

## **ADDITIONAL WAITEMATA HARBOUR CONNECTIONS**

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Auckland Transport has been (in conjunction with the NZ Transport Agency Waka Kotahi and Auckland Council) planning for the future cross harbour strategic transport needs between the North Shore and Auckland. A recent business case identifies the need to enhance the existing busway, commence more detailed work on a supplementary rail-based Rapid Transit Network intervention and also consider a range of motorway network improvements.

These interventions will be critical for creating travel patterns and a mode share which can reduce emissions and offer a more sustainable future for North Shore travel. The overall investment would be the largest in NZ's transport history, and would have significant land use and economic implications. This paper will outline the key issues, the implications for shaping Auckland's future travel and land use patterns, and some of the next steps. Recent interest in the resilience of the Auckland Harbour Bridge will also be covered in the paper.

## INTRODUCTION

Auckland Transport (AT) has been, in conjunction with the NZ Transport Agency Waka Kotahi and Auckland Council, planning for the future cross harbour strategic transport needs between the North Shore and Auckland.

A recent business case identifies the need to enhance the existing busway, commence more detailed work on a supplementary rail-based Rapid Transit Network intervention and also consider a range of motorway network improvements.

This paper will outline the key issues, the implications for shaping Auckland’s future travel and land use patterns, and some of the next steps.

## CONTEXT

Auckland is home to around 1.7 million people of which around 337,000 live on the North Shore.

The Auckland Harbour Bridge (the harbour bridge), is the most travelled route in New Zealand, carrying on average around 171,000 vehicles per day in 2018 (around 205,000 people assuming an occupancy of 1.2 people per vehicle) and around 30,000 public transport trips per day.

This part of the Waitematā Harbour is a highly valued and sensitive environment and much of the coastal marine area within the project area is classified under the Auckland Unitary Plan as a Significant Ecological Area – Marine.

This nationally significant corridor faces several key problems now and into the future.

Population and employment growth are leading to an increased demand for travel, which will increasingly exceed the existing network’s capacity. As capacity is reached and exceeded across more modes of transport and across more of the day, there will be significant detrimental effects on access, travel choice and the efficient movement of goods and services. Figure 1 shows the significant growth in projected North Shore population, with relatively little growth in employment – meaning people will have to travel from the area for work.

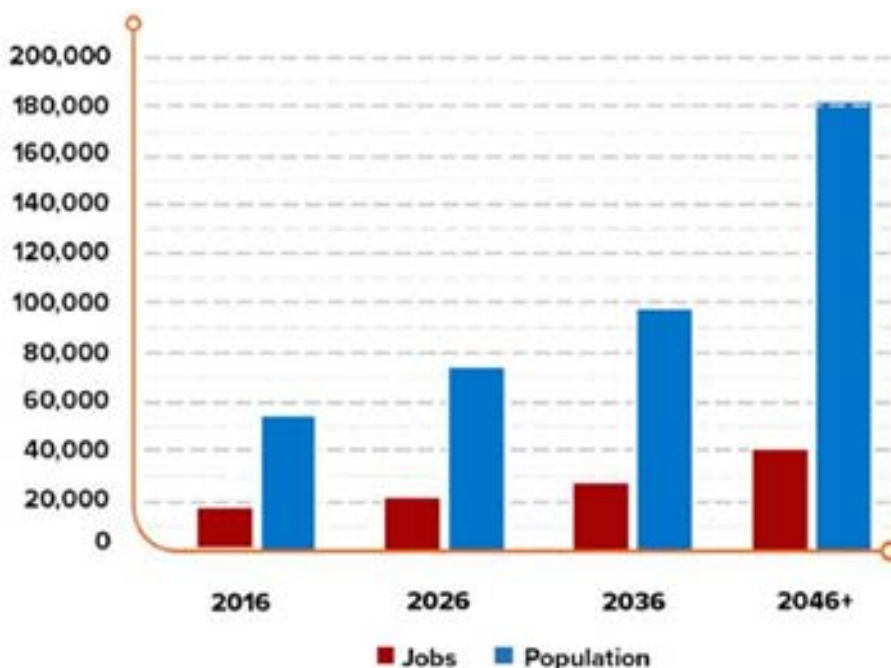


Figure 1: North Shore population and employment projections

The North Shore also has a very high and growing dependency on the State Highway corridor, particularly for cross-harbour travel, which means that its vulnerabilities have increasingly significant impacts on Auckland and New Zealand if service levels are compromised. While the harbour bridge is in good condition, it is an ageing structure with growing maintenance needs and will require increasing traffic management restrictions to protect its ongoing structural integrity.

Figure 2 below shows total travel demand from 2013 and projections for 2046.

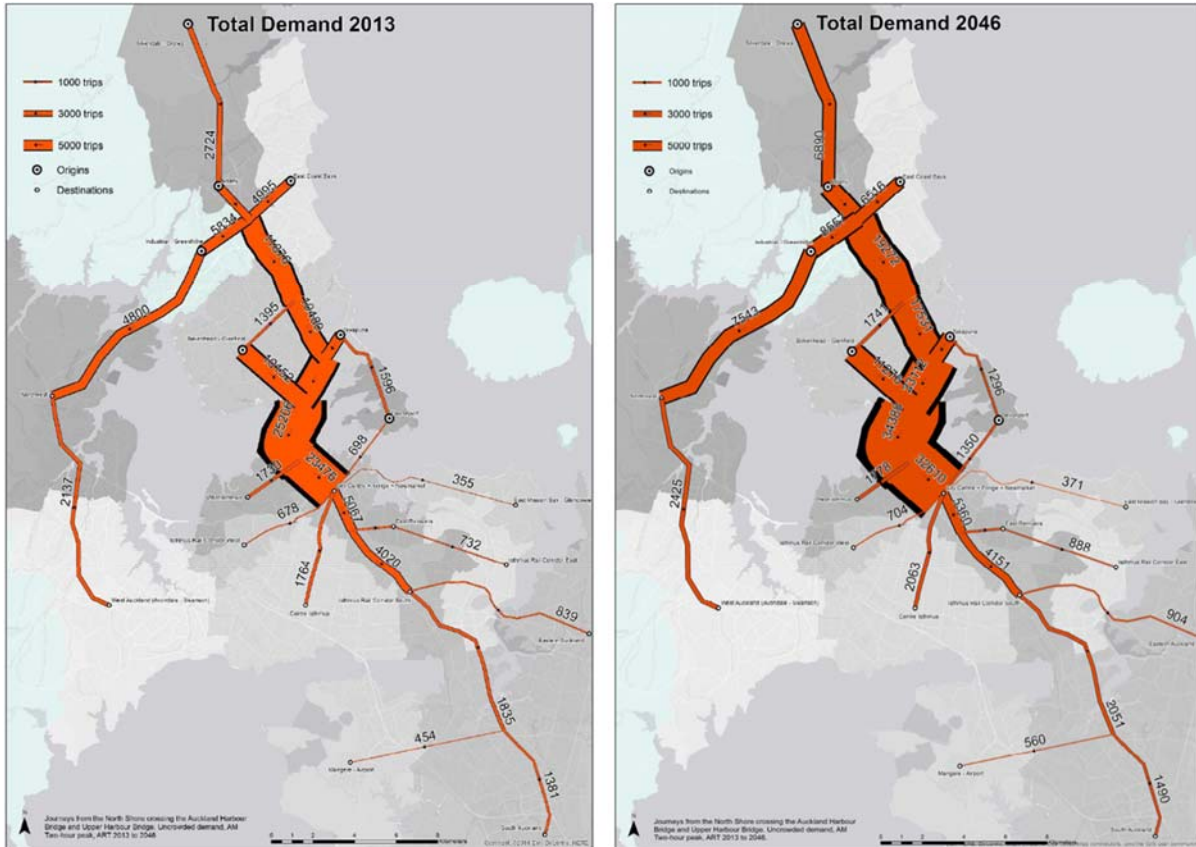


Figure 2: Cross-harbour travel demand 2013 and 2046

As well as total demand, it is important to look at the composition or mode of that demand. Increasingly people are travelling via public transport (the Northern Busway, which carries over 7 million trips annually). Figure 3 shows the current and projected mode share for cross-harbour travel. The public transport mode share just for city centre destinations is even more pronounced.

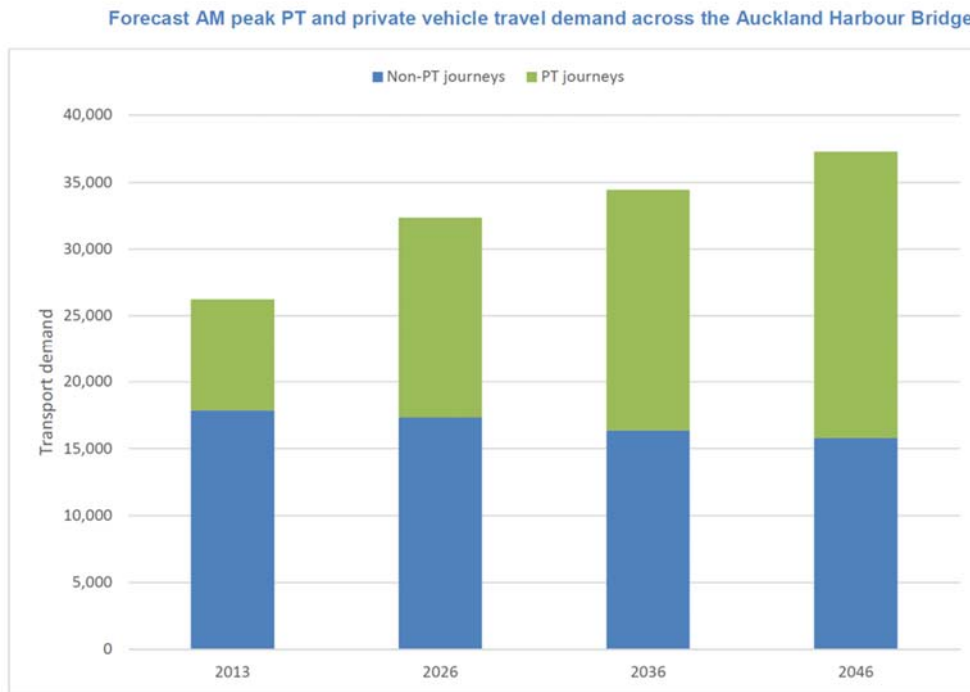


Figure 3: Mode share of cross-harbour travel demand from 2013 to 2046

## BUSINESS CASE

The need for improved connectivity between the North Shore and the Auckland isthmus has been anticipated for several decades and many studies have looked into possible options. Figure 4 summarises some of the Waka Kotahi investigations leading up to the most recent work.



Figure 4: Summary of previous investigations into additional harbour crossings

This previous/historic work resulted in an emerging preference from Waka Kotahi for a combined road-rail tunnel beneath the harbour, as illustrated in Figure 5.



Figure 5: Schematic of previous Waka Kotahi proposal for an additional harbour crossing

In 2018 the Minister of Transport asked Waka Kotahi to provide advice on the “need, timing, form and function of any new cross harbour connections”. A business case – jointly developed by AT, Waka Kotahi and Auckland Council – was commenced. The business case built on work previously undertaken by AT and Waka Kotahi separately and updated investigations with the most recent demands and policy expectations.

Specifically, the business case considered the direction in the 2018 Auckland Transport Alignment Project (ATAP), which outlined the “urgent need” to “confirm a rapid transit corridor’s future mode and alignment, including how it integrates with a potential future road crossing”. ATAP also noted “the need to provide more certainty about the optimal timing, modal mix, configuration and operation” of any future crossing.

While there have been several previous studies into improved connections across the Waitematā Harbour, these studies have largely focused on options analysis, rather than defining the problem to be solved or outlining a case for investment. This business case is also the first investigation to take a fully mode neutral approach that is consistent with business case principles and considers the wider transport system at the same time.

The prime purpose of the business case was to understand the case for improved transport connections between the North Shore and Auckland isthmus. The business case focused on the strategic transport corridor made up of State Highway 1 and the Northern Busway (corridor), and in particular the key section across the harbour. However, it also recognised that changes made in this corridor would have implications across the wider transport system. For this reason, the project retained a broad view, covering the entire North Shore and stretching from Orewa to south of the Central Motorway Junction.

## KEY FINDINGS

The business case developed three problem statements (relative weightings from the business case are shown in brackets):

- Increasing difficulties serving the growing travel demand along the corridor is worsening travel choice and reducing connectivity between people and places (55%)
- Inefficiencies and unreliability in the movement of goods and services will drive up costs and delays and impede access to markets and customers (15%)
- Reliance on a constrained and vulnerable Auckland Harbour Bridge and corridor risks the provision of resilient and reliable transport and utilities services (30%).

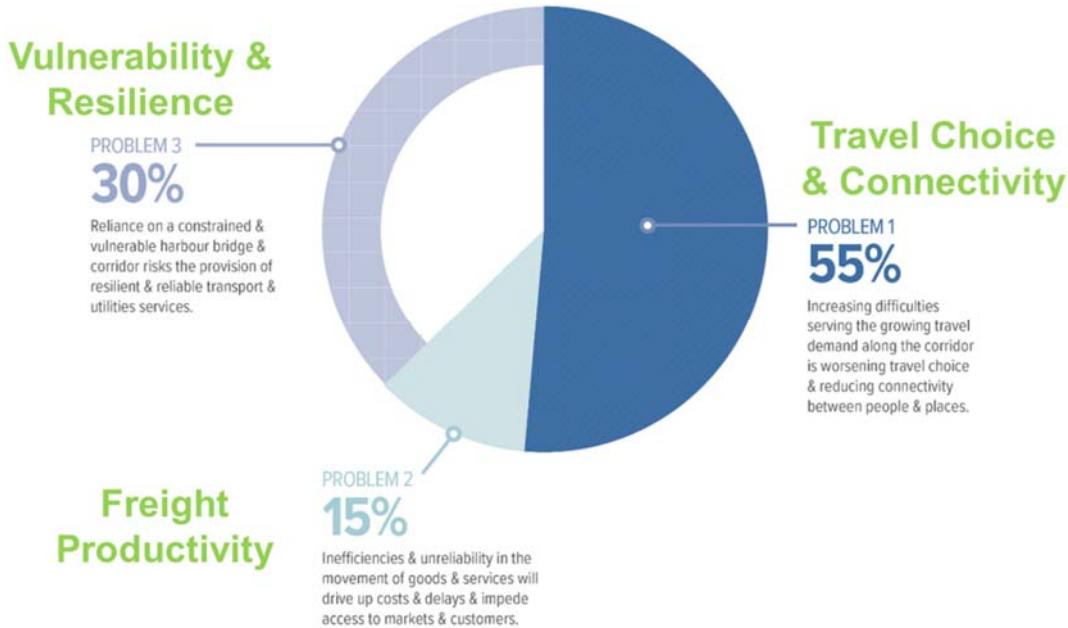


Figure 6: Problem statements from business case

As can be seen, addressing growing travel demand was the key focus of the business case. The need to deal with ‘freak’ catastrophic accidents on the harbour bridge through improved resilience was noted by the business case, but the substantial cost and low likelihood of occurrence meant that providing resilience through an alternative roading link had a very low relative benefit.

The business case focuses on ‘programme level’ issues and conclusions – outlining the following high-level series of interventions to be progressed further.

The business case found that the timing and scale of growth on the North Shore is a key driver of the timing of investment. There is an important link between the timing of greenfield urbanisation around Dairy Flat on the North Shore and the need for high-cost rapid transit and road investment. Focused growth around major centres (especially Takapuna and Albany) and of employment on the North Shore could help reduce pressure for travel across the harbour.

Road pricing, if applied, could help reduce congestion on the corridor, likely delaying the need for road investment. However, it will increase public transport demand and potentially bring forward the need for rapid transit upgrades. Legislative change would be required before any road pricing scheme could be introduced.

The analysis confirmed the need to progressively enhance the Northern Busway to meet the growth in demand, until a supplementary higher capacity Rapid Transit Network intervention can be delivered. The inability to meet future public transport demand to, from, and within the North Shore would constrain Auckland’s economic performance and inhibit planned urban growth.

It was identified that this was needed urgently and as such AT have already commenced work on a detailed business case for busway enhancements that is expected to be completed in 2021. The outcomes of this and the extent to which the busway enhancement ultimately boosts public

transport capacity will impact the timing and nature of subsequent investments.

The analysis has determined that, even with enhancements, an upgraded busway will not have sufficient capacity to meet medium-long term public transport demand. After considering a wide range of options, the preferred approach is to provide an additional rail-based rapid transit connection across the harbour.

The business case identifies that the additional rapid transit connection should directly serve Takapuna and Smales Farm from the north and south, as well as integrate with the busway and the wider public transport network. North of Smales Farm the business case identifies that further work is required to determine the route of the rail connection, whether or not it replaces the current busway and how it interfaces with long-term route protection work and growth planning north of Albany.

The business case does not determine the specific timing of this investment as it is dependent on a range of factors, including population growth, the introduction of road pricing and the success and longevity of the busway enhancements. Nevertheless, an additional rail-based connection is likely to be needed around the mid to late 2030's. The planning, design and construction timeframes for a project of this scale are likely to be around 15 years.

The business case does not identify a specific mode for this connection. Finalising the mode of this new rapid transit connection (i.e. light-rail, light-metro or heavy rail) will be done through a regionwide network planning process because of significant interdependencies with other rapid transit corridors/projects such as City Centre to Mangere and North-West Rapid Transit.

These short and longer term interventions will significantly improve access and transport choice for many people who will have access to an improved public transport network. It will significantly increase transport capacity across the Waitematā Harbour and enable many more people to avoid the impacts of congestion. It will also improve the resilience of the transport network by providing an alternative mode and physical link to the road-based bridge connection and provide an alternative crossing for other infrastructure providers.

The rapid transit connection will not however fully address all the problems and investment objectives identified by the project. Traffic congestion on the existing harbour bridge is forecast to remain, increasingly stretching into interpeak hours, and the harbour bridge will remain the primary road connection, leaving the network exposed in the case of a catastrophic event or when the bridge needs to undergo structural upgrading or maintenance (an increasingly likely situation over time).

The business case therefore still considers there is reason to progress with investigating a new or upgraded road connection.

Modelling undertaken for the project comes to similar findings as previous work has; that constructing additional lanes across the Waitematā Harbour will not eliminate congestion and only minimally improve travel times, due to the saturation of the overall road network. Increasing traffic volumes across the harbour would also likely feed more traffic into the city centre and along local roads (running counter to project and Auckland Plan objectives). If traffic capacity is limited on these links (such as through reductions in traffic capacity into the city centre), it would appear counterintuitive to invest in additional capacity and then deliberately restrict it. These matters will need to be addressed in the next phase of work.

Taking into account these factors above, and considering the significant size of the investment likely required, the business case recommended that the other options (busway enhancement, applying road pricing, and the provision of a new rail connection) be considered first before the construction of an additional road connection.

The timing of the need for the new or upgraded road connection is even more unsure than the rapid transit connection, as it in turn relies to some degree on the form, function and timing of that connection. Nevertheless, the business case does not identify a need for the road connection before the mid to late 2040's.

Figure 7 below shows the indicative timing proposed for the three main physical interventions.

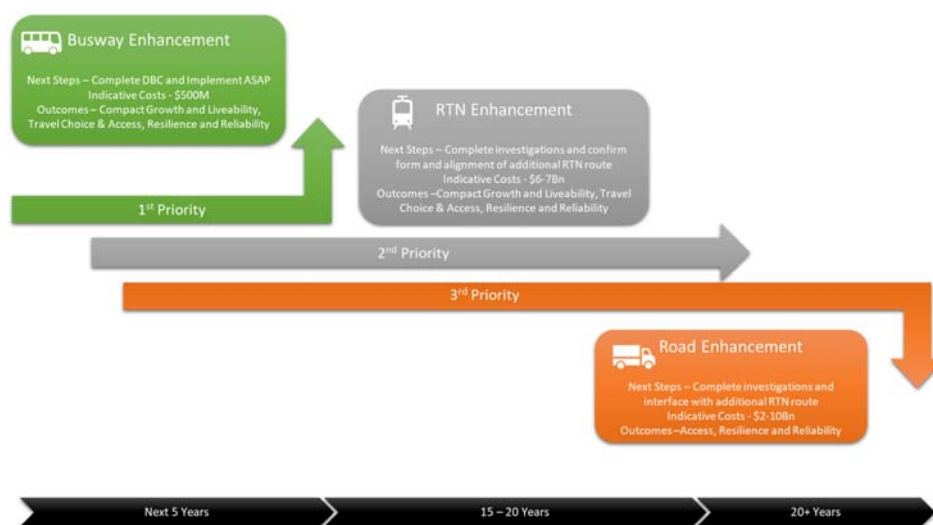


Figure 7: Schematic showing indicative timing of key business case recommendations

## COSTS

The business case identifies the capital cost range of the recommended programme as being approximately \$6-18 billion, anticipated to be incurred between 2024 to 2047. This consists of the following high-level estimates:

**Busway enhancements:** \$0.5-0.6 billion for bus improvements

### Rail-based connections:

- \$5 billion for a tunnel from the city centre to Takapuna and Smales Farm;
- \$3 billion to extend this from Smales Farm to Albany (noting these are nominal examples of networks for estimation purposes only)

### Road connection:

- \$1-2 billion for an in-line road bridge expanding the capacity of the existing bridge; or
- \$10 billion for a road tunnel from the city centre to Esmonde Road and additional motorway lanes to Constellation Drive.

Once completed, the cost range of the programme's operations and maintenance would be approximately \$100-130 million annually, mostly for management of tunnel operations.

Funding for the next phases of work, being the Strategic Transport Networks business case and the implementation of any busway enhancements, will be considered by AT and Waka Kotahi as part of their forthcoming (respective) Regional Land Transport Plan (RLTP) and National Land Transport Programme (NLTP) planning and approval processes.

In the long-term, the funding of either or both of the more substantial connections would have significant financial implications, being equivalent to 30-50% of the current RLTP programme. The ongoing development of ATAP will guide the likely investment levels and timing, in conjunction with other regional projects.



## CLIMATE CHANGE IMPLICATIONS

The findings of the business case and its recommendations will inform future decisions which impact upon the region's climate response. The implications of these future decisions could include:

- **Transport emissions:** Modelling undertaken for the business case suggests that once constructed, a rapid transit connection would reduce transport emissions, while an improved road connection would increase them.
- **Growth and land use change:** Changes to growth and land use patterns as a response to transport investment (whether purposefully as a change to land use zoning and/or by the market reacting to particular investment) are likely to impact on levels of emissions. Rapid transit investment is likely to support a more compact urban form focused in the existing urban area and around centres, which in turn is likely to generate fewer emissions. Investment in improved motorways on the other hand is likely to support less dense, higher polluting, greenfields growth.
- **The construction of the connection/s:** The general construction process contributes to greenhouse gas emissions through the production and transport of materials and the site work and construction process itself. Given the large scale of the works required, the construction of any connection across the Waitematā Harbour is likely to generate significant climate emissions.
- **Improved resilience to weather events:** Some sections of the corridor are particularly exposed to adverse weather events, which may become unpredictable and extreme as a result of climate change. Upgrades to the corridor can help reduce this exposure and improve resilience, such as through the raising of the northern approach to the Harbour Bridge which is presently subject to coastal inundation from storm events and sea level rise.

## RESILIENCE (BRIDGE STRIKE UPDATE)

In September 2020, a truck was blown over whilst crossing the harbour bridge and struck part of the bridge superstructure, forcing the closure of numerous lanes over several weeks whilst repairs were made. Although this specific incident was not modelled in the business case, many variations of traffic restrictions and bridge restrictions were assessed as part of resilience considerations.

The occurrence of the truck incidence does not fundamentally alter the findings of the business case (it was, after all, the first time in 60 years that such an incident occurred). It is expected that - due to the age and increased use of the bridge - network-impacting incidents will increasingly occur, but also the rest of the State Highway network will also experience issues. Hence resilience concerns are not solely related to the bridge.

It is noted that the continuing operation of the Northern Busway meant that (other than some sections over the harbour bridge) public transport demand was able to continue to be served. Had a separate rapid transit (and/or walking/cycling) crossing been available, large volumes of people would still have been able to travel reliably across the harbour completely unaffected by traffic conditions. This supports the approach proposed in the business case to pursue a separate rapid transit crossing in the first instance, with ongoing investigations to improve resilience.

## NEXT STEPS

The next phases of the project are:

- **Ongoing delivery of busway enhancements** following completion of the Enhanced Busway Improvements detailed business case.
- Development of a **Strategic Transport Networks single-stage business case** covering:
  - a) The rapid transit connection - including form, alignment and timing.
  - b) Strategic transport networks (road and rapid transit) - looking at the wider transit network on the North Shore as well as how the road connection will integrate with the rapid transit connection. This phase will also consider whether the connections should be constructed together or separately (temporally and/or spatially).

- c) Route protection based on the outcomes of (a) and (b).

Work is also underway as part of ATAP on the development of rapid transit planning guidance to help inform long-term rapid transit planning decisions, such as those required in the Strategic Transport Networks business case. This work includes staff of Auckland Council, AT and Waka Kotahi. Public engagement will occur as part of the Strategic Transport Networks business case

## **REFERENCES**

*Additional Waitemata Harbour Connections business case (2020)*, Waka Kotahi, Auckland Transport, Auckland Council.

*Auckland Transport Alignment Project (ATAP) (2018)*, Auckland Transport, et al, Auckland