Transport Technical Analysis

Appendix F1

Job title	Landsborough to Nambour	Job number
		86618/70
		Date
		4 December 2008
Subject	Vissim Analysis of Rail Crossings	

This file note presents the results of Vissim modelling undertaken of the Mooloolah and Landsborough open level crossings (OLCs). The purpose of the analysis was to determine the extent of vehicle queuing and delays which occur whilst the railway crossings are closed to road traffic.

Year 2026 and 2046 AM and PM peaks were analysed for the Do Nothing (no rail upgrade) and Do Something (with rail upgrade) scenarios. Analysis of the Mooloolah OLC also included year 2005 peak volumes.

Assumed train frequencies for the Do Nothing scenario were based on data collected in April 2005, and are shown in the table below.

Service Times During Peak Hour for Do Nothing Scenario

	Southbound	**Northbound**
AM Peak	8:27	8:57
	8:43	
PM Peak	17:55	17:32
	18:00	17:56
	18:19	18:02

For the Do Something scenario, it was assumed that there would be four services in each direction. The assumed frequencies are shown in the table below.

Service Times During Peak Hour for Do Something Scenario

	Southbound	**Northbound**
AM Peak	8:05	8:07
	8:20	8:22
	8:35	8:37
	8:55	8:52
PM Peak	17:35	17:37
	17:50	17:52
	18:05	18:22
	18:20	18:37

It was assumed that the duration of closure of the railway crossing would be approximately 60 seconds for southbound trains and 100 seconds for northbound trains. All trains were assumed to stop at the Mooloolah station for the purposes of this analysis.

The Vissim model for each scenario was run 3 times with different seed values. The results of the analysis presented in the following tables includes average delay, maximum delay and maximum queue length. Screenshots of the Vissim model taken for each scenario run are included in Attachment A to indicatively show the traffic performance of the railway crossings.

Mooloolah OLC Analysis Results

2005 AM		Do Nothing		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)
Bray Road	EB	1	95	25
Neill Road	SB	12	120	38
Mooloolah Connection Road	WB	3	98	112

2005 PM		Do Nothing		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)
Bray Road	EB	6	158	74
Neill Road	SB	21	197	52
Mooloolah Connection Road	WB	12	162	143

2026 AM		Do Nothing			Do Something		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)	Average Delay (s)	Max Delay (s)	Queue (m)
Bray Road	EB	1	97	19	6	106	70
Neill Road	SB	15	119	62	31	167	90
Mooloolah Connection Road	WB	4	98	106	13	124	91

2026 PM		Do Nothing			Do Something		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)	Average Delay (s)	Max Delay (s)	Queue (m)
Bray Road	EB	5	132	38	6	106	32
Neill Road	SB	21	169	65	19	142	52
Mooloolah Connection Road	WB	12	135	133	11	124	98

2046 AM		Do Nothing			Do Something		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)	Average Delay (s)	Max Delay (s)	Queue (m)
Bray Road	EB	1	95	58	8	107	71
Neill Road	SB	59	194	159	161	397	162
Mooloolah Connection Road	WB	6	101	114	18	137	134

2046 PM		Do Nothing			Do Something		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)	Average Delay (s)	Max Delay (s)	Queue (m)
Bray Road	EB	7	161	12	7	107	11
Neill Road	SB	58	367	118	118	246	68
Mooloolah Connection Road	WB	17	170	105	105	134	70

Landsborough OLC Analysis Results

2026 AM		Do Nothing			Do Something		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)	Average Delay (s)	Max Delay (s)	Queue (m)
Gympie St North	EB	1	44	34	2	46	37
Gympie St North	WB	1	44	30	3	44	25

2026 PM		Do Nothing			Do Something		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)	Average Delay (s)	Max Delay (s)	Queue (m)
Gympie St North	EB	3	44	35	2	46	15
Gympie St North	WB	2	44	33	3	44	21

2046 AM		Do Nothing			Do Something		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)	Average Delay (s)	Max Delay (s)	Queue (m)
Gympie St North	EB	1	44	34	2	45	35
Gympie St North	WB	1	44	39	3	44	39

2046 PM		Do Nothing			Do Something		
Approach	Direction	Average Delay (s)	Max Delay (s)	Queue (m)	Average Delay (s)	Max Delay (s)	Queue (m)
Gympie St North	EB	2	44	41	2	46	40
Gympie St North	WB	2	43	46	3	44	39

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Roland Cathcart		
Signature			

ATTACHMENT A
Vissim Screenshots

Figure A1 – Mooloolah OLC, 2005 AM

Figure A2 – Mooloolah OLC, 2005 PM

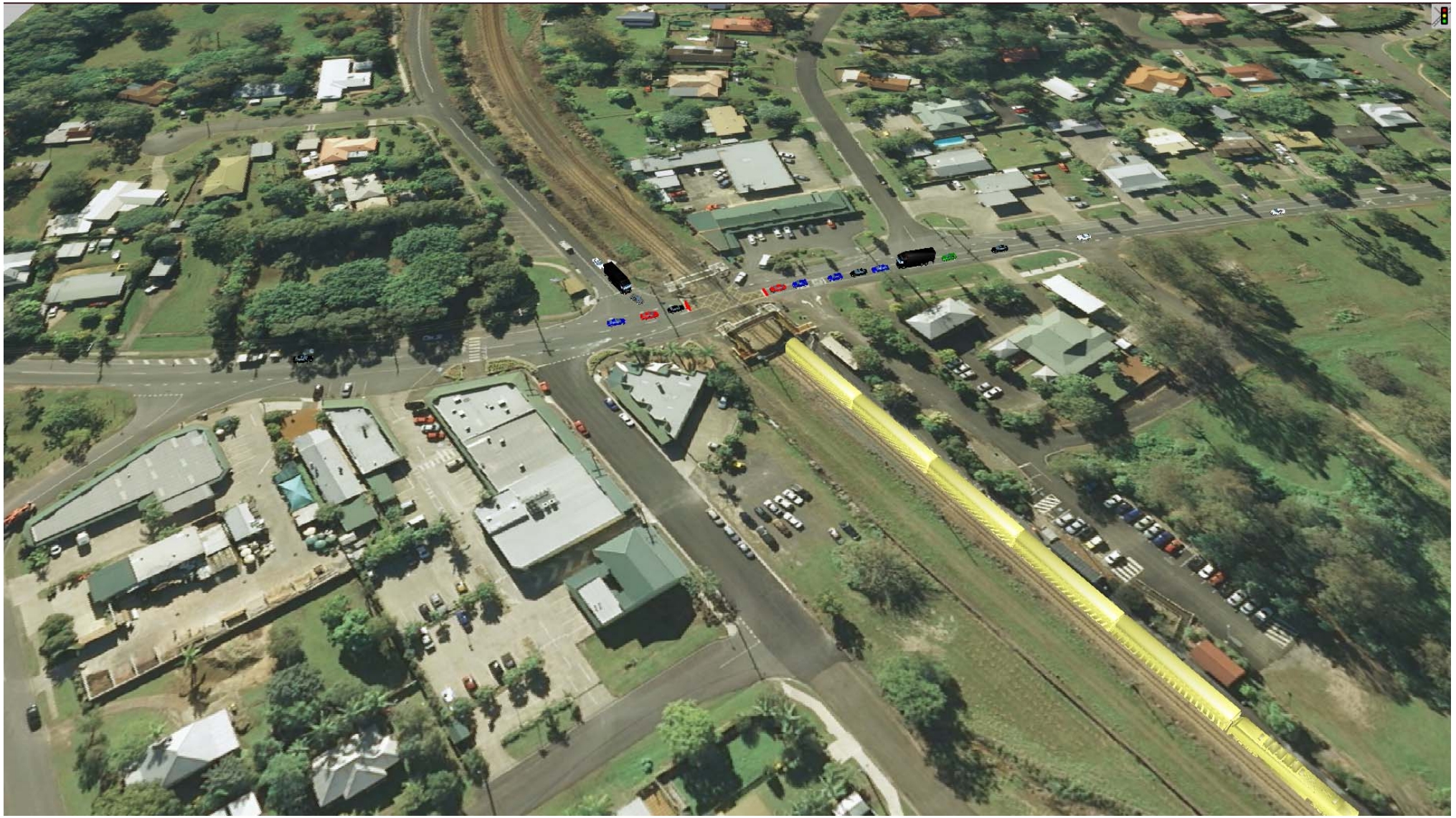

Figure A3 – Do Nothing Scenario, Mooloolah OLC, 2026 AM

Figure A4 – Do Nothing Scenario, Mooloolah OLC, 2026 PM

Figure A5 – Do Nothing Scenario, Mooloolah OLC, 2046 AM

Figure A6 – Do Nothing Scenario, Mooloolah OLC, 2046 PM

Figure A7 – Do Something Scenario, Mooloolah OLC, 2026 AM

Figure A8 – Do Something Scenario, Mooloolah OLC, 2026 PM

Figure A9 – Do Something Scenario, Mooloolah OLC, 2046 AM

Figure A10 – Do Something Scenario, Mooloolah OLC, 2046 PM

Figure A11 – Do Nothing Scenario, Landsborough OLC, 2026 AM

Figure A12 – Do Nothing Scenario, Landsborough OLC, 2026 PM

Figure A13 – Do Nothing Scenario, Landsborough OLC, 2046 AM

Figure A14 – Do Nothing Scenario, Landsborough OLC, 2046 PM

Figure A15 – Do Something Scenario, Landsborough OLC, 2026 AM

Figure A16 – Do Something Scenario, Landsborough OLC, 2026 PM

Figure A17 – Do Something Scenario, Landsborough OLC, 2046 AM

Figure A18 – Do Something Scenario, Landsborough OLC 2046 PM

Queensland Transport

Landsborough to Nambour Rail Corridor Study

Landsborough to Nambour Demand Forecast Review

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Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 4 108 Wickham Street, Fortitude Valley QLD 4006, GPO Box 685 Brisbane QLD 4001
Tel +61 7 3023 6000 Fax +61 7 3023 6023
www.arup.com

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Contents

Appendices

1 Introduction

The purpose of this report is to outline the high level strategic transport modelling and demand forecasting for the upgrade of the North Coast Rail Line between Landsborough and Nambour (L2N). The demand forecasts are intended to provide an indication of the likely patronage along the corridor as a result of the proposed upgrade and not for the purposes of a detailed economic assessment.

A key focus of the report is to provide an understanding of the pertinent factors in future demand along the corridor rather than quantitative results. However, a number of scenarios are discussed including results.

1.1 Transport Model

A number of demand forecasting tools are available for the purposes of this study. These ranged from spreadsheet models (created specifically for the study) to more complex transport models. Given the timeframes and need for consistency with previous planning work undertaken in the region, it was decided, in consultation with Queensland Transport (QT), to base the current Landsborough to Nambour forecasting task on previous transport modelling work undertaken for Queensland Transport (QT) in the region.

From the documentation supplied, the transport model for the Sunshine Coast region has not been rigorously validated against base conditions, but was deemed a sufficient tool for forecasting demand for Landsborough to Nambour at this stage of project feasibility. Further discussion on the model relationship with observed data is discussed later in the report.

All assumptions made by Arup in using this model have been agreed with QT and TransLink to ensure they are satisfied that the approach taken does not bias the results.

2 Review of Transport Model

The supplied sketch transport model was reviewed in terms of its "fitness for purpose" for forecasting demand along the Landsborough to Nambour corridor. The critical issues identified include:

- Coded alignment for the Landsborough to Nambour Corridor;
- Operational parameters for the corridor;
- Time periods represented
- Input files
- Translink fares
- Representation of External Trips (between Sunshine Coast and Brisbane)
- Generalised Cost
- Park and Ride Representation
- Demographic Inputs

The supplied model has a design year of 2026 and 2051, both with "high series" demographic forecasts. The 2051 has an additional set of demographic assumptions, which is called a "high access" model. The 2051 high access scenario combines consolidated demographic growth around areas accessible to public transport, with high frequencies for the public transport which is expanded in **Section 4** of this report.

The model deals with public transport by assigning a hierarchy to "corridors". It identifies Primary Corridors, such as the North Coast Rail Line and CAMCOS, and Secondary Corridors, such as bus routes between the coastal and inland townships. Assumptions are then applied network wide based on the hierarchy, such as frequency and speed.

2.1 Supplied Model Scenarios

A description of supplied model scenarios is as follows:

- 2005 Base Model – The "validated" 2005 base model
- 2026 High Demographics – 2026 High Growth Demographic Series model
- 2051 High Demographics – 2051 High Growth Demographic Series Model
- 2051 High Access Demographics – 2051 High Access with concentrated demographic land uses surrounding the public transport corridors

It is understood that a 2026 and 2051 low series demographics model was developed, however it was not supplied as part of the work undertaken in this report.

2.2 Landsborough to Nambour Rail Alignment

As part of the review of the supplied transport model, it was found that the future scenarios do not contain the preferred EIS alignment for the Landsborough to Nambour Rail project. A track improvement is implied due to the increased frequency on the rail corridor. The current alignment with its single track would not support the frequency of rail paths modelled in the base scenario. Thus the existing and preferred alignment has been recoded into the model to better represent the appropriate distances and speeds from the operational modelling undertaken for the EIS.

The supplied model was been coded with a speed of 80 km/h on the "primary public transport corridors" in the model. This includes the existing alignment on the Landsborough to Nambour section of the North Coast rail line. However, analysis undertaken by Systemwide shows that the current rail corridor is not able to maintain a speed of 80km/h

due to the existing alignment and speed restrictions. The speed has thus been reduced to 60 km/h for the existing Landsborough to Nambour section.

The Systemwide analysis for the proposed alignment highlights that it is possible that Inter-Urban passenger services would achieve speeds in excess of 100 km/h on the proposed alignment. For the purposes of the demand forecasting analysis, an average speed of 90km/h has been assumed.

2.3 Rail Corridor Traffic

The model does account for the various types of rail traffic that currently use the corridor. As a transport route of regional significance, the Landsborough to Nambour section of rail caters for significant volumes of freight along with limited stop travel and tilt trains. This could limit the capacity of the corridor to such an extent to make the frequencies assumed in the supplied 2051 high access scenario unachievable.

2.4 Modelled Time Period Scenarios

The off peak period of the supplied model does not allow for times of no operation of the public transport corridor. The AM Peak (07:00 – 09:00), PM Peak (16:00 – 18:00) and other Off-Peak times are modelled. However, based on existing data, public transport will not be operational over a 24 Hour period, thus the patronage forecasts for the 24 Hour period could be slightly higher than anticipated.

This is not a critical issue as the total impact of vehicle traffic in the off-peak period during the evening would decrease significantly in conjunction with the public transport patronage, thus having and have a minimal impact on passenger volumes.

2.5 Factor File and Patronage Change

Upon the completion of the SCTFM (road based model) model run, the model calculates the mode share and also the total magnitude of motorised person trips for the modelled area.. However, the mode share process references the incorrect files for Home Based Vistors (HBV). The HBW (Home Based Work) file has been imported as opposed to the **HBV**. **Table 2.5** below shows the difference in patronage forecast with the changed file name. Currently this is based on the supplied modelling only and will be further assessed as part of the “with L2N” options.

Table 2.5: Erroneous Factor File Impact

Scenario Description	Year	Time Period	Total Patronage					
			Supplied Model (HBW file)			Corrected Factor File		
			Mot Pers	Priv Veh	PT	Mot Pers	Priv Veh	PT
Supplied PT Modelling – High Series	2026	PM	285,600	277,100	8,400	281,300	273,200	8,100
		24H	1,746,100	1,691,400	54,700	1,747,200	1,696,400	50,800
Supplied PT Modelling – High Series	2051	PM	442,700	428,500	14,200	436,000	423,700	12,300
		24H	2,661,300	2,582,100	79,200	2,663,000	2,588,000	75,000
Supplied PT Modelling – High Access	2052	PM	441,300	389,400	51,900	434,600	386,400	48,200
		24H	2,658,600	2,342,100	316,500	2,660,300	2,343,000	317,300

2.6 Fares File

The fares input files were examined and compared to the existing data on the TransLink website (*www.translink.com.au/qt/translin.nsf/index/ti_fares_aug08 - effective 4 August*

2008). Based on this information it was found that the fares for inbound and outbound passengers travelling from zones pay the same fare, however the **fare.fac** file has different values on certain instances. **Appendix A** shows the comparison that has been undertaken with the adjusted current fares and those used in the supplied model.

Table A.1a shows the peak hour fares and **Table A.1b** shows the off-peak fares used in the supplied model. The adjusted fares tables used as a sensitivity test in the forecast modelling are shown in **Table A.1c** for the peak period and **Table A.1d** for the off-peak period. The fares have been obtained from TransLink and have been summarised, it was found to be higher than that of the supplied fares. Using this fare structure would thus increase private vehicle trips as public transport would be deemed to be more expensive. To balance the proposed fare the total of the supplied fare was used and the new fair was then proportionally adjusted to represent the same total. This adjustment was undertaken as there was no supporting data as to how the fares were derived, which may include the usage of concession ticketing prices.

The result being the same total as that of the supplied fares but a restructure of the fare cost matrix and having the inbound and outbound values match.

2.7 External Sector Assumptions

The external zones in the model have been “hard coded” into the SCTFM model for the road based vehicle volumes. The southern cordon of the model occurs south of Caboolture and as such trips between the Sunshine Coast and Brisbane are not explicitly modelled. This is undertaken using cordon volumes based on historic growth rates extrapolated forward and the model process matching those volumes in the road network assignment. Hence, the total volume of external public transport trips will be influenced by the cordon volume being imported into the SCTFM model. The factor files that are used within the model does not change the total cordon volumes, however it will affect route choice.

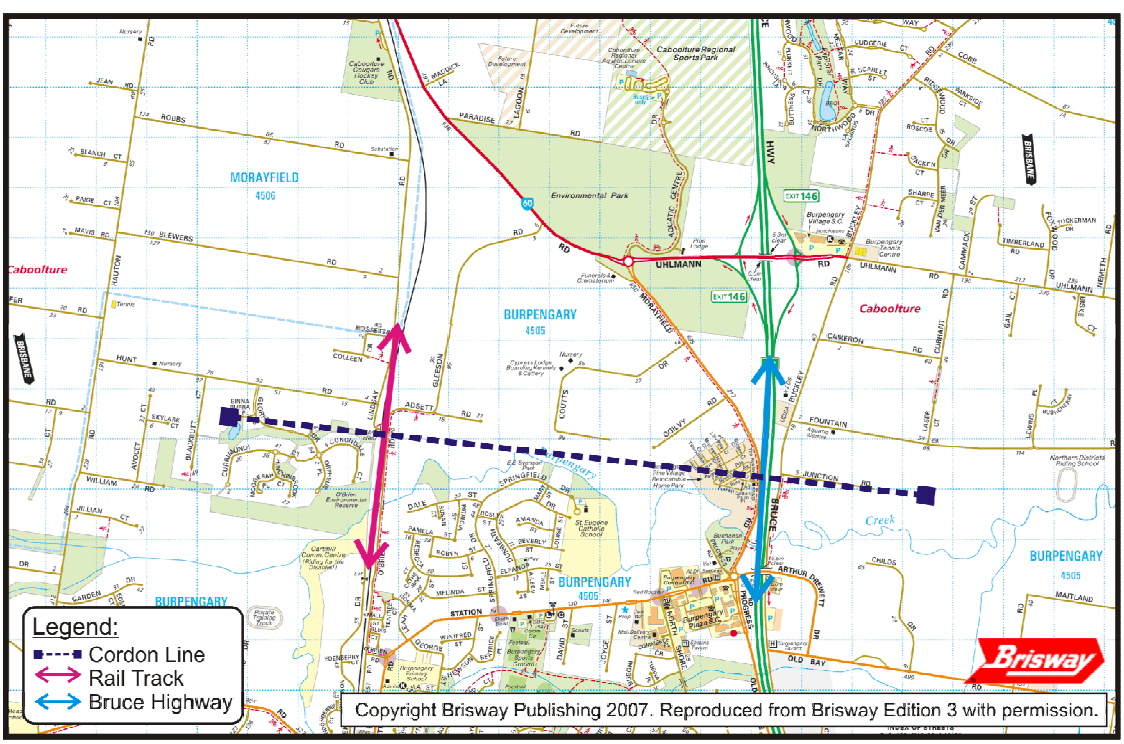


Figure 2.7: Southern Cordon Location

Section 6 of this report further expands upon the outputs from the model, including at the external sector.

2.8 Users Generalised Cost (Utility)

Generalised cost is assumed to increase at the same rate as CPI in the model with both transport users value of time and road vehicle operating costs increasing at the same rate. A sensitivity was undertaken as part of this review to under the impacts of road user operating costs increasing at higher level than CPI.

2.9 Public Transport Fares

With a zonal based fare system, as utilised by TransLink, a proportional higher cost increase for short trips can offset the cost increase for longer trips. Thus it is unlikely that the cost of a ticket for travel between Nambour and Brisbane will increase at the same rate as an inter-zonal trip in Brisbane Zone 1.

The model does not take into account an increase of fares over and above CPI and has been kept the constant for all modelled scenarios. The fare structure is based on the version prior to the "Go Card" implementation. A sensitivity test undertaken for the purposes of this review does however have an adjusted fare structure which has a relative discount for longer distance travel. Given that sensitivity test represents the current fare structure, it is considered this would be most appropriate for forecast models.

2.10 Park & Ride

The model does not provide any additional data for Park and Ride at Corridor Station locations. These facilities are not explicitly modelled in the supplied transport model.

2.11 Demographic Inputs

Table 2.11a and **Table 2.11b** below outline the population and employment forecasts used in the model for the towns along the rail corridor. **Table 2.11a** also includes 2006 ABS population census data for the purposes of comparison. The 2005 model demographics are slightly higher than the ABS 2006 census population figures; however some of this may likely be a result of the model zones not matching up with the ABS census zones. It is considered the estimates are within are acceptable level of accuracy.

Table 2.11a: Model population forecasts for L2N townships

	Town						
Year	Landsborough	Mooloolah	Eudlo	Palmwoods	Woombye	Nambour	Total
2005	3,343	2,478	686	4,424	2,557	10,386	23,874
2006 (ABS)	3,028	3,252	851	4,487	2,094	9,773	23,485
2026	5,222	2,912	967	8,676	4,200	15,877	37,854
2051 High	10,261	5,722	1,841	13,158	4,879	37,809	73,670
2051 High Access	10,261	5,722	1,841	13,158	4,879	37,809	73,670

Source: Queensland Transport

Table 2.11b: Model employment forecasts for L2N townships

	Town						
Year	Landsborough	Mooloolah	Eudlo	Palmwoods	Woombye	Nambour	Total
2005	1,027	416	134	552	1,004	11,937	15,069
2026	1,502	405	244	948	1,408	16,152	20,659
2051	3,629	979	534	1,299	1,802	44,721	52,964
2051 High Access	3,629	979	534	1,299	1,802	44,721	52,964

Source: Queensland Transport

It should be noted that whilst the accompanying technical report states that some development consolidation around transport nodes has been assumed for the “High Access” scenario, no such intensification exists in the demographic input files. However the number of person trips from these towns does increase as a result of the “High Access” scenario. Further investigation of this result is required.

3 Comparison against Observed Data

The following sections discuss a high level review of model outputs against observed data.

3.1 Model Validation Data

The accompanying modelling technical report supplied by QT states that ticketing data shows that there are over 10,000 two-way public transport trips south of Landsborough. It is understood that this data includes school trips on privately operated bus services. The school trips are unlikely to be a large proportion of these trips given the relatively small population of the area and distance required to travel to major schools. At the time of writing this report Arup have not been supplied the supporting information in order to confirm this volume.

This volume is comparable to the North Coast Rail Line in the 2005 base model, but in the order of 10,000 trips would appear high given the number of rail services and overall PT capacity. There are currently 26 rail services on the corridor and an additional 24 Railbus services all day in both directions between Caboolture and Nambour, (10 of which are express to Landsborough and Nambour). Assuming each bus service contains 50 passengers, there would be 1,200 trips on the bus throughout the day. These assumptions would leave 8,800 people for 26 rail services, implying approximately 340 people on every train in the day south of Landsborough. Based on anecdotal evidence, the ticket data volumes appear high however further investigation is required.

3.2 Journey to Work

A review of Journey to Work (JTW) data indicates that trips to Brisbane from the Sunshine Coast have a higher Public Transport mode share than all trips in the Sunshine Coast. A summary of key findings is given below:

- 2001 JTW - Sunshine Coast to everywhere - 87,000 trips, 500 train trips (0.5% of total Sunshine Coast Home Based Work Trips)
- 2003/2004 SEQTS - Sunshine coast to everywhere - 11,200 trips, 23 train trips (0.2% of total Sunshine Coast Trips)
- 2006 JTW - Sunshine coast to everywhere - 119,000 trips, 744 train trips (0.6% of total Sunshine Coast Home Based Work Trips)
- 2006 JTW - Sunshine coast to Brisbane - 6,700 trips, 600 train trips (9% of total Home Based Work trips from Sunshine Coast to Brisbane)

Pertinent points from the analysis for the Landsborough to Nambour study include:

- Most of the work-based train travel is travel to Brisbane (600) with the other trips (114) going to other towns on the north coast line.
- The data indicates that current rail performs a greater role in the transport network for travel between the Sunshine Coast and Brisbane than the role that PT plays for local trips within the Sunshine Coast region.
- The data indicates 8% per annum increase in home based work rail trips between 2001 and 2006.
- Home Based Work trips are likely to make up the majority of travel on current rail trips in the Sunshine Coast region.
- The 600 train trips from the Sunshine Coast to Brisbane as identified from 2006 JTW data is would appear lower than comparable ticketing data used for model validation purposes.

More detailed output from the JTW is contained in **Appendix B**.

4 Modelled Scenarios

Table 4.1 below shows the modelled scenarios and a brief summary of assumptions, which are included as part of the demand forecasting based on the supplied transport model.

Table 4.1: Scenarios Modelled for the Review

Scenario Number	Year	Demographics	PT Network
1	2026	High	Without L2N Rail Upgrade
2	2026	High	With L2N Rail Upgrade
3	2051	High	Without L2N Rail Upgrade
4	2051	High	With L2N Rail Upgrade
5	2051	High Access	Without L2N Rail Upgrade
6	2051	High Access	With L2N Rail Upgrade
*7**	*2026*	*High*	*With L2N Rail Upgrade*
*8**	*2051*	*High*	*With L2N Rail Upgrade*
*9**	*2051*	*High Access*	*With L2N Rail Upgrade*

* - Sensitivity modelling undertaken with updated fare structure, detailed data is included in **Appendix A** and also **Section 6**.

Due to the preferred alternative alignment for the Landsborough to Nambour Public Transport Corridor it has been assumed that a more feasible 90km/h could be achieved. This is further explained in **Section 2.2** of the report.

Table 4.2 below shows the assumed speeds for the Public Transport (PT) corridors and also the PT frequencies that have been assumed for this analysis.

Table 4.2: Scenario Speed & Frequency Assumptions

Scenario	PT Frequency (Peak / Off-Peak) (min)			Speed (km/h)		
	L2N	Primary Corridor	Secondary Corridor	L2N	Primary Corridor	Secondary Corridor
1	30/60	15/30	15/30	60	80	60
2	15/30	15/30	15/30	90	80	60
3	30/60	15/30	15/30	60	80	60
4	15/30	15/30	15/30	90	80	60
5	10/20	10/20	15/30	60	80	60
6	10/20	10/20	15/30	90	80	60

The frequency assumptions for the 2051 High Access modelling scenario has been assumed at 10 minute peak and 20 minute off-peak frequencies for the Landsborough to Nambour Public Transport corridor and also for the Primary Public Transport corridors. This has been changed from the supplied 5 minute peak and 10 minute off-peak frequencies that were supplied as it was thought to be unrealistic not allow for other uses of the corridor. The Secondary corridors operating parameters have been retained as per the supplied model.

5 Demographic Assumptions

5.1 High Level Review of Population and Employment Forecasts

Nambour is in the unique position of currently having more employment than residents, partly due to the fact that it has several large employment generators such as Nambour General Hospital and the Sunshine Coast Regional Council Offices. The current resident to employment ratio according the 2005 model is 0.87 persons per job. However, the demographics input into the model show that employment and population will balance out by 2026 with 0.98 persons per job, but the gap will widen by 2051 with 0.85 person per job.

The recently released Draft SEQ Regional Plan 2009-2031 identifies Maroochydore as the major area of growth becoming "*the business, community services and employment focus for the Sunshine Coast*", while Nambour "*supports the higher retail, employment and service needs of Nambour, and the surrounding semi-urban and rural hinterland population*". Therefore, this policy setting will allow the possibility that employment increases at a faster rate than population in Nambour however the commercial opportunities appear currently focused towards the coastal region.

5.2 Induced Population Demand

With the improved accessibility created by a major transport investment, an area becomes a more attractive place for people to live as they have increased access to transport. As accessibility to transport improves, the desirability of a location as a place to live also increases and an 'induced population' and 'induced demand' for transport in this area can be observed. Population forecasts generally do not take this induced demand into account and thus, the population forecasts may underestimate the growth in an area.

This element is difficult to accurately determine and has not been included in any of the assumptions. However, this phenomenon could result in the 2051 demographic forecasts being achieved at an earlier point in time.

5.3 Growth potential within the urban footprint

The 2051 populations for the rail towns show that there is some significant increase in population for some towns such as Palmwoods and Nambour. But, based on the areas zoned for residential use, Landsborough and Mooloolah have the potential for further increase beyond these forecasts.

If you apply a density of 10 households per hectare, which is typical of Residential A developments, along with a 2.5 person per household occupancy, then it is possible to get a population in excess of 14,000 for Landsborough and 13,000 for Mooloolah, although, it is accepted that this may not be achievable due to factors such as environmental constraints or public opposition to large scale developments.

These increases in population have not been explicitly modelled in for this review. Further consultation with planning authorities would be required before any such assumptions can be modelled with a reasonable sense of certainty.

6 Demand Forecasts

6.1 Station Boarding/Alighting Patronage

Table 6.1 shows the total patronage numbers for the boarding and alighting at each of the station on the Landsborough to Nambour corridor. This has been undertaken for a 24 Hour period.

Table 6.1: Boardings/Alightings at Landsborough to Nambour Stations

Station	Boarding/ Alighting	2005 (24H)	2026 (24H)			2051 (24H)			2051 High Access (24H)		
			S1	S2	*S7**	S3	S4	*S8**	S5	S6	*S9**
Nambour	Boarding	4,000	6,800	7,300	*7,300*	8,600	9,200	*9,000*	28,700	32,800	*30,800*
Nambour	Alighting	4,000	6,900	7,400	*7,300*	8,600	9,200	*9,000*	26,100	30,200	*28,100*
Woombye	Boarding	100	300	300	*300*	400	400	*400*	700	700	*700*
Woombye	Alighting	100	200	200	*200*	300	300	*300*	700	700	*700*
Palmwoods	Boarding	400	700	700	*700*	800	800	*800*	1,600	1,400	*1,300*
Palmwoods	Alighting	400	600	600	*600*	700	700	*700*	1,600	1,400	*1,400*
Eudlo	Boarding	100	100	100	*100*	100	100	*100*	500	500	*400*
Eudlo	Alighting	100	100	100	*100*	200	200	*200*	400	500	*400*
Mooloolah	Boarding	0	100	100	*100*	100	100	*100*	500	500	*500*
Mooloolah	Alighting	0	100	100	*100*	100	100	*100*	600	600	*600*
Landsborough	Boarding	8,400	11,300	11,800	*11,700*	13,300	13,900	*13,800*	14,200	18,700	*17,600*
Landsborough	Alighting	8,200	11,500	11,900	*11,900*	13,400	13,900	*13,900*	14,200	18,800	*17,500*

* Changed Fare File Sensitivity Models

Figure 6.1 illustrates the peak hour patronage along the corridor for sections of rail between stations, split by direction of travel.

The key outcomes of the study in terms of boardings and alightings along the corridor are:

- Landsborough generally has a greater number of boardings and alightings up to 2026 with Nambour having the greater number along the corridor by 2051
- The largest increases in patronage of approximately 7% due the Landsborough to Nambour upgrade are at the Landsborough Station apart from the 2051 “High Access” scenario.
- In the 2051 “High Access” scenario the Nambour Station patronage increases by up to 30% as a result of the Landsborough to Nambour upgrade.
- The 2051 “High Access” scenario is shows patronage significantly greater than the base 2051 scenario indicating that high frequency and development intensification will yield significant increase in patronage,
- Given the number of jobs at Nambour, the mode share to train is extremely high and would suggest “CBD like” road user costs are implied such as parking, road network congestion etc.

6.1.1 Sensitivity Tests

Three sensitivity tests were undertaken for the purposes of the review:

- Updating the Public Transport fares to the current fare structure (with a discount for longer distance trips)
- Increasing the Vehicle Operating Costs for road based users.

6.1.2 Vehicle Operating Cost Sensitivity

A sensitivity test has been undertaken by increasing the cents per kilometre travelled from the existing 13c/km to 27c/km for the 2026 High, 2051 High and 2051 High Access models.

The 27c/km was based on the price of vehicle travel per km increased at a 1% p.a. compounded growth rate up to 2020 based on the relationship between

- Consumer Price Index (CPI)
- Average Weekly Earnings
- Historic Price of Crude Oil
- Efficiency gains in fuel efficiency in vehicles.

The cost per kilometre rate was then kept the constant beyond 2020 and assumed to rise at the same value as value of time.

It was found that the model produces a negligible impact on the patronage and vehicle forecast volumes.

6.2 External Public Transport and Road Traffic Volumes

Table 6.2 below shows the external volumes from the southern section of the model for each of the modelling scenarios. As stated previously, it is should be noted that the trips to/from Brisbane have been “hard coded” into the SCTFM model and are based on forecast traffic growth rates as mentioned previously in Section 2.7.

Table 6.2: Southern External Volumes

Scenario	Year	24H Vehicle Volumes	Growth (Absolute)	Compound Growth p.a (%)	24H PT Patronage	Growth (Absolute)	Compound Growth p.a (%)
-	2005	58,140	-	-	10,880	-	-
1	2026 High	87,900	29,760	1.99%	19,330	8,450	2.77%
3	2051 High	127,670	39,770	1.50%	22,560	3,230	0.62%
5	2051 High Access	109,950	22,050	0.90%	44,930	25,600	3.43%
2	2026 High	87,890	29,750	1.99%	19,340	8,460	2.78%
4	2051 High	127,660	39,770	1.50%	22,580	3,240	0.62%
6	2051 High Access	109,420	21,530	0.88%	45,520	26,180	3.48%
7*	2026 High	87,910	29,770	*1.99%*	19,330	8,450	*2.77%*
8*	2051 High	127,680	39,770	*1.50%*	22,560	3,230	*0.62%*
9*	2051 High Access	110,800	22,890	*0.93%*	43,990	24,660	*3.34%*

* Changed Fare File Sensitivity Models

Figure 2.7 shows the extent of the modelling area to the south. The same zone connects the road network and also the public transport corridor.

Although the model cordon is geographically south of Caboolture, the model treats Caboolture as an external zone.

Key outcomes of the analysis of the external volumes include:

- Modelling suggests that the will not increase travel between the Sunshine Coast and Brisbane however recognising that these trips are not modelled explicitly in the model so the results should be treated with caution;
- Growth for rail travel generally is greater than Bruce Highway growth to 2026 with Bruce Highway growth greater from 2026 to 2051.
- The 2051 “High Access” scenario has significantly greater growth along the rail corridor compared to road based travel.

- Bruce Highway traffic volumes at the southern external are consistent with current planning intent for the corridor to 2051.

6.3 Comparison of North Coast Rail Line to CAMCOS

As a comparison of the North Coast Rail Line and CAMCOS, the peak hour volumes of both are illustrated in **Figure 6.3**, the modelled scenarios highlight the following points:

- Current land use uptake for developments is dispersed. If this trend continues, then patronage on the North Coast Line is forecast to exceed that of the CAMCOS line.
- If development intensifies to be more transport oriented, then it is likely that CAMCOS patronage will be greater than the North Coast Line, mainly as there are larger areas identified for development along the CAMCOS corridor.
- External trips in the model are under-represented as a result of the external model methodology, as described in Section 2.7. Therefore, both CAMCOS and the North Coast Rail Line forecast demand is likely to lower than what may be realised if the current trend is continue.

Further detailed analysis should be undertaken to assess the relationships between both rail corridors and wider public transport planning in the Sunshine Coast region.

7 Summary of Findings

The review has highlighted some key aspects of the demand forecasting task for the Landsborough to Nambour corridor and the wider Sunshine Coast.

7.1 Key Findings

The key findings from the high level review of the sketch transport model include the following:

- Patronage is likely to increase by approximately 5-10% as a result of the Landsborough to Nambour upgrade with further significant increases possible if intensification ad greater levels of public transport service are provided in combination with road network strategies
- Nambour station appears to benefit most of the stations along the corridor from higher service frequency and development intensification
- With, trend, dispersed development patterns the Landsborough to Nambour upgrade appears to have similar patronage to the CAMCOS line
- Long distance (to Brisbane) home based work trips are currently a significant proportion of the travel along the rail line. Forecast modelling indicates this proportion is likely to reduce however further investigation is required
- Telecommunications companies are currently targeting these long distance trips for use of mobile devices (internet and mobile telephones). Should take up of these services be significant it is reasonable to assume that the “attractiveness” of using rail for long distance commuter trips will remain strong.

7.2 Further Investigation

Throughout the course of this review, a number of key issues regarding the transport planning and modelling arose including:

- Park and Ride – park and ride has not been dealt with explicitly and has the potential to provide significant uplift to stations outside the major townships. The review of the model indicated only minor growth at these stations as a result of the lack of explicit modelling of park and ride.
- CAMCOS – Further detailed investigation into the relationship between CAMCOS, the Landsborough to Nambour upgrade and the wider public transport network is required including development patterns around stations and interaction with travel between Brisbane
- Travel between Sunshine Coast and Brisbane – Current data shows rail trips to Brisbane make up a significant proportion of public transport usage on the Sunshine Coast. Further investigation is required to understand how this may change over time, including the influence of non-transport cost elements such as lifestyle and commercial decisions
- Nambour mode share – The model forecasts a significant mode share to rail at Nambour with development intensification and a greater level of public transport service. Further investigation as to what measures would facilitate such a significant increase in rail travel is required, particularly in the context of regional Sunshine Coast planning.

Glossary

The following list outlines the abbreviations used in this report:

Abbreviations	
ABS	Australian Bureau of Statistics
CPI	Cost Price Index
HBV	Home Based Visitors
HBW	Home Based Workers
JTW	Journey to Work
L2N	Landsborough to Nambour
PT	Public Transport
QT	Queensland Transport
SCTFM	Sunshine Coast Travel Forecast Model
SEQ	South East Queensland

Appendix A

Fare Structure

Appendix A – Fare Structure Comparison

Fare Structure

Table A.1a: Peak fare (Supplied)

	gi1	gi10	gi11	gi12	gi13	gi14	gi15	gi16	gi17	gi18	gi19	gi20	gi21	gi22	gi23
gi1	1.54	3.32	3.49	4.12	4.49	4.71	5.41	5.79	5.83	8.62	4.58	9.69	9.33	7.55	7.99
gi10	3.58	0.96	1.54	1.13	2.14	2.41	2.74	3.07	3.34	3.61	3.88	4.48	5.01	5.61	6.28
gi11	3.97	1.54	1.54	1.05	1.80	2.14	2.24	1.69	1.75	3.34	3.61	3.88	4.48	5.01	5.61
gi12	4.55	0.90	1.54	1.54	0.92	0.90	2.14	1.20	1.37	3.07	3.34	3.61	3.88	4.48	5.01
gi13	4.91	1.07	1.65	1.17	0.77	1.08	1.28	1.33	1.91	2.74	3.07	3.34	3.61	3.88	3.00
gi14	5.29	2.41	2.14	0.90	1.02	1.02	0.92	0.97	1.26	1.20	2.74	3.07	3.34	3.61	3.88
gi15	5.39	1.37	2.41	1.07	1.30	1.00	1.06	0.98	1.21	1.43	2.41	1.83	3.07	3.34	3.61
gi16	5.66	3.07	2.74	1.79	1.36	0.90	1.02	0.91	0.98	1.23	1.07	1.20	1.83	3.07	1.67
gi17	6.21	1.67	1.92	2.59	1.64	1.87	1.34	1.00	1.14	1.10	1.41	1.83	1.91	1.92	2.31
gi18	8.62	3.61	3.34	3.07	1.37	1.80	1.15	0.90	1.07	0.96	1.28	1.25	1.07	1.80	1.37
gi19	6.05	3.88	3.61	3.34	3.07	2.74	2.41	1.43	1.32	0.93	1.15	1.14	1.05	1.50	1.92
gi20	9.69	4.48	3.88	3.61	3.34	3.07	2.74	1.20	1.62	1.35	1.12	1.08	1.10	1.35	1.68
gi21	7.77	5.01	4.48	3.88	3.61	3.34	3.07	1.37	1.72	1.60	1.08	1.11	0.77	1.12	1.45
gi22	7.20	5.61	5.01	4.48	1.94	3.61	3.34	2.31	1.82	2.41	2.14	1.26	0.96	1.00	1.21
gi23	8.12	6.28	5.61	5.01	3.52	3.88	3.16	2.23	2.30	2.47	2.00	1.44	1.63	1.18	1.22

Table A.1b: Off-Peak fare (Supplied)

	gi1	gi10	gi11	gi12	gi13	gi14	gi15	gi16	gi17	gi18	gi19	gi20	gi21	gi22	gi23
gi1	1.19	2.56	2.69	3.18	3.47	3.64	4.18	4.47	4.50	6.65	3.53	7.48	7.20	5.83	6.16
gi10	2.76	0.74	1.19	0.87	1.65	1.86	2.11	2.37	2.58	2.78	2.99	3.45	3.87	4.33	4.85
gi11	3.06	1.19	1.19	0.81	1.39	1.65	1.73	1.30	1.35	2.58	2.78	2.99	3.45	3.87	4.33
gi12	3.51	0.70	1.19	1.19	0.71	0.70	1.65	0.93	1.06	2.37	2.58	2.78	2.99	3.45	3.87
gi13	3.79	0.83	1.28	0.91	0.59	0.83	0.99	1.02	1.47	2.11	2.37	2.58	2.78	2.99	2.31
gi14	4.08	1.86	1.65	0.70	0.79	0.79	0.71	0.75	0.97	0.93	2.11	2.37	2.58	2.78	2.99
gi15	4.16	1.06	1.86	0.83	1.00	0.77	0.82	0.76	0.93	1.10	1.86	1.41	2.37	2.58	2.78
gi16	4.37	2.37	2.11	1.38	1.05	0.70	0.78	0.71	0.76	0.95	0.83	0.93	1.41	2.37	1.29
gi17	4.79	1.29	1.48	2.00	1.26	1.44	1.04	0.77	0.88	0.85	1.09	1.41	1.47	1.48	1.78
gi18	6.65	2.78	2.58	2.37	1.06	1.39	0.89	0.70	0.82	0.74	0.99	0.97	0.83	1.39	1.06
gi19	4.67	2.99	2.78	2.58	2.37	2.11	1.86	1.10	1.02	0.72	0.89	0.88	0.81	1.16	1.49
gi20	7.48	3.45	2.99	2.78	2.58	2.37	2.11	0.93	1.25	1.04	0.86	0.84	0.85	1.04	1.30
gi21	5.99	3.87	3.45	2.99	2.78	2.58	2.37	1.06	1.33	1.24	0.84	0.86	0.59	0.87	1.12
gi22	5.56	4.33	3.87	3.45	1.50	2.78	2.58	1.78	1.41	1.86	1.65	0.97	0.74	0.77	0.93
gi23	6.27	4.85	4.33	3.87	2.71	2.99	2.44	1.72	1.77	1.90	1.55	1.11	1.26	0.91	0.94

Proposed sensitivity fare structure for the Sunshine Coast Public Transport model.

Table A.1c: Peak fare (Revised)

	gi1	gi10	gi11	gi12	gi13	gi14	gi15	gi16	gi17	gi18	gi19	gi20	gi21	gi22	gi23
gi1	1.16	3.37	3.75	4.24	4.72	5.10	5.54	5.97	6.50	6.88	7.27	7.80	8.18	8.62	9.05
gi10	3.37	1.16	1.40	1.64	1.83	2.07	2.31	2.50	2.74	2.94	3.37	3.75	4.24	4.72	5.10
gi11	3.75	1.40	1.16	1.40	1.64	1.83	2.07	2.31	2.50	2.74	2.94	3.37	3.75	4.24	4.72
gi12	4.24	1.64	1.40	1.16	1.40	1.64	1.83	2.07	2.31	2.50	2.74	2.94	3.37	3.75	4.24
gi13	4.72	1.83	1.64	1.40	1.16	1.40	1.64	1.83	2.07	2.31	2.50	2.74	2.94	3.37	3.75
gi14	5.10	2.07	1.83	1.64	1.40	1.16	1.40	1.64	1.83	2.07	2.31	2.50	2.74	2.94	3.37
gi15	5.54	2.31	2.07	1.83	1.64	1.40	1.16	1.40	1.64	1.83	2.07	2.31	2.50	2.74	2.94
gi16	5.97	2.50	2.31	2.07	1.83	1.64	1.40	1.16	1.40	1.64	1.83	2.07	2.31	2.50	2.74
gi17	6.50	2.74	2.50	2.31	2.07	1.83	1.64	1.40	1.16	1.40	1.64	1.83	2.07	2.31	2.50
gi18	6.88	2.94	2.74	2.50	2.31	2.07	1.83	1.64	1.40	1.16	1.40	1.64	1.83	2.07	2.31
gi19	7.27	3.37	2.94	2.74	2.50	2.31	2.07	1.83	1.64	1.40	1.16	1.40	1.64	1.83	2.07
gi20	7.80	3.75	3.37	2.94	2.74	2.50	2.31	2.07	1.83	1.64	1.40	1.16	1.40	1.64	1.83
gi21	8.18	4.24	3.75	3.37	2.94	2.74	2.50	2.31	2.07	1.83	1.64	1.40	1.16	1.40	1.64
gi22	8.62	4.72	4.24	3.75	3.37	2.94	2.74	2.50	2.31	2.07	1.83	1.64	1.40	1.16	1.40
gi23	9.05	5.10	4.72	4.24	3.75	3.37	2.94	2.74	2.50	2.31	2.07	1.83	1.64	1.40	1.16

Table A.1d: Off-Peak fare (Revised)

	gi1	gi10	gi11	gi12	gi13	gi14	gi15	gi16	gi17	gi18	gi19	gi20	gi21	gi22	gi23
gi1	0.89	2.59	2.89	3.26	3.63	3.93	4.27	4.60	5.02	5.31	5.61	6.00	6.30	6.65	6.97
gi10	2.59	0.89	1.09	1.26	1.41	1.61	1.78	1.93	2.13	2.27	2.59	2.89	3.26	3.63	3.93
gi11	2.89	1.09	0.89	1.09	1.26	1.41	1.61	1.78	1.93	2.13	2.27	2.59	2.89	3.26	3.63
gi12	3.26	1.26	1.09	0.89	1.09	1.26	1.41	1.61	1.78	1.93	2.13	2.27	2.59	2.89	3.26
gi13	3.63	1.41	1.26	1.09	0.89	1.09	1.26	1.41	1.61	1.78	1.93	2.13	2.27	2.59	2.89
gi14	3.93	1.61	1.41	1.26	1.09	0.89	1.09	1.26	1.41	1.61	1.78	1.93	2.13	2.27	2.59
gi15	4.27	1.78	1.61	1.41	1.26	1.09	0.89	1.09	1.26	1.41	1.61	1.78	1.93	2.13	2.27
gi16	4.60	1.93	1.78	1.61	1.41	1.26	1.09	0.89	1.09	1.26	1.41	1.61	1.78	1.93	2.13
gi17	5.02	2.13	1.93	1.78	1.61	1.41	1.26	1.09	0.89	1.09	1.26	1.41	1.61	1.78	1.93
gi18	5.31	2.27	2.13	1.93	1.78	1.61	1.41	1.26	1.09	0.89	1.09	1.26	1.41	1.61	1.78
gi19	5.61	2.59	2.27	2.13	1.93	1.78	1.61	1.41	1.26	1.09	0.89	1.09	1.26	1.41	1.61
gi20	6.00	2.89	2.59	2.27	2.13	1.93	1.78	1.61	1.41	1.26	1.09	0.89	1.09	1.26	1.41
gi21	6.30	3.26	2.89	2.59	2.27	2.13	1.93	1.78	1.61	1.41	1.26	1.09	0.89	1.09	1.26
gi22	6.65	3.63	3.26	2.89	2.59	2.27	2.13	1.93	1.78	1.61	1.41	1.26	1.09	0.89	1.09
gi23	6.97	3.93	3.63	3.26	2.89	2.59	2.27	2.13	1.93	1.78	1.61	1.41	1.26	1.09	0.89

Appendix B

Journey to work data

Table B1.1 below contains 2006 JTW data for trips from Caloundra, Maroochy and Noosa, to Brisbane (including Pine Rivers, Caboolture, Logan, Ipswich, excluding Beaudesert).The data indicates that 10% of journeys to work from Caloundra, Maroochy and Noosa, to Brisbane are by train.

Table B1.1: 2006 Journey to Work data for Trips to Brisbane

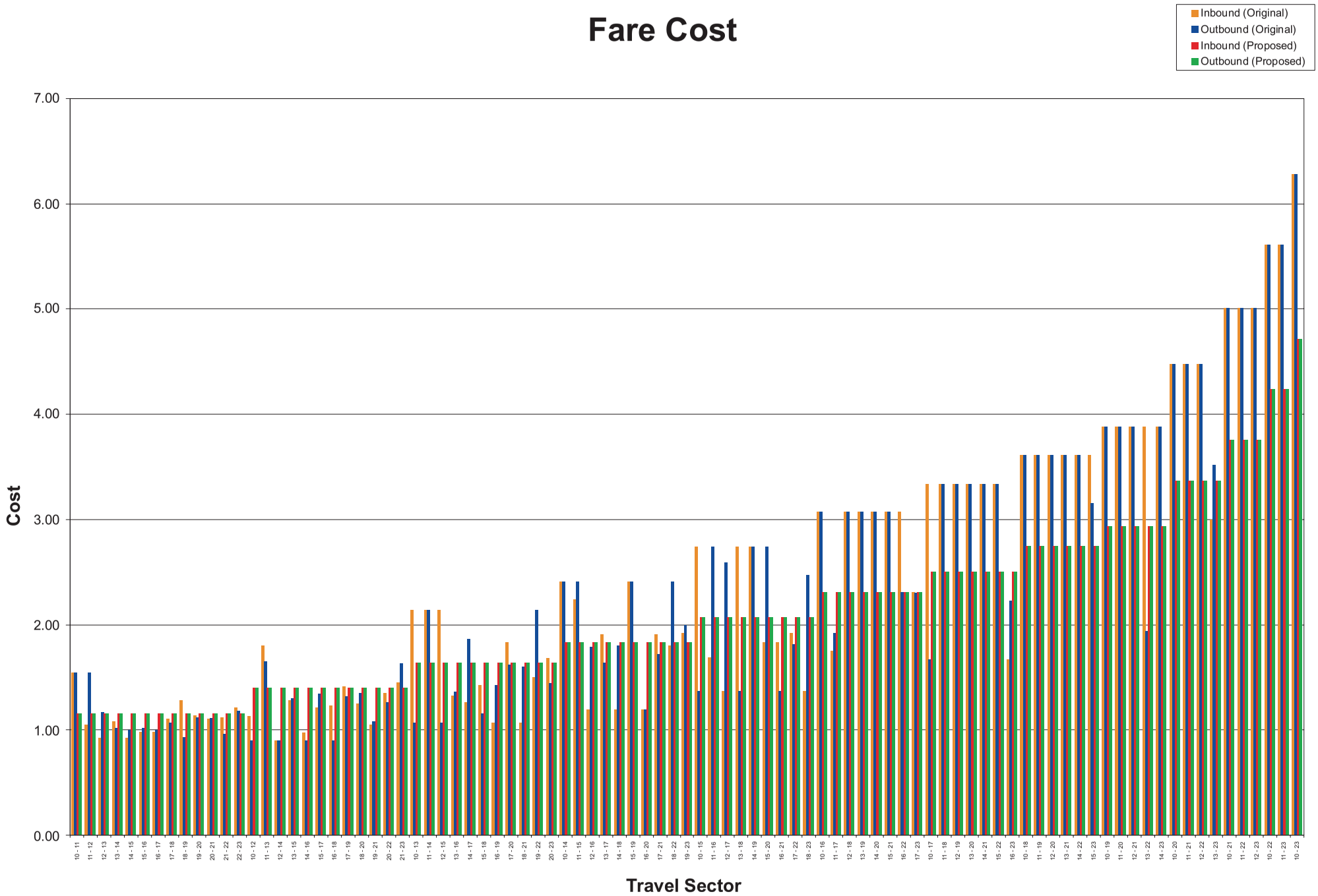
	Caloundra	%	Maroochy	%	Noosa	%
Car, as driver	2,242	67%	1,792	64%	353	65%
Car, as passenger	155	5%	170	6%	34	6%
Taxi	3	0%	6	0%	0	0%
Motorbike/scooter	24	1%	23	1%	0	0%
Truck	51	2%	35	1%	6	1%
Bicycle	3	0%	0	0%	0	0%
Walked only	35	1%	56	2%	19	3%
Train	349	10%	219	8%	27	5%
Bus	18	1%	26	1%	17	3%
Ferry	0	0%	6	0%	0	0%
Other	10	0%	18	1%	0	0%
Worked at home	48	1%	42	2%	22	4%
Did not go to work	394	12%	376	14%	64	12%
Not stated	37	1%	13	0%	3	1%
Total	3,369	100%	2,782	100%	545	100%

Table B1.2 below contains 2001 journey to work data for all trips originating from Caloundra, Maroochy and Noosa, and travelling to a place of employment anywhere in Australia. Only 1% of all trips to work from the Caloundra, Maroochy and Noosa areas are by train. This would be because the main employment districts in these areas (Caloundra City, Mooloolaba and Noosa) do not have easy accessibility to train services. However, from **Table B1.1** above, it is evident that commuters are willing to use the train for longer trips to Brisbane.

Table B1.1: 2001 Journey to Work data for trips to all destinations

	Caloundra	%	Maroochy	%	Noosa	%
Train, Motorised other	145	1%	126	0%	15	0%
Train, non-motorised other	123	0%	78	0%	18	0%
Bus, motorised other	51	0%	64	0%	40	0%
Bus, non-motorised other	218	1%	382	1%	152	1%
Ferry, any other	3	0%	12	0%	9	0%
Car as driver/motor bike/motor scooter, any other	15,846	62%	29,955	64%	9,095	60%
Car as passenger/Taxi, any other	1,822	7%	3,209	7%	1,110	7%
Walked only	858	3%	1,494	3%	593	4%
Bicycle, any other	280	1%	447	1%	176	1%
Other	733	3%	1,284	3%	422	3%
Worked at home	2,055	8%	3,449	7%	1,538	10%
Did not go to work	3,115	12%	5,573	12%	1,918	13%
Not stated, not applicable, overseas visitor	245	1%	398	1%	151	1%
Total	25,494	100%	46,471	100%	15,237	100%

Fare Cost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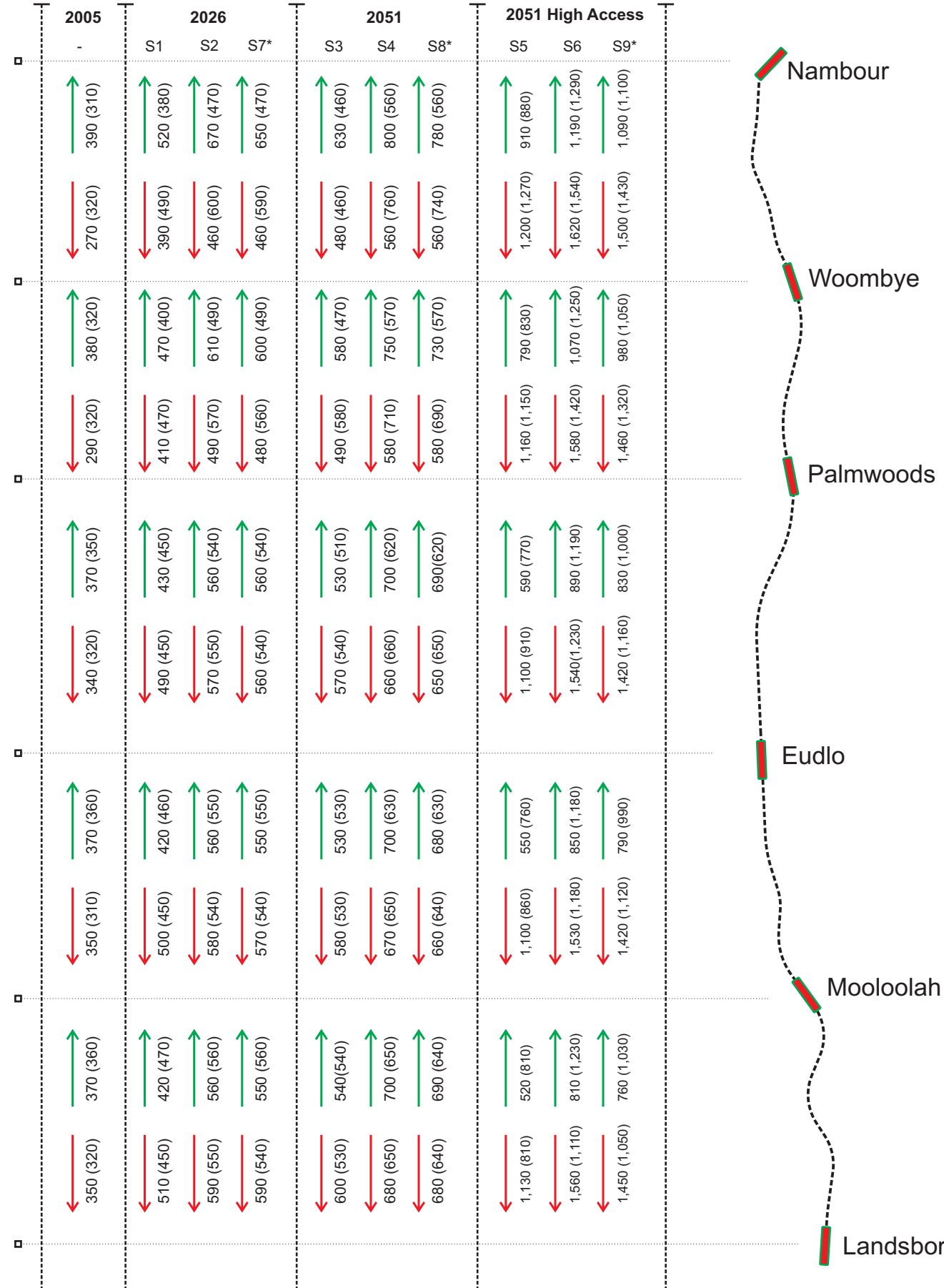
5.00
4.00
3.00
2.00
1.00
0.00
Cost
Travel Sector



Legend:

- → - Northound
- ← - Southbound
- 270 - AM Patronage
- (310) - PM Patronage

Schematic Only

Landsborough to Nambour Peak Period Corridor Patronage

FIGURE:	Figure 6.1	PREPARED BY:	CPR
DATE:	12/12/08	CHECKED BY:	PJH
JOB NUMBER:	86618	SCALE:	NTS

FILE LOCATION: J:\86000\86618\Documents\Reports\Transport\L2N Sensitivity Modelling\FiguresPatronage_Direction.d

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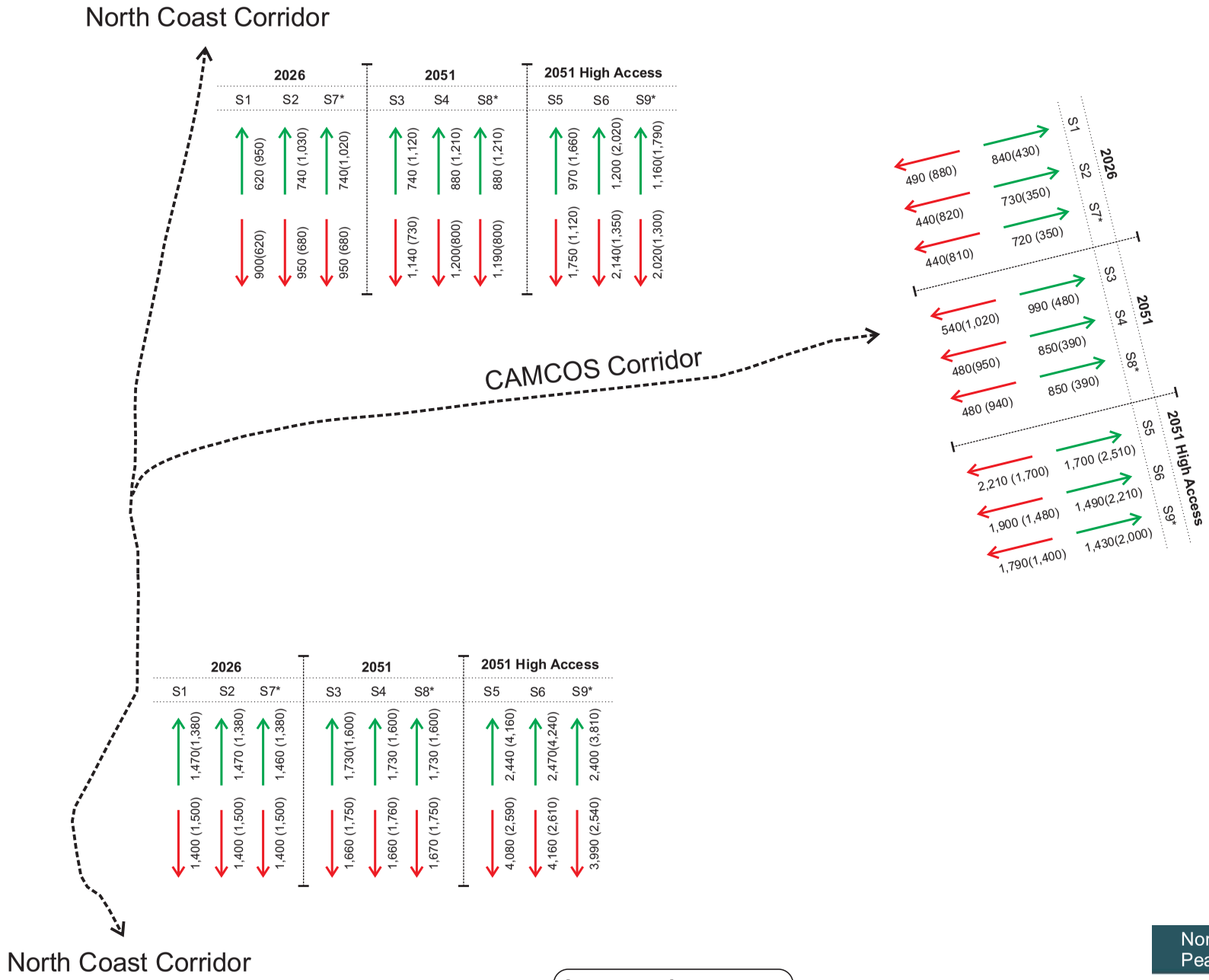

Legend:

- → - NB/EB
- ← - SB/WB
- 270 - AM Patronage
- (310) - PM Patronage

Schematic Only

North Coast / CAMCOS Corridor Peak Period Patronage Volumes			
FIGURE:	Figure 6.3	PREPARED BY:	CPR
DATE:	12/12/08	CHECKED BY:	PJH
JOB NUMBER:	86618	SCALE:	NTS
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