

# Waitemata Harbour Crossing Study Study Summary Report Executive Summary





# Waitemata Harbour Crossing Study

## STUDY SUMMARY REPORT EXECUTIVE SUMMARY

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Sinclair Knight Merz  
25 Teed Street  
PO Box 9806  
Newmarket, Auckland New Zealand  
Tel: +64 9 913 8900  
Fax: +64 9 913 8901  
Web: [www.skmconsulting.com](http://www.skmconsulting.com)

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# 1. Executive Summary

## 1.1 Report Purpose

Organisations responsible for planning transport infrastructure around the Auckland Harbour (the Project Partners) decided to undertake the Waitemata Harbour Crossing Study, to identify the preferred location for an additional harbour crossing. Issues associated with the Wynyard Quarter Plan Change prompted the need to this matter to be given some urgency.

The study objective was:

**“To identify the preferred option for delivering integrated, safe, responsive and sustainable cross-harbour travel between North Shore and the Isthmus to facilitate the future growth and development of the Auckland Region.”**

Supporting this objective, a series of project objectives and functional principles were derived. The overall theme was focused towards improving passenger transport links between North Shore City and the CBD, improving wider regional connectivity for all modes of travel and improving the resilience and flexibility of the transport network.

This report describes the study, which was carried out in two separate phases; phase 1 involved development of a long list of possible options for a new harbour crossing and a subsequent assessment to determine a short list. In Phase 2, the short listed options were refined and assessed in greater detail, from which a recommended option was identified for the new crossing.

## 1.2 Evaluation Framework

Given the policy background for New Zealand transportation projects, an LTMA / RLTS themed evaluation framework was developed as an assessment tool to initially determine short listed options, then which option was to be recommended. Key criteria within the evaluation framework were as follows:

- Economic Development and Regional Growth – covering consistency with the Regional Growth Strategy and economic growth;
- Connectivity – addressing connections between transport networks, functional principles and flexibility;
- Environmental – sustainability issues and the key environmental criteria such effects on natural and built environments;
- Social & Community – measures of social severance and displacement of communities; and
- Implementation – relating to cost only in Phase 1, but extended to include risk, constructability, staging and flexibility in Phase 2.

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### 1.3 Study Phase 1

The first task in Phase 1 was development of a long list of feasible options for the crossing. A key aspect of the study was to consider how to provide for both passenger transport and other modes crossing the harbour. Given the long term planning horizon for the project, the passenger transport element of the new crossing was optimised for electrified suburban rail. All options were developed recognising the potential future use of the existing Auckland Harbour Bridge.

The study identified 159 possible options for a new harbour crossing (plus a “do-nothing” option of no new crossing), with tunnels or bridges joining the same points considered to be two separate options. In addition, options were generated with intermediate connection points where possible; for example routes connecting Esmonde Road to SH16 (Port and Westbound) at Central Motorway Junction (CMJ) have possible connections at Onewa and Wynyard.

Once the option long list was finalised, options were evaluated to produce a short list. The first step focussed on the positive aspects of the options, namely economic development, regional growth and connectivity criteria, from which a reduced list of options was derived. Subsequently, the reduced option list was reassessed using a more refined assessment system and considered both positive and negative aspects of options.

Operational options, such as ferries, did not reach the short list as they did not satisfy the project objectives as effectively as other options. However, measures to optimise use of existing infrastructure and improve ferry services are likely to be implemented prior to a new harbour crossing.

The evaluation process concluded with a short list of options on three alignments, although the question of whether the crossing would be a bridge or a tunnel had not been settled. Ports of Auckland operational requirements rendered a bridge impractical from Princess Wharf eastwards, as the approaches would be too long to achieve the necessary height. However, alignments that would be suitable for rail by bridge were feasible to the west of Princes Wharf, given the gradients would have to be shallower than the existing bridge.

Phase 1 of the study concluded with the following option short list:

#### **Option 1: Esmonde to Britomart**

- Passenger transport (only) in a new tunnel or on a new bridge between Esmonde and Britomart, with possible connections at Onewa and Wynyard.
- General traffic on the existing Auckland Harbour Bridge
- Walking and cycling on either a new bridge or the existing Auckland Harbour Bridge (with appropriate modifications to the existing bridge.)





### **Option 2 Esmonde to Britomart & SH16**

- Passenger transport in either a new tunnel or new bridge across the harbour, with tunnels to landside connections between Esmonde and Britomart. Possible connections at Onewa and Wynyard.
- General traffic in either a new tunnel, or new bridge (as well as on the existing bridge), with tunnels to landside connections between Esmonde and SH16 at either Wellington Street (Port and Westbound) or Newton (Westbound only). Possible connections at Onewa and Wynyard.
- Walking and cycling on either a new bridge or the existing Auckland Harbour Bridge (with appropriate modifications to the existing bridge.)

### **Option 3 Esmonde to Britomart & Grafton**

- Passenger transport in a new tunnel between Esmonde and Britomart. Possible connection at Onewa.
- General traffic in a new tunnel between Esmonde and Grafton (as well as on the existing bridge) with possible connection at Onewa.
- Walking and cycling on the existing Auckland Harbour Bridge (with appropriate modifications to the existing bridge.)

A plan showing each of these options is included as Figure 1 overleaf.

## **1.4 Study Phase 2**

Phase 2 of the study involved developing the short listed option concepts, assessments of performance and impacts against a range of criteria, then comparing options using the evaluation framework.

It was assumed that an electrified suburban rail operation crossing the harbour to North Shore would be similar to that currently proposed for the south side of the harbour. The rail network is planned to be enhanced with the introduction of the CBD rail loop. An important part of the CBD rail loop will be a City Centre rail station, probably in the vicinity of Albert Street / Wellesley Street. Hence for this phase of study the southern limit of the passenger transport element of the harbour crossing was taken to be Fanshawe Street / Quay Street, rather than Britomart.



**LEGEND**

- COMBINED PT AND GENERAL TRAFFIC
- PT ONLY
- GENERAL TRAFFIC ONLY



WAITEMATA HARBOUR CROSSING STUDY  
OPTION SHORT LIST - FIGURE 1





Although the future of passenger transport across the harbour may be rail, it was also recognised that buses would continue to be the dominant form of passenger transport across the harbour for the medium term at least. Therefore the study did consider how bus based passenger transport operations would continue until a rail based service commenced.

The importance of walking and cycling for cross harbour travel is highlighted in the project objectives and functional principles. Neither mode is suited to tunnels, due to general environment, safety and amenity factors. Hence for tunnel options, it was assumed that both modes would be accommodated on the existing harbour bridge.

The western options 1 and 2 had alternative combinations of either a bridge or a tunnel crossing; as work progressed it became clear that other alternatives were possible, for example different tunnelling technologies (immersed tubes, cut and cover or driven) could suit different conditions. The alternatives for each option which emerged during Phase 2 of the study were as follows:

#### **Option 1: Esmonde to Britomart**

- Tunnel Option 1A: Cut and cover rail tunnel through Wynyard Quarter
- Bridge Option 1B: Rail bridge to west of Wynyard Quarter, passing over Westhaven Marina, then in tunnel beneath Wynyard Quarter. Walking and cycling on new bridge.
- Tunnel Option 1C: driven rail tunnel west of Wynyard Quarter, passing under Westhaven Marina, then in tunnel beneath Wynyard Quarter.

#### **Option 2 Esmonde to Britomart & SH16**

- Tunnel Option 2A: Cut and cover rail and road tunnels through Wynyard Quarter. Road link to SH16 (only) at CMJ
- Bridge Option 2B: Road and rail bridge to west of Wynyard Quarter, passing over Westhaven Marina; rail then in tunnel beneath Wynyard Quarter, road in tunnel to connect to SH1 and SH16. Walking and cycling on new bridge.
- Tunnel Option 2C: driven tunnel west of Wynyard Quarter, passing under Westhaven Marina, rail then in tunnel beneath Wynyard Quarter, road in tunnel to connect to SH1 and SH16.



### **Option 3 Esmonde to Britomart & Grafton**

Two alternative layouts emerged during the concept development phase for Option 3, the differences relating to how the southern tie in for general traffic will be configured.

- Tunnel Options 3A & 3B; driven rail tunnel to Albert Street; driven road tunnel to Beach Road, cut and cover tunnel to Grafton.

Option 3B has the advantage of less complex construction, and also has the potential to serve a future link to the east. However, the route for port traffic from CMJ and the south would not be so beneficial, as it precludes a dedicated grade separated link for this movement and would revert to a layout similar to that which existed prior to the Grafton Stage 2 project.

As the study progressed, a third configuration for Option 3 emerged. Option 3C combined the rail route of Option 1C (through Wynyard) with the general traffic route to Grafton.

Once the option configurations were settled, assessments were made about option performance and impacts. Key results of these assessments were:

#### **Economic Development and Regional Growth:**

- All options have regional economic benefits
- Option 3A best performing, closely followed by Options 2C and 3B

#### **Connectivity**

- All options provide connectivity benefits for the regional transport network
- Passenger transport options improve connectivity between North shore and CBD
- On balance, all roading options provide a similar level of connectivity benefits
- Options 3A and 3B provide the greatest level of resilience to the existing harbour bridge as they connects with the Southern Motorway south of CMJ
- Options 2B, 2C and 3B provide best network flexibility; Options 2B and 2C allow existing road space on the harbour bridge to be either reallocated to their modes, remain as 'spare' capacity or retired from service, Option 3B would best suit a future AMETI connection.

#### **Environmental**

- Passenger transport only options result in the least environmental impact
- Environmental effects are considerable for all traffic options
- Option 3 provides most adverse construction effects

#### **Social & Community**

- All options offer social and community benefits



- Some options benefits are offset by adverse effects (both construction and long term) on communities
- Option 2C best scoring option

### Implementation

- All options have implementation challenges (complexity, consenting, cost)
- Option 2B is the best performing option
- Option 3 is the most expensive and complex option to implement

Given the inherent uncertainties in a high level strategic study, the costing assessments can only be considered indicative in absolute terms at this stage. The range of indicative costs identified for the short listed options is shown in Table 1-1 below.

Option	Cost Range (Millions - 2008 values)
1A	1,000 - 1,200
1B	1,200 - 1,500
1C	1,000 - 1,200
2A	3,700 - 4,100
2B	3,100 - 3,500
2C	3,700 - 4,100
3A	4,700 - 5,100
3B	4,700 - 5,100

Table 1-1: Indicative Option Cost Range

### 1.5 Study Conclusion

The assessment work undertaken on each of the options for the Waitemata Harbour Crossing led to the following key conclusions:

- Improving passenger transport accessibility between North Shore City and the CBD was the first functional principle of the study. A passenger transport component to an additional crossing is therefore required.
- Given the desire for Wynyard Quarter to be re-developed with a high passenger transport mode share, it would be preferable for a dedicated passenger transport facility to access this area.





- Alternative vehicular connectivity would provide wider regional connections and benefits that passenger transport alone could not serve. This would maximise the broader economic benefits of a new crossing (agglomeration benefits).
- Options that provide additional vehicular connectivity also provide opportunities to reallocate road space on the existing harbour bridge for either dedicated public transport (bus lanes) or active modes (cycling and walking) as well as providing an alternative traffic route across the harbour during incidents and maintenance activities.
- Bridge options were not favoured due to their visual impact on the harbour and surrounding areas such as Westhaven Marina.
- Driven tunnel technology provides several advantages, including flexibility as to when the project is implemented. Options that incorporate rail and road could be constructed separately at different stages, although there would be savings in cost and disruption during construction if they were built together

The evaluation showed that for passenger transport alone, Option 1C was the best option. Option 1C provided high quality connectivity to key public transport nodes, including Wynyard Quarter. As noted above, with driven tunnel technology, Option 1C could be provided effectively independent to whatever option (if any) was adopted for additional road capacity.

The choice of road crossings then becomes one of no crossing (Option 1), an option in the vicinity of Wynyard Quarter (Option 2), or an option aligned with Grafton Gully (Option 3). Overall, the study found that:

- The best overall performing option in the evaluation assessment was Option 2C, although the scoring range between options was not large,
- The best performing option across a range of sensitivity tests which looked at different weightings for the five main criteria in the evaluation framework was Option 2C
- Where Option 2C was not the best option in individual tests it still scored highly compared to the alternative road options.
- The option that achieved the most balanced demand for general traffic between the new and existing crossings was Option 2C.

Based on the work undertaken, the conclusion of this study is that Option 2C, consisting of a new driven tunnel between Esmonde Road through Wynyard Quarter to the CBD for passenger transport, and from Esmonde Road to SH1 / SH16 at CMJ for general traffic, is the option which best meets the project objectives and functional principles. Therefore, Option 2C should be adopted as the preferred route for a further Waitemata Harbour Crossing.



This option has sufficient flexibility to allow the passenger transport and general traffic components of the crossing to be constructed separately if desired, although there would be savings in cost and disruption during construction if they were built together.