ONE SIZE DOESN'T FIT ALL – RECONCILING OVERLAPPING TRANSPORT NETWORKS IN A CONSTRAINED URBAN ENVIRONMENT

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ABSTRACT

Similar to most urban areas, Auckland has a constrained arterial road network that is often over capacity and under pressure from multiple transport modes, including private vehicles, buses, freight, cycling and walking. As additional growth occurs, the demand for travel will only increase along these corridors and further exacerbate current capacity constraints.

Historically, Auckland Transport has relied upon corridor management plans as one of the main tools to resolve these multimodal conflicts and establish a strategic direction for arterial roads throughout the region. While a valuable tool, the corridor management plan process often struggles to deliver acceptable recommendations for all transport networks. For example, bus priority is often recommended at the expense of providing cycle facilities.

A smarter network-based approach has been trialled by Auckland Transport to reconcile the multimodal priorities for its arterial road network. This involves a multi-step, consistent and repeatable process of testing whether multiple modal priorities (i.e., freight, buses, cycling, etc.) can share the same corridor either through potential widening or other measures to optimise the corridor space. If it is not possible to accommodate all transport networks in the same arterial route, alternative routing options are explored as a means of developing network plans that deliver the desired operational outcomes and are achievable.

INTRODUCTION

The Auckland Plan created the transport vision "to create better connections and accessibility within Auckland, across New Zealand and to the World" and established the following four key transport priorities:

1. Manage Auckland's transport as a single system
2. Integrate transport planning and investment with land use development
3. Prioritise and optimise investment across transport modes
4. Implement new transport funding mechanisms

To deliver on this vision and key transport priorities, Auckland Transport and the NZ Transport Agency in collaboration with Auckland Council have been developing the Integrated Transport Programme (ITP) which sets out the 30 year investment programme for the region through a 'One Network' approach. As part of the ITP development, Auckland Transport developed an Investment Logic Map (ILM) which presents key problem definitions associated with Auckland's transport network. The two biggest problems to emerge from the ITP ILM are as follows:

- Limited quality transport options and network inefficiencies undermine resilience, liveability and economic prosperity
- The existing transport network won't adequately support growth in a way that achieves a quality compact city

To respond to these issues of growth pressures, supporting a quality compact city and provide a quality and resilient transport system, Auckland Transport has developed network plans for numerous transport modes, including freight, public transport and cycling. Historically, these networks have been developed in relative isolation from each other and as a result, there are considerable overlaps in the respective network plans. These network overlaps create uncertainty regarding the feasibility of delivering all transport networks. Figure 1 provides a map of the Auckland region illustrating the overlapping freight, public transport and cycling networks.

Overlapping transport networks are a reality of virtually every transport system and typically only become a problem when increased transport demand begins to compromise reliable travel times and safety. In order to enable growth and create a more liveable city, Auckland is taking significant measures to improve public transport throughout the region and increase patronage. In high volume, busy bus corridors, bus lanes and other priority measures are being implemented to provide more reliable travel times for bus passengers. While creating bus lanes is beneficial for bus passengers and enables increased people movement efficiencies, there can be typically are adverse impacts to other road users, namely through increased travel times to other road users and/or a loss of parking along the arterial. For example, cyclists can ride in bus lanes but this likely only benefits more experienced cyclists as less experienced cyclists prefer a physically separated cycle facility, particularly when riding on a high volume or high speed urban street. Due to limited space in Auckland's arterial road network, it is often challenging to provide both separated cycle facilities as well as dedicated bus lanes. This also presents an issue for operating the network in terms of the decision logic for making minor improvements to certain modes within a corridors. This paper explores a network based approach to reconcile these modal priorities and deliver optimum solutions for Auckland.

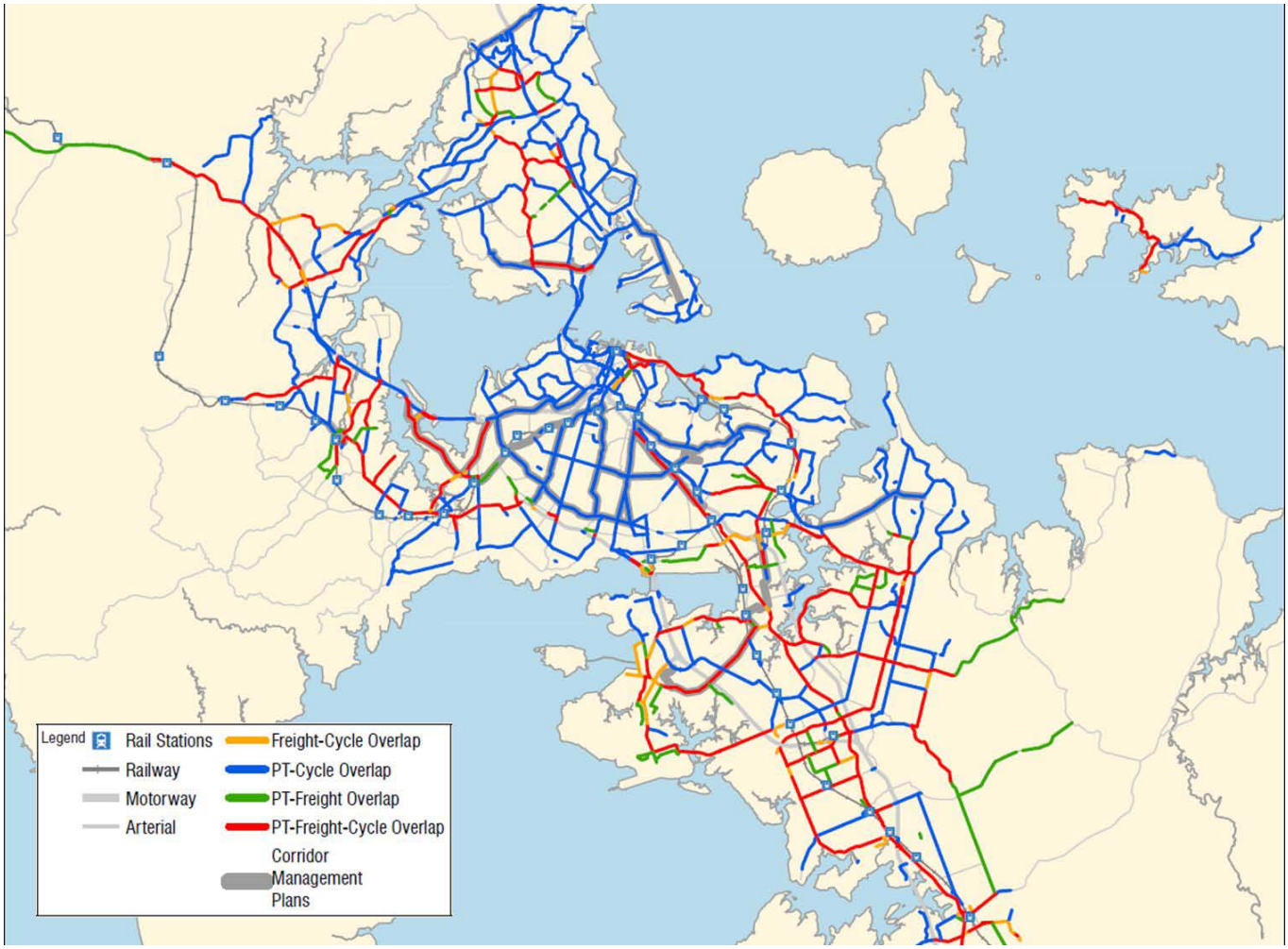


Figure 1: Overlapping transport networks in Auckland

PROBLEM DEFINITION

For the purposes of this project, we defined our problem as follows:

1. Auckland Transport has significant overlap in proposed modal networks.
2. Auckland Transport cannot continue to publish proposed modal network maps that are unlikely to be delivered to required standard.
3. Corridor Management Plans have been determining the likely outcome regarding modal priorities, individual corridor by corridor, without understanding the overall network implications.
4. Auckland Transport is potentially missing opportunities and wasting money through undertaking renewals, bus lanes, cycle facilities, etc. in these corridors without clear and shared agreement on their intended future priority.

SHARED PRINCIPLES

We approached these problems with the following shared principles regarding the implementation of the transport networks:

- All optionsfor delivering one or multiple networks on a corridor assume on-street parking removal. This is consistent with the principle applied in the Auckland Transport Parking Discussion Document.
- The treatments in town centres are excluded and are to be considered separately as the

place-function of town centres is weighted more heavily alongside the movement function of any of the transport networks
- The standards for delivery of transport networks and associated changes to road corridors are to comply with Auckland Transport's Code of Practice (ATCOP).
- If an alternative route is to be provided, particularly for cyclists, it is to be invested in properly and more experienced, confident cyclists will still be able to use the main corridor.
- Corridor widening in constrained, mature urban areas is generally not desirable, practicable or affordable.

SELECTED AUCKLAND TRANSPORT TERMINOLOGY

To provide wider context in which this approach is made to reconcile overlaps, a number of tools and processes are mentioned within this paper. The function of each of these is outlined below.

Corridor Management Plans	are a strategic document to look at the future of a corridor including surrounding land use, the modal priorities and projects to deliver these outcomes within these corridor.
Auckland Transport Code of Practice (ATCOP)	outlines the transport-related infrastructure design standards in Auckland. In the context of this paper, and among other things, these standards set the requirements for cycle facilities given certain vehicle numbers and speed, bus and freight lane facility requirements.
Network Operating Plans	are a planning and operational tool to inform decisions and to link those decisions to both strategic objectives and operational interventions. They look at how to best operate the network today, and improvements that can be made from here.

METHODOLOGY

In an effort to create a more integrated and coordinated multimodal transport plan, we undertook a process to challenge and interrogate the published modal networks. This process included consideration of all transport networks, including the freight network, public transport network (bus and rail) and cycle network. Appendix A provides a flow chart depiction of the process by which the networks were challenged and tested in order to reconcile any modal conflicts.

When network overlaps were identified that couldn't be accommodated in the existing corridor, there are two fundamental options available – 1) widen corridor and 2) accept a lower level of service for at least one of the transport modes. As noted above, corridor widening is not typically a desirable or practical option in most constrained, urban corridors in Auckland, so most of the analysis focused on exploring the permutations of Option 2. Figure 2 shows the options that were explored to reconcile the overlapping transport networks.

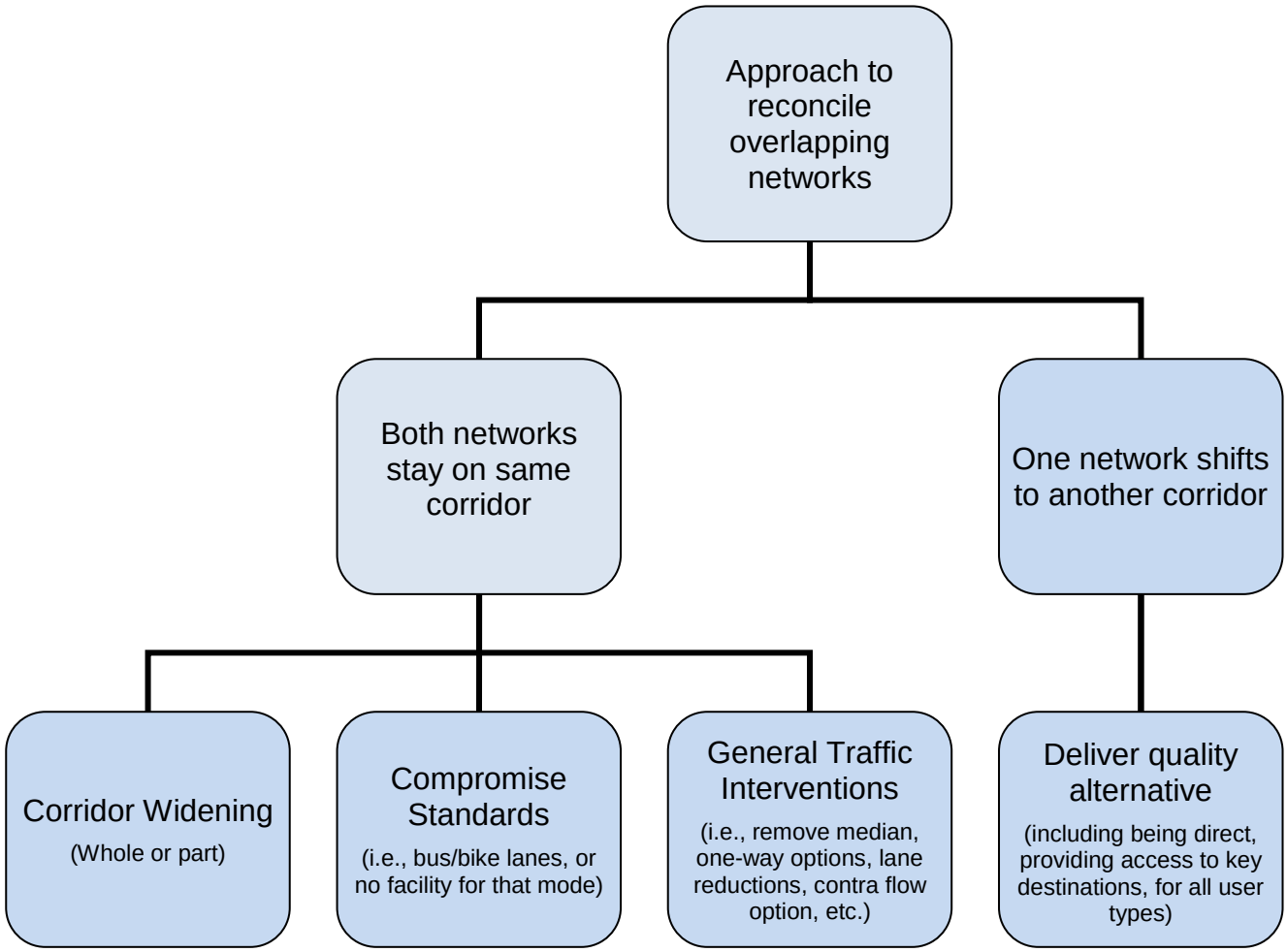


Figure 2: Options to reconcile overlapping networks

MT EDEN ROAD CASE STUDY

As a means of testing the viability and practicality of delivering multiple transport networks in the same corridor, we selected Mt Eden Road as a case study as it provides a good opportunity to explore the merits of various cross section arrangements. Mt Eden Road is a north-south arterial on the central isthmus that extends from Three Kings centre (Mt Albert Road) towards the city centre via Symonds Street. Figure 3 provides a map illustrating where Mt Eden Road (green dashed line) sits in the overall context of the Auckland Plan's urban centres and business areas. A corridor management plan is currently being prepared for Mt Eden Road. This will also investigate wider options and particular needs along the corridor, and will be reviewed on the basis of applying this methodology to the surrounding network.

Mt Eden Road has bidirectional average daily traffic of between 14,000 at Three Kings and exceeding 20,000 AADT along sections in Balmoral. Mt Eden Road serves different functions along its length, such as a main street in Mt Eden Village and a secondary arterial along the sections through Balmoral and Three Kings. Mt Eden Road is part of the Frequent Transit Network[1], the Auckland Cycle Network and is also an over-dimension route. Mt Eden Road has an

[1] As defined in the Auckland Regional Public Transport Plan, frequent bus services operate at a minimum of every 15 minutes between 7am – 7pm and require priority measures to achieve speed and reliability requirements.

average kerb to kerb cross section of 14.4m and a property to property cross section of 26.2m. Figure 4 provides both a Google Street view image and a typical cross section with dimensions of the existing corridor layout.

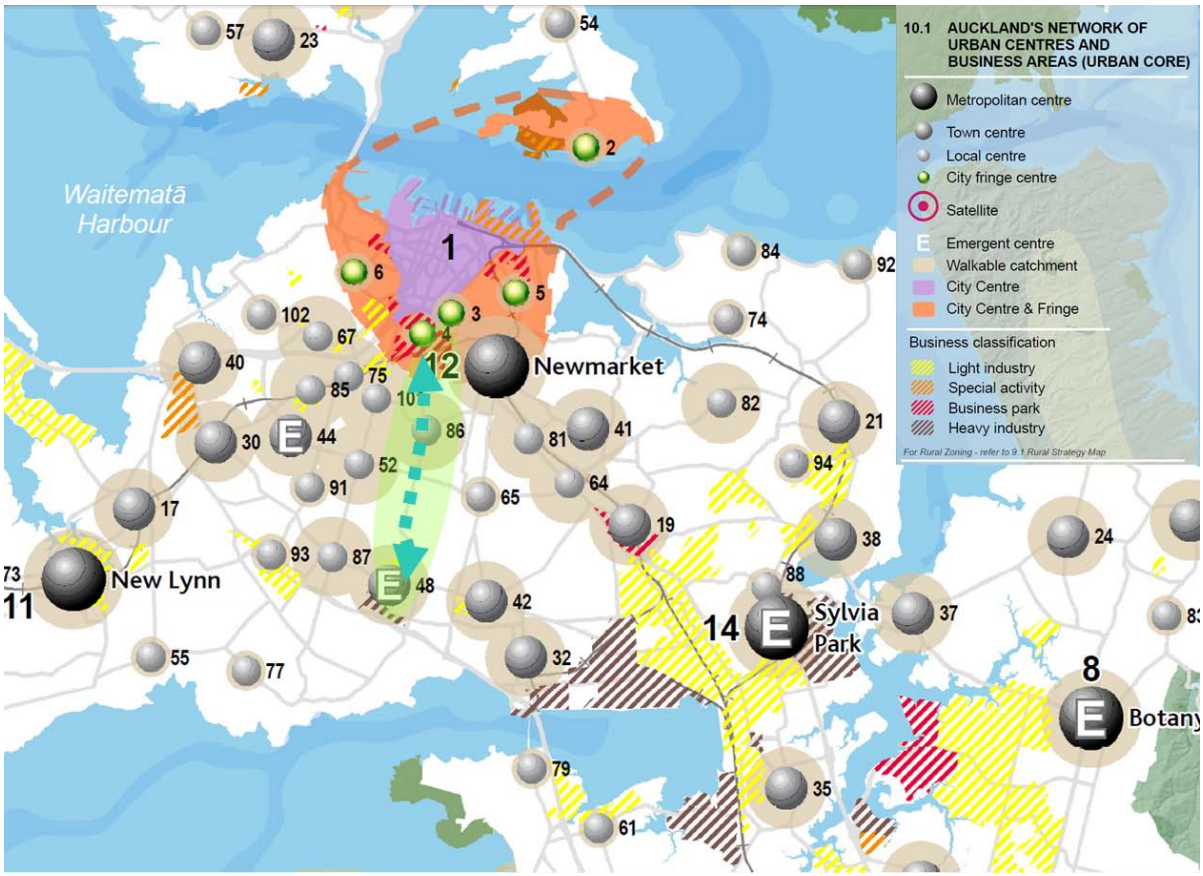


Figure 3: Mt Eden Road corridor in context of Auckland Plan's urban centres

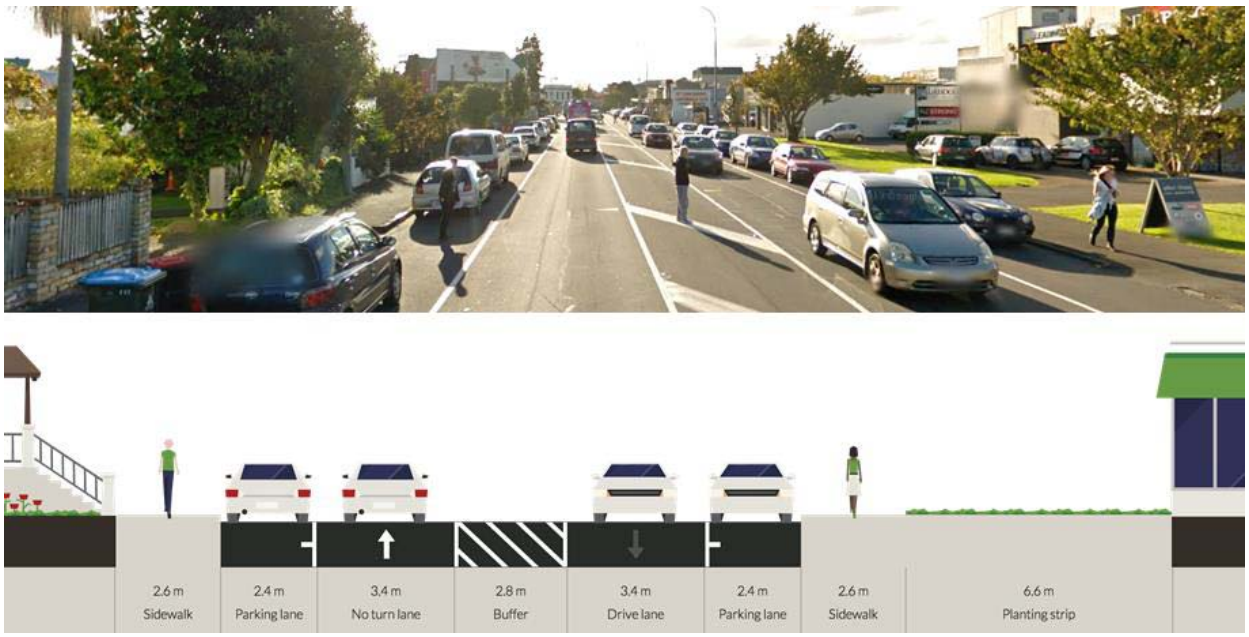


Figure 4: Mt Eden Road typical cross section

In order to fit all of the above referenced transport networks into the Mt Eden Road corridor (dedicated facilities for buses and cycles in accordance with ATCOP standards), corridor widening of 7.3m would be necessary if on-street parking is eliminated and widening of 12.1m would be necessary if on-street parking is retained. As was noted above in the shared principles section, corridor widening is not considered to be desirable, practical or affordable. Another approach to deliver all networks in the same corridor could involve compromising the design standards for bus and cycle lanes, but this is also considered an unacceptable outcome as noted in the shared principles section by the need to comply with ATCoP standards. The last option to deliver the planned bus and cycle facilities in the corridor involves various general traffic interventions, which includes consideration of innovative measures such as tidal vehicle lanes and contra-flow bus lanes. Figure 5 provides a potential cross section for tidal vehicle lanes and a dedicated bus lane in the peak direction of travel. This option has a number of safety and access issues, only provides bus priority in the peak direction of travel, requires approximately 4m of corridor widening and is considered to be undesirable from a place making and pedestrian safety perspective. Overall, the general traffic intervention options are largely untested in a New Zealand street environment context and are therefore considered fairly risky and are not the preferred means of delivering the required transport networks. Further work is being undertaken to investigate the circumstances under which these options could work.

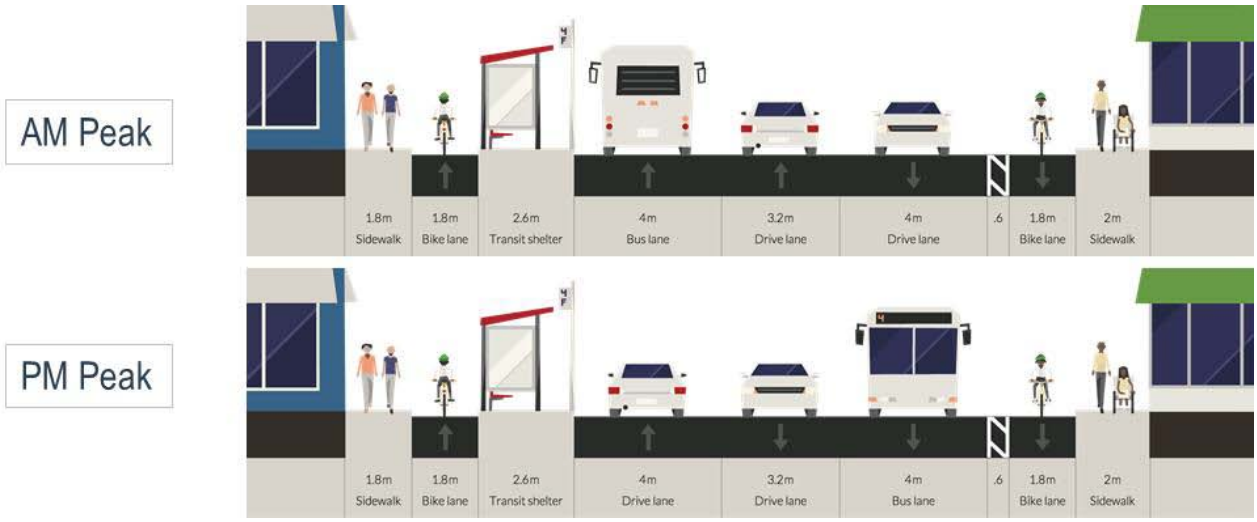


Figure 5: Potential cross section for tidal vehicle lanes and peak direction bus lane for Mt Eden Road

Since none of the options associated with keeping both the bus and cycle networks on Mt Eden Road deliver a high quality solution, shifting one of the networks to a parallel route was evaluated as an alternative means of delivering the transport networks. Mt Eden Road is a busy, well patronised bus corridor so moving the buses off of Mt Eden Road is not a realistic or practical option, particularly considering plans exist to improve the carrying capacity of Mt Eden Road either through double decker buses or light rail transit. Cycling is inherently more flexible so alternative routes were explored to provide a high quality parallel cycle connection to Mt Eden Road, provided access to town centres are retained and developed. As noted in the shared principles above, more experienced cyclists could continue to use Mt Eden Road but a parallel facility could be delivered to provide less experienced cyclists with a more comfortable and safer facility.

Figure 6 illustrates a potential parallel cycle route to the east of Mt Eden Road as well as a potential cross section for Mt Eden Road if cycle facilities are not required. The dotted lines on the map illustrate desire lines between the parallel cycle route and Mt Eden Road. Adequate cycle provision must be made along these desire lines as part of the development of the parallel cycle route. This option delivers both transport networks, does not require any corridor widening, and also provides the potential to use the bus lanes for off-peak parking if desired. It should be noted that the parallel cycle route needs to be invested in properly and be as direct as possible in order to be well utilised and attract new cyclists. The parallel cycle route must provide safe crossing

facilities of intersecting arterials, should take appropriate measures to reduce vehicle speeds and volumes and should utilise wayfinding signage to provide cyclists with a legible cycle route. In summary, the option of providing conventional bus lanes on Mt Eden Road and a parallel cycle route is considered the most cost effective and implementable approach to deliver the planned transport networks. Having clear objectives will also better enable the application of the Network Operating Plan for this route and the surrounding network.

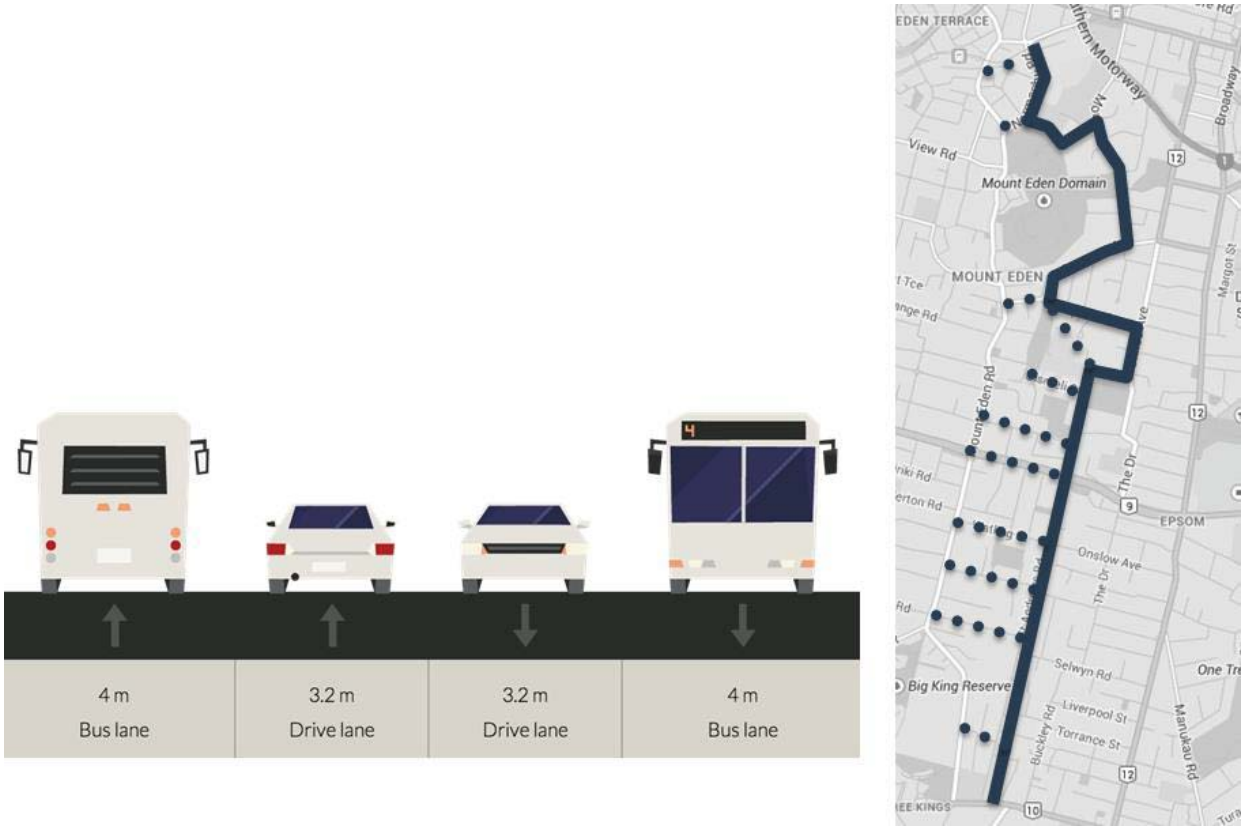


Figure 6: Conventional bus lanes on Mt Eden Road and parallel cycle facility

CONCLUSION

Following are the key conclusions from this paper:

1. **Multi-modal *network* approach** – it's critically important to take an integrated multi-modal *network* approach (as opposed to a corridor by corridor approach) when planning the transport system as all modes are interrelated and are competing for the same valuable space. Failure to take a multi-modal approach is likely to result in sub-optimal solutions and is likely to jeopardise the delivery of all transport networks. For example, in the absence of a network approach, priority measures may not be provided for any transport mode which will compromise reliability, safety and overall resilience of the transport system.
2. **Clear objectives and principles** – as with any planning project, it's important to have clear objectives, principles and measures of success to guide the decision-making process. For this evaluation, the objectives and principles were fundamental to selecting the preferred option which delivered the best outcomes from a transport and place making perspective. In undertaking a process to reconcile the competing interests, the setting of agreed principles allows different parties to agree to a process for reconciling the overlaps. The clearer and non-competing objectives from reconciled networks allow Network Operating Plans to make improvements and refinements to improve all modes.
3. **Data, data, data** – in the age of 'big data', we are increasingly relying upon more up-to-date and extensive datasets to inform our decisions. However, we often do not have the same type or quality of data between transport modes so efforts are be taken to improve this in the future. This is currently being developed through Network Operating Plans, however there is a need to better account for pedestrians & cyclists through this process. Auckland Transport has quite extensive data for public transport users and services but the quality of data on pedestrians and cyclists is not nearly as robust. Therefore, it is recommended that Auckland Transport expand the overall quality of its pedestrian and cyclist dataset.
4. **Evaluate the options and make an informed decision** – in order to achieve the best outcome from a 'One Network' perspective, it is recommended that an informed decision be made regarding modal priorities in order to deliver optimal transport outcomes for the region. As discussed throughout this paper, this decision should be based upon an evaluation of all options. Therefore, the more prudent approach is to assess the merits of each option as described in this paper and then select the option that delivers the best outcome for all transport modes.

REFERENCES

Auckland Council (2012). *Auckland Plan*, Auckland, NZ
Accessible from http://theplan.theaucklandplan.govt.nz/

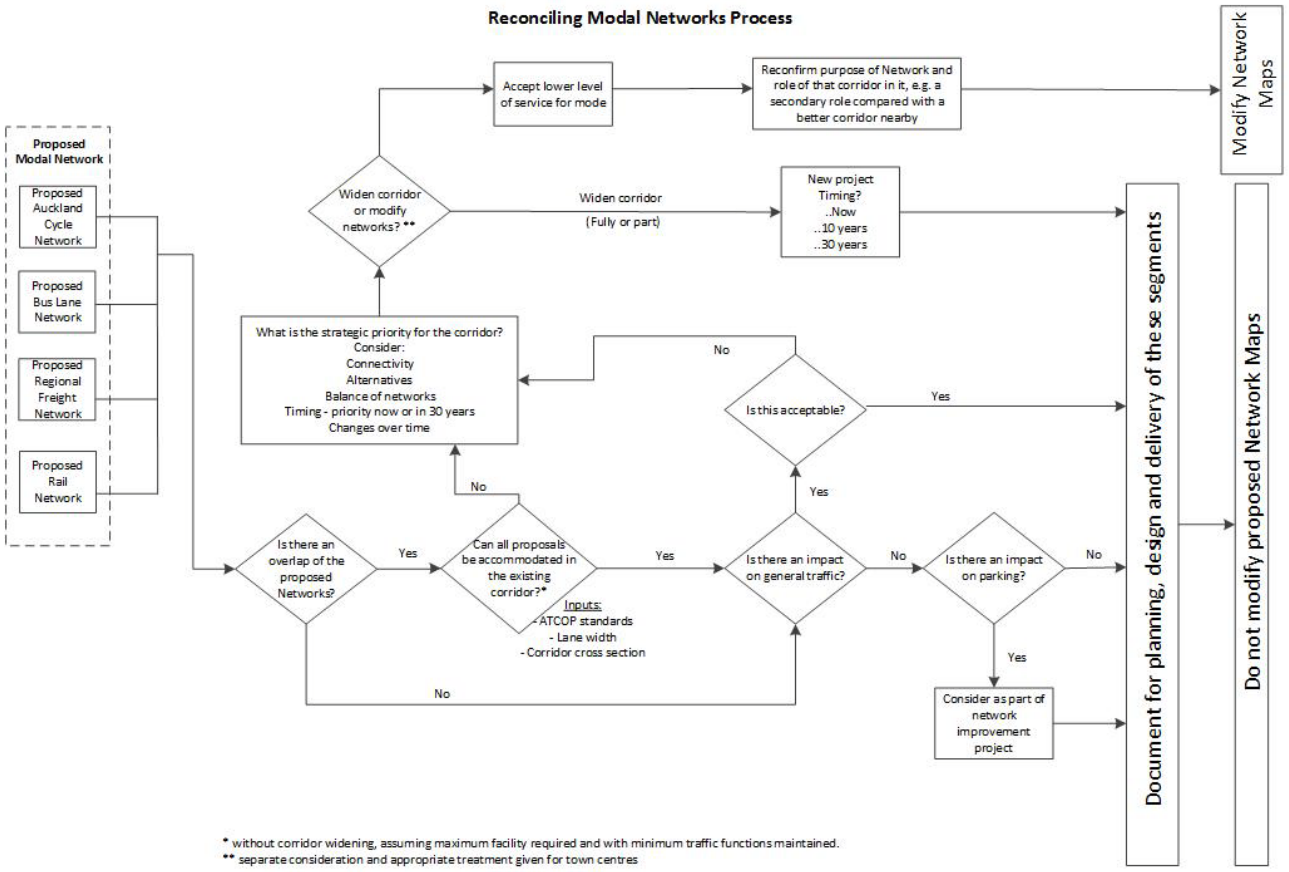
Auckland Transport (2012). *Integrated Transport Programme*, Auckland, NZ.
Accessible from https://at.govt.nz/media/imported/3805/ITP-final-amended-version.pdf

Auckland Transport (2013). *Auckland Regional Public Transport Plan*, Auckland, NZ.
Accessible from https://at.govt.nz/about-us/transport-plans-strategies/auckland-regional-public-transport-plan/

Auckland Transport (2014). Auckland Transport Code of Practice, Auckland, NZ
Accessible from: https://at.govt.nz/about-us/auckland-transport-code-of-practice/

Auckland Transport (2014). *Parking Discussion Document*, Auckland, NZ
Accessible from: https://at.govt.nz/media/503106/ATParkingDiscussion.pdf

APPENDIX A


Reconciling Modal Networks Process
Proposed Modal Network
Proposed Auckland Cycle Network
Proposed Bus Lane Network
Proposed Regional Freight Network
Proposed Rail Network
Is there an overlap of the proposed Networks?
Yes
Can all proposals be accommodated in the existing corridor?*
Inputs:
- ATCOP standards
- Lane width
- Corridor cross section
Yes
Is there an impact on general traffic?
No
Is there an impact on parking?
No
Yes
Consider as part of network improvement project
No
No
What is the strategic priority for the corridor?
Consider:
Connectivity
Alternatives
Balance of networks
Timing - priority now or in 30 years
Changes over time
Yes
Is this acceptable?
No
Widen corridor or modify networks? **
Widen corridor
(Fully or part)
New project Timing?
..Now
..10 years
..30 years
Accept lower level of service for mode
Reconfirm purpose of Network and role of that corridor in it, e.g. a secondary role compared with a better corridor nearby
Modify Network Maps
Document for planning, design and delivery of these segments
Do not modify proposed Network Maps
* without corridor widening, assuming maximum facility required and with minimum traffic functions maintained.
** separate consideration and appropriate treatment given for town centres