

Report

Penlink Four Laning Update 2018

Prepared for Auckland Transport(Client)

By Beca Limited (Beca)

21 February 2018

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Revision History

Revision N°	Prepared By	Description	Date
A	James Ellison	Initial Draft for Client Comment	21/02/2018
B	James Ellison	Draft with initial Client Comments	27/02/2018
C	James Ellison	Updated with travel times	12/03/2018

Document Acceptance

Action	Name	Signed	Date
Prepared by	James Ellison		27/02/2018
Reviewed by	Soumya Subba		27/02/2018
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on behalf of	Beca Limited		

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1 Background

This report was prepared by Beca Limited (“**Beca**”) solely for Auckland Transport and documents an update of the traffic modelling and economic analysis of the Penlink project. The scope of this commission is to prepare additional scenarios for Penlink.

2 Introduction

This report follows on from the work carried out and reported on in 'Penlink Economic Analysis Update – 2017'. As such details of the development of the network and scenarios has not been included in this report therefore it is important that this report is read in conjunction with the previous report.

This analysis is to investigate the impact of implementing Penlink using four laning. The increased number of lanes increases the cost of Penlink to \$348 million dollars which was used in the Benefit Cost Ratio.

3 Methodology

3.1 Network Assumptions

For the purposes of this update two scenarios have been modelled, A and C using forecast years of 2026 and 2046. These scenarios were identified as part of the work 'Penlink Economic Analysis Update – 2017'.

Scenario A: SH1 widening to Redvale (NB only)

Scenario C: SH1 widening to Wilks (both directions), and Wilks south facing ramps

The revised cost of Penlink is given as \$348 million dollars as per the estimate supplied by Auckland Transport.

The volume/capacity from the model runs are shown **Figure 1** to **Figure 12**.

The subsequent BCRs calculated using these model runs are shown in Table 1 to **Table 4**.

Table 10 shows a summary of the BCRs along with the AADT for each scenario.

4 Outputs

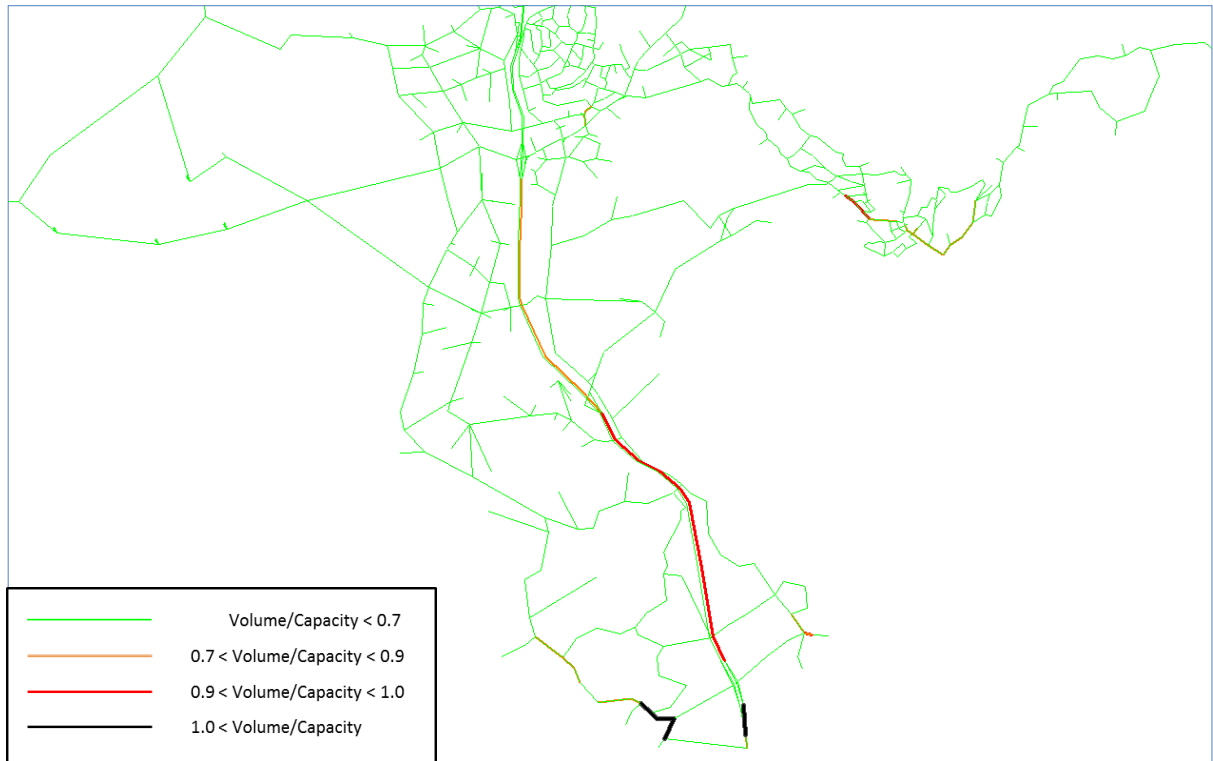


Figure 1 2026 AM Tolled Volume/Capacity

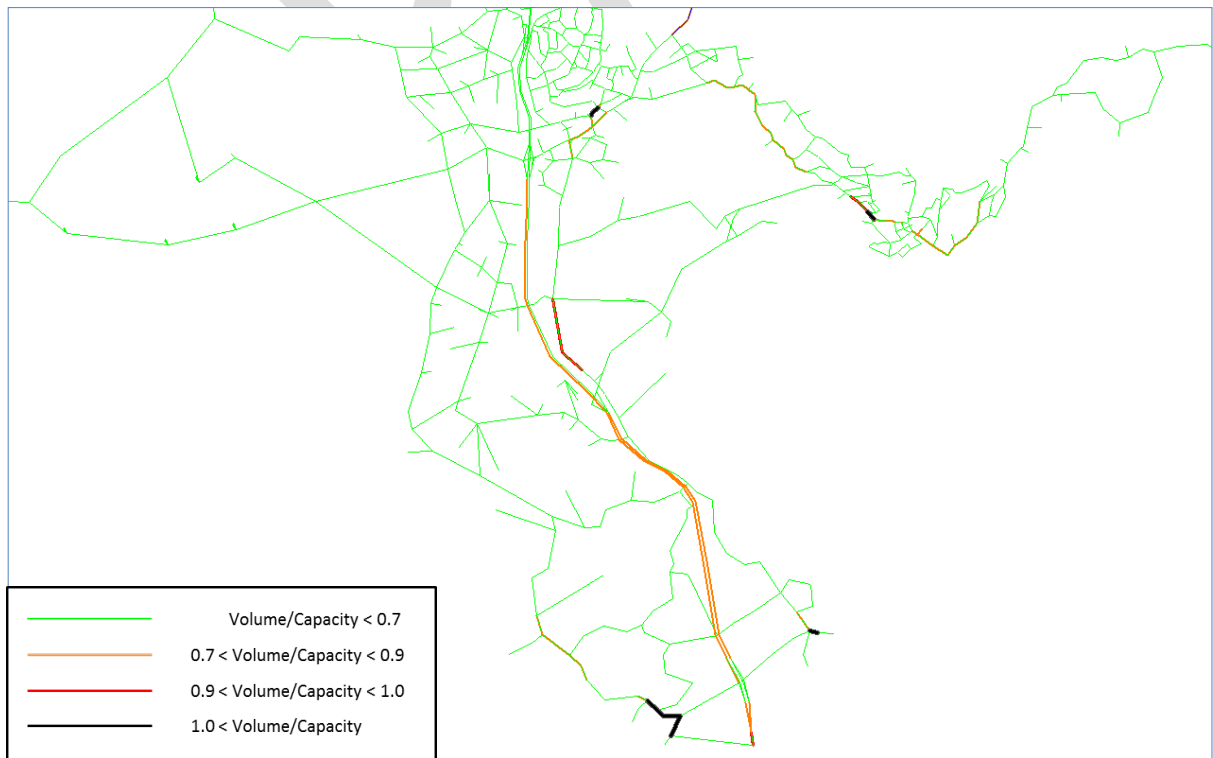


Figure 2 2026 PM Tolled Volume/Capacity

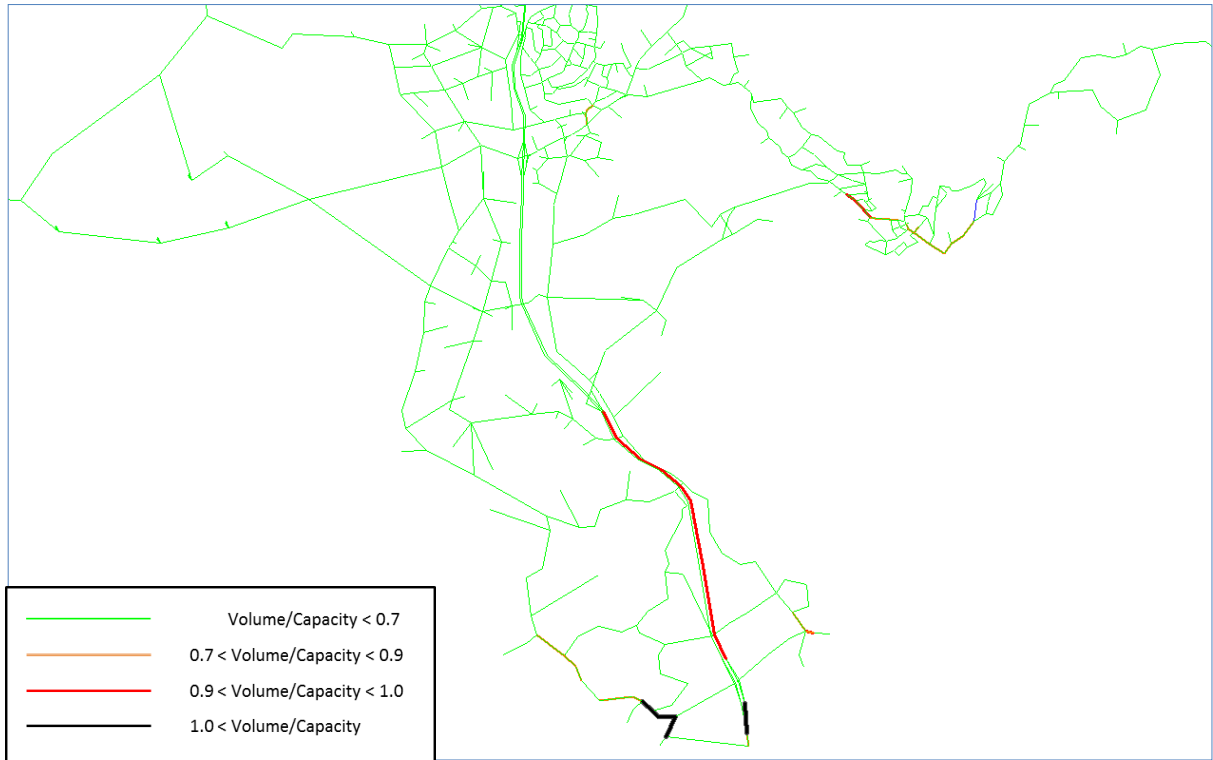


Figure 3 2026 AM Un-tolled Volume/Capacity

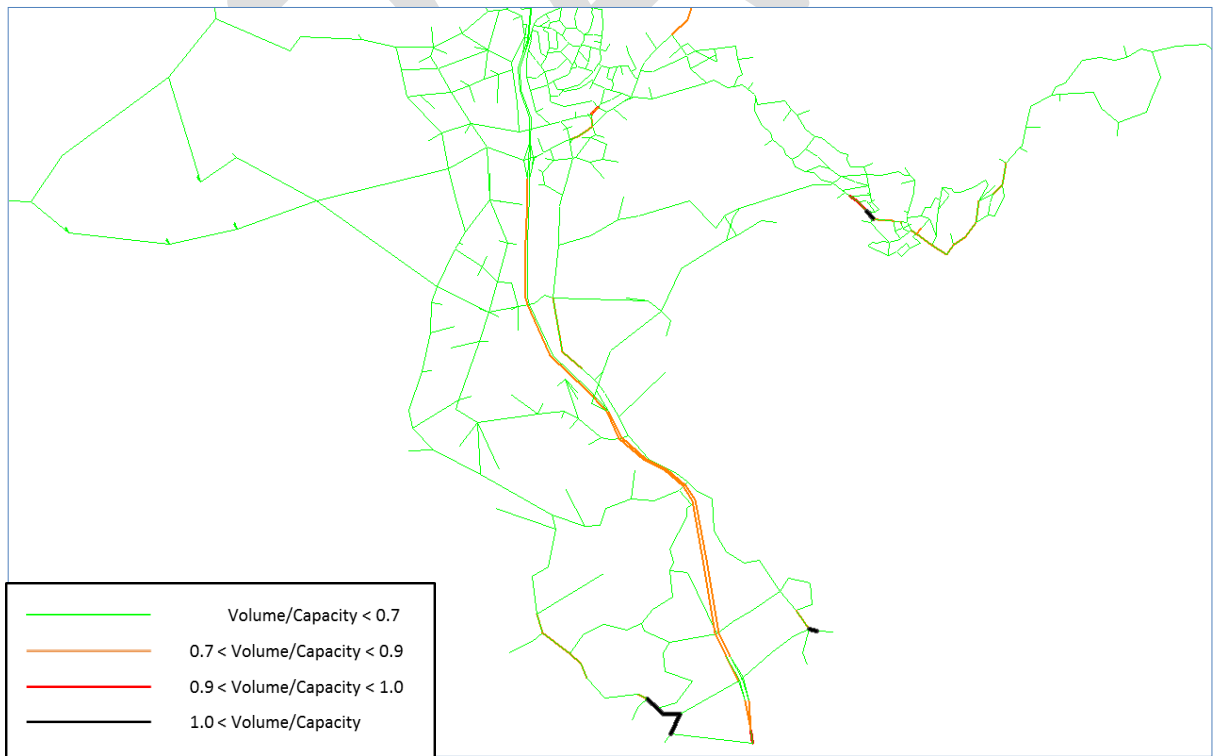


Figure 4 2026 PM Un-tolled Volume/Capacity

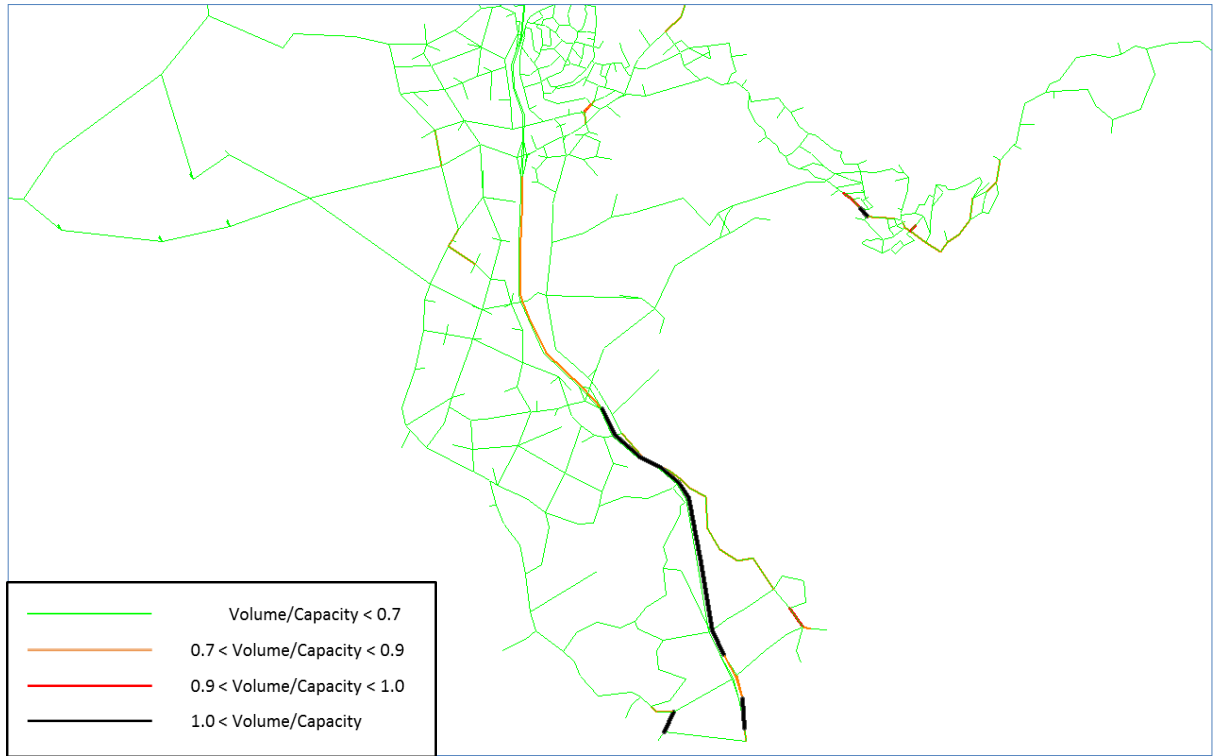


Figure 5 Scenario A 2046 AM Tolled Volume/Capacity

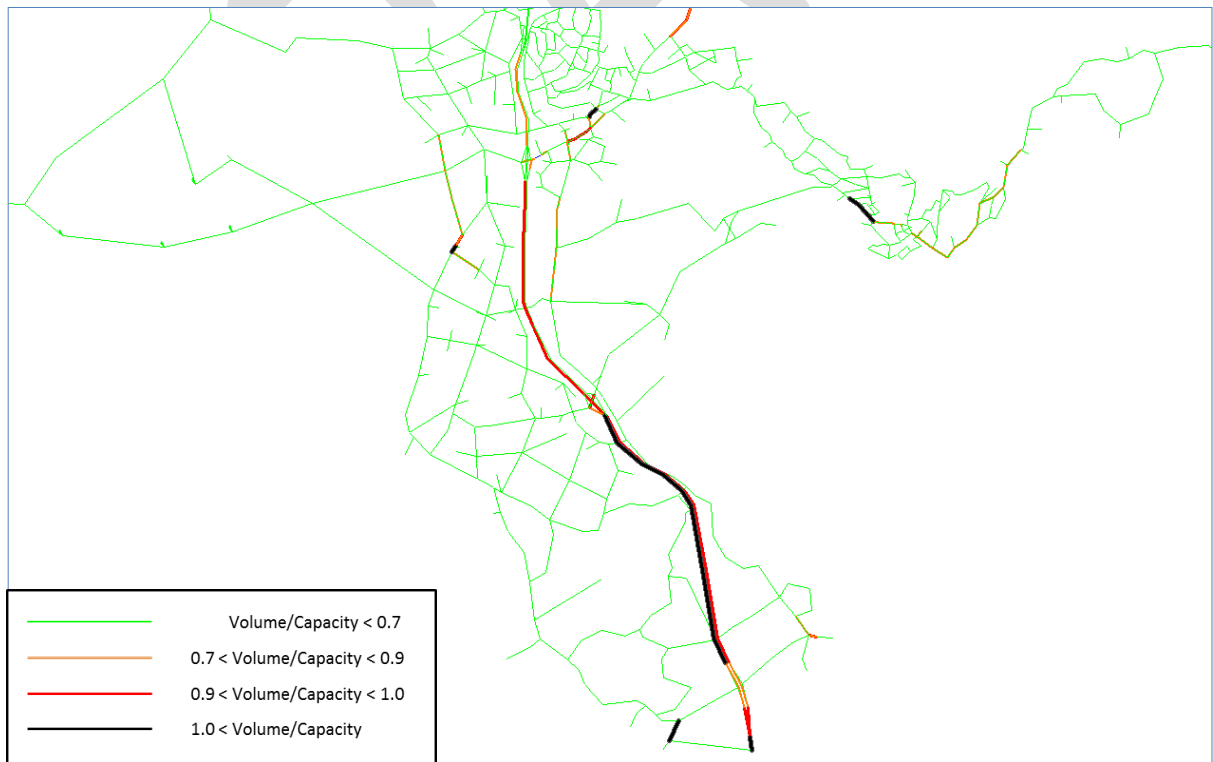


Figure 6 Scenario A 2046 PM Tolled Volume/Capacity

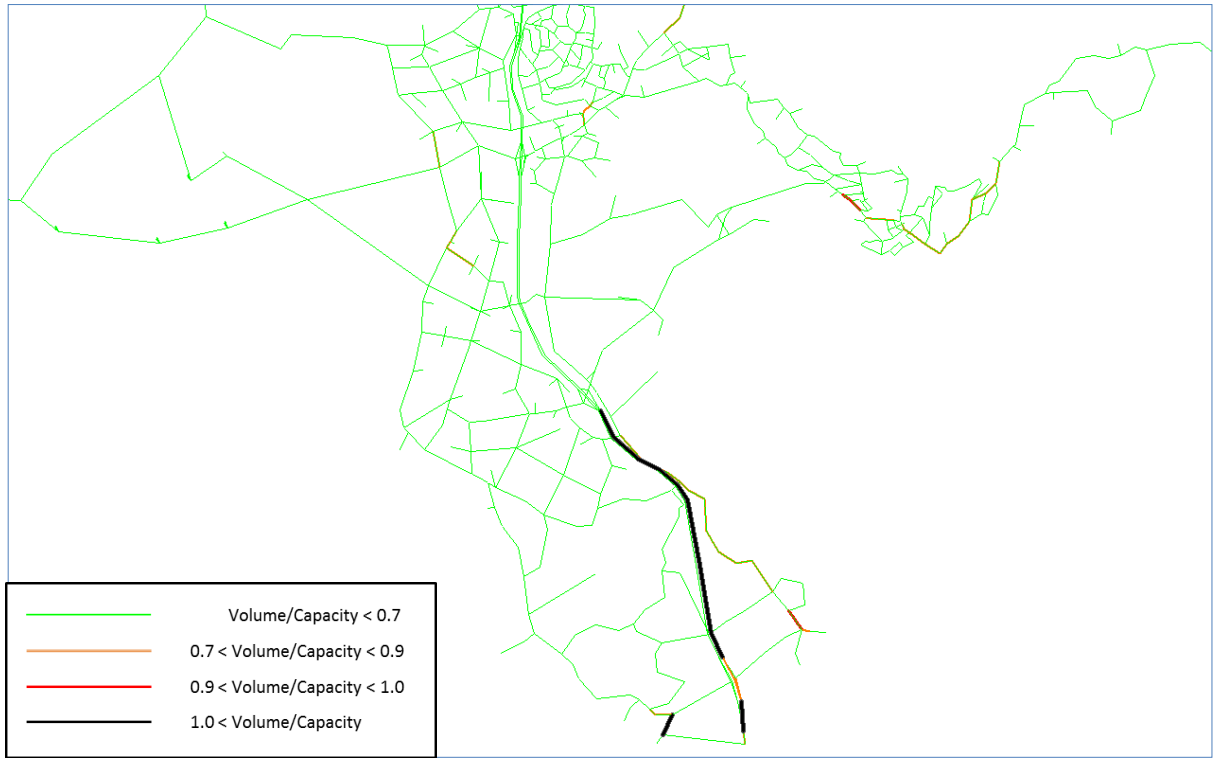


Figure 7 Scenario A 2046 AM Un-tolled Volume/Capacity

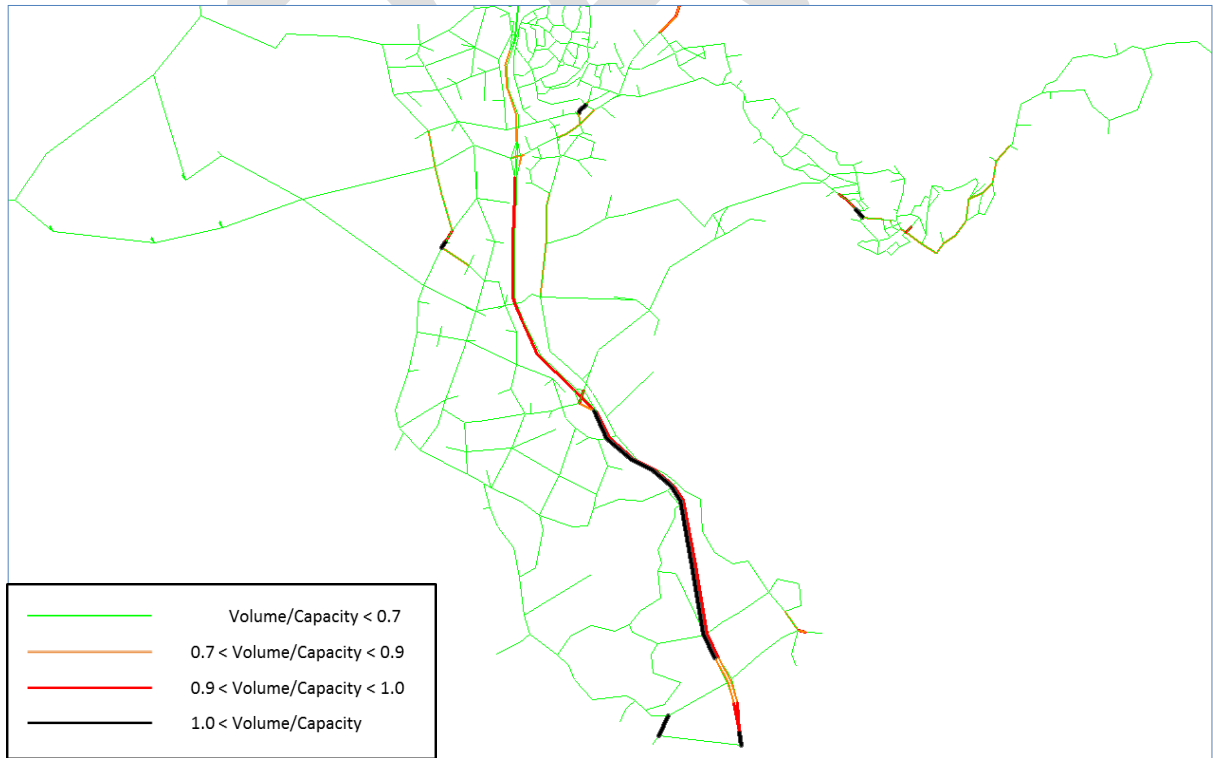


Figure 8 Scenario A 2046 PM Un-tolled Volume/Capacity

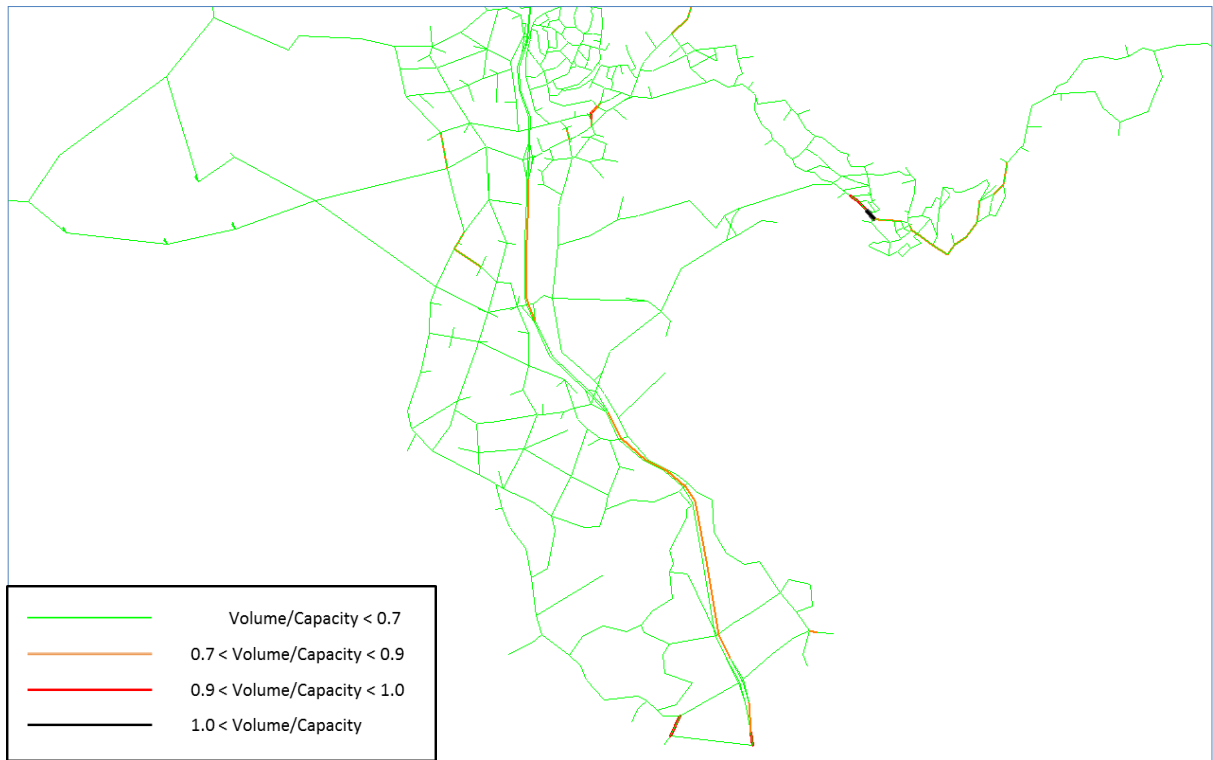


Figure 9 Scenario C 2046 AM Tolled Volume/Capacity

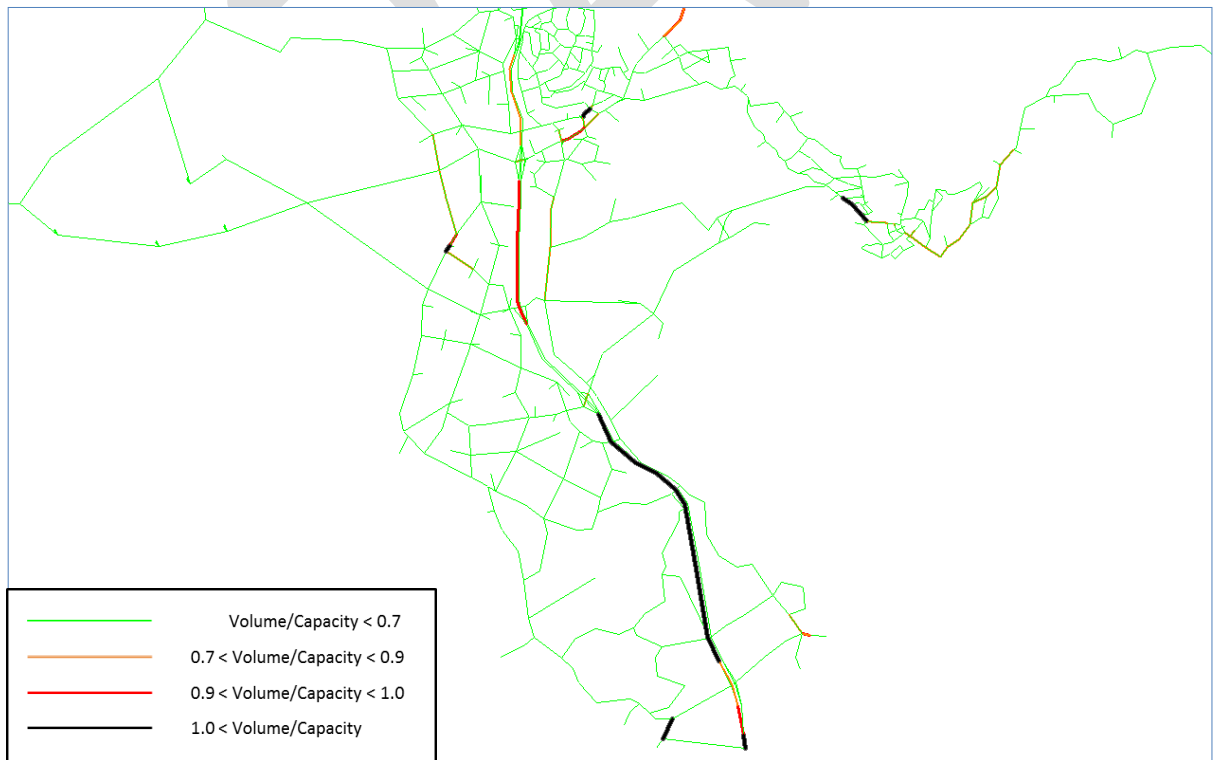


Figure 10 Scenario C 2046 PM Tolled Volume/Capacity

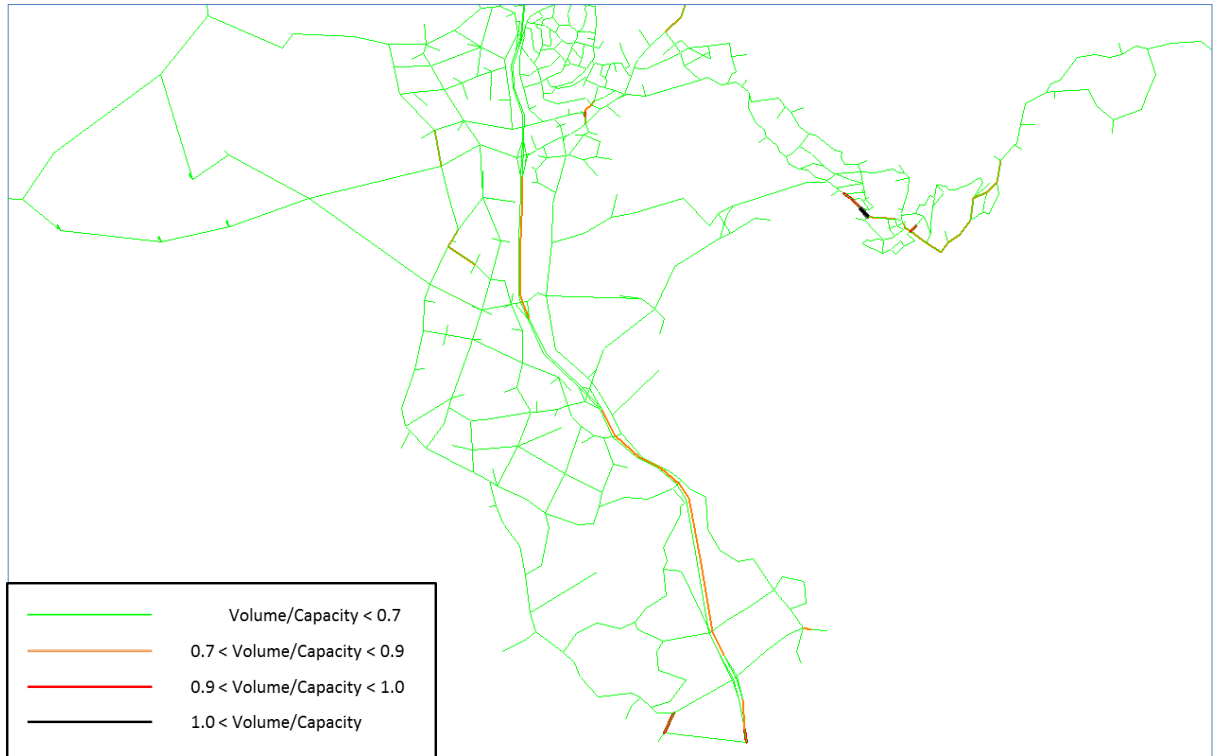


Figure 11 Scenario C 2046 AM Un-tolled Volume/Capacity

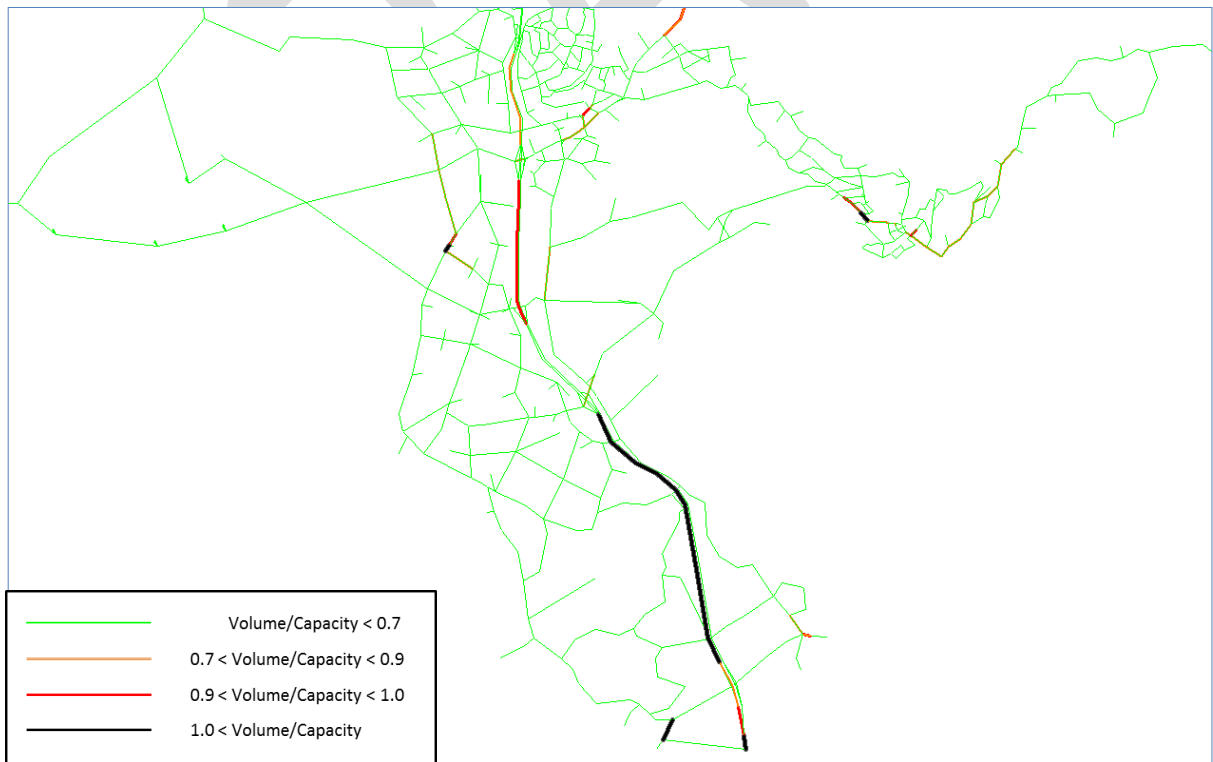


Figure 12 Scenario C 2046 PM Un-tolled Volume/Capacity

Table 1 Scenario A (Tolled) Economic Evaluation

Item	Base	With Agglomeration	With all WEBS
Travel Time Costs, \$M PV	1,145.6		
Congestion Costs, \$M PV	236.2		
Trip Reliability, \$M PV	57.3		
Vehicle Operating Costs, \$M PV	122.9		
Accident Costs, \$M PV	19.3		
Cyclists, \$M PV	1.9		
CO ₂ , \$M PV	6.1		
Agglomeration Benefits, \$M PV		206.6	
Other WEBS, \$M PV			46.8
PV TOTAL BENEFIT, \$M	1,589.5	1,796.1	1,842.9
Construction, \$M		348.0	
Construction, \$M PV		297.4	
Annual/Periodic Maintenance, \$M PV		30.5	
Toll Transaction Costs, \$M PV		16.8	
PV of total costs, \$M		344.8	
PV Net Revenue, \$M		123.5	
National BCR	4.8	5.5	5.6
Government BCR	6.6	7.6	7.8

Table 2 Scenario A (Un-tolled) Economic Evaluation

Item	Base	With Agglomeration	With all WEBS
Travel Time Costs, \$M PV	1,190.7		
Congestion Costs, \$M PV	241.0		
Trip Reliability, \$M PV	59.5		
Vehicle Operating Costs, \$M PV	131.7		
Accident Costs, \$M PV	19.3		
Cyclists, \$M PV	1.9		
CO ₂ , \$M PV	6.6		
Agglomeration Benefits, \$M PV		214.6	
Other WEBS, \$M PV			46.8
PV TOTAL BENEFIT, \$M	1,650.8	1,865.4	1,912.2
Construction, \$M		348.0	
Construction, \$M PV		297.4	
Annual/Periodic Maintenance, \$M PV		30.5	
Toll Transaction Costs, \$M PV		0.0	
PV of total costs, \$M		328.0	
PV Net Revenue, \$M		0.0	
National BCR	5.0	5.7	5.8
Government BCR	5.0	5.7	5.8

Table 3 Scenario C (Tolled) Economic Evaluation

Item	Base	With Agglomeration	With all WEBS
Travel Time Costs, \$M PV	672.8		
Congestion Costs, \$M PV	122.4		
Trip Reliability, \$M PV	33.6		
Vehicle Operating Costs, \$M PV	94.7		
Accident Costs, \$M PV	19.3		
Cyclists, \$M PV	1.9		
CO ₂ , \$M PV	4.7		
Agglomeration Benefits, \$M PV		123.4	
Other WEBS, \$M PV			46.8
PV TOTAL BENEFIT, \$M	949.5	1,072.9	1,119.7
Construction, \$M		348.0	
Construction, \$M PV		297.4	
Annual/Periodic Maintenance, \$M PV		30.5	
Toll Transaction Costs, \$M PV		16.8	
PV of total costs, \$M		344.8	
PV Net Revenue, \$M		123.6	
National BCR	2.9	3.3	3.4
Government BCR	3.7	4.3	4.5

Table 4 Scenario C (Un-tolled) Economic Evaluation

Item	Base	With Agglomeration	With all WEBS
Travel Time Costs, \$M PV	722.7		
Congestion Costs, \$M PV	128.9		
Trip Reliability, \$M PV	36.1		
Vehicle Operating Costs, \$M PV	103.7		
Accident Costs, \$M PV	19.3		
Cyclists, \$M PV	1.9		
CO ₂ , \$M PV	5.2		
Agglomeration Benefits, \$M PV		132.3	
Other WEBS, \$M PV			46.8
PV TOTAL BENEFIT, \$M	1,017.9	1,150.2	1,197.0
Construction, \$M		348.0	
Construction, \$M PV		297.4	
Annual/Periodic Maintenance, \$M PV		30.5	
Toll Transaction Costs, \$M PV		0.0	
PV of total costs, \$M		328.0	
PV Net Revenue, \$M		0.0	
National BCR	3.1	3.5	3.6
Government BCR	3.1	3.5	3.6

5 Public Transport Usage

ART3 predicts both bus passengers and park and ride passenger, albeit the latter is very simplistically modelled. It ART3 park and ride is only allowed in the peak direction in the AM peak this is in the west bound direction and in the PM peak this in the east bound direction. This is in line with the way that commuters would use the park and ride system. These predictions from ART3 are are peak predictions (2hrs) rather than single hour predictions.

In ART3 both the park and ride station and the bus system is unconstrained by capacity meaning an excess of capacity can be predicted. When running the ART model some of the park and ride trips were moderated to reflect likely parking capacity at the sites. Under this moderation 50% of the excess trips were assumed to be using the bus the whole way with 50% driving the whole way.

The proposals for Park and Ride as part of TFUG have been updated to run along the State Highway with stations being located adjacent to interchanges. In 2046, current proposals have stations at Redvale Interchange, Wilks Road, Grand Drive, Wainui and Silverdale. Due to the routing, only Redvale Station users would use Penlink.

In 2026, there is only a station at Silverdale. As such, there are no Penlink PnR users in 2026.

Table 5 ART3 predictions of PnR Users on Penlink in 2046

	AM	PM
Westbound	1,171	-
Eastbound	-	859

6 Travel Time Analysis

Travel time analyses were undertaken to compare the travel time during the peaks traveling to and from Whangaparaoa via Penlink and Silverdale. **Figure 13** and **Figure 14** show the routes analysed for the AM and PM peaks respectively. The section of SH1 to and from the Redvale Interchange was common for both routes. The results from the analysis are shown in **Table 6** to **Table 9**

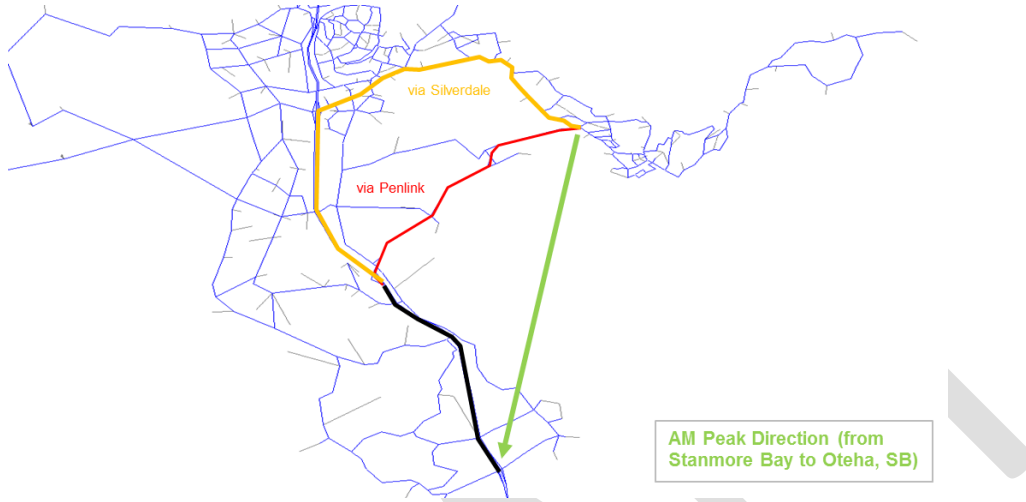


Figure 13 AM Peak Travel Route Map

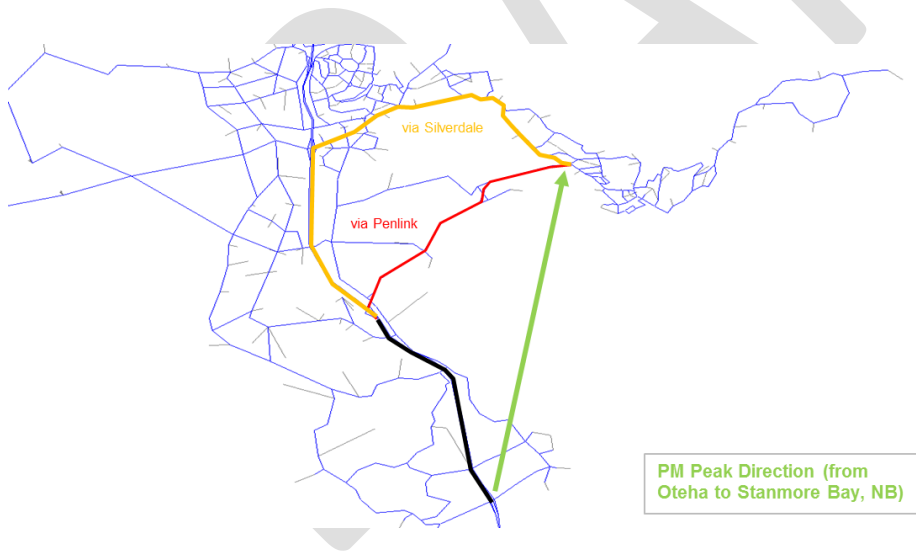


Figure 14 PM Peak Travel Route Map

Table 6 2026 Travel Time Results

	2026 No Penlink	2026 2-Lane Penlink Untolled	2026 2-Lane Penlink Tolled	2026 4-Lane Penlink Untolled	2026 4-Lane Penlink Tolled
AM Peak Direction Totals (from Stanmore Bay to Oteha, SB)					
	AM (mins)	AM (mins)	AM (mins)	AM (mins)	AM (mins)
via Penlink	-	13.6	12.1	11.6	11.5
via Silverdale	23.9	19.2	20.1	19.1	19.8
PM Peak Direction Totals (from Oteha to Stanmore Bay, NB)					
	PM (mins)	PM (mins)	PM (mins)	PM (mins)	PM (mins)
via Penlink	-	12.9	10.7	9.9	9.8
via Silverdale	39.9	18.4	18.9	18.2	18.7

Table 7 2046 Scenario A Travel Time Results

	2046 ScenA No Penlink	2046 ScenA 2-Lane Penlink Untolled	2046 ScenA 2-Lane Penlink Tolled	2046 ScenA 4-Lane Penlink Untolled	2046 ScenA 4-Lane Penlink Tolled
AM Peak Direction Totals (from Stanmore Bay to Oteha, SB)					
	AM (mins)	AM (mins)	AM (mins)	AM (mins)	AM (mins)
via Penlink	-	25.6	19.1	18.4	18.0
via Silverdale	33.9	26.3	27.2	25.7	26.2
PM Peak Direction Totals (from Oteha to Stanmore Bay, NB)					
	PM (mins)	PM (mins)	PM (mins)	PM (mins)	PM (mins)
via Penlink	-	23.9	17.1	15.0	14.7
via Silverdale	70.7	25.3	26.0	24.2	24.7

Table 8 2046 Scenario B Travel Time Results

	2046 ScenB No Penlink	2046 ScenB 2-Lane Penlink Untolled	2046 ScenB 2-Lane Penlink Tolled
AM Peak Direction Totals (from Stanmore Bay to Oteha, SB)			
	AM (mins)	AM (mins)	AM (mins)
via Penlink	-	18.0	11.6
via Silverdale	32.3	18.6	19.6
PM Peak Direction Totals (from Oteha to Stanmore Bay, NB)			
	PM (mins)	PM (mins)	PM (mins)
via Penlink	-	24.0	17.3
via Silverdale	71.9	25.3	26.1

Table 9 2046 Scenario C Travel Time Results

	2046 ScenC No Penlink	2046 ScenC 2-Lane Penlink Untolled	2046 ScenC 2-Lane Penlink Tolled	2046 ScenC 4-Lane Penlink Untolled	2046 ScenC 4-Lane Penlink Tolled
AM Peak Direction Totals (from Stanmore Bay to Oteha, SB)					
	AM (mins)	AM (mins)	AM (mins)	AM (mins)	AM (mins)
via Penlink	-	17.8	11.4	10.4	10.0
via Silverdale	26.9	18.3	19.3	17.6	18.1
PM Peak Direction Totals (from Oteha to Stanmore Bay, NB)					
	PM (mins)	PM (mins)	PM (mins)	PM (mins)	PM (mins)
via Penlink	-	23.9	17.1	15.1	14.7
via Silverdale	39.3	25.0	25.7	23.8	24.4

It should be noted that these travel times have been generated from the model based on the models as they stand. Therefore these travel times should be taken as indicative for comparison purposes only and should not be used in there absolute form.

7 Summary

A summary of the results is shown in **table 5** below.

Table 10 -4-Lane Penlink Summary Table

	Scenario A		Scenario C	
	Tolled	Un-tolled	Tolled	Un-tolled
National BCR	5.6	5.8	3.4	3.6
Government BCR	7.8	5.8	4.5	3.6
AADT (in 2026)	11,800	17,800	11,800	17,800
AADT (in 2046)	16,800	23,200	16,800	23,100
Toll	2.20	-	2.20	-