What are the key transferable risks and who is best placed to meet these eg: scope, approvals, land, programme

Any procurement strategy will also need to consider the interface with urban development, Transit Orientated Development (TOD) and growth development partnerships and alliances.

Next Steps

- The overarching Procurement Strategy and Procurement Plan for the Project will initially be addressed during the business case phase (in 2018).
- As part of the business case, and specifically in the Commercial Case, procurement options will be fully assessed and evaluated.

- When considering procurement options for the Project, the following matters will influence procurement option selection:
 - The scale and complexity of the Project across design, construction and operations and related risks, interfaces and resource requirements
 - Market capacity to tender and to design / construct / deliver
 - Timescales, funding sources and affordability implications
- It will be essential to develop a procurement option that is proven and has been previously successfully implemented.
- External advice is being provided in respect to procurement options and will continue through the business case stage. A number of external advisors will contribute to the procurement options assessment.

4.6 Progress to date – Design

Current Status

City to Mt Roskill:

- A reference design is being completed for the City to Mt Roskill section, inclusive of the Wynyard Quarter to Queen Street section. The level of design will equate to a 20-30% final design and will be used to inform the business case, detailed design process, costings, land take, consenting and will also assist in consultation.

Mt Roskill to Airport:

- A route options report is due by late November 2017. This report will be used to inform the Airport to City route options selection process that will be undertaken as part of the business case process.
- Work is underway on coordinating the designs of the Airport terminal, forecourt and roading network with the Airport to City and Airport to Botany corridors.

Next Steps

City to Mt Roskill:

- The reference design will be reviewed internally and with partners and key stakeholders in Q1 of 2018. This would likely be followed in Q2 2018 by wider consultation that could either be incorporated into the reference design or noted for updating through detailed design depending on the impact of the changes required.
- The depot options assessment and the alternative access assessment will be completed in 2018 as part of the business case work and may lead to further updating of the reference design.
- A cost focussed value management/value engineering exercise should also be undertaken in Q2 2018 using the reference design as the basis.
- Technical investigations will continue to progress, including undertaking detailed design for early works where necessary.

4.7 Progress to date– Consenting/Notice of Requirement

Current Status

- A Consenting Strategy and Consenting Implementation Plan were prepared on the basis that the Project would be delivered for a vehicle agnostic solution within 30 years.
- The Consenting Strategy recommended consenting be achieved through a Notice of Requirement (NoR) to secure a designation for the construction, operation and maintenance of the system.
- The methodology for securing the designations and consents is yet to be determined pending the delivery case. The various options include traditional two step Council/Environment Court process, Direct Referral to the Environment Court or a Board of Inquiry. It is important that the method/process selected is fit for purpose to deliver the Project within the timeframes, risk profile and procurement method.
- To support the NoR, an assessment of alternatives was required to assess a number of options and requirements to determine the preferred solution to take to reference design. This assessment is also necessary to support the land acquisition process. There are a number of options papers currently underway to finalise the options evaluation process.

Next Steps

- An option evaluation and assessment of alternatives was undertaken to support the Central Access Plan LRT solution and project objectives. Alternatives continue to be considered as required to support any consent and Public Works Act requirements.
- When the scope of the Project expanded after ATAP to include the Airport, a new set of project objectives was created to support an Airport to City Centre LRT solution. The next step for the option evaluation process is to:
 - Obtain endorsement by governance for the new project objectives
 - Confirm alignment between Mt Roskill and the Airport
 - Confirm that assumptions and requirements for existing options evaluation papers are still relevant
- A revised Consenting Strategy that excludes a transitional aspect will be required to deliver LRT in accordance with the current delivery programme if a decision is made to progress directly to LRT.
- Once the reference design has been completed, the planning process for consenting the preferred solution can commence. This will involve preparing an Assessment of Environmental Effects to support an NoR – which involves an assessment of the existing environment and assessment of the effects of the reference design against that environment. It will include recommendations on draft conditions and mitigation to avoid, remedy or mitigate any adverse effects.
- The integrated NoR and Resource Consent package is anticipated to be lodged Q4 2019/Q1 2020.
- The application will be publicly notified in 2020 with a Hearing and decision likely to be issued in Q4 2020/Q1 2021 with construction commencing in the latter part of

2021. Under special legislative powers, elements of the approvals and planning process could be expedited.

4.8 Progress to date– Property

Current status

- AT has \$40m capex for the 17/18 Financial year to progress strategic land acquisitions for the Depot and other constrained sites currently under development.
- AT has confirmed interest with the Transport Agency in acquiring the land located at Stoddard Road, Mt Roskill for the depot site. A response is pending from the Transport Agency.

Next steps

- A Property Acquisition Strategy will be finalised once the reference design is complete
- Land acquisition is programmed to commence in Q4 2019

4.9 Progress to date – Communications and stakeholder engagement

Current status

- Stakeholder engagement to date has focussed on key partners and stakeholders, including the Crown and ministries, the Transport Agency, Auckland Council – Mayor, councillors and local boards, with minimal public engagement during the investigation phase.
- A Stakeholder Engagement Strategy, Communications Strategy, and Public Engagement Strategy have all been developed

Next Steps

- Proactively engage a wider audience in the Project, including Mana Whenua and the public, in conjunction with the Auckland Council consultation processes in Q1 2018, engagement activities such as presentations and increasing available information through a range of communications platforms.
- Once the reference design is complete, a more comprehensive public consultation process will commence that will be followed by targeted landowner consultation with those affected by the Project.
- Joint Communications Strategy
- Branding and identity creation
- Media Strategy
- Social Media Strategy

5. Legislation

Changes to legislation are required to enable the operation of LRT within the road corridor separate from a general traffic lane. Recommended legislative changes have been assessed earlier in the Project.

Due to the nature of LRT running in the road corridor, it would be necessary to obtain interim certification and possibly licencing prior to testing and commissioning.

Dependent on the delivery mechanism that is selected for the delivery of an LRT network, special legislation could potentially be required in order to expedite legal processes and thereby the timing of its implementation. To ensure a service offering is in place within the 2024 or earlier programme timeframe, enabling legislation would need to include among others, the following elements; acquisition, consenting, design, operational considerations and potentially procurement considerations.

6. Constraints and Risks

The Project Team has developed a comprehensive risk register, including mitigation measures, as part of the project documentation. The key risks associated with programme delivery have been identified as:

- Unilateral political and key stakeholder (NZTA, MoT, Treasury, Auckland Council) support and commitment is critical – without unilateral support there may be risks to decision approval and funding limitations
- Decision-making and approval processes – delays in decision-making and approval processes leads to a delay in delivery of programme. Given the required in-service dates, decisions must be streamlined and made on time.
- Procurement & delivery – time delays, market response
- Capacity and capability – the lack of capacity and capability, both domestically and in the international market, may result in the inability to deliver on time and within budget (particularly in the construction and infrastructure sector relative to the various contract packages and timescales required); a number of significant international heavy and light rail transit projects are in market or due to come to market
- Governance and risk management – appropriate processes and controls are not established or cannot be created to fit with and oversee procurement.

7. Programme

The Project Team, supported by its external professional advisors, has set out a “best case” Reference Project delivery timescale (see Appendix 1). This “best case” shows in-service operations commencing in 2025 (following a period of commissioning and testing starting in 2024) for the whole route. These dates are directly comparable to similar large and complex LRT projects delivered in overseas jurisdictions. Appendix 2 shows the estimated activity timeframes for each stage of the project.

This operational date reflects the time taken to complete, among others, the following activities (many of which overlap or will be in parallel):

- Single stage Detailed Business Case and funding identification and approvals
- Reference design completion
- Assessment of Environmental Effects / planning approvals (Designation, Notification, RMA)
- Land and property acquisition
- Pre-procurement planning and market engagement / market warming

- Community engagement, stakeholder engagement and consultation
- Procurement and tenderer selection
- Enabling and early works, utilities diversions
- Construction - infrastructure
- Rolling stock procurement and manufacture
- Operational testing and commissioning

Bringing forward the “best case” in-service date would result in significant additional risk, including those identified in the initial Acceleration Report, which would need to be mitigated at local and national government levels.

8. Financials

The costs included in this memo are broad estimates and based on current information. They will be further refined as part of the business case process.

The business case will also confirm funding sources and funding contributions (including funding parties) for the Project. Given the importance of funding and Auckland Council’s fiscal restrictions, it is recommended that funding sources are considered now and, where applicable, appropriate financial advice is sought.

Costs do not include the potential cost premium that may be associated with delivery in the current market, and adjustments are likely once design development, construction methodology and rolling stock requirements are finalised. Light rail vehicle (LRV) costs are calculated at \$10m per unit. Cost ranges are indicative at this stage based on design to date.

8.1 Project Cost Estimate – subject to change

The project capital cost estimates in the table below are estimated in the current environment with a reasonable forecast delivery programme. These costs are subject to change and should be considered concept design costs at best.

Capital Costs Element	2016-17 \$m
Wynyard to Mount Roskill	\$930 - \$1,205m
Mount Roskill to Airport	\$1,240 - \$1,780m
Total inclusive of rolling stock, property, risk and contingency	\$2,170 – \$2,985m

- *Indicative Cost Envelope (in millions)*

8.2 Funding elements for early consideration

- Option for a joint central and local government delivery to allocate expertise and risk to best entity to manage; it is recommended that a joint project team be created between the Transport Agency and AT
- Impact of project phasing
- Contributions of land as project contributions and or funding source

- Potential for land swaps
- Implications of potential PPP delivery and funding impacts, including timeframe impacts
- Potential for packaging of project parts
- Value capture and targeted rate opportunities
- Linkages to housing development
- Impact on project parts (land, structures and rolling stock)
- Impacts of the introduction of a regional fuel tax
- Land transfer and asset ownership - before any agreement regarding land transfer is entered into, it is critical to have an agreement between all parties on the final ownership, maintenance and operation of the asset
- Legislation – special legislation would be required if Crown land was to be acquired through a mechanism other than LINZ
- Currently in accord with usual processes, it is assumed Land and Property costs will initially be funded by AT / AC and then reclaimed as part of overall costs within the NZTA funding element
- Operating, Maintenance and Lifecycle Costs over 30-year period to be separately considered

9. Economic assessment

Previous preliminary economic appraisal of an LRT network, based on serving Queen Street and Dominion Road in the short-term and the possible medium- to long-term expansion to service the Airport, was undertaken as part of the initial project investigation work. That assessment indicated that the expected economic benefits clearly exceeded costs when applying the Transport Agency’s Economic Evaluation Manual (EEM). The preliminary assessment indicated a benefit cost ratio (BCR) range of 1.2 to 1.4.

External professional advisory firms have indicated that the actual BCR is likely to be in the range 2.0 to 2.5, depending on the factors taken into account and the level of population growth in Auckland. It should be noted that 2.4 is the mid-point BCR between medium and high growth based on the EEM. A BCR of 2.2 is the central estimate of an alternative calculation based on the property value impacts observed on multiple similar international projects.

A full economic assessment will be undertaken as part of the business case. This will follow the Transport Agency’s methodology and will also measure Wider Economic Benefits and Land Use Economics assessments.

EEM-based benefit calculation, discounted at six per cent over forty years.

Benefit category	Medium population growth NPV (\$m)	High population growth NPV (\$m)
Travel time benefits	1050	1190
Public transport user benefits	239	263
Reliability benefits	770	845

Noise	75	75
Health benefits from walking	66	88
City Centre pedestrian travel time	25	25
Emissions	4	3
Residual value	60	30
Agglomeration	157	179
Total	2365*	2653*

10. Next Steps – Accelerated Implementation Plan

There are a number of options should a decision be made to accelerate aspects of the Project. A programme of early enabling works can be delivered in an accelerated timeframe that would subsequently accelerate the timeframe for further works and secure the integrity and continuation of the Project.

The Project Team has previously considered project acceleration options upon request from Mayor Phil Goff in July 2017. Significant risks and challenges were identified in respect of acceleration options for delivery of the full route, in particular those related to procurement approach and timeframes.

The current programme has a number of risks associated with it. Any acceleration of the programme would increase the risk profile considerably, which would need effective mitigation.

However, there are elements of the programme that could be accelerated to ensure the integrity of the operational delivery date of 2024.

The key deliverables that could be accelerated include:

- CMJ Bridge
- K'Rd structure
- Dominion Road Junction
- Fanshawe St Pedestrian Bridge
- Downtown Carpark access ramps
- Lower Hobson St flyover
- Stoddard Depot

11. Next Steps

- It is necessary for AT and the Transport Agency to agree the business case requirements for LRT
- AT recommends the approach of preparing a Single Stage Detailed Business Case (in accordance with NZTA requirements)

Briefing Note

- Project options appraisal, including assessment of alternative modes and technologies and any viable transition options
- Preferred project option identification and confirmation of route and corridor requirements (including protection)
- Upon identification of the preferred project option, the procurement options assessment can commence.





12. Key AT contacts

Mark Lambert

Chief Transport Services Officer

M 021 489 067

20 Viaduct Harbour, Auckland 1010

Mark.Lambert@at.govt.nz

Greg Edmonds

Chief Infrastructure Officer

M 021 812 761

20 Viaduct Harbour, Auckland 1010

Greg.Edmonds@at.govt.nz

Cynthia Gillespie

Chief Strategy & Development Officer

M 021 735 197

20 Viaduct Harbour, Auckland 1010

Cynthia.Gillespie@at.govt.nz

Wally Thomas

Chief Stakeholder Relationships Officer

20 Viaduct Harbour, Auckland 1010

M 021 593 412

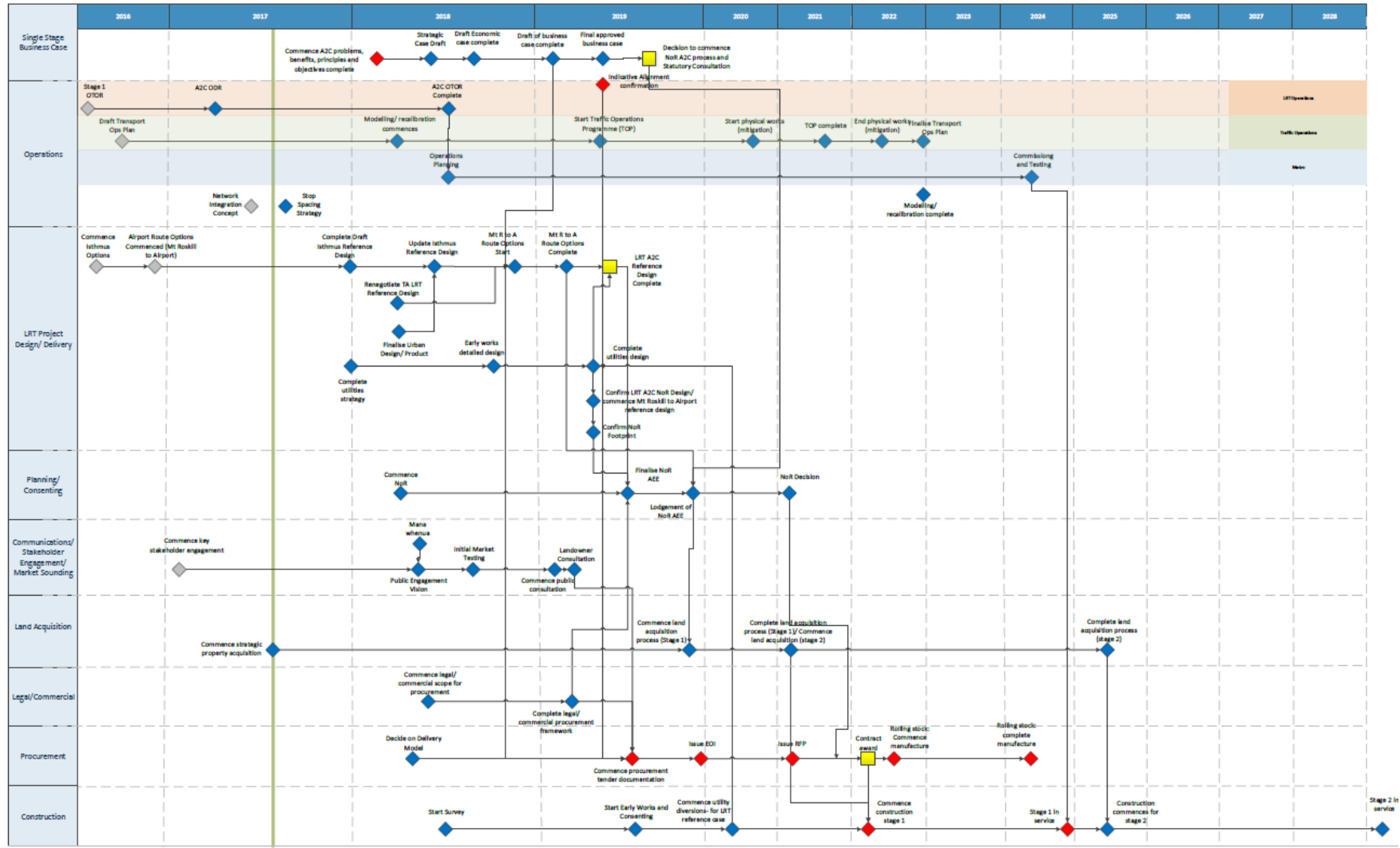
wally.thomas@at.govt.nz

Briefing Note

Ap

Mass Transit Approvals Programme and Milestones – Stage 1 In Service 2024 - Based on PPP or similar consortium Procurement Model, LRT as Reference Case

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pendix 1: Programme

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Appendix 2: Estimated Activity timeframes

Stage 1: Business Case (Route Protection and Implementation)	
Business Case	12 – 15 months
Engagement with Treasury	3 – 6 months
Market engagement	
Business Case approvals	3 months
Stage 2: Pre-procurement	
Assessment of Environmental Effects	12 months
Planning approvals	12 – 15 months
Market engagement	
Engagement with Treasury	As required
Develop procurement documentation	6 months
Stage 3: Procurement	
EOI	2 months
Shortlisting	2 months
RFP process	6 months
Evaluation	3 months
Negotiation and Financial Close	3 – 6 months
<i>Early / enabling works</i>	<i>TBC</i>
Stage 4: Construction - Phase 1	
Complete detailed design for construction	<i>6 months</i>
Depot	<i>12 months</i>
Rolling stock	<i>18 months</i>
Stage 1 construction (City to Mt Roskill)	<i>30 months</i>
Commissioning	<i>3 – 6 months</i>

Appendix 3: Previous Studies

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