



MINISTERIAL BRIEFING NOTE

Subject	Northern Pathway Project Update		
Date	14 April 2021		
Briefing number	BRI-2118		

Contact(s) for telephone discussion (if required)				
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Action taken by Office of the Minister

- Noted**
- Seen by Minister**
- Agreed**
- Feedback provided**
- Forwarded to**
- Needs change [please specify]**
- Withdrawn**
- Overtaken by events**

14 April 2021

Minister of Finance

Minister of Transport

NORTHERN PATHWAY PROJECT UPDATE

Purpose

1. This briefing provides you with an update on the Westhaven to Akoranga section of the Northern Pathway project, following the Waka Kotahi NZ Transport Agency Board being presented with a preferred option at its 25 March 2021 meeting.

Walking and cycling connection across the Waitematā Harbour

2. The Northern Pathway shared user path is the critical missing strategic link in the Auckland active modes network. It would connect the north shore of Auckland with the central isthmus, linking the extensive active mode investment already made by Waka Kotahi and Auckland Transport on either side of the harbour and providing transport, environmental, and user health benefits.
3. Over 2.5 million¹ users a year are forecast to cross the harbour (1.5 million of whom will be cyclists) with a harbour connection in place, with sensitivity tests showing up to 3.2 million trips a year could occur. By 2048, there will be over 180,000 jobs and 130,000 homes predicted to be located within the project's catchment area.
4. Suburbs north of Takapuna would be within 30mins of the CBD by e-bike, increasing the catchment for employment within 30 mins of travel by bike by 60 percent. These forecasts are conservative given the uptake of e-bikes and micro-mobility technology continues to occur at rates faster than predicted.
5. The connection will link the \$300-400 million of planned and delivered strategic cycling infrastructure delivered over the last decade, providing a step change in mode choice for the region and enabling users to ride from Takapuna (and ultimately Albany) through to the Airport, Westgate and Eastern suburbs on dedicated cycling facilities.
6. Not only would this project be transformational for commuters, there is a significant recreational and tourist opportunity as well given the proximity to the CBD and the link to Takapuna. Similar projects around the world have comparable demands:
 - Sydney Harbour Bridge: 3,500 pedestrians and 1,750 cyclists a day
 - Golden Gate Bridge: 5,500 pedestrians and 4,000 cyclists a day.

¹ Forecast in 2048

Waka Kotahi Board meeting – December 2020

7. In December 2020, the Waka Kotahi Board was advised that through the Northern Pathway design development process (including design work and additional wind and geotechnical testing) it has become apparent that the risk to the existing bridge by adding any further structural element (including the proposed walking and cycling path) is unacceptable to the ongoing operation and resilience of the structure. The relevant Board Paper is attached in full as Attachment 1.
8. The Board was advised that alternative options have therefore been considered to deliver the outcomes; some of which are feasible and others which are not.
9. The feasible options include:
 - a) **A short-term Operational Option (i.e. a ferry):** With a budget of around \$60 million, a ferry would be relatively quick to implement; however, it is not a walking and cycling connection. It also has some consenting challenges and a high operating cost of around \$5-10 million per annum.
 - b) **A new separate structure for walking and cycling:** Would deliver a high-quality walking and cycling connection across the harbor, providing resilience benefits and completing a strategic missing link in the Auckland walking and cycling network. However, there would be consenting challenges, and it would take around 4-5 years to become operational and would come at a significant cost.
 - c) **A new structure for multiple modes:** Could deliver public transport, road benefits and resilience. It would take an estimated seven years to be operational. It has a considerable consenting risk and significant cost. This would be accelerating considerable investment in this corridor ahead of other areas of the transport system, with long-term investment in an additional Waitematā Harbour crossing still required in the future.
10. The following three options were ruled out as not feasible:
 - a) **SkyPath:** Engineering reviews of the original lightweight carbon fibre SkyPath project, consented in 2016, identified that the design does not meet the current loading standards and would require exemptions from the bridge manual. Loading restrictions would be required from opening day, with the possibility of no pedestrian loads in the future.
 - b) **The previous Northern Pathway option attached to the existing bridge:** A truss / pier supported option is not considered feasible due to the impact on the resilience of the existing structure, load management, constructability concerns and poor user experience.
 - c) **Using lanes on the existing bridge:** Using existing lanes in the short term, (replacing two current lanes with walking and cycling), would reduce the bridges' peak hour capacity by 20-40 percent, significantly impacting the performance of buses and have a number of operational challenges (see Appendix 1).

11. The update also noted to the Board that the work done to date on the Additional Waitematā Harbour Crossing Business Case assumes that a walking and cycling link across the existing bridge structure is in place.

12. After considering the above, the Board resolved that:

'they were committed to a walking and cycling option, but that it should not be at any cost. Given the engineering risks, the Board's view was that no new structure should be attached to the existing bridge. They encouraged Management to investigate innovative short and medium options for walking and cycling options (separately to consideration of any alternative crossing options to resolve resilience concerns)'.

Options analysis

13. Since December 2020, the project team has been subsequently developing alternative options for providing an active mode link across the Waitematā Harbour. This has considered a wide range of options, including both structural and non-structural, and various alignments and forms of a crossing. These were presented to the Board at their March 2021 meeting (Attachment 2).

14. From the initial long listing process the following options were shortlisted:

- a) Structural – New bridge at the full navigational height
- b) Structural – New bridge at mid-height
- c) Structural – New bridge at mid-height with opening span in centre
- d) Structural – Gondola
- e) Non-Structural – Dedicated ferry solution
- f) Non-Structural – Dedicated bus-based solution.

15. Appendix 2 provides a summary of the key aspects of each shortlisted option. The option of using the existing lanes on the bridge was not shortlisted.

16. Based on an assessment of these short-listed options, the following conclusions have been drawn:

- a) Neither of the two non-structural options represent an acceptable long-term solution as they are unlikely to meet the outcomes sought. The need to transfer to another mode will reduce user attractiveness and therefore reduce the ability of these solutions to meet the forecast demand. In the short term however, these options do provide potential merit to provide an immediate connection across the harbour whilst awaiting the long-term solution.
- b) The Gondola option could provide wider benefits (increased recreational and tourist trips); however, there are concerns with the lower level of service for users and the need to transfer to another mode. The Gondola option also has the highest approvals risk of the shortlisted options and carries a significant cost (including CAPEX and OPEX).

- c) The mid-height structural option would restrict large boats such as the Chelsea Sugar ships or naval vessels from passing under the bridge, while only offering a relatively small cost saving, so is not considered appropriate. A mid-height option with an opening centre addresses the adverse impact of reduced navigation under the bridge; however, it comes at a cost premium that is three times that of a fixed span.
- d) The full-height bridge option is the best performing long-term solution as it provides a dedicated 24/7 cross harbour connection, a high level of amenity for users and can meet forecasted demand (with scope for further growth in demand). A potential version of this solution could include a mid-high-mid double deck truss bridge with full height navigational clearance.

Recommended Option: Full-height bridge

- 17. The preferred option endorsed by the Board is a full height bridge option, with a recommendation to consider an interim operational option until the long-term solution can be implemented.
- 18. The full height structural bridge option has an estimated P50 cost of \$650-\$715 million, depending on design, with a P95 of \$715-\$785 million.
- 19. This solution would take in the order of five years to be operational (including consenting and design development), which is two years later than outlined in the NZ Upgrade Programme Establishment Report.
- 20. The cost of a new structural component of the project is higher than originally proposed; however, the project has focussed on both minimising project costs and maximising outcomes that can be delivered for users. Options exist to optimise the design, for example the width can increase from 5.5 to 9.2 metres at only 10 percent additional cost.
- 21. Additional funding would be required to deliver the preferred option given the current funding allocation within NZ Upgrade Programme for this project. This funding gap, \$290-\$375 million (at P50), would require either savings to be found from across the NZ Upgrade Programme or through additional Crown investment.
- 22. With a continued focus on outcomes, given the five-year implementation window, we have also considered the option of providing an interim operational option. This would provide a strong message to users that this link is important and enable early mode shift growth.
- 23. Work is underway to further investigate the viability of an interim operational option, such as a dedicated bus or ferry service. Initial indications are that implementing a service would take 6-12 months and require an initial capital investment of \$30-\$58 million (depending on which option is implemented), with an annual operation cost of \$6 million.
- 24. Assessing the project against the current Investment Decision Management Framework (IDMF) shows the value of the project, with the highest rating against the GPS Alignment (Very High) and Schedule (High) criteria. This is due to the mode shift, reduced emissions and completion of a strategically important link characteristics of the project.

25. The Benefit Cost Ratio (BCR) is currently assessed as being 0.4-0.6. The BCR is based on the benefits calculated in the 2019 SSBC for the Northern Pathway project, and on the updated costs. The BCR therefore does not take into account of the most recent changes and benefits of the preferred option.

Risks

26. As with all options there are risks. The main risks associated with the preferred option include:

- a) Partner and Stakeholder Engagement: This is a significant project in the Auckland landscape and will attract strong views and perspectives from partners (such as Iwi and Council) and the wider community. This is a risk that delays or increases the cost of the project if not managed appropriately.
- b) Materials: This is a significant structure and materials availability of specialist skills and materials is a risk in the current COVID environment.
- c) Statutory Approvals: A project of this significance is not without approvals risks during the consenting phase. For this option, these include visual impacts, impacts on the harbour (ecological predominantly) and Iwi implications (particularly the Pa site on the northern landing).

Next Steps

27. Subject to Joint Ministers' agreement, with the identification of the preferred solution which has now been endorsed by the Waka Kotahi Board, the following is proposed:

- a) Waka Kotahi is to engage with joint Ministers in order to confirm funding arrangements for the preferred option, via further advice.
- b) We will then undertake the development of a design for the entire project that will confirm the crossing's exact form (structural and architectural) and the amenity outcomes which will be delivered for users, including obtaining the necessary consents for the long-term structure.
- c) We will investigate the viability of an interim operational option (bus or ferry type solution) whilst the detailed design and construction is underway on the long-term structure.
- d) Finally, Waka Kotahi will engage with stakeholders and the community throughout the above steps to build support for the project and understand community concerns.

It is recommended that you:

1. **Note** the contents of this briefing Yes / No



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Brett Gliddon

General Manager, Transport Services

Date: 14 April 2021

.....
Hon Grant Robertson, Minister of Finance

Date:

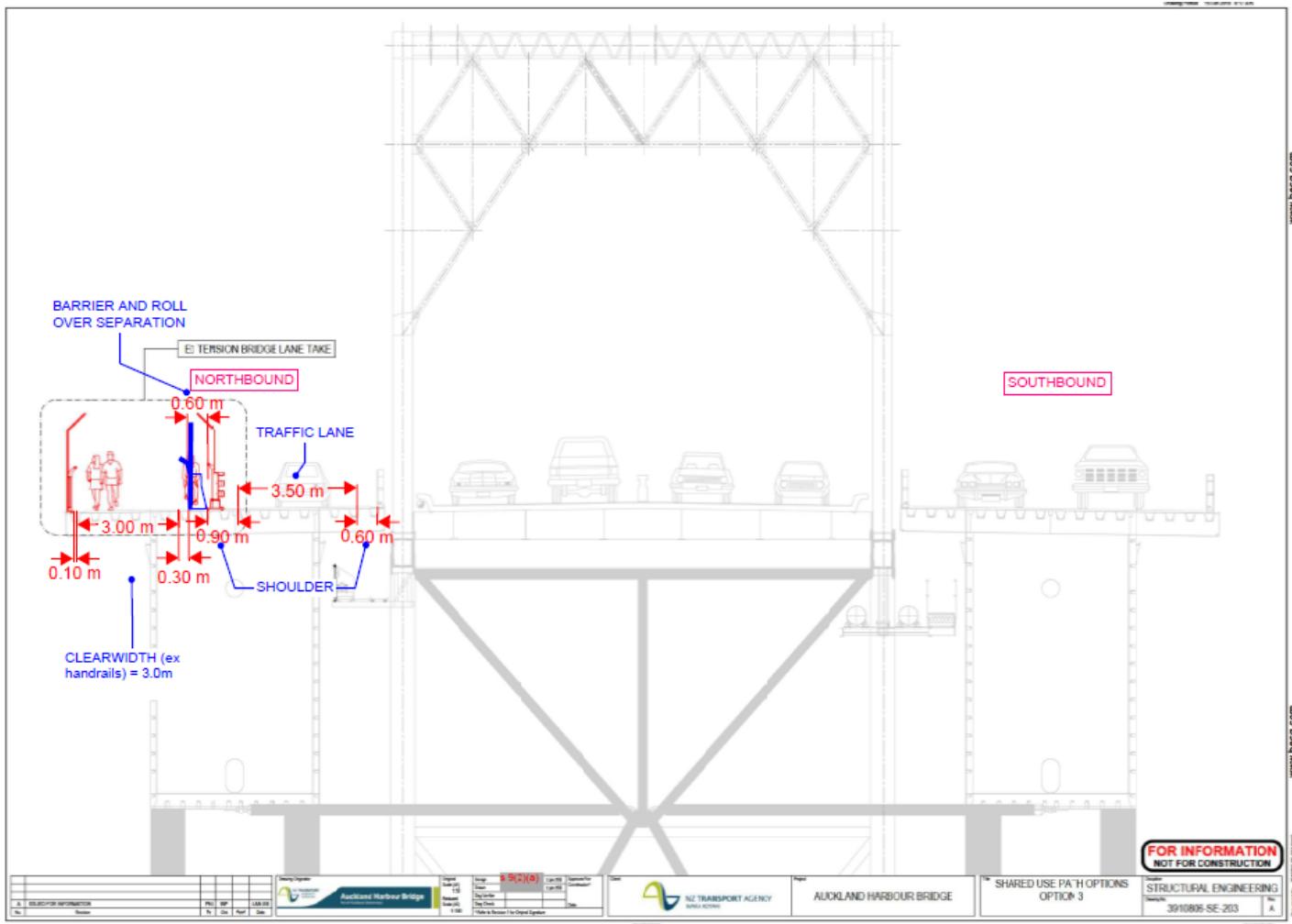
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Hon Michael Wood, Minister of Transport

Date:

Appendix 1: Rationale for not using lanes on the existing bridge

To safely provide a facility using the existing bridge, two lanes of the existing bridge would be required. Two lanes are required as a single lane would provide less than 3m for a walking and cycling path once safety barriers, gradients and shoulders were taken into account.

Figure 1: Cross section of the existing bridge



The forecasted volumes, speed differential of different users and gradients of the bridge do not meet the required standards and would carry significant safety risks. There would also be implications to the operation and performance of the existing users of the bridge, including public transport and freight.

Using present day volumes (and assuming the resultant lane arrangement on the bridge would be three lanes in each direction at all times), taking two lanes out to provide for walking and cycling across the harbour would:

- e) Result in current demand exceeding the reduced available capacity (three lanes in each direction) from 5am to 8pm on an average weekday. This excludes any allowance for growth (which is forecast).

- f) Increase the levels of congestion on the bridge (as a result of any lane reallocation) which would have a disproportionate impact on the performance of the busway as currently the busway has priority up to the bridge and not on the bridge itself (as it is not needed), however the bridge would become the constraint in the network, adversely impacting the performance of the entire busway.
- g) Have considerable impact on the operation of the wider strategic transport system. It is important to note that the network either side of the bridge is a constraint in the network, and not the bridge itself. Therefore, reducing capacity on the bridge would result in the bridge becoming the constraint in the network. This would have far reaching ramifications for the transport system, as was seen in the recent bridge strike of the Harbour Bridge which resulted in the wider transport system being put under considerable strain, including public transport and freight operations.

Appendix 2: Assessment of shortlisted options

Option	Details	Positives	Challenges
Ferry	<ul style="list-style-type: none"> This option would provide a dedicated ferry for active mode users across the harbour from the existing Northcote terminal to the existing Wynyard terminal Assumed to operate 6am to 12am daily on a dedicated shuttle system (approx. 15 min frequency) Capital investment of \$58M for terminal upgrades and Ferries is required, along with an annual OPEX of \$6M pa Programme: Implementation is forecast to take approximately around 24mths to procure the Ferries 	<ul style="list-style-type: none"> Low capital cost to implement Scalable to meet demand as it changes (increases) over time Makes use of existing infrastructure 	<ul style="list-style-type: none"> Operational challenges in providing sufficient capacity (berthing) for forecast demand Operational complexity with running in parallel with existing (paid ferry service) Some capital works required at Northcote wharf to accommodate additional ferry's Requires transfer for users, providing a lesser user experience
Bus	<ul style="list-style-type: none"> Scope: This option would provide a dedicated bus for active mode users across the harbour, with two options considered: <ul style="list-style-type: none"> Long Option – Smales/Akoranga to Wynyard Short Option – Stafford Rd to Curran Street Assumed to operate 6am to 12am daily on a dedicated shuttle system (approx. 10 min frequency) Capital investment of \$30M for terminal upgrades and Buses is required, along with an annual OPEX of \$6M pa 	<ul style="list-style-type: none"> Low capital cost to implement Scalable to meet demand as it changes (increases) over time Makes use of existing infrastructure 	<ul style="list-style-type: none"> Operational challenges in providing sufficient capacity (city end bus stop capacity) for forecast demand Operational complexity with running in parallel with existing (paid bus service) Some capital works required at drop off and pick up locations Requires transfer for users, providing a lesser user experience

	<ul style="list-style-type: none"> Implementation is forecast to take approximately 6-12mths to procure the specific buses, consenting risks are not considered 		
Bridge: Same Height	<ul style="list-style-type: none"> Dedicated structure at the same navigational clearance of the existing bridge. Options of the structure were estimated as part of this option, including: <ul style="list-style-type: none"> 5.5, 7.6 and 9m width Mid-high-mid double deck truss form Capital investment of \$650-\$735M, (from and width dependent) Programme: Implementation is forecast to take approximately 5 years from approvals to implementation 	<ul style="list-style-type: none"> Consistent with NZUP scope as originally proposed Provides a continuous and permanent connections across the harbour 24/7 Delivers the outcomes sought for the project 	<ul style="list-style-type: none"> Takes five years to implement, Capital cost is in the order of twice the current Establishment Report budget for the project
Bridge: Mid Height Fixed	<ul style="list-style-type: none"> Dedicated structure at the height of the lower truss member of the existing bridge (24m above mean water line). Capital investment of \$650-\$730M, depending on the cross section Implementation is forecast to take approximately 5 years from approvals to implementation 	<ul style="list-style-type: none"> Consistent with NZUP scope as originally proposed Provides a continuous and permanent connections across the harbour 24/7 Delivers the outcomes sought for the project Lower height provides enhanced user experience (reduced gradients) 	<ul style="list-style-type: none"> Takes five years to implement, Capital cost is in the order of twice the current Establishment Report budget for the project Lower height restricts current type of vessels that can go under the bridge
Bridge: Mid Height with middle opening	<ul style="list-style-type: none"> Dedicated structure at the height of the lower truss member of the existing bridge (24m above mean water line) till the centre span, then an opening the middle (to allow full height vessels to go through as required). Additional piers (to the number of the existing structure) to narrow 'opening' section to approximately 100m. Capital investment of \$750-\$830M, depending on the cross section, in the 	<ul style="list-style-type: none"> Consistent with NZUP scope as originally proposed Provides a continuous and permanent connections across the harbour 24/7 Delivers the outcomes sought for the project Lower height provides enhanced user experience (reduced gradients) 	<ul style="list-style-type: none"> Takes five years to implement Capital cost is in the order of twice the current Establishment Report budget for the project Opening structure a further \$100M. Two additional piers required into the harbour (compared to other structure options)

	<p>order of \$100M more for the opening element</p> <ul style="list-style-type: none"> Implementation is forecast to take approximately 5 years from approvals to implementation 		
Gondola	<ul style="list-style-type: none"> This option would provide a Gondola for active mode users across the harbour from Northcote to Westhaven Assumed to operate 6am to 12am daily Capital investment similar to the bridge options is required, along with an annual OPEX of approximately \$5M pa Implementation is forecast to take approximately 3 years to complete 	<ul style="list-style-type: none"> Scalable to meet demand as it changes (increases) over time High capacity Opportunity for increased tourist trips Less intrusion into the seabed compared to bridge options 	<ul style="list-style-type: none"> Operational complexity with running in parallel with existing (paid ferry service) Requires transfer for users, providing a lesser user experience Statutory approvals carries risk with scale of landings at either end of the option. Cost is the same order of magnitude as the bridge options

Attachment 1: Northern Pathway presentation to December 2020 Board Meeting

Attachment 2: Northern Pathway presentation to March 2021 Board Meeting

Northern Pathway & Additional Waitematā Harbour Connections

Board Workshop – December 2020

Paper Sponsor Brett Gliddon, GM Transport Services

Version Final

Date 14 December 2020

No of Pages 31

Legal Review Lucy Riddiford

COMMERCIAL IN CONFIDENCE

Workshop purpose

- The transport connections across the Waitematā Harbour are a critical component of the Auckland region's transport system
- We have an emerging challenge on the delivery of the strategy in this corridor
- This is a workshop to provide you with the background of the strategy and challenges in the corridor, and to seek your feedback.

Problem Statement

- Northern Pathway and Additional Waitematā Harbour Connections (AWHC) have assumed we can build walking and cycling on the existing Auckland Harbour Bridge (AHB) structure

Issue # 1

- AWHC assumes a dedicated walking and cycling link across the harbour is in place

Issue # 2

- Current engineering advice is that it is not recommended to attach any further structures to the existing bridge

Issue # 3

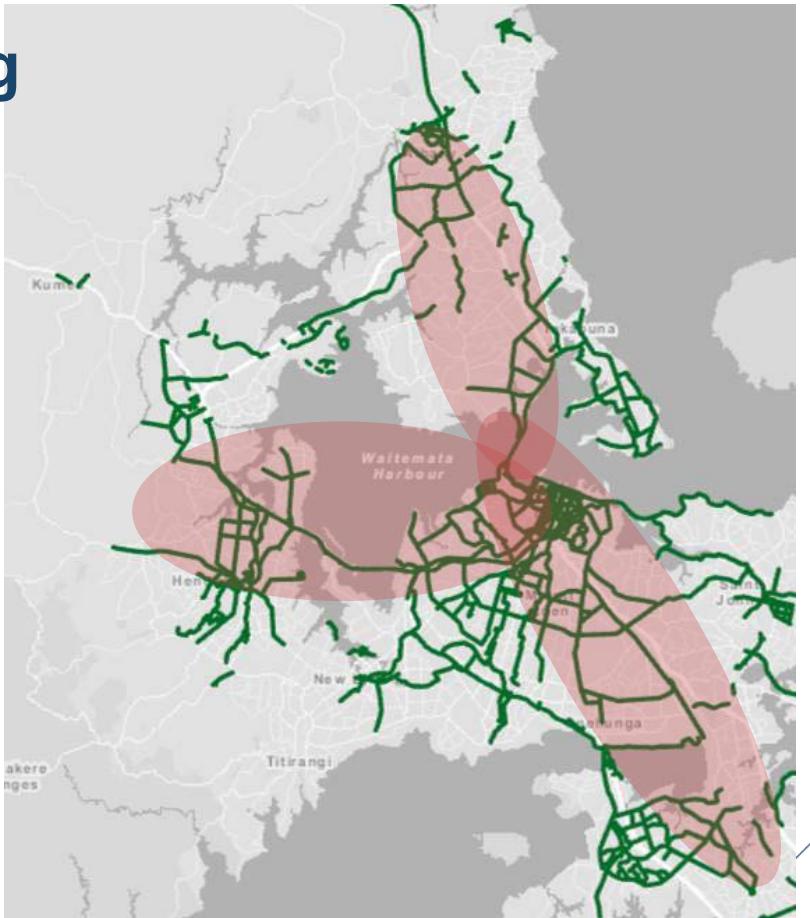
- To align with the long term strategy we need to reconsider the timing, form and function of the current investment to achieve a walking and cycling link.

The background image shows an aerial view of the Waitemata Harbour in Auckland, New Zealand. A prominent bridge, likely the Auckland Harbour Bridge, spans the water. In the distance, the city of Auckland is visible with its characteristic hilly terrain and urban sprawl.

History

Importance of walking and cycling

- The harbour is a critical missing link in the wider region's strategic cycling network, connecting areas of the network with current and existing investment
 - \$685M in current RLTP for walking and cycling
 - Waka Kotahi has already spent significant dollars on dedicated walking and cycling projects in in Auckland in the last 10 years
- Provides missing link between two significant cycling networks that are forecast to carry 6,500 walking and cycling trips a day across the AHB in 2048.

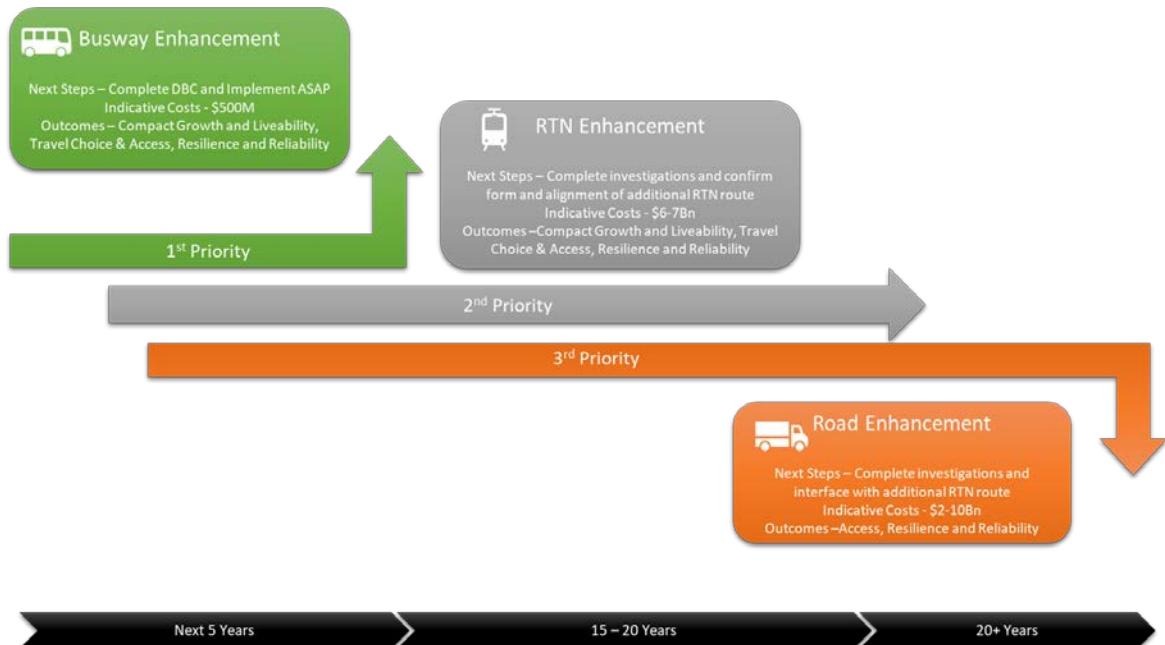


Recap of work done for an Additional Harbour Crossing



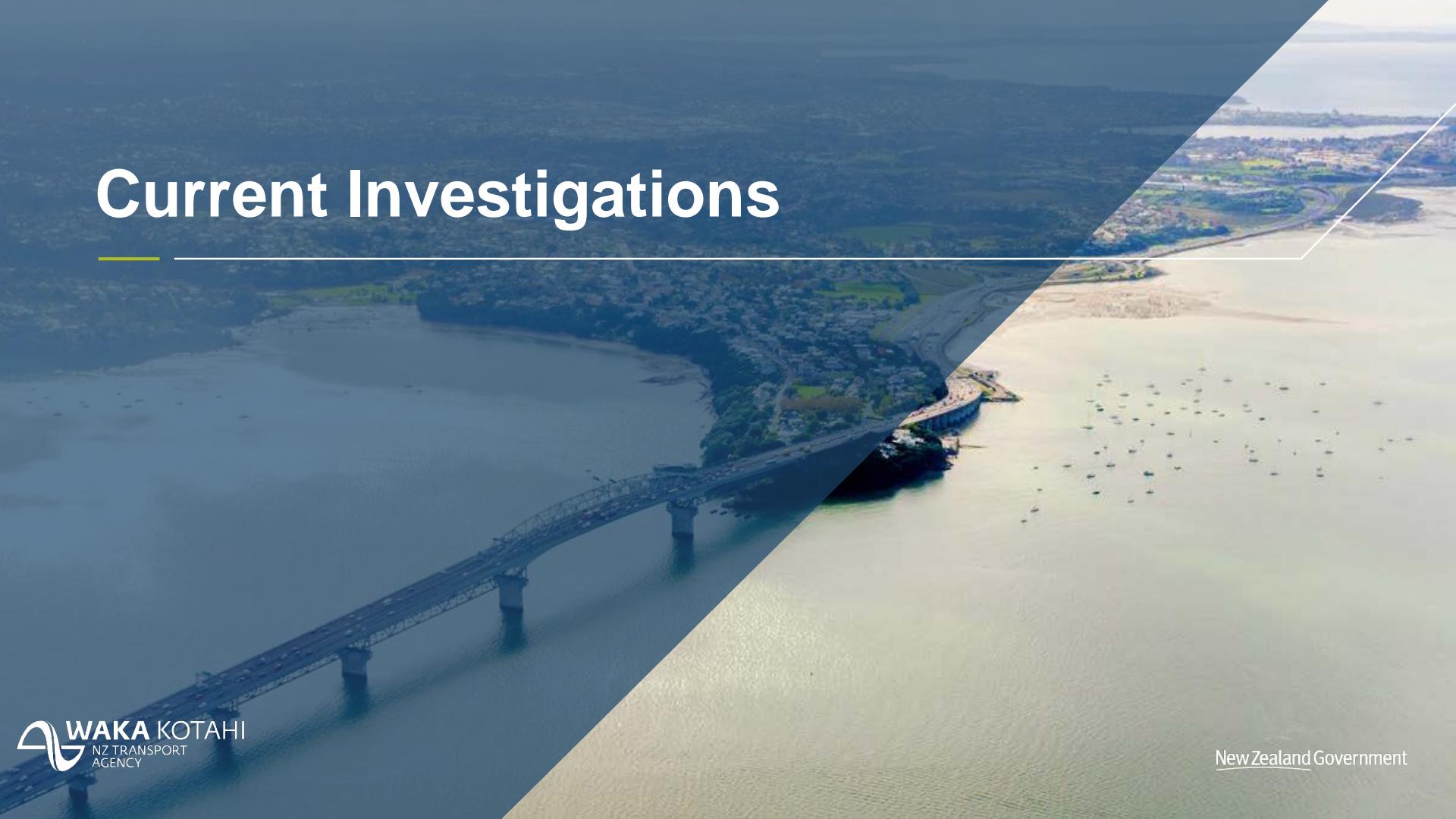
Waka Kotahi and partners agreed way forward for long term harbour connections

- The most recent AWHC business case approach considered a wider transport system approach
- **CRITICALLY, walking and cycling link assumed in place (Northern Pathway)**
- Demand management and land use considerations need to be progressed.



Planned final form and function of harbour crossing

- The existing AHB remains and will provide:
 - Traffic lanes dedicated to the city
 - Buses running from enhanced busway
 - **Walking and cycling attached**
- New tunnel(s) for rail based Rapid Transit Network (RTN)
- New tunnel(s) with additional road capacity for traffic linking North Shore with Port, West and South.



Current Investigations

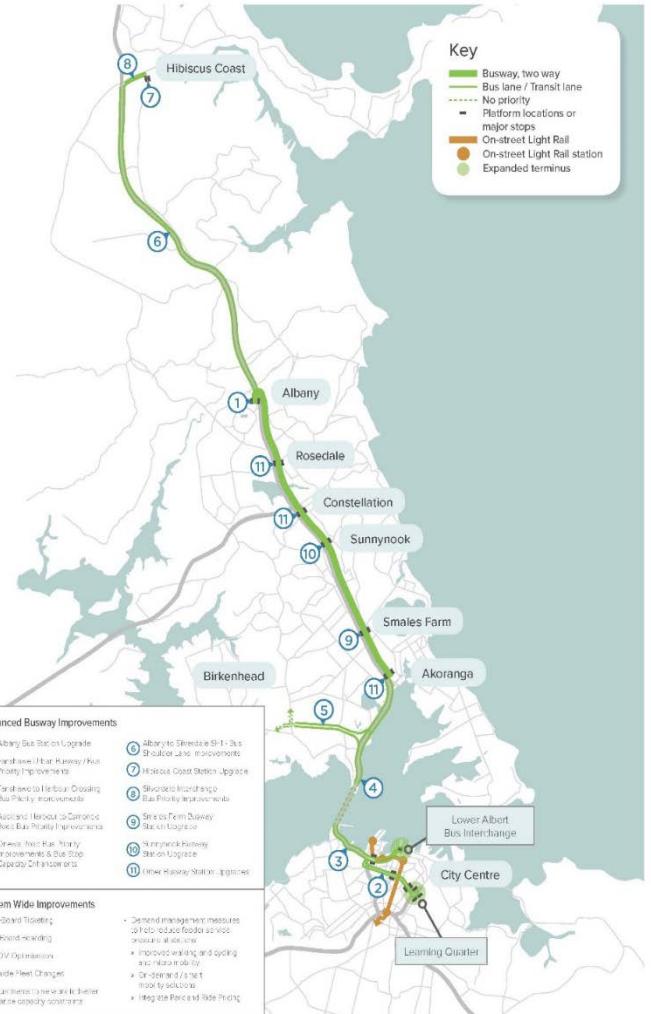
Current works underway

- \$20M to continue the development of the AWHC business cases and confirm form, function and timing
- Enhanced Busway Detailed Business Case
- Northern Pathway delivery
 - SeaPath
 - Existing bridge investigations.



Enhanced Busway works underway

- DBC currently underway by Auckland Transport
- Identified as first priority from AWHC business case to delay need for additional RTN across the harbour
- Forecast increase in capacity of approximately 30% through:
 - Double Decker buses
 - Station upgrades
 - Improved mainline priority (where lacking)
- **This work is needed regardless of the future approach.**



The Northern Pathway project has been progressed in parallel with the AWHC business case

- The project will provide a **seamless dedicated walking and cycling link** between Auckland's City Centre and the North Shore, which will connect with existing local paths to extend the region's walking and cycling network.
- **Part of the NZUP package** for Auckland
- It is split into three connected sections for delivery:
 - Westhaven to Akoranga – design and consenting phase (NZUP)
 - Akoranga to Constellation Drive - business case phase
 - Constellation Drive to Albany - construction phase.

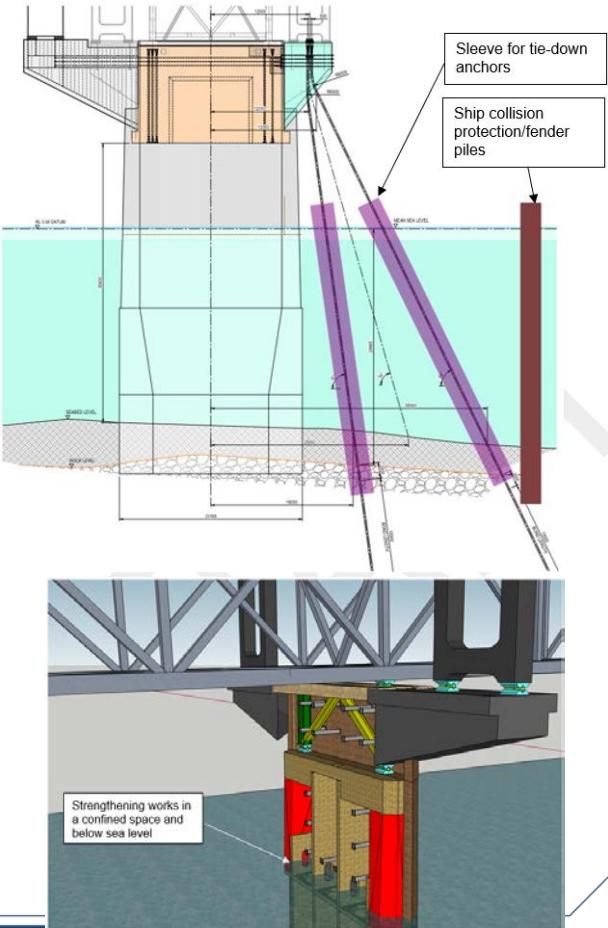


Northern Pathway Challenges



Challenges with Northern Pathway

- We have recently tested and progressed the design and constructability of the 'on bridge' section of the Northern Pathway
- Significant adverse impact on existing bridge resilience identified
- Major strengthening works required to the existing piers to counter-balance the pathway. Tie-down system required
- Peer review and challenge team confirm strengthening required and option is high risk
- Highly constrained option, high risk with limited opportunity
- Key concerns relate to:
 - Extent of counter-balancing required using tie-down system
 - Impact on the existing bridge resilience
 - Constructability
 - Safety due to working in piers and below water line
 - Low head height and damage to existing structure.



Why the Skypath option is not feasible

- Original lightweight carbon Skypath project consented in 2013
- Engineering reviews identified that design “*does not meet current loading standards*” and would require exemptions from bridge manual
- Detailed design issues still unresolved, including stormwater and wind issues
- Safety and operational issues unresolved (narrow tube)
- Carbon structure new technology not proven
- Loading restrictions required from opening day
- Possibility of no pedestrian loads in the future
- **Therefore considered not feasible** to implement by Waka Kotahi

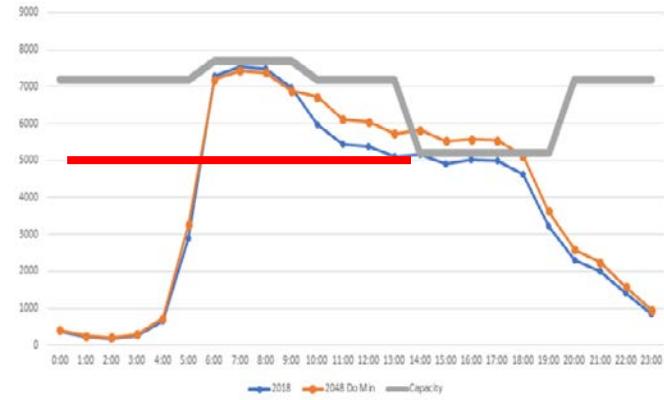
Options considered using the existing bridge

Truss / pier supported option



- Option not considered feasible due to:
 - Impacts on resilience of existing structure (truss and box girder)
 - Strengthening of existing structures
 - Load management required on truss
 - Constructability concerns
 - Poor user experience.

Use existing lanes (short term)

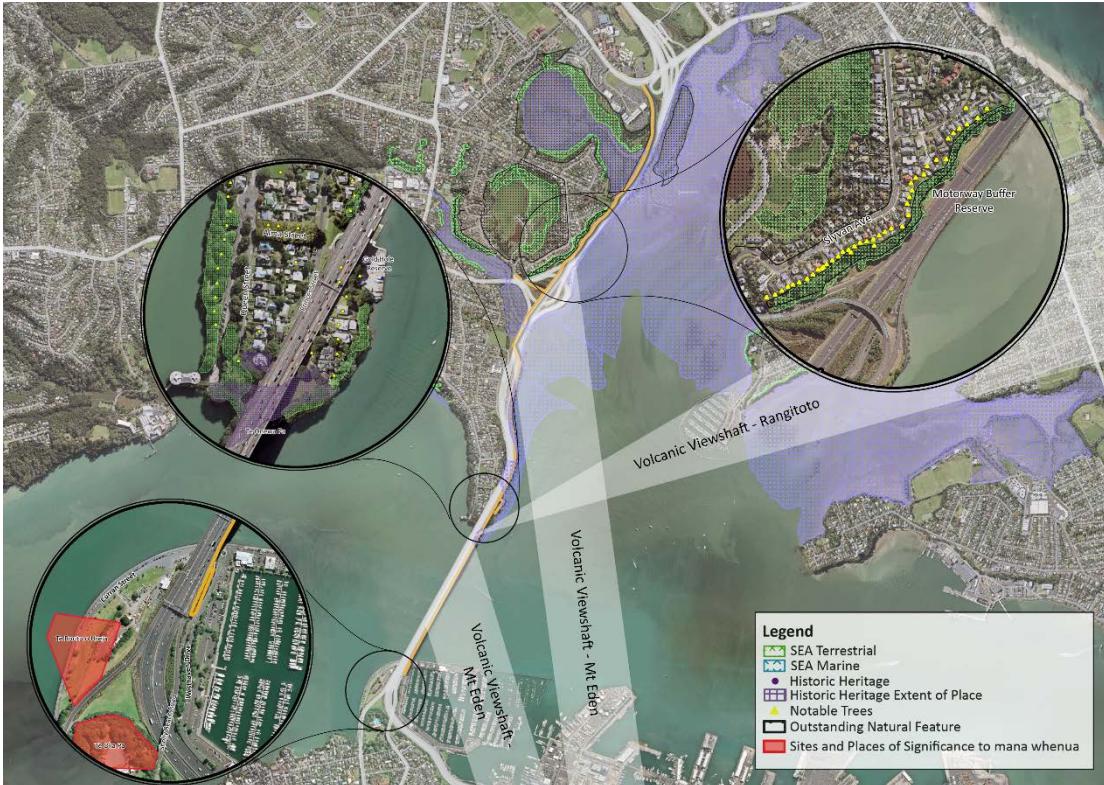


- Would replace two current lanes with walking and cycling
- Would reduce peak hour capacity by 20-40% depending on operation
- Would impact on the performance of buses
- Would likely require considerable reconfiguration of the moveable median barrier.



Possible ways forward

Northern Pathway Challenges – Akoranga to Westhaven

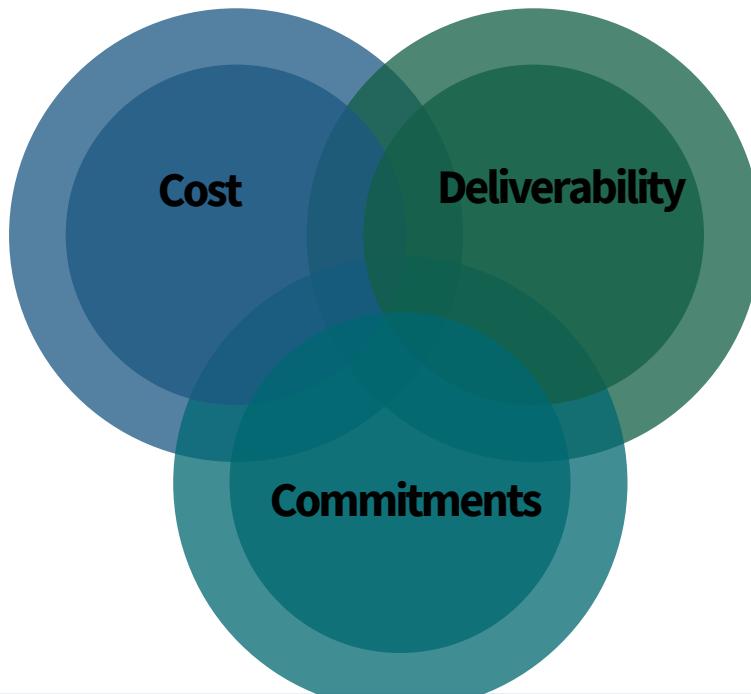


Key macro issues Northern Pathway are grappling with

- This is a key government initiative (NZUP funded) and unlocks wider investment

COST

- The new proposed solution is more expensive than the previous
- Different solutions have different cost implications
- Timing of solution and therefore cost implication.



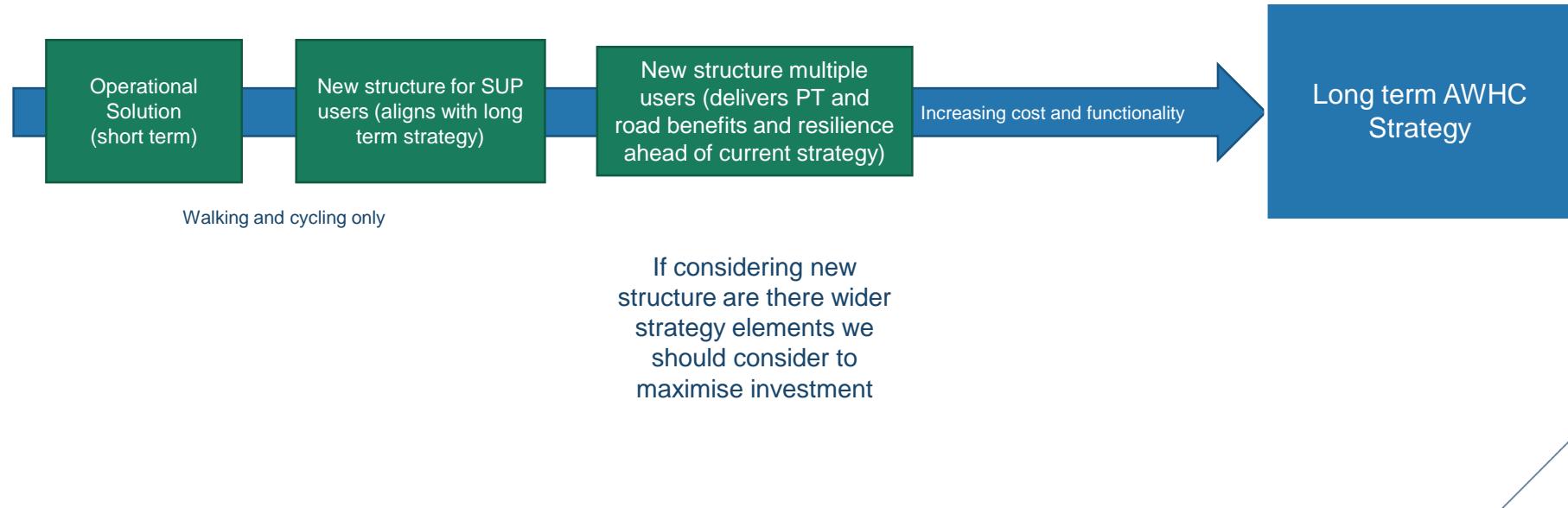
DELIVERABILITY

- Consenting challenges
- Resilience of the bridge an important consideration
- Different solutions have different risk profiles.

COMMITMENTS

- Commitments already made
- Timeliness importance consideration
- The immediate need is to focus on the most appropriate solution and get underway.

Broad Options were considered to respond to the macro issues



More detailed options developed to assist

- We then developed and number of sub-options in more detail, including:

Operational Solution



Range of different options on bridge, off bridge

Off Peak use of existing bridge

Ferry link

New structure for W&C



Range of different widths and bridge forms

'Flat' bridge

9m wide W&C

Different Alignments

New structure for multiple users



Range of different capacity and forms looked at

W&C + Busway

W&C + 3 additional lanes

W&C + Busway + 3 additional lanes

Operational Option (Ferry)

- Stays within budget (approx. \$60M)
- Relatively quick to implement (1-2 years depending on ferries)
- **Is not a walking and cycling connection**
- Has some consenting challenges
- High operating burden (\$5-\$10M pa)
- Would be in place for at least 15 years and likely longer (so not short term).



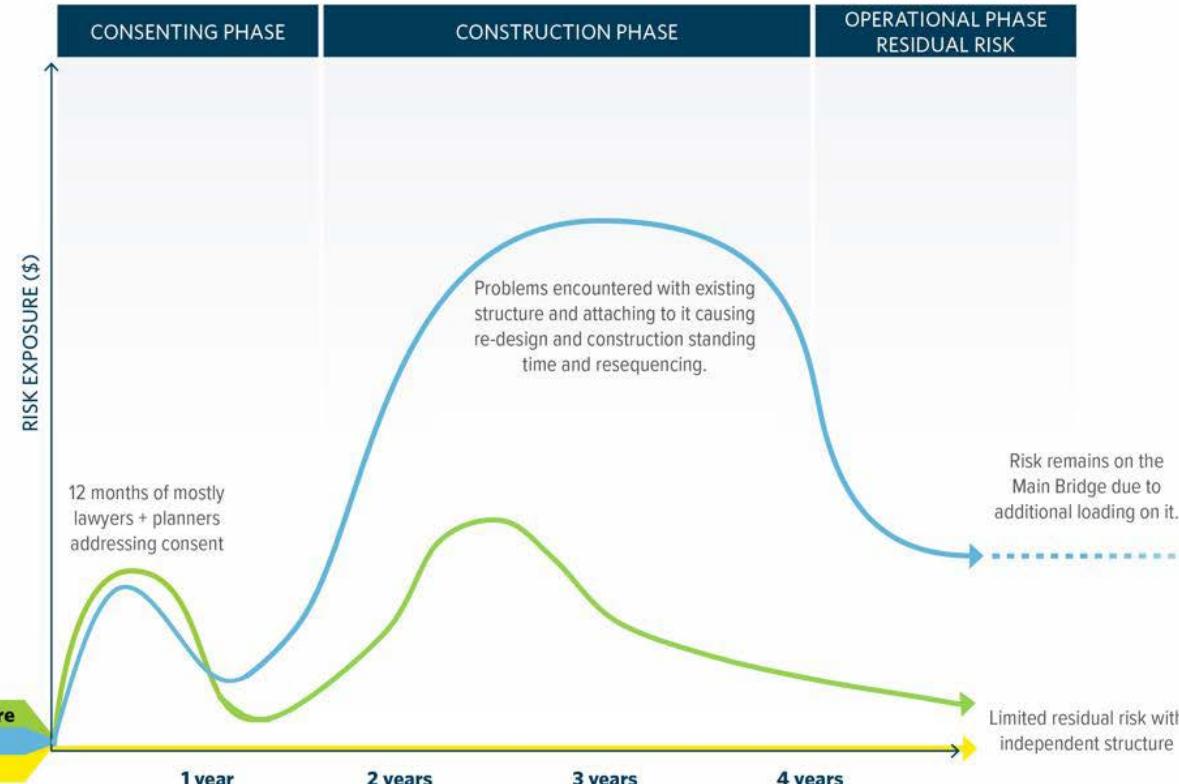
Separate structure for walking and cycling

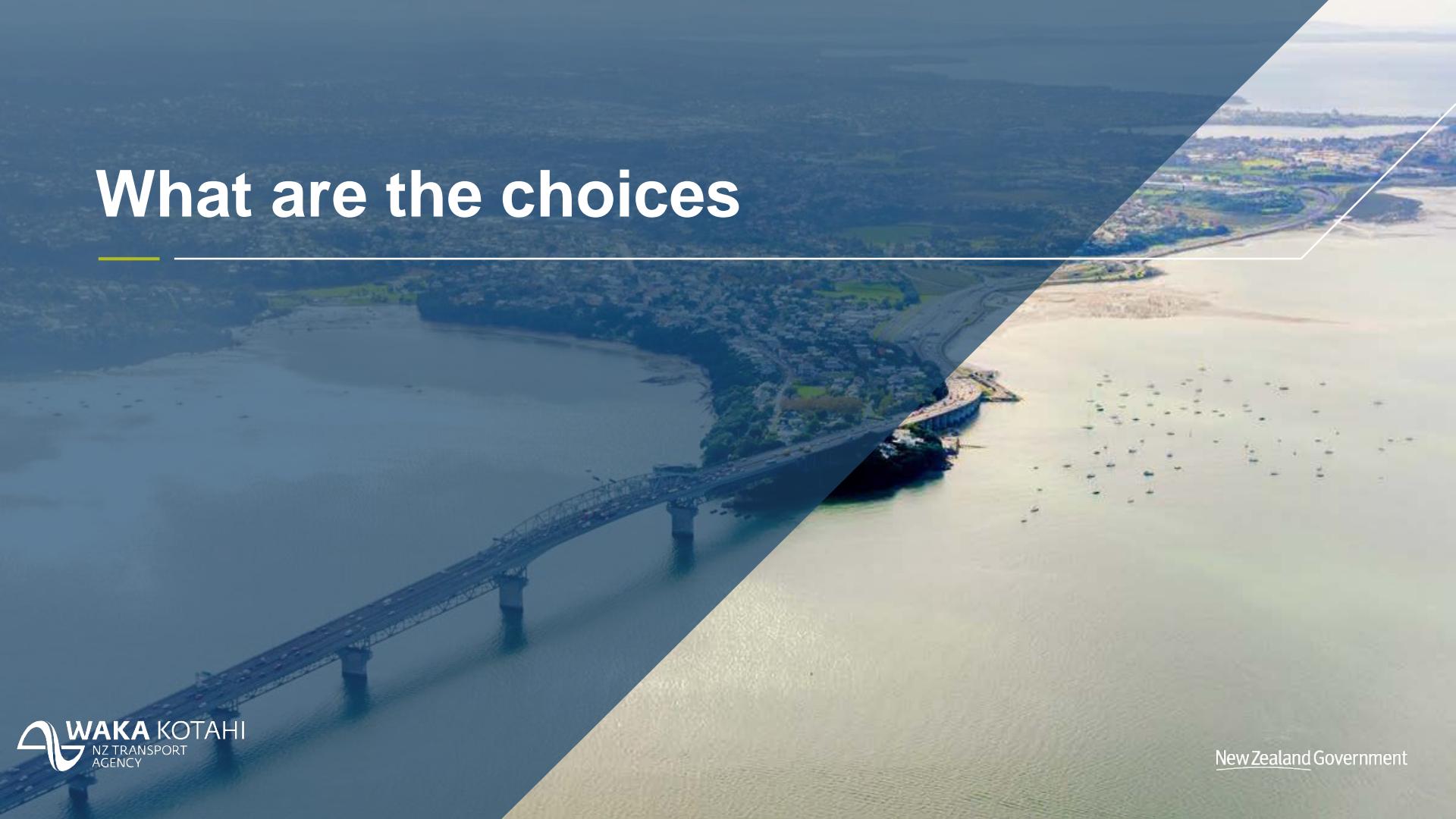
- Delivers a high-quality walking and cycling link across the harbour
- Provides some resilience benefits
- Completes a strategic missing link in the Auckland walking and cycling network
- Has a cost of \$520-\$675M
- Has some consenting challenges
- Would take 4-5 years to be operational.



Relative cost and risk of an attached vs new structure

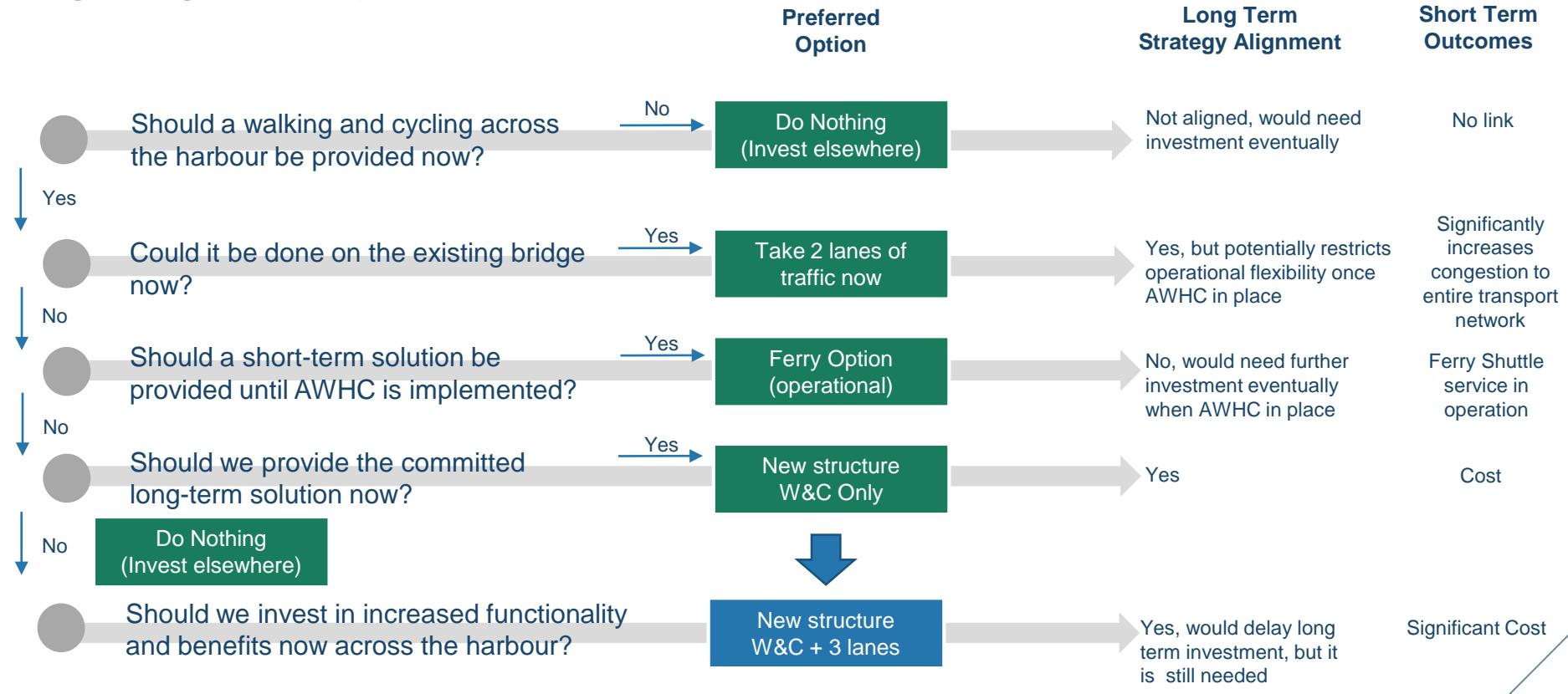
Current costs of both options are similar, however the risk profile is very different.





What are the choices

Our Choices



What are the potential implications of a new structure?

- Could reshape the timing, form and function AWHC strategy, including bringing forward some of the benefits to provide for operational flexibility and increased resilience

The existing Harbour Bridge remains and will provide:

Traffic lanes dedicated to the city

Buses running from enhanced busway

Walking and cycling attached

New tunnel(s) for rail based RTN (Rapid Transit Network)

New tunnel(s) with additional road capacity for traffic linking

North Shore with Port, West and South

Existing AHB								New Independent Bridge						
	West Extn Bridge		Original Truss Bridge				East Extn Bridge		Lane+5	Lane+4	Lane+3	Lane+2	Lane+1	SUP
	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6	Lane 7	Lane 8						
Current Configuration	NBBus + NBT	NB T	NBT	NBT / SBT	NBT / SBT	SBT	SBT	SB Bus + SBT						
				<- Moveable Barrier -->										
SUP Only	NBBus + NBT	NB T	NBT	NBT / SBT	NBT / SBT	SBT	SBT	SB Bus + SBT						SUP
				<- Moveable Barrier -->										
SUP + 1 lane PT	NBBus + NBT	NB T	NBT	NBT / SBT	NBT / SBT	SBT	SBT	SBT						
				<- Moveable Barrier -->										
SUP + 2 lanes	NBBus + NBT	NB T	NBT	NBT	NBT	SBT	SBT	SBT						
				Fixed Barrier -->										
SUP + 2 lanes PT	NBT	NB T	NBT	NBT / SBT	NBT / SBT	SBT	SBT	SBT						
				<- Moveable Barrier -->										
SUP + 3 lanes	NBBus + NBT	NB T	NBT	NBT	NBT	-	SBT	SBT						
				Moveable Barrier <-- -->										
SUP + 3 lanes PT	NBT	NB T	NBT	NBT	NBT / SBT	SBT	SBT	SBT						
				<- Barrier -->										
SUP + 4 lanes	NBBus + NBT	NB T	NBT	NBT	NBT	-	SBT	SBT						
				Barrier -->										
SUP + 4 lanes PT	NBT	NB T	NBT	NBT	NBT	SBT	SBT	SBT						
				Barrier -->										
SUP + 5 lanes PT	NBT	NB T	NBT	NBT	NBT	-	SBT	SBT						
				Barrier -->										

Should we be considering a W&C + other modes new crossing?

BENEFITS	CHALLENGES
<ul style="list-style-type: none">Potentially delays need for larger AWHC investment (RTN and Road) by 5-15 yearsDelivers a high-quality shared user path across the harbourProvides safety and resilience benefits to the bridge through removal of median barrier and lane of traffic in middle span, allowing existing trusses to be protected with armorProvides off peak traffic improvementsIncreased bus performance, reduces busway travel times by approx 5minsRemoves current heavy traffic load on lane 2 of the bridge	<ul style="list-style-type: none">Brings forward strategy decisions which potentially could reduce optionsIt will take time to implement with an estimated 7 years until being operationalHas considerable consenting riskIs a lot of money (over a \$1Bn) and will likely have a BCR less than 1.0Comes with some reputational risk around budget and fact that this would be accelerating considerable investment in this corridor ahead of scheduled need and ahead of other areas of the transport systemStill requires long term AWHC investment in the future

The trade offs with the current budget of \$360M



- Releases approx. \$360M of funding

- Provides walking and cycling link across the harbour within allocated budget

- Provides long term walking and cycling link as promised now

- Brings forward benefits for PT and road users
- Delivers resilience to the existing bridge
- Delays need for future investment in AWHC

Do nothing
(invest \$360M elsewhere)

Operational (Ferry)
solution
\$360M

Dedicated W&C
Structure
\$360M+\$2-300M

New structure with
W&C and other lanes
\$360M+\$900-1,200M



- Does not deliver critical and Govt confirmed piece of infrastructure
- Reduces effectiveness of existing investment

- Not same quality of link
- Requires future investment in the long term when AWHC implemented
- Would be a long-term solution

- Cost has increased resulting in need for increased funding now to implement

- Is expensive, requires considerable additional funding
- Will still require AWHC investment
- Longest to implement

Long term strategy is important to remember in all of this

- The existing Auckland Harbour Bridge remains and will provide:
 - Traffic lanes dedicated to the city
 - Buses running from enhanced busway
 - **Walking and cycling attached**
- New tunnel(s) for rail based RTN
- New tunnel(s) with additional road capacity for traffic linking North Shore with Port, West and South.

Northern Pathway

Board Attachment – March 2021

This Document

- This document provides a summary of the technical work undertaken to investigate alternative options (to the originally assumed specimen design) and includes:
 - Strategic Context
 - Approach of work undertaken
 - Option Assessment
 - Key trade offs
 - Recommended Option
 - Next Steps

Strategic Context



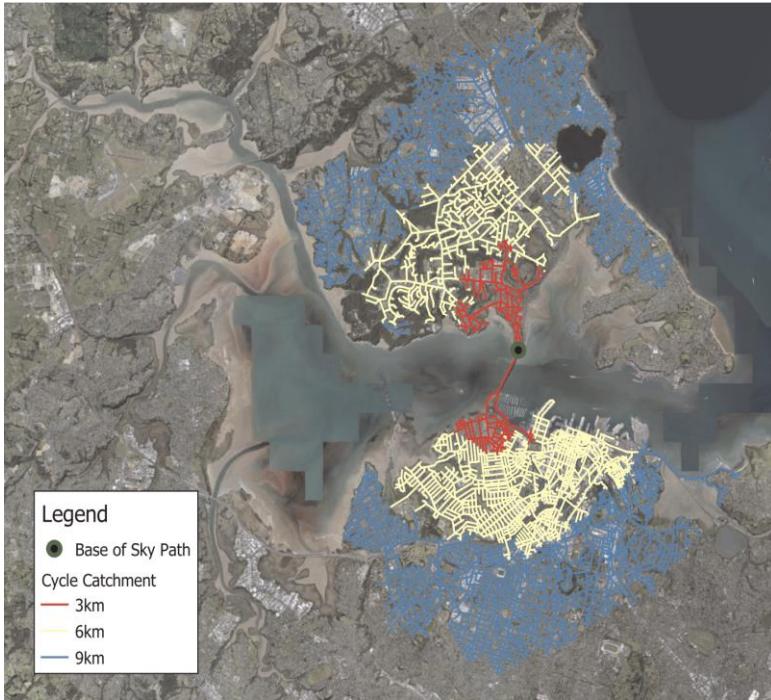
Importance of Walking and Cycling across the harbour

- A walking and cycling connection across the Waitemata harbour is a nationally significant project, part of the strategic national network that has been delivered over the last ten years
- Auckland is one of the most car dominated cities in the world with around 70 percent of all journeys to work made by car, with many of these journeys able to be undertaken by cycling or walking
- The National and Regional transport policies are aligned in the need to increase mode choice for users and to increase active mode share, not only to address the overall performance of the transport system, but also for the health benefits of the systems users. The latest RLTP is seeking that 70% of new trips are absorbed by PT or active modes
- The Additional Waitemata Harbour Crossing Connections business case requires the Northern Pathway to be in place



Importance of Walking and Cycling across the harbour

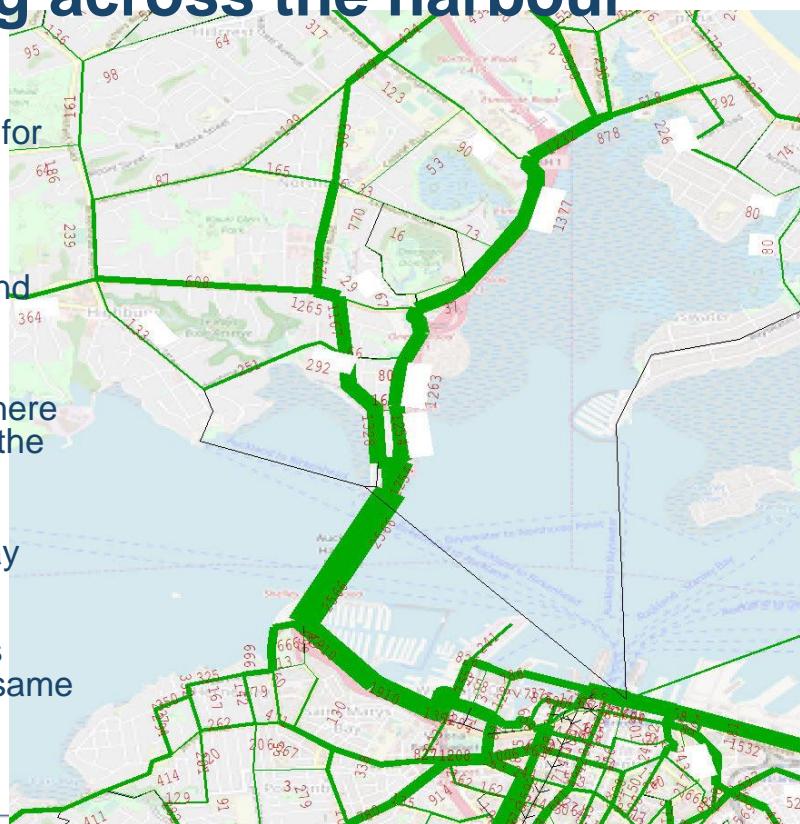
- Mode shift is happening, with walking and cycling trips increasing at a faster rate than other modes. Cycling trips on key routes in Auckland have been increasing at 10% pa, with many over that rate as well (with North Western cycleway over 20%pa)
- By 2031, it is expected that 8.17 million cyclists will be passing AT's count sites each year. This represents growth of 120% over the 3.7 million figure recorded during 2020.
- **With the link in place over 2.5M* users a year are forecast to cross the harbour** (1.5M* cyclists), with sensitivity test showing upto 3.2M* trips a year could occur
- The forecast is 25% more than the current Tamaki Drive cycleway forecast, but this project has twice the residential catchment
- There will be over 180,000 jobs and 130,000 homes predicted in the project catchment by 2048
- Technology changing the attractiveness of cycling, with suburbs north of Takapuna within 30mins of the CBD by e-bike, increasing the catchment to employment within 30mins by bike by 60%
- These forecasts are conservative given the uptake in e-bikes and micro-mobility technology continues to happen at faster rates than predictions



* Forecast in 2048

Importance of Walking and Cycling across the harbour

- Completing these missing critical strategic links in the transport system has been shown to have far reaching positive outcomes for the transport system
- The connection will link \$3-400M of implemented and planned strategic cycling infrastructure, providing a step change in mode choice for the region and enable users to ride from Takapuna (and Albany ultimately) through to the Airport, Westgate and Eastern suburbs on dedicated cycling facilities
- Not only would this project be transformational for commuters, there is a significant recreational and tourist opportunity as well given the proximity to the CBD and the link to Takapuna. Similar projects around the world have comparable forecast demands:
 - Sydney harbour bridge : 3,500 peds and 1,750 cyclists a day
 - Golden Gate Bridge : 5,500 peds and 4,000 cyclists a day
- This connection would also increase access to one of the worlds great harbours and provide heath and wellbeing benefits at the same time



The Northern Pathway project

- Part of a wider corridor of walking and cycling investment
- Southern section (Westhaven to Akoranga) is included in the NZUP package for Auckland (\$360M, open 2023/2024)

The NZUP objectives for this project are to:

- increase the number of those walking and cycling to work across the Auckland Harbour Bridge from 0–3% of daily trips by 2028
- increase the number of daily walking and cycling recreation and tourism trips across the Auckland Harbour Bridge from 0 to 2,500
- increase the total number of walking and cycling trips between Esmonde Road and the Auckland Harbour Bridge to 1,500 by 2046
- improve transport system capacity
- improve access to community assets and the natural and built environment
- increase the number of households with access to the natural environment and community assets between Esmonde Road and the Auckland Harbour Bridge by walking and cycling



Northern Pathway – Westhaven to Akoranga

- An Alliance was recently appointed to test and progress the design and constructability of the ‘on bridge’ section of the Northern Pathway
- Through the development of the recommended option the Alliance consider the Beca preliminary design carries too much risk to the existing structure to construct
 - Two international peer reviews confirm this position
- A number of options considered, with an independent structure seen as the most appropriate solution by the Alliance
- This came at a forecast cost of \$520-\$675M
- **A workstream was therefore commenced to understand what options could deliver against the project objectives**

Why not the earlier Skypath option?

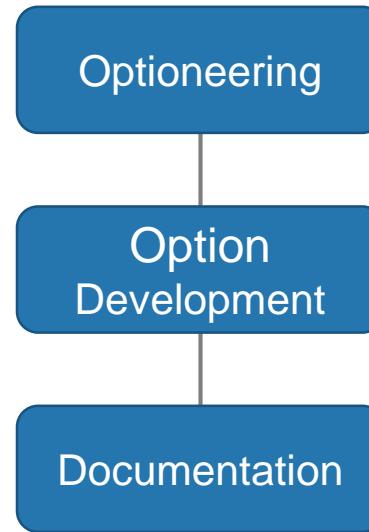
- Not feasible due to risks of implementation and loading on existing structure
 - Operational constraints unacceptable given growth projections

Approach Undertaken



The Optioneering Process

- A three-stage approach was used of this most recent analysis, including:
 - **Stage 1 Optioneering** – Go wide for options and quickly assess and confirm shortlist.
 - **Stage 2 Option Development** – Shortlisted options developed in more detail and assessed against key criteria
 - **Stage 3 Documentation** – Development of summary presentation with supporting report



Key assumptions:

- Structural options could not be attached to the existing bridge
- Northern Pathway landward works assumed to be in place

Landward component

An aerial photograph of a bridge spanning a wide river. A thick yellow line is drawn from the top left corner of the slide down to the bridge, highlighting the 'landward component' of the project. The bridge has a distinctive curved section and is surrounded by green land and water. In the background, a complex highway interchange is visible near a coastal area.

Landside (Northcote Pt to Akoranga) works

Specimen Design

- Development of the landside works (Akoranga to Northcote) has continued in parallel to the crossing section option analysis
- Key issues include:
 - The Alliance has been looking at an alternative landside option that may provide some cost saving and amenity enhancements over the currently costed route
 - This alternative does come with higher consenting challenges and therefore both options are being developed further by the Alliance.
- Total cost for this section in the order of \$100M
- This section could be operational in two years from lodgement
- Clarity on the crossing section is required to enable the design to be finalised and approvals documentation to be completed



Option Assessment

1

Long List Option Development

- Workshop held on 21st January 2020
- Identified a number of different alignment and forms for a new structure as well as operational solutions. Comparing these resulted in 48 different options for assessment.
- This included standalone structures on four different alignments, different forms including tunnels and bridges at different heights
- Operational options such as ferry and hover craft were also considered, as well as bus-based options
- Alternative options including a gondola were also considered



Short List Options

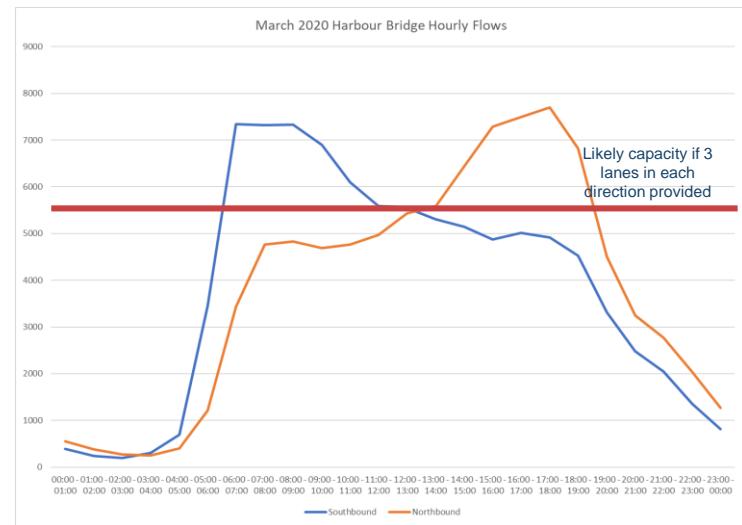
- The long list options were assessed, and the following options were short listed for further analysis:

Option	Sub Element
Option 1 : Operational - Ferry	<ul style="list-style-type: none">Northcote to Wynyard
Option 2 : Operational – Bike Bus	<ul style="list-style-type: none">Stafford to Westhaven
Option 3 : Separate structure – Eastern High	<ul style="list-style-type: none">Alignment AMatch height of existing bridge
Option 4A : Separate structure – Eastern Mid 1	<ul style="list-style-type: none">Alignment AMid height entire length
Option 4B : Separate structure – Eastern Mid 2	<ul style="list-style-type: none">Alignment AMid height with raised height in the middle
Option 5 : Gondola	<ul style="list-style-type: none">Northcote to Westhaven



Why not use the existing bridge?

- Using present day volumes, taking the required two lanes out to provide for walking and cycling across the harbour (2 lanes needed to provide active modes safely) the current demand would exceed the available capacity (3 lanes in each direction) from 5am to 8pm on an average weekday
- This excludes any allowance for growth (which is forecast)
- By 2046+ when the additional cross harbour capacity (through a tunnel) is provided, even then the removal of 2 lanes would mean there was no spare capacity/resilience during peak periods (which was part of the rationale for the tunnel, to provide increased relief and resilience for the current bridge)



Option 1 : Non-Structural - Ferry

- **Scope:** This option would provide a dedicated ferry for active mode users across the harbour from the existing Northcote terminal to the existing Wynyard terminal, other terminal considered were:
 - Gold Hole terminal considered on north side
 - Queens Wharf also considered on city side
- Assumed to operate 6am to 12am daily on a dedicated shuttle system (approximately 15 min frequency)
- **Cost:** Capital investment of \$58M for terminal upgrades and Ferries is required, along with an annual OPEX of \$6M pa
- **Programme:** Implementation is forecast to take approximately around 24mths to procure the Ferries

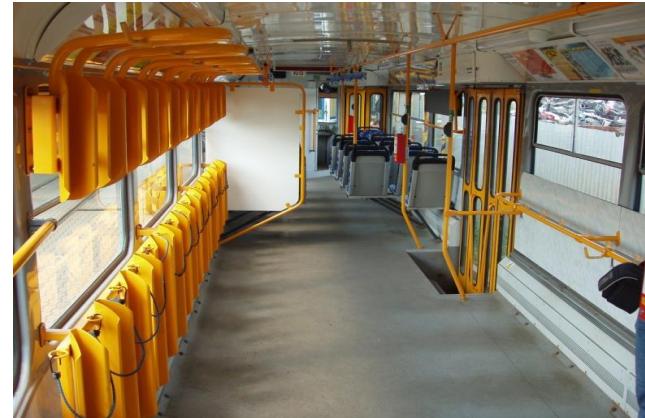


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Strengths	Challenges
<ul style="list-style-type: none">• Low capital cost to implement• Scalable to meet demand as it changes (increases) over time• Makes use of existing infrastructure	<ul style="list-style-type: none">• Operational challenges in providing sufficient capacity (berthing) for forecast demand• Operational complexity with running in parallel with existing (paid ferry service)• Some capital works required at Northcote wharf to accommodate additional ferry's• Requires transfer for users, providing a lesser user experience

Option 2 : Non-Structural - Bus

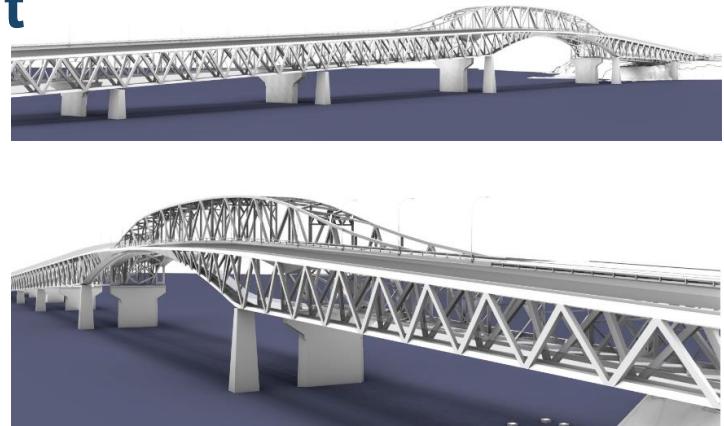
- Scope:** This option would provide a dedicated bus for active mode users across the harbour, with two options considered:
 - Long Option – Smales/Akoranga to Wynyard
 - Short Option – Stafford Rd to Curran Street
- Assumed to operate 6am to 12am daily on a dedicated shuttle system (approximately 10 min frequency)
- Cost:** Capital investment of \$30M for terminal upgrades and Buses is required, along with an annual OPEX of \$6M pa
- Programme:** Implementation is forecast to take approximately 6-12mths to procure the specific buses, consenting risks are not considered



Strengths	Challenges
<ul style="list-style-type: none">• Low capital cost to implement• Scalable to meet demand as it changes (increases) over time• Makes use of existing infrastructure	<ul style="list-style-type: none">• Operational challenges in providing sufficient capacity (city end bus stop capacity) for forecast demand• Operational complexity with running in parallel with existing (paid bus service)• Some capital works required at drop off and pick up locations• Requires transfer for users, providing a lesser user experience

Option 3 : Structural – Existing Height

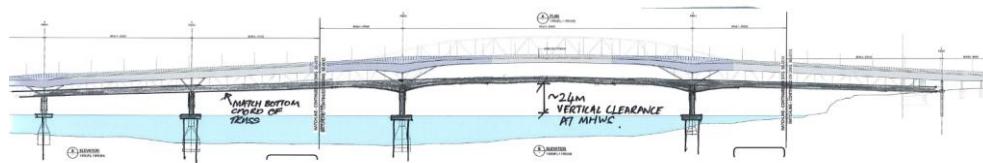
- **Scope:** Dedicated structure at the same navigational clearance of the existing bridge.
- **Form:** Options of the structure were estimated as part of this option, including:
 - 5.5, 7.6 and 9m width
 - Mid-high-mid double deck truss form
- **Cost:** Capital investment of \$650-\$735M, (from and width dependent)
- **Programme:** Implementation is forecast to take approximately 5 years from approvals to implementation



Strengths	Challenges
<ul style="list-style-type: none">• Consistent with NZUP scope as originally proposed• Provides a continuous and permanent connections across the harbour 24/7• Delivers the outcomes sought for the project	<ul style="list-style-type: none">• Takes five years to implement, approximately 2 longer than Establishment report dates• Capital cost is in the order of twice the current Establishment Report budget for the project

Option 4a : Structural – Mid Height Fixed

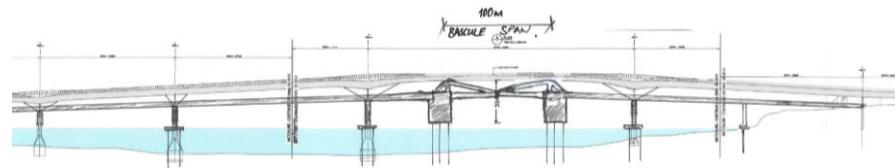
- Scope:** Dedicated structure at the height of the lower truss member of the existing bridge (24m above mean water line).
- Cost:** Capital investment of \$650-\$730M, depending on the cross section
- Programme:** Implementation is forecast to take approximately 5 years from approvals to implementation



Strengths	Challenges
<ul style="list-style-type: none">Consistent with NZUP scope as originally proposedProvides a continuous and permanent connections across the harbour 24/7Delivers the outcomes sought for the projectLower height provides enhanced user experience (reduced gradients)	<ul style="list-style-type: none">Takes five years to implement, approximately 2 longer than Establishment report datesCapital cost is in the order of twice the current Establishment Report budget for the projectLower height restricts current type of vessels that can go under the bridge

Option 4b : Structural – Mid Height, centre opening

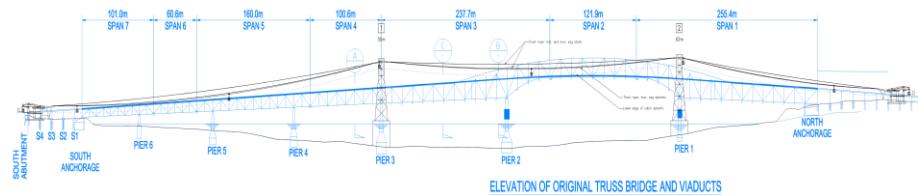
- Scope:** Dedicated structure at the height of the lower truss member of the existing bridge (24m above mean water line) till the centre span, then an opening the middle (to allow full height vessels to go through as required). Additional piers (to the number of the existing structure) to narrow 'opening' section to approximately 100m.
- Cost:** Capital investment of \$750-\$830M, depending on the cross section, in the order of \$100M more for the opening element
- Programme:** Implementation is forecast to take approximately 5 years from approvals to implementation



Strengths	Challenges
<ul style="list-style-type: none">Consistent with NZUP scope as originally proposedProvides a continuous and permanent connections across the harbour 24/7Delivers the outcomes sought for the projectLower height provides enhanced user experience (reduced gradients)	<ul style="list-style-type: none">Takes five years to implement, approximately 2 longer than Establishment report datesCapital cost is in the order of twice the current Establishment Report budget for the projectOpening structure a further \$100MTwo additional piers required into the harbour (compared to other structure options)

Option 5 : Structural – Gondola

- **Scope:** This option would provide a Gondola for active mode users across the harbour from Northcote to Westhaven
- Assumed to operate 6am to 12am daily
- **Cost:** Capital investment similar to the bridge options is required, along with an annual OPEX of approximately \$5M pa
- **Programme:** Implementation is forecast to take approximately 3 years to complete



Strengths	Challenges
<ul style="list-style-type: none">• Scalable to meet demand as it changes (increases) over time• High capacity• Opportunity for increased tourist trips• Less intrusion into the seabed compared to bridge options	<ul style="list-style-type: none">• Operational complexity with running in parallel with existing (paid ferry service)• Requires transfer for users, providing a lesser user experience• Statutory approvals carries risk with scale of landings at either end of the option.• Cost is the same order of magnitude as the bridge options

Option Assessment

- Option Assessment undertaken, key conclusions from this:
 - Operational options, whilst less costly, do not fundamentally deliver the outcomes sought for the project in the long term.
 - The Gondola option is also less attractive from an outcomes perspective (requires transfer for users) and carries a substantial capital and operating cost.
 - Structural options deliver the outcomes sought, however comes at a significant cost
 - Best performing structural options are those with a full height (in the middle)

Criteria	Full Height 5.5m	Options (Long Term)				Options (Long Term)								Options (Long Term)								
		Full Height		Twin Deck (Full height in the middle)		Mid Height (Opening Middle)		Mid Height (Entire Length)		Gondola		Dedicated Ferry Northcote to Wynyard		Dedicated Ferry Northcote to CBD		Dedicated Ferry Gold		Dedicated Ferry Gold		Dedicated Bike Bus (Long)		
		7.6m	9m																			Dedicated Bus (Short)
Investment Objective - Provide W&C Connection for demand	3	3	3	3	2	3	2	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1
Investment Objective - Quality of User Experience	2	3	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
Investment Objective - Allows for wider landuse/transport interface opportunities	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Deliverability (Programme and permissions complexity)	-2	-2	-2	-2	-3	-3	-2	-2	-2	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
Affordability (Cost and funding)	-3	-3	-3	-3	-4	-3	-4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Statutory Approvals	-2	-2	-2	-2	-4	-3	-3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2	-2
ESR (Sustainability?)	1	1	1	1	-1	1	-2	-1	-1	-1	-1	-2	-2	-2	-2	-2	-2	-1	-1	-1	-1	-1
Stakeholders/Reputation	1	3	3	3	1	1	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2

Preferred solution – Outcomes delivery

- The significant cost of the option is in the base structure
- For a small incremental cost increase a substantial increase in outcome can be achieved
- The previous design width was generally 5.5m
- It is recommended that 7.6m is the minimum standard to be applied
- The 9m+ and twin deck options are preferred as they provide future proofing, user experience and safety benefits. **A 65% increase in width (and therefore amenity) can be provided for a 10% increase in cost.**

Item	Description	5.5m Harbour Crossing Inland route		7.6m Harbour Crossing Inland route		9.3m Harbour Crossing Inland route		Mid-High-Mid 7.6m Harbour Crossing Inland route	
		\$ Mio	%	\$ Mio	%	\$ Mio	%	\$ Mio	%
0	IPAA Phase	21.9	3%	21.9	3%	21.9	3%	21.9	3%
A	Physical works	389.7	60%	411.6	61%	436.7	61%		
B	Design	59.7	9%	59.7	9%	62.7	9%		
C	Contingencies	76.2	12%	80.9	12%	85.8	12%		
C.1	Inherent Risk	22.1	3%	23.2	3%	24.6	3%		
C.2	Discrete Risk	35.2	5%	37.0	5%	39.2	5%		
C.3	Escalation	18.8	3%	20.8	3%	22.0	3%		
D	Waka Kotahi Managed Costs and Contingencies	101.7	16%	103.5	15%	105.7	15%		
D.1	Managed costs	73.0	11%	74.8	11%	77.0	11%		
D.2	Risk and contingency	28.7	4%	28.7	4%	28.7	4%		
	Project Evaluation	649.1	100%	677.7	100%	712.8	100%		
	P95 funding risk	64.4	10%	67.2	10%	70.7	10%		
	Project Total at P95	713.6		745.0		783.5			
								807.3	

Allows for one lane up hill, no space separation between down hill and uphill traffic

Allows for one lane up hill, separation between down hill and uphill that can be used for overtaking

Allows for two lanes up hill, and two lanes downhill, increasing safety and amenity

Pedestrians would be at lower level, separated from cyclists (on upper level), except for the middle where users would be separated, but on the same level

Recommended Option

An aerial photograph of a bridge spanning a wide river. A yellow bracket highlights the bridge structure. In the background, there's a coastal town with buildings and roads. The water is a mix of blue and greenish-brown tones.

WAKA KOTAH
NZ TRANSPORT
AGENCY

The recommended long term solution

- A full height independent structure crossing with a landward component that links Westhaven to Akoranga
- A transformational piece of lead infrastructure delivering quality outcomes that will meet the base demand of 4,500 users in 2026 and 6,560 in 2046
- 5 years to implement from approval (including detailed design and approvals)
- Is forecast to cost in the order of \$650M- \$735M (@ P50 contingency), being made up approximately of:
 - \$100M for landward works
 - \$550M - \$635 for new crossing (width dependent)
- The location where the recommended solution is proposed is significant from a landscape and environment perspective and it is critical that the solution appropriately responds to the significance of its location

IDMF Assessment

Using the IDMF assessment criteria shows the strategic importance of this project, completing a critical piece of the Auckland transport system

- GPS Alignment – **Very High** : Better travel options, provides strategic regional missing link
- Schedule – **High** : Realises the benefit of considerable wider transport programme of active mode investment either side of the harbour
- Efficiency – **Very Low** : BCR is in the order of 0.4-0.6

The BCR is low, however there are some limitations with the current quantification of benefits for a project like this, particularly related to tourism and wider economic benefits and also the improvements in the wider transport system which are considered to be under represented in this current BCR



Further considerations

- A permanent and continuous active modes link across the harbour is the recommended solution
- The longer it takes to implement the long-term solution, there is the option/attraction to provide an interim (operational) solution for cross harbour active mode users.
- This would provide users with a connection across the harbour as soon as possible
- Depending on the required duration of an interim solution, impacts on the mode of an interim solution. If the solution was very short term (say less than 5 years) buses would be more attractive, any longer and a ferry-based solution becomes more attractive.
- Any interim ‘short term solution’ would come with a cost, as follows:
 - Bus based – Capex of approx. \$12M and Opex of \$3Mpa
 - Ferry based – Capex of approx. \$20M and Opex of \$3Mpa

Next Steps



Next Steps

- Work needs to be undertaken on the recommended long-term **Structural Bridge** solution to develop it further, including:
 - The Alliance will undertake the following tasks within their current capped IPAA amount, including:
 - Land Concept design (what it is);
 - Crossing –Visual Preliminary Concept design (what it is);
 - Confirmations of user outcomes within the indicated cost range (what it does);
 - Production of public engagement collateral for consenting (keep momentum);
 - Reassurance of cost, programme, quality and risks
 - Investigation of the viability of the interim operational option
 - Engagement with stakeholders and project partners, including Auckland Transport and Mana Whenua to ensure that the option is appropriately commensurate with the significant landscape and environment