

Northern Link

Phase 2 – Detailed Feasibility Study

TECHNICAL REPORT NO. 15
ECONOMIC ASSESSMENT

■ September 2008 ■

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1 Scope

1.1 Economic Environment Terms of Reference

This economics section of the EIS report addresses the economic impact issues that are specified in the Terms of Reference (TOR) for the Northern Link Environmental Impact Statement (EIS). It identifies and evaluates the costs and benefits of the project on the economic environment including the significance of the project in the local economic context. An evaluation framework has been developed comprising Cost Benefit Analysis (CBA) modelling and Computable General Equilibrium (CGE) modelling to estimate the benefits and costs of the project during both construction and operational phases. This framework has addressed the following requirements of the TOR:

- to provide a clear definition of the economic objectives and scope of the project, including the extent of the study area for the purpose of economic assessment;
- to set and justify a timeframe for analysis that reflects the economic life of the principal asset;
- to identify and justify an appropriate project-specific discount rate;
- to identify and examine all costs and benefits of the project including direct user costs and benefits (e.g. tolls, vehicle operating costs taking into consideration both changes to route lengths and travel times, changes to vehicle accident rates, based on scenario testing and safety improvements), environmental effects and indirect costs and benefits to the broader community such as road and public transport network effects, socio-economic effects including employment, and land use changes;
- to identify key stakeholders (including, businesses and their employees) residing or operating within the study corridor or those areas outside the study corridor that may be affected by the project and an evaluation of the benefits and costs of the project to these stakeholders;
- to examine the impact of timing of delivery of the project on its commercial viability; and
- appropriate testing of sensitivity of key parameters.

The following sub sections describe the project that is the subject on the economic assessment and also the approach that has been adopted to address the TOR requirements.

1.2 Project Definition

The Northern Link Project (NLRT) provides a straight through tunnel connection from the Western Freeway west of the Toowong roundabout to the Inner City Bypass (ICB) east of Kelvin Grove Road. Other connections to Milton Road at Toowong and Kelvin Grove Road at Kelvin Grove are also included in the project. The mainline driven tunnel alignment is approximately 5.5km in length, two lanes each way from the Western Freeway near the Toowong roundabout to the ICB at Kelvin Grove. Traffic connectivity to Kelvin Grove Road from the tunnel is provided that will improve accessibility to the Brisbane CBD and the northern and western city fringe. At the western end of the tunnel, traffic connectivity will also be provided to the Toowong precinct.

1.3 Approach

The overriding economic objective of the NLRT is to enhance the economic efficiency of transport in the Brisbane road network, particularly between the western suburbs and Brisbane north/Australia TradeCoast (ATC) and at the same time providing broader economic benefits to industry and the community in Brisbane and the region. The economic assessment has been undertaken by comparing the existing economic environment to the future economic environment with the NLRT constructed and operational over the proposed concession period.

The following approach has been adopted to identify and assess the economic benefits and costs of the project:

- Identification of existing economic activities in the project corridor and key economic activity localities elsewhere that currently are influenced by the existing road network;
- Description and assessment of future economic activities in the proposed NLRT corridor including an assessment of potential areas for future development;
- Review of public planning documents that impact on the corridor including the National Institute of Economic and Industry Research (NIEIR) Brisbane Long Term Planning Economic Indicators study;
- Development of an NLRT Cost Benefit Analysis Model to provide investment findings to assess the economic viability of the Project in terms of travel time savings, vehicle operating costs savings, road safety savings, environmental and external benefits; and
- Simulation of the Monash University's Centre of Policy Studies (COPS) CGE Model to assess the broader regional and state economic impacts for both the construction and operational phases of the project.

2 Description of the existing economic environment

2.1 Northern Link Corridor

2.1.1 Introduction

The NLRT is part of the TransApex suite of projects, which would ultimately provide motorway-standard ring road connections to allow cross city travel movements to bypass the CBD. NLRT would provide a direct connection from the Western Freeway at Toowong to the Inner City Bypass at Kelvin Grove, bypassing the inner western suburbs of Toowong, Auchenflower and Milton. The project seeks to achieve improved transport efficiency and reliability for the SEQ region supporting the operation and competitiveness of the regional and state economies.

The NLRT is being proposed at a time of unprecedented growth in the SEQ and Queensland. In 2006-2007 Queensland's economic growth was at an eight year high of 6.8 percent, well above the growth of 2.5 percent in the rest of Australia. Queensland's average annual growth rate for the past 10 years is 5.1 percent compared with 3.2 percent for the rest of Australia.

Queensland's prosperous economy has also created significant employment opportunities across the state and in particular in SEQ. Over the past year employment in Queensland increased by 4.6 percent and accounted for more than 92,000 persons or about one-third of all jobs created in Australia. Consequently, Queensland's unemployment rate is at an all time low of 4 percent.

This report describes the existing economic environment in the directly affected suburbs within the NLRT corridor, namely Milton and Toowong/Auchenflower. In addition, the NLRT will be the significant transport link between the major economic centres of the Brisbane CBD, ATC and Western Corridor and will also impact on accessibility and connectivity to and from these centres and surrounding areas. Consequently, the existing economic environment in these centres and their surrounding areas is also described.

Each of these major economic centres depends for their success on high capacity transport access and connectivity. From an economic point of view it is important to understand the performance and projected future of each centre so as to understand the broader improvements to regional prosperity that may be able to be supported by the NLRT.

2.1.2 Description of Milton's economic environment

Milton is an inner suburb located approximately 2 km west of Brisbane's CBD. The suburb has an area of 1.2 km² and a population of 1,782 persons. The population density in Milton is approximately 1485 persons/km².

Due to the proximity to the CBD, Milton primarily provides service functions to business activities in to the CBD. The suburb is a mixture of light industry, warehouses, commercial offices, retail and single and multiple occupancy residences. The main roads are Milton Road, which runs beside the Ipswich rail line and Coronation Drive, which runs along the Brisbane River.

Milton Road is a busy arterial with mostly residential buildings in the west of the suburb and large industrial, commercial and entertainment establishments in the east. In proximity to the CBD, Suncorp Stadium and the Castlemaine Perkins Brewery are notable establishments.

The landmark Suncorp Stadium (formerly Lang Park) has a 52,500 seat capacity and a state-of-the-art facility able to accommodate a range of sporting and other entertainment uses. The site covers an area of 7.42 hectares. It is located in proximity to Milton Railway station. During events the facility attracts additional traffic and activities including public transport movements and pedestrians.

2.1.3 Description of Toowong / Auchenflower's economic environment

Toowong is an inner suburb located about 5 km west of the CBD. Toowong is 5.2 km² in area and has a population of 15,858. The population density in Toowong is approximately 3071 persons/km².

The suburb has a commercial precinct around the Toowong Village Shopping Centre. There are a number of multi-storey office buildings along Coronation Drive, High Street and Sherwood Road. However, the suburb is predominantly residential with a mix of medium density dwellings and detached houses.

Toowong is a well connected suburb accessible by public transport, such as CityTrain (Toowong and Auchenflower railway stations), Brisbane Transport buses and CityCat ferry services, and via roads and bicycle paths. Toowong's major access roads from the north/east are Coronation Drive and Milton Road. Moggill Road and the Western Freeway connect the suburb to the south and west. Other main roads are High Street and Sherwood Road. However, the road network is suffering from general traffic congestion particularly in the peaks, reducing the flow from the CBD to the western corridor and vice versa.

Coronation Drive connects Brisbane's CBD and the suburbs of Milton and Toowong/Auchenflower. Coronation Drive follows the Brisbane River from the Riverside Expressway through Milton and Auchenflower and terminates in Toowong at Benson Road and High Street. In 2004 Coronation Drive was completely redeveloped and equipped with a Tidal Flow System to improve traffic flows.

Toowong is a major transport node with most bus and train routes passing through Toowong from the CBD to the western suburbs. The Toowong railway station lies on the Ipswich line and is located under the Toowong Village Shopping Centre. Buses travel along Coronation Drive from the city to the Toowong Village Shopping Centre and then further on to the University of Queensland and other western suburbs.

There are two main bicycle paths. The Bicentennial Bikeway runs along the Brisbane River allowing access to the Brisbane CBD through to Toowong for pedestrian and bicycle traffic and proceeds toward the University of Queensland. The second bicycle path runs from Coronation Drive along the Western Freeway.

Toowong Village and Tower was built in 1986 and is located about 3 km from the CBD servicing Toowong, Taringa, St. Lucia, Milton and Auchenflower. It has 86 specialty stores, anchored by David Jones department store, Coles Supermarket and Kmart discount department store. In addition, the

centre provides a wide range of services including banks, travel agency, post office, medical centre, hair salons, the Brisbane City Council Library and a 350 seat food court. The gross lettable area is 46,275 m² on three levels with an annual turnover of \$154 million. Toowong Tower is a 13 level office building including serviced office facilities. The centre has 10 undercover car parking levels including a commuter car park with more than 1,600 spaces, accessible from the intersection of Sherwood Road and High Street.

Toowong has two large hotels, the Regatta Hotel and the Royal Exchange Hotel. In addition, the Park Road Precinct provides a unique shopping and dining experience with boutiques, restaurants, café and gift stores. It has become a trendy spot visited by many tourists and locals.

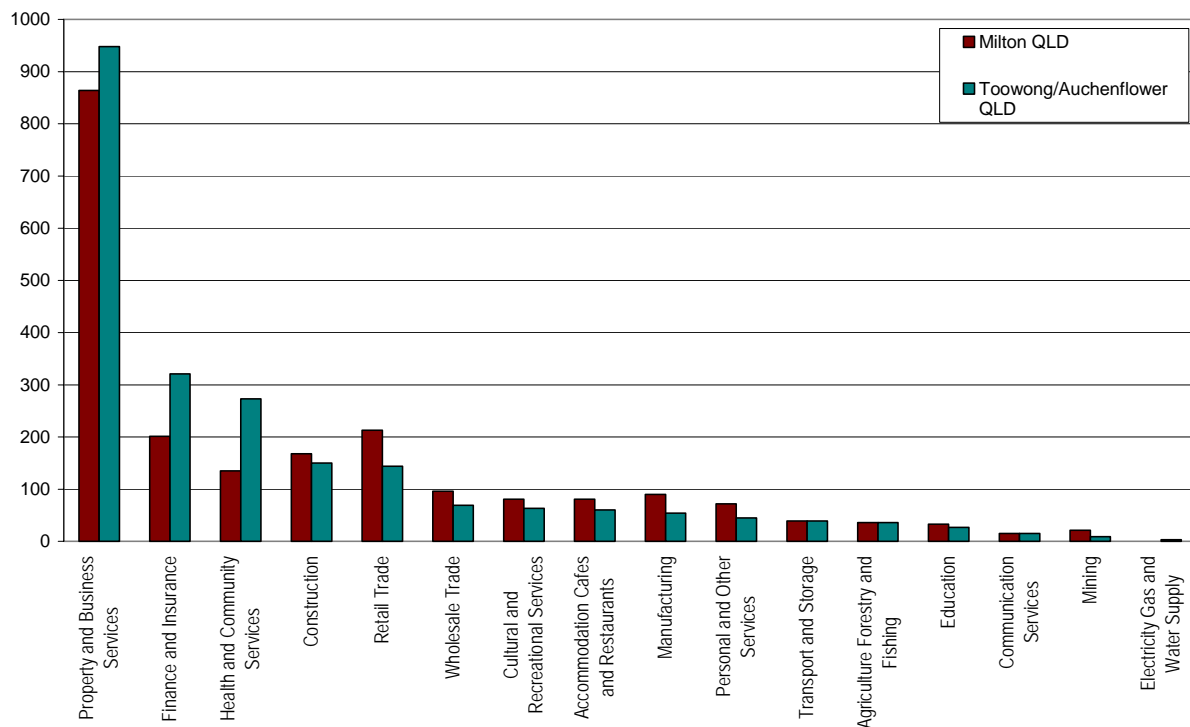
The Wesley Hospital located in Auchenflower on Coronation Drive is one of Queensland's largest private hospitals. With over 430 beds, the hospital employs over 1900 full, part time and casual staff and offers a range of health services across 35 specialties with over 900 accredited doctors. The Wesley Hospital has plans to develop a multi-storey car park and build a nine storey complex which will include a day surgery floor of 34 beds and a total of 178 acute care beds on four other floors.

The University of Queensland St Lucia is located on the fringe of the described area. The university has about 37,740 students, 5,660 staff and generates an estimated \$937 million in revenue annually.

2.1.4 Existing businesses in Milton and Toowong / Auchenflower

There are 2,145 business in Milton and 2,256 businesses in Toowong/Auchenflower. The distribution of these businesses in industry sectors is very similar in Milton and Toowong/Auchenflower. Most of the businesses are in the Property and Business Services sector, followed by Finance and Insurance; Health and Community Services; Construction and Retail Trade. In both suburbs, approximately, 40 percent of all businesses are in the Property and Business Services sector, another 10 percent in the Finance and Insurance industry.

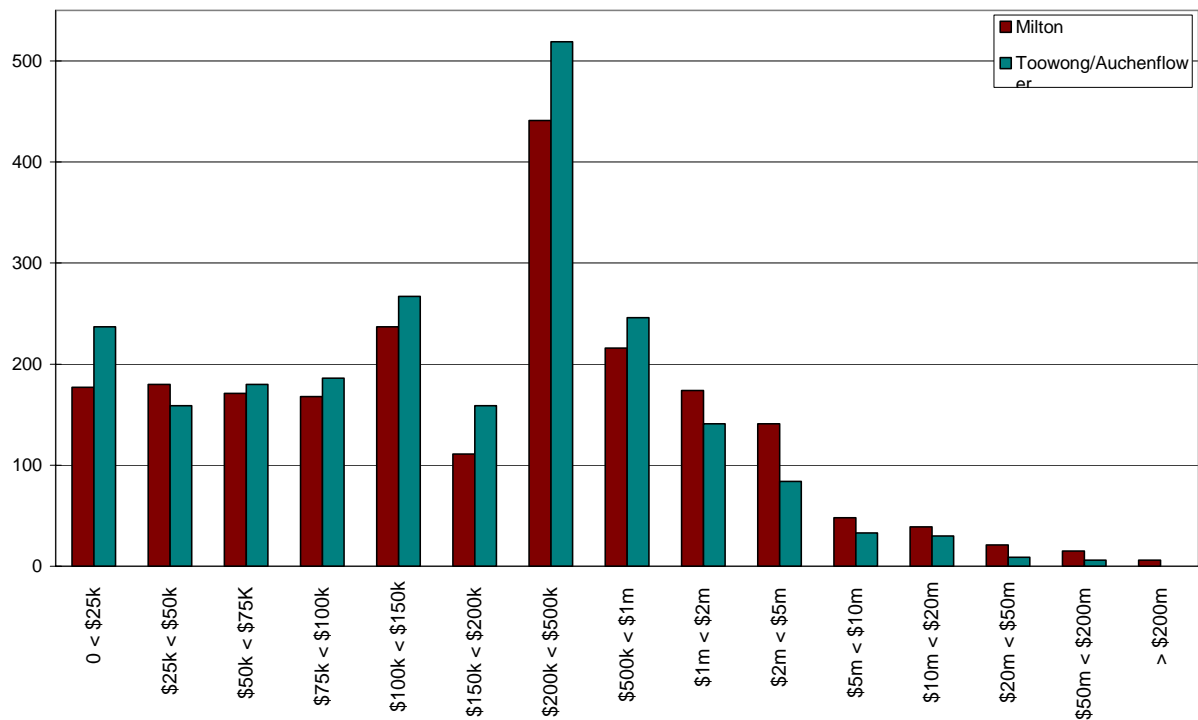
■ **Figure 1: Number of businesses in Milton and Toowong/Auchenflower**



Source: Australian Bureau of Statistics, 8165.0 Jun 2003 to Jun 2006 Counts of Australian Businesses, including Entries and Exits Table 3.1 Businesses by Postcode by Industry Division, by Employment Size Ranges: June 2006. Postcodes: 4064 and 4066.

Most businesses in Milton and Toowong/Auchenflower are small and medium size enterprises. Fifty percent of total businesses have a turnover of less than \$200,000. However, there are 6 businesses in Milton with a turnover of more than \$200 million.

■ **Figure 2: Annual turnover businesses in Milton and Toowong/Auchenflower**



Source: Australian Bureau of Statistics, 8165.0 Jun 2003 to Jun 2006 Counts of Australian Businesses, including Entries and Exits, Table 3.2 Businesses by Postcode by Industry Division, by Annual Turnover Ranges: June 2006. Postcode 4064 and 4066.

A band of businesses is established along Coronation Drive. A number of multi storey office buildings are found along Coronation Drive from Milton to Toowong Shopping Centre. It is difficult to clearly recognise clusters of certain industry sectors; however the table below identifies some of the companies situated in Milton and Toowong/Auchenflower. In addition, there are multi storey residence buildings, hotels, and retail shops. Most of the land along this major local arterial is fully developed with some recently constructed commercial buildings.

■ **Table 1: Representative companies in Milton and Toowong/Auchenflower**

	Industry Division	Number of businesses in Milton and Toowong/Auchenflower	Representative companies
1	Property and Business Services	1812	<ul style="list-style-type: none"> ● OCE ● Graystone ● Bombardier Transport+ ● Intergraph ● McCormick Rankin Cagney ● Beilby Recruitment ● Benchmark Recruitment ● Davies Collison Cove (Attorneys) ● ABS Business Sales ● Enigma Business Products

	Industry Division	Number of businesses in Milton and Toowong/Auchenflower	Representative companies
			<ul style="list-style-type: none"> • Huxbury Quinn Marketing and Advertising • MBE Business Service Centres • Pipers Australia – Brisbane (Attorneys) • Corporate Consulting Services • Isles Lethbridge Solicitors • James White Lawyers • John Martin Valuations • Liquor Licensing Consultants • Mackenzie Dixon Lawyers • QC's Building Services • Davies Collison Cave (Attorneys) • JB Goodwin Midson and Partners • Mitchell & Associates • PPB QLD
2	Finance and Insurance	522	<ul style="list-style-type: none"> • Sun Super • GE • Aviva Navigator • Transpacific Insurance Group • Intacard • NAB • ABN-Amro Morgans • BKO Group Pty Ltd • Cardinal Financial Planning • Credifix Financial Services • Mortgage Force Australia • MSI Taylor Financial Services
3	Health and Community Services	408	<ul style="list-style-type: none"> • Campbell Brothers Ltd • In touch • Australia Red Cross, Queensland Office • FOGS Queensland • Home Instead Senior Care
4	Construction	318	<ul style="list-style-type: none"> • Leighton • Clough • Monadelphous • Pradella • Boral • Maunsell AECOM • Mirvac
5	Retail Trade	357	<ul style="list-style-type: none"> • Brumby's • Epic Cycles • Kratz Jewellery • Maria Cosgrove Gallery • Mary Ryans Bookstore • Spar

	Industry Division	Number of businesses in Milton and Toowong/Auchenflower	Representative companies
			<ul style="list-style-type: none"> • Office Works • Pro Dive • Travel Concepts
6	Wholesale Trade	165	<ul style="list-style-type: none"> • Varied
7	Cultural and Recreational Services	144	<ul style="list-style-type: none"> • Polish Club
8	Accommodation Cafes and Restaurants	141	<ul style="list-style-type: none"> • Joseph Alexander Restaurant • Coffee Club • Oxley Restaurant • Onyx Restaurant and Lounge Bar • The Coro Hotel • McDonald's Restaurant • Blue Frog Café • Regatta Hotel • Many others at Park Road
9	Manufacturing	144	<ul style="list-style-type: none"> • Varied
10	Personal and Other Services	117	<ul style="list-style-type: none"> • Brisbane Circle • Bunk Media
11	Transport and Storage	78	<ul style="list-style-type: none"> • Kennards Self Storage
12	Agriculture Forestry and Fishing	72	<ul style="list-style-type: none"> • Generally offices only
13	Education	60	<ul style="list-style-type: none"> • QTAC University & College Admission Centre • Hubbard School • Axicom College • Ministry Education Commission • Forte School of Music
14	Communication Services	30	<ul style="list-style-type: none"> • Dimension Data • Unisys • GBST • 3Telcom • Aurion • Onmitronics • Server101 • Architect4Web.com.au • MSD Information Technology • Commerce Vision • Computrix
15	Mining	30	<ul style="list-style-type: none"> • Offices only
16	Electricity Gas and Water Supply	3	<ul style="list-style-type: none"> • Origin
	Total All Industries	4401	

A small cluster of businesses is located on Milton Road at its junction with Baroona Road. Businesses here include:

- Commerce Vision
- Pro Dive
- Corporate Consulting Services
- Ministry Education Commission
- Office Works
- Spar
- BP petrol station
- McDonald's Restaurant
- Kennards Self Storage

In addition, there are a number of smaller and other existing shopping centres in the wider precinct that will be influenced by the NLRT. These shopping centres include:

- Auchenflower Shopping Precinct (Milton Road, Auchenflower);
- Bardon Shopping Centre (MacGregor Terrace, Bardon);
- Paddington Shopping Centre (Given Terrace and Latrobe Terrace, Paddington) is a major shopping centre with basement and decked car parking, two levels of retail and an upper level of office/commercial. Shops include Woolworths, coffee shops, fashion, bakery, butcher, fruit shop, Australia Post, restaurants and bank services;
- Indooroopilly Shopping Centre (Moggill Road, Indooroopilly) is located 6 km west of Brisbane CBD and has over 250 shops including Myer, Target, Woolworths and specialty stores on 3 levels mostly undercover with parking available; and
- Taringa Shopping Centre (Moggill Road, Taringa) has a number of local shops such as convenience, cafes, other retail and professional services.

2.1.5 Economic profile: Milton and Toowong / Auchenflower

Data used in the following analysis has been collected from Australian Bureau of Statistics, 2006 Census Community Profile Series, in particular, Statistical Local Area (SLA) which is defined as an area comprising one or more districts, for example Milton and Toowong/Auchenflower. SLAs are part of the Australian Standard Geographical Classification Areas and historical data is available.

Population growth is one of the major drivers of economic prosperity including consumption growth and freight demands. The estimated population in Milton and Toowong / Auchenflower grew from 14,476 in 1996 to 15,243 in 2001 and 17,640 in 2006, which represents an annual average growth rate of 3.1 percent over the last five years. The growth rate for 2001/2006 was more than double the rate for the period 1996 – 2001 and overall higher than the annual average growth rate for Brisbane which was 2.1 percent for the five year period from 2001 to 2006.

■ **Table 2: Population growth 1996, 2001, 2006**

Suburb	Population			Average annual population change	
	1996	2001	2006	5 years to 30 June 2001 in percent	5 years to 30 June 2006 in percent
Milton	1,637	1639	1782	-0.8	2.6
Toowong/Auchenflower	12839	13604	15858	1.1	3.2
Total	14,476	15,243	17,640	0.9	3.1

Source: ABS, 3218.0 Regional Population Growth, Australia. This publication contains estimates of the resident population of Statistical Local Areas, for June 30 for 1996, 2001 and 2006. Estimates for 1996 and 2001 are final, estimates for 2006 are preliminary (p), based on the results of the 2006 Census of Population and Housing.

Milton and Toowong/Auchenflower are affluent suburbs with a young population and a below state average household size. The median age of persons living in Milton and Toowong/Auchenflower is 29 respectively 28 years. This is far below Brisbane's and Queensland's median age which is 35 respectively 36 years. Individual incomes in Milton are higher than in Toowong/Auchenflower and about 21 percent / 27 percent higher than in Brisbane/Queensland (respectively). Individual incomes in Toowong/Auchenflower are approximately 15 percent / 22 percent higher than in Brisbane/Queensland (respectively). However, rents in Milton and Toowong/Auchenflower are significantly higher compared to Brisbane and Queensland.

■ **Table 3: Milton and Toowong/Auchenflower – Community profile**

	Milton	Toowong / Auchenflower	Brisbane	Queensland
Median age of persons	29	28	35	36
Median individual income (\$/weekly)	658	612	516	476
Median family income (\$/weekly)	1,723	1,705	1,262	1,154
Median household income (\$/weekly)	1,198	1,196	1,111	1,033
Median housing loan repayment (\$/monthly)	1,613	1,635	1,300	1,300
Median rent (\$/weekly)	250	260	220	200
Average number of persons per bedroom	1.1	1.1	1.1	1.1
Average household size	2.1	2.2	2.6	2.6

Source: ABS 2006 Census Community Profile Series.

Based on 2006 Census data, the sectors offering the most employment opportunities for persons living in Milton and Toowong/Auchenflower are Professional, scientific & technical services; Health care & social assistance; and Education & training. Proximity to the CBD certainly contributes to the similar employment profile in both suburbs, however there is some deviation.

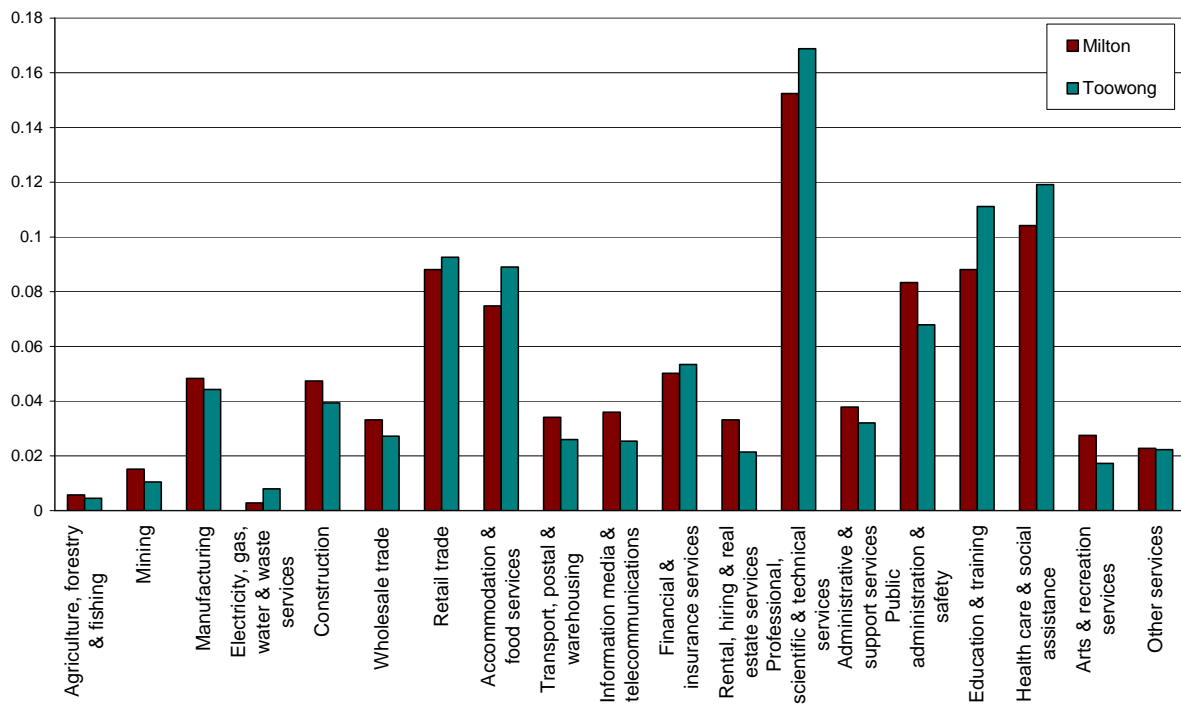
Milton’s employment profile is relatively stronger in the following industries:

- Arts and recreation services
- Information media and telecommunications
- Rental, hiring and real estate services
- Public administration & safety

Toowong’s employment profile is relatively stronger in the following sectors:

- Education and training
- Professional, scientific and technical services
- Health care and social assistance
- Accommodation and food services

■ **Figure 3: Employment by industry sector comparison: Milton and Toowong / Auchenflower (in percent of total persons), 2006**



Source: ABS 2006 Census Community Profile Series, Table B42 Industry of Employment by Age by Sex, excerpt.

Almost 70 percent of the employed persons in Milton work full-time while in Toowong/Auchenflower the figure is 64 percent. In Toowong there are more people working part-time at 30 percent, compared to 26 percent in Milton.

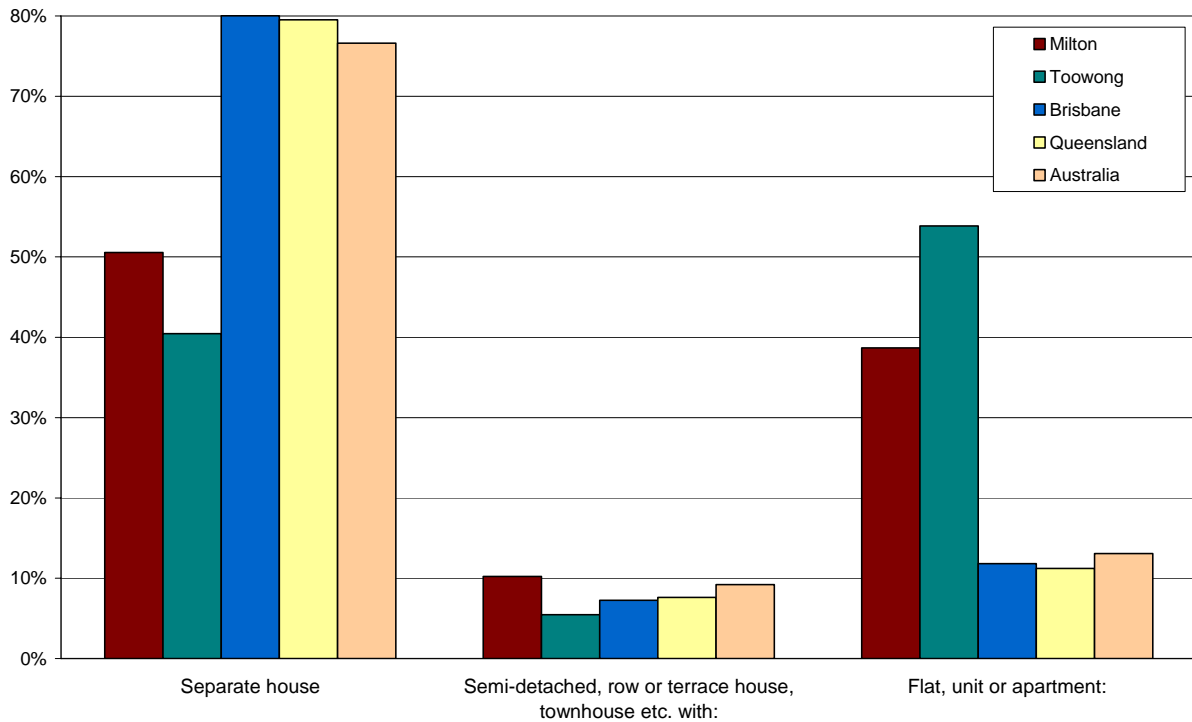
■ **Table 4: Labour Force Status: Milton and Toowong/Auchenflower**

	Milton	Toowong/Auchenflower
	<i>Total Persons</i>	<i>Total Persons</i>
Employed, worked:		
Full-time(a)	735	5,594
Part-time	283	2,652
Employed, away from work(b)	19	319
Hours worked not stated	16	154
<i>Total</i>	<i>1,053</i>	<i>8,719</i>
Unemployed, looking for:		
Full-time work	12	181
Part-time work	24	260
<i>Total</i>	<i>36</i>	<i>441</i>
Total labour force	1,089	9,160
Not in the labour force	298	3,054
Labour force status not stated	170	1,225
Total	1,557	13,439

Source: ABS 2006 Census of Population and Housing, Table B41 Labour force status by age by sex.

The increase in population in SEQ and the trend towards smaller household size, changing household structures and the demand for a diversity of housing forms will require about 575,000 new dwellings by 2026 in the region. As both suburbs are close to Brisbane's CBD, it is not surprising that Milton and Toowong have more flats, units or apartment dwellings compared to Queensland generally. As there are neighbourhoods in Milton which are still largely residential in character, Milton has a higher percentage of separate houses.

■ **Figure 4: Dwelling structure: Milton, Toowong/Auchenflower, Brisbane, Queensland, Australia**



Source: ABS 2006 Census Community Profile Series, Table B31 Dwelling structure, excerpt.

In Milton about 50 percent of occupied private dwellings are owned or being purchased by the occupiers and about 47 percent are rented. In Toowong the percentage of dwellings occupied by the owners or purchasers is slightly higher at almost 58 percent, with only 40 percent of dwellings being rented.

2.2 Major economic growth centres outside of the NLRT corridor

2.2.1 Background

Ongoing economic prosperity and an increase of economic activities will promote continuous movements of people and goods from one economic growth centre toward other growth areas and the CBD. The NLRT would become an important component of the necessary transport network to facilitate these developments. How Brisbane’s transport network will be extended and developed further is outlined in the South East Queensland Infrastructure Plan and Program 2007-2026 (SEQIPP). SEQIPP also includes a 10-year commitment to fund the necessary infrastructure supporting the economic and population growth. However, there is currently no financial commitment to build the NLRT. The prefeasibility study was commissioned under the TransApex plan.

The transport infrastructure investment program for the Western Corridor includes works over the next four years (2007-08 to 2010-11) such as relieving traffic congestion on the Ipswich Motorway, improving passenger rail services on the Ipswich line and improving road and public transport links to service growing population centres at Springfield and Ripley Valley. At a later stage, as alternatives to

the Ipswich Motorway a public transport corridor between Springfield and Ipswich, southern rail infrastructure corridor and an upgrade of the Logan Motorway are planned. Total estimated investment for Western Corridor transport infrastructure projects is approximately \$5,203 million.

The *South East Queensland Regional Freight Network Strategy 2007 – 2012* highlights the importance of the transport network to the movement of freight for the regional, Queensland and national economies. The five year strategy was released by the Queensland Government in June 2007 to implement the transport strategies outlined in the South East Queensland Regional Plan. The SEQ freight network consists of five corridors and two key inter-modal terminals. One of the corridors is the Western Freight Corridor, which comprises the Warrego and Cunningham highways. Both highways connect with the Ipswich Motorway in the inner freight corridor to provide access to the western industrial precincts and ATC. Increased road freight activities are identified in the following key locations:

- Brisbane's Central Business District
- ATC
- New industrial and urban development in the Western corridor
- New industrial land areas such as Ebenezer and Purga.

Freight transport demand is a derived demand depending on economic activities in the region. Consequently, if economic activity increases in the Western Corridor, freight movements within the south east will also increase and goods not consumed within the SEQ will be moved to other regions for national or international exports. One of the trade gateways in the north east is the ATC.

A 2004 freight demand study on freight generation within South East Queensland showed that businesses in the region produced approximately 45 million tonnes (mt) of freight annually, consumed 18 mt of locally produced goods and 15 mt of goods sources from outside the region. Households consume approximately 15 mt of freight, sourced from inside and outside SEQ. Goods not consumed within the region are exported, typically through the Port of Brisbane and to a minor extent through Brisbane Airport.

The following is an outline of the current economic environment in the above growth centres within the NLRT catchment area.

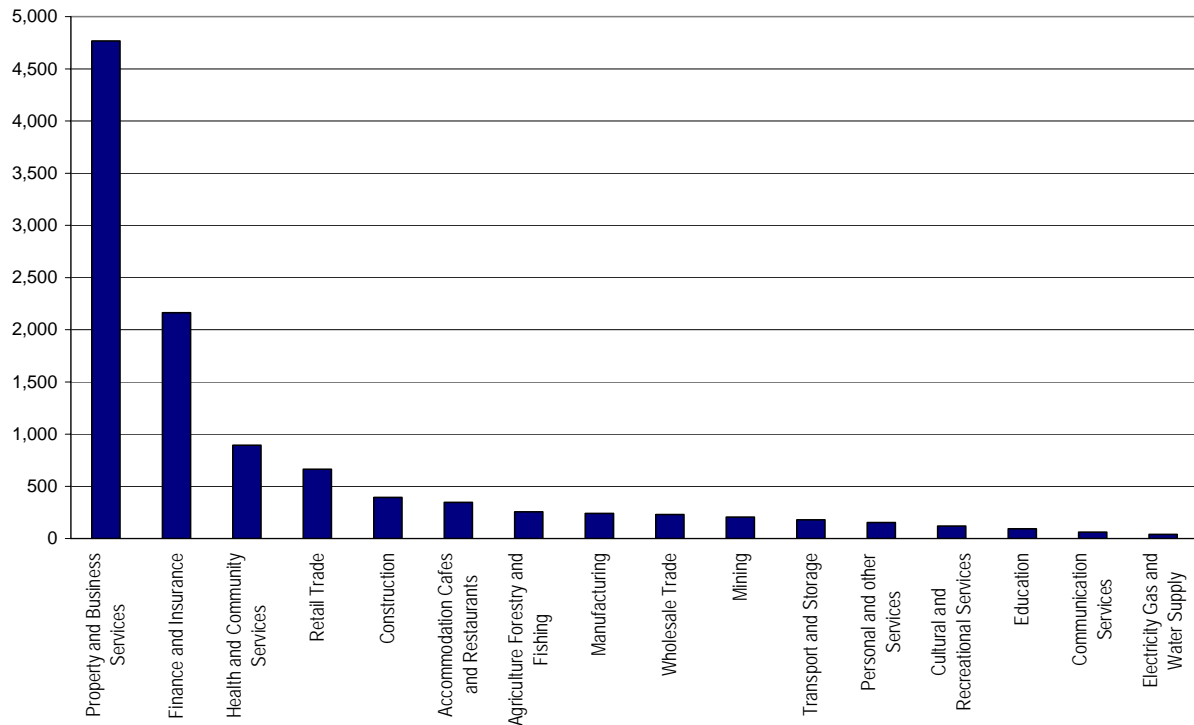
2.2.2 Brisbane CBD

Brisbane City Council (BCC) released its 2026 vision as the *Brisbane Economic Development Plan 2006 – 2011*. The report builds on earlier reports namely the *Economic Development Strategy for Brisbane* and the *City of Brisbane Economic Development Framework for Action 2002-2005* and on the Queensland Government's *South East Queensland Regional Plan*.

The developed strategies were based on a clustering approach identifying and fostering 13 industry clusters. Clusters offer the opportunity to develop and enhance comparative and competitive advantages to firms. Clusters increase the interconnectivity and interdependence of businesses and

institutions creating positive external effects and synergy effects. In addition, they are offering people advanced employment opportunities. A most important prerequisite for a cluster is its endowment on which the market participants can build on. Milton and Toowong benefit from their proximity to the CBD and from their existing service industries which play an important role in expanding the economy.

■ **Figure 5: Number of businesses in Brisbane’s CBD**



Source: Australian Bureau of Statistics, 8165.0 Jun 2003 to Jun 2006 Counts of Australian Businesses, including Entries and Exits Table 3.1 Businesses by Postcode by Industry Division, by Employment Size Ranges: June 2006. Postcodes: 4000.

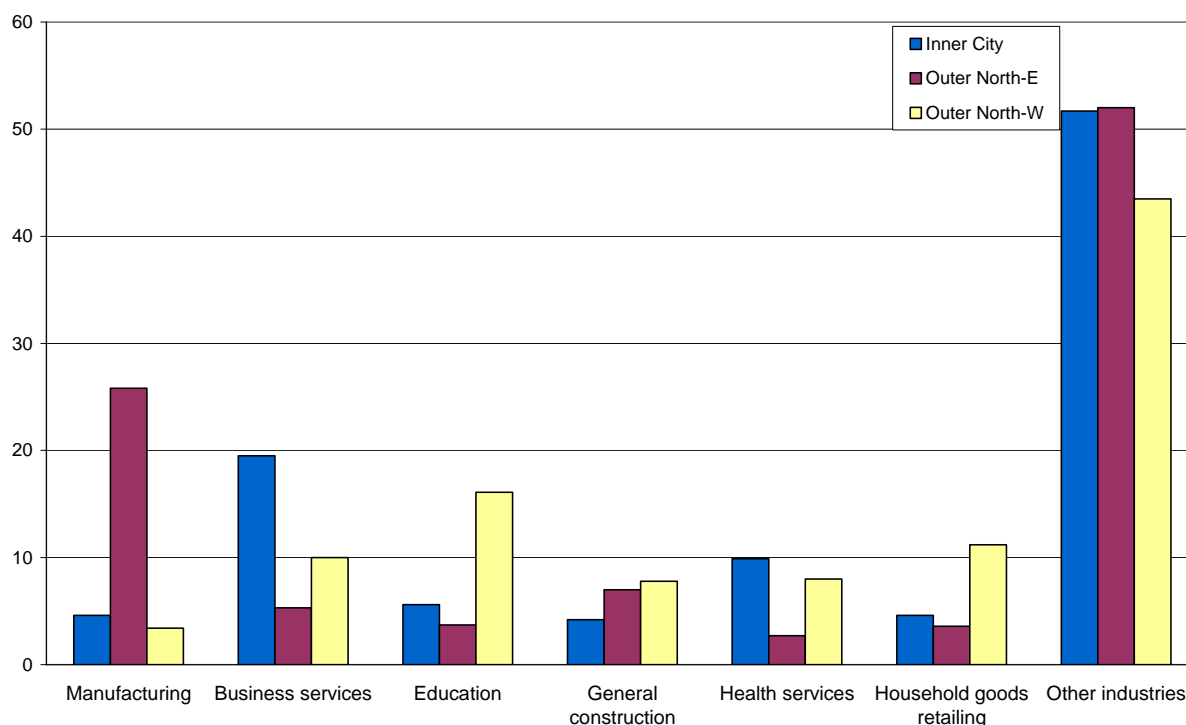
The idea of industry clusters and economic hubs is also present in the current Economic Development Plan. Brisbane’s key economic hubs are the CBD and ATC. Forecasts show that about 190,000 people are to be employed in 2026 in the CBD, 100,000 people at ATC. Significant projected employment growth will also occur in Milton and Toowong/Auchenflower, and the projected industry sectors in which the job growth will occur are Retail Trade, Property & Business Services, Health & Community Services.

Based on current industry and employment structure, both Milton and Toowong/Auchenflower are already well positioned to utilise these opportunities. BCC’s productive precincts strategy identifies both suburbs as key economic zones which are areas to be considered for prioritised infrastructure provision and land use facilitation.

The industry patterns in the CBD differ compared to the outer regions. The Outer North-East incorporates the ATC while the Outer South West includes the Western Corridor area. The figure

below shows the percentage contribution of the major employing subdivisions. The domination of business services and health services in the CBD is apparent. Of all employment in the Inner City region, almost 20 percent is in business services plus approximately 10 percent in health services. In the Outer North-East only about 5 percent and about 3 percent of all employment is in business and health services respectively. In the Outer South-East these percentages are similar with about 6 and 4 percent respectively. However, manufacturing and general construction are the major employment generators in the Outer North-East and Outer South-East regions with about 26 and 27 percent respectively in manufacturing and about 7 percent in construction for both regions.

■ **Figure 6: Employment by industry – 2004 percent by region**



Source: National Institute of Economic and Industry Research (2005) Brisbane Long Term Planning Economic Indicators. A report for the Brisbane City Council. October 2005, page 33.

In terms of output, manufacturing is still the largest industry sector. Manufacturing will continue to contribute the major share of Brisbane’s export growth in the years to 2026, followed by property and business services.

The forecast provided by the National Institute of Economic and Industry Research (NIEIR) for Brisbane’s Economic Development Plan showed that employment in Brisbane City will grow to 850,000 by 2026 and to about 1.2 million in the Brisbane Urban Footprint. The five largest industries in terms of total employment will be property and business services, retail, health and community services, manufacturing and construction. In terms of additional employment numbers, the greatest growth industries will be retail, property and business services, health and community services, construction, and transport and storage. The growth in employment will be confined to some areas.

The single largest employment generator is the SLA Inner City followed by the SLA City Remainder with a total of more than 80,000 people. Other major growth areas are the Outer North East and Outer South East. The Outer South West and Ipswich will increase from 83,000 to 117,000 and the Outer East from 28,000 to 50,000. As a result, the growth in the promoted industrial area, CBD, ATC and the Western Corridor, will continue.

The Brisbane Long Term Infrastructure Plan (BLTIP) provides a 20 year planning horizon for the required infrastructure provision linking to Brisbane City Council's Economic Development Plan, the SEQ Regional Plan and the SEQ Infrastructure Program and Plan.

Brisbane City Council has taken future population growth, employment growth by sectors and suburbs and export growth into consideration when outlining its strategic infrastructure categories and projects. As part of the strategy, Brisbane City Council identified that the future growth of travel has to be less than the growth in population in order to maintain a sustainable level of travel demand which is manageable in the future. Transport and land use has to be managed to increase accessibility and connectivity.

Under TransApex, Brisbane City Council is pursuing a program of transport network initiatives, which are also incorporated in BLTIP, in response to high levels of congestion. The NLRT is one of these initiatives. In addition, a number of strategic transport investigations studies focusing on growth areas, for example the Western Brisbane Transport Network Investigation (WBTNI), ATC Transport Study, and the Hamilton/Eagle Farm Transport Investigation, will provide further information about future infrastructure requirements.

Brisbane's CBD displays a strong office market with ongoing construction activities on new buildings and extensions. As of July 2007 a record low vacancy rate in the CBD of 1.2 percent or 20,174 m² was recorded, with average rents increasing by 41 percent over the previous 12 months. The mid-year Office Market Report from the Property Council also stated that the office vacancy rate in the CBD fringe had fallen to a record low of 1.3 percent. However, almost 200,000 m² of new floor space is expected in the Near-city area over the next 18 months, bringing some release in a very tight market and offering businesses the choice to expand their search for office space into Milton and/or Toowong/Auchenflower.

2.2.3 Australia TradeCoast

ATC is SEQ's trade and industrial hub located at the mouth of the Brisbane River encompassing the Port of Brisbane and Brisbane Airport. Its industries include, among others, transport, logistics, aviation and aerospace. ATC covers an area of about 8,000 ha with over 1,300 ha of land available for future development.

ATC is a major economic and employment driver in Brisbane and SEQ and is expected to provide up to 100,000 jobs in 2026. Over the past 12 months, investment in infrastructure and other developments has reached in excess of \$660 million. Some of the current and planned projects include:

- Jointly developing TradeCoast Central – 120 ha master-planned industrial and community development;
- Water recycling projects – including continual upgrading of Luggage Point, Gibson Island and Whyte Island waste water treatment plants and water reticulation;
- \$1.88 billion Gateway Upgrade Project – duplication of the Gateway Bridge and upgrading of the Gateway Motorway;
- Southern Infrastructure Corridor investigations – Ipswich to Yatala and Ebenezer, and standard gauge rail connection to ATC; and
- \$70 million metropolitan rail freight upgrades on lines serving ATC.

The link between the ATC transport hub with its integrated air, sea, road and rail facilities, and the Western Corridor industrial hub and its interstate transport centre, will be strengthened by the NLRT. Economic activity in the region will be enhanced by improved transport routes, and by creating strategic freight networks connecting economic activity areas. The Queensland Government will support economic growth in the Western Corridor by upgrading strategic road freight routes and it will also improve freight flows into and around the ATC. One of the key projects is the Gateway Upgrade Project, which will facilitate further growth in freight and passenger movements by improving the major arterial road and public transport infrastructure.

2.2.4 Port of Brisbane

The Port of Brisbane is the major transport hub in SEQ and Australia's fastest-growing container port, generating a total annual contribution to the Queensland economy of \$770 million. During the 2006-2007 financial year over 2,600 ships loaded or unloaded over 28 million tonnes of cargo over the port's wharves. In 2006-2007 the Port of Brisbane increased its performance significantly. For the fifth consecutive year container trade, both in import and export of containers through the port, increased to 875,069 TEUs (Twenty-foot Equivalent Units) representing an annual growth of 14.2 percent. The growth in containers was reflected in an increase in the number of container ships (up 3 percent or 1,100 vessels) entering the Port of Brisbane during that period.

In 2006-2007 total trade in tonnes increased by 4.9 percent, imports by 7.3 percent and exports by 1.9 percent. Major import commodities were retail items increasing by 15.6 percent, iron and steel (15.9%) and transport equipment including motor vehicles (15.6%). Export of woodchips increased by 63.6 percent, refined oil and gas by 15.4 percent and meat products by 12.2 percent.

Container imports in 2006 comprised 410,454 TEUs. The containers hold the following:

- 11 percent household items and F.A.K. (freight all kinds)
- 7.33 percent building products
- 6.46 percent electrical equipment
- 5.18 percent paper and wood pulp
- 5.11 percent iron and steel

- 4.35 percent machinery
- 3.46 percent retail other, and
- 3.31 percent rubber manufactures.

Export container trade added up to 399,202 TEUs. The major commodities were:

- 13.5 percent eat products
- 5.3 percent cotton
- 5 percent paper and wood pulp
- 4.3 percent timber
- 2.8 percent F.A.K
- 2.6 percent cereals
- 2.3 percent building products
- 2.2 percent food other
- 2.1 percent iron and steel.

The following current and planned infrastructure investments will increase economic activities around the Port of Brisbane precinct:

- \$54 million dedicated container wharf – a new 372-metre-long container wharf (Wharf 10) is due for completion in mid-2008;
- Over \$250 million for terminal and wharf infrastructure for the new container berths (Berths 11 and 12). Proposals to operate Berths 11 and 12 are currently being considered. Preliminary land development work for the new berths has already commenced and they are expected to be operational by 2011 and 2013 respectively;
- \$46 million General Purpose Berth – a new 210-metre-long wharf to handle break-bulk cargoes, due for completion in 2008;
- Port Gate Estate – new 23 ha freight forwarding and customs-broking warehouse estate, including the 8 ha Port Gate Precinct, developed by Tzaneros Enterprises;
- Port Central – development has commenced on a “town centre” at the Port of Brisbane to provide office, commercial, retail and recreational facilities;
- Northshore Hamilton – 80 ha residential and urban renewal development project at Hamilton. In late 2007 work is due to start on Stage 1, a 2.5 ha riverfront park. The first land sale to developers is expected in early 2008;
- \$400 million Portside Wharf & Brisbane Cruise Terminal – opened in August 2006;
- \$150 million Rivergate Marina – shipyard and marina opened in April 2006;
- Metroplex on Gateway – office and industrial estate; and

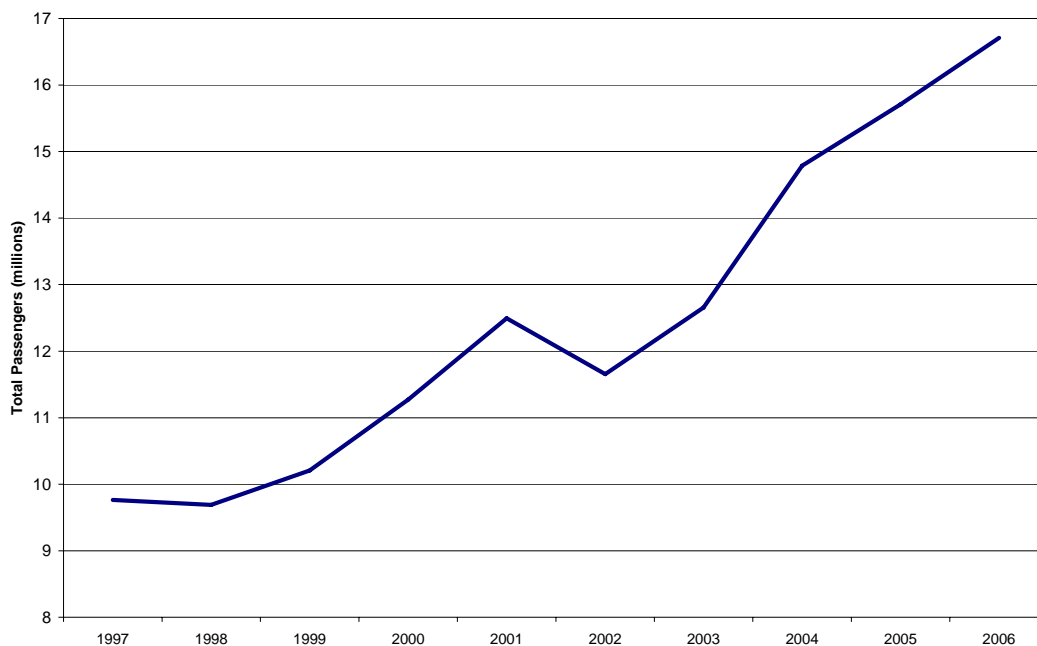
- Port of Brisbane Motorway upgrade.

2.2.5 Brisbane Airport

Brisbane Airport was privatised through long-term leases in 1997. Brisbane Airport Corporation (BAC) operates the Brisbane Airport and will invest about \$2.2 billion over the next 10 years. A further \$2 billion will be invested by BAC’s tenants and partners on the 2,700-hectare site with more than 1,000 hectares available for commercial development. More than 100 businesses employing about 16,000 people are currently operating directly at Brisbane Airport. The airport operates 24 hours.

At Brisbane Airport, annual growth in domestic airline passenger activity averaged 5.7 percent annually over the past ten years. The international sector experienced average annual growth rate of 5.9 percent. The total number of passengers increased to more than 16 million in 2006, which represents a 6 percent increase on the 2005 data. Total passengers are forecast to grow to 35 million by 2025. This is the largest percentage increase of all major Australian airports.

■ **Figure 7: Passenger levels at Brisbane Airport (1997 – 2006) (Total passengers in million)**



Source: BTRE Aviation Statistics Section

Air freight carried on international flights has continued to grow steadily. The annual total freight for 2005-2006 was 85,154 tonnes (44,879 tonnes on incoming and 40,275 tonnes on outgoing flights). This represents an increase of 5.15 percent since 2004-2005.

Some of the current and planned infrastructure projects initiated by BAC to expand the ATC precinct include:

- \$1 billion New Parallel Runway Project;

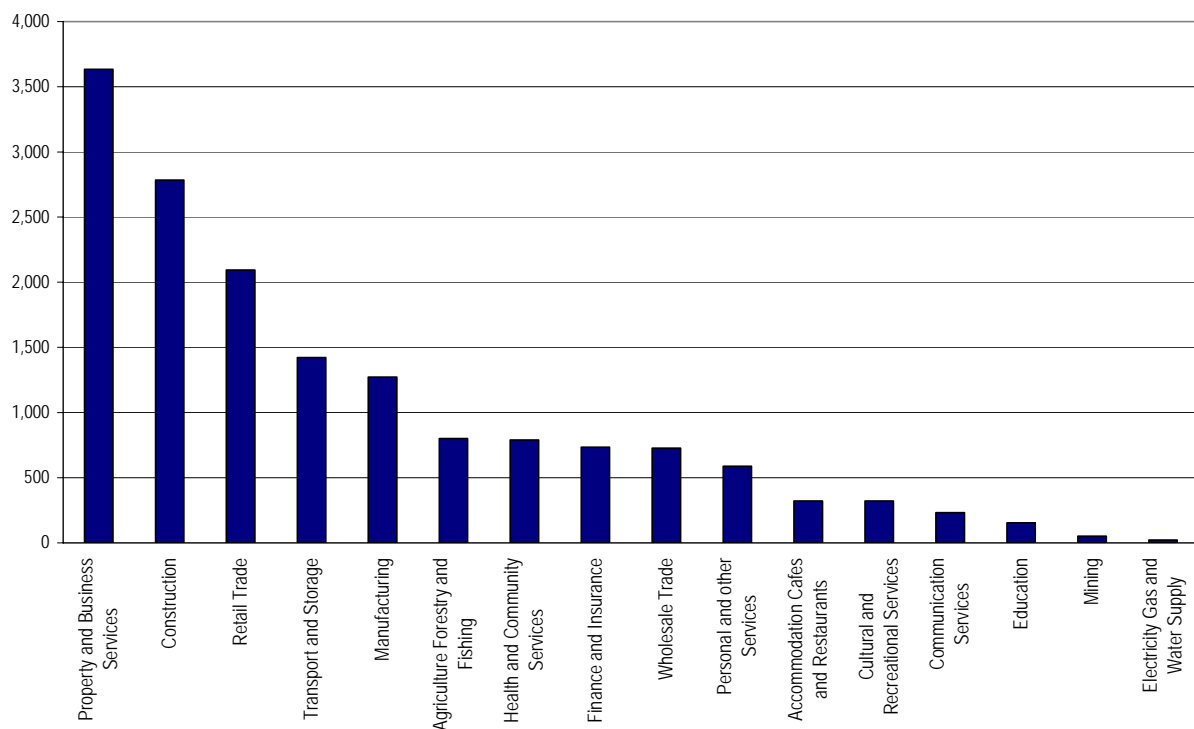
- Major expansion of International Terminal Facilities – including \$350 million of current projects underway;
- Expansion of Domestic Terminal;
- Northern Access Road Project linking the new Gateway Motorway to the Airport;
- Number 1 Airport Drive precinct – including plans for an on-airport hotel, gym, supermarket, golf course, medical centre, office buildings and childcare centre;
- \$100 million Da Vinci Centre redevelopment over the next five years for Australia’s first airport based aviation training and education precinct; and
- Expansion of Aerotech Park aircraft maintenance facilities.

2.2.6 Western Corridor

The Western Corridor is an extension of Brisbane’s Outer South-West. The Western Corridor stretches generally from Wacol in the east through Ipswich to Amberley and also includes Ebenezer, Swanbank, Ripley Valley and Springfield.

In 2006 more than 16,000 businesses were located in the Western Corridor region. More than one fifth of the businesses operate in property and business services, followed by construction (about 17 percent) and retail (13 percent).

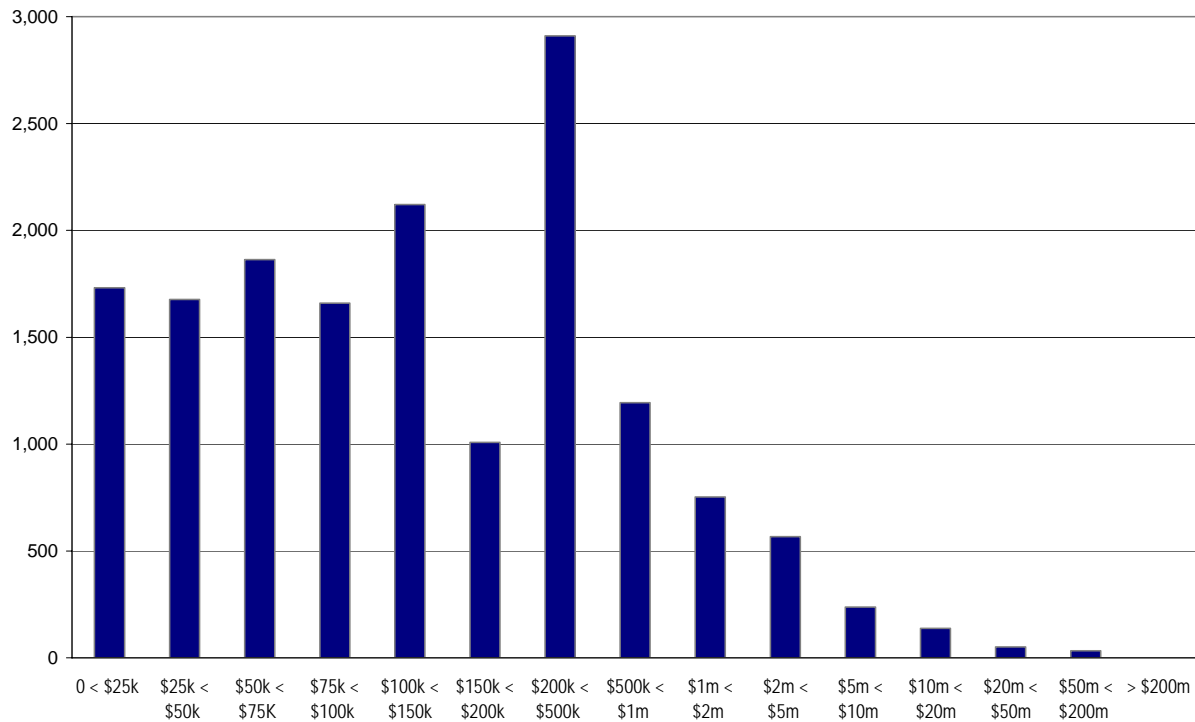
■ **Figure 8: Number of businesses in the Western Corridor**



Source: Australian Bureau of Statistics, 8165.0 Jun 2003 to Jun 2006 Counts of Australian Businesses, including Entries and Exits Table 3.1 Businesses by Postcode by Industry Division, by Employment Size Ranges: June 2006. Postcodes: 4073, 4074, 4075, 4076, 4077, 4078, 4300, 4301, 4303, 4304, 4305, 4306.

More than 80 percent of the businesses in the Western Corridor have an annual turnover of less than \$500,000 making most of them small and medium size enterprises. There are only 33 businesses in the area with an annual turnover of between \$50 million and \$200 million.

■ **Figure 9: Annual turnover businesses in the Western Corridor**



Source: Australian Bureau of Statistics, 8165.0 Jun 2003 to Jun 2006 Counts of Australian Businesses, including Entries and Exits, Table 3.2 Businesses by Postcode by Industry Division, by Annual Turnover Ranges: June 2006. Postcodes: 4073, 4074, 4075, 4076, 4077, 4078, 4300, 4301, 4303, 4304, 4305, 4306.

Current growth patterns show that since 2001 Ipswich City has experienced a significant increase in population growth rates despite the fact that the between 1986 and 2004 the fastest-growing areas were along the coast and not in the western regions. Managing the growth in the Western Corridor is one of the key features of the South East Queensland Regional Plan 2005 – 2026 (SEQ Regional Plan). This growth in the Western Corridor will increase demand for transportation of people and freight between the west, the Brisbane CBD and the ATC.

There are a number of factors supporting the notion of future opportunities, economic development and job creation for the Western Corridor such as:

- Availability of suitable land for large-scale industries and logistics with adequate separation from sensitive land uses;
- Good freight transport links to state and national highway and rail networks;

- A workforce with the appropriate mix of skills for local industries;
- Investment in training and upgrading skills; and
- Competitively priced energy.

As a major new urban growth area likely to more than double its current population in the next 20 years, the Western Corridor gains from the availability of residential and industrial land. There is the opportunity to create a large number of jobs, through economic growth and investments in infrastructure and services. Aerospace, freight, training and education have been identified as industries with high growth potential due to the proximity to Amberley airbase and existing campuses.

By identifying the Western Corridor as a future urban development area, the SEQ Regional Plan's strategies give priority to infrastructure and services in the area aiming to facilitate an increasing proportion of the forecast population growth and economic activities to move to the Western Corridor.

3 Future Economic Environment

3.1 Easing of Traffic Congestion

The future growth of Brisbane as a prosperous and sustainable city will include the agglomeration of economic activities that are fundamentally dependent on mobility and accessibility. Any impedance of movement and accessibility can create significant economic costs by reducing productive efficiency through traffic delays and increasing transport costs.

Road congestion imposes direct economic and environmental costs on road users and the broader community in the form of time and money wasted in slow moving traffic, particularly in the morning and afternoon peaks.

Traffic is an outcome of the way the Brisbane community functions, the economic activities of Brisbane industrial and commercial sectors and the road choices that are currently available.

The objectives of the NLRT from an economic perspective include:

- The regional need to provide for efficient cross city movement of people and freight while maintaining the amenity of the local streets; and
- The above includes reducing the interaction of light and heavy vehicles on local and surface arterials.

In the context of the NLRT, the additional road capacity offered by the project in conjunction with the travel demand management initiatives on Milton Road and Coronation Drive will have the objective of enhancing traffic flows on local and sub-arterial roads in the corridor.

The end result will be to make local precincts more environmentally friendly in terms of safety, amenity, emissions and reducing the significant variability in volumes, speed and vehicle segmentation. The redirection of around 60,500 vehicles a day through the tunnel and away from surface roads will have positive effects on amenity, liveability, safety and the potential land use development opportunities.

There will be some induced traffic generated by additional capacity, with traffic modelling on a network basis suggesting a 1% to 2% increase, but importantly the NLRT will divert existing surface traffic into the tunnel, particularly in the peaks, and away from existing local and sub-arterial surface roads.

3.2 Economic Development

Brisbane City Council's 2026 vision for Brisbane is to be "prosperous and sustainable with cohesive healthy communities...a leader in technology, driving a strong economy that provides job opportunities for all." The key themes that are articulated in this vision include an accessible city, a smart and prosperous city, an active and healthy city and a regional and world city.

Supporting this longer term vision and the pathway leading to short to medium enhanced economic performance, Brisbane City Council has recently adopted the *Brisbane Economic Development Plan 2006–2011* [BEDP].

A number of key socio-economic aggregates have been forecast to 2026 in the BEDP that will need to be supported by economic infrastructure such as road investment. These forecasts include:

- The population of greater metropolitan area defined by the Brisbane Statistical Division will grow from 1.8 million persons in 2006 to 2.4 million.
- The residential population of the Brisbane Local Government Area [LGA] will grow from 980,000 persons in 2006 to 1.19 million in 2026.
- Employment in the Brisbane LGA will increase from 585,000 persons to 850,000 persons in 2026.
- With regard to forecast employment growth, the BEDP highlights that 80% of the Brisbane LGA growth in employment (i.e. 212,000 persons) to 2026 will be concentrated in 20% of the city's suburbs.
- The suburbs or areas within the catchment of the NLRT, namely Brisbane Central Business District (CBD), ATC, Milton and the inner northern suburb of Herston figure prominently in the top 10 centres of future employment growth. For example, employment in the CBD will increase from 120,000 in 2006 to 190,000 in 2026, while the ATC will increase from the existing 34,000 to 100,000 persons.
- Connectivity and accessibility to the CBD and ATC resulting from the NLRT will be a major factor in reducing journey time between the outer western suburbs of Brisbane and the CBD and ATC.

The BEDP has a key theme that Brisbane needs to have world class roads and other economic infrastructure to ensure the efficiency and competitiveness of the city's economic activity. This high quality infrastructure is required to attract and support high levels of productivity and export based private investment. The BEDP has set an annual export growth rate of 4 percent that will grow the city's value of exports from a current \$32 billion in 2004 to \$79 billion by 2026.

In terms of major road investment such as the NLRT, the BEDP identifies the need for Brisbane road infrastructure to maintain the current high level of service, and specifically the need to contain travel times at current levels and not allow travel times to rise excessively over time.

The NLRT project will complement other BCC initiatives currently under investigation including:

- Implementation of the CBD Master Plan that will cater for an increase in jobs from 120,000 in 2006 to 190,000 in 2026.
- The preparation of a strategy with ATC to maximise the economic development and employment potential of the ATC to increase jobs growth from 34,000 in 2006 to 100,000 in 2026.

- Supporting economic activity and future employment growth in inner city locations around knowledge based industries (e.g. University of Queensland – St Lucia and QUT – Kelvin Grove), hospitals (eg RBWH and Wesley) and other creative precincts (Fortitude Valley); and
- Development of the Brisbane Transport Plan to provide the provision of an efficient and effective transport system that will enable workers to access employment and to have the flexibility to readily change their place of employment.

The NLRT supports the key success measures for the BEDP namely:

- Newly completed transport infrastructure projects that service the needs of the city’s major jobs growth locations, including freight and commuter requirements.
- Strong private investment in the Brisbane CBD and ATC.
- The development of export-oriented firms that are reflected in the rising average aggregate earnings of the Brisbane workforce relative to the rest of Australia.

3.3 Future Freight Activity

The *South East Queensland Freight Strategy 2007 – 2012* provides direction for the future policy, planning, infrastructure design, operations and institutional arrangements to encourage the effective and efficient end to end delivery of freight in SEQ. The strategy supports the *South East Queensland Regional Plan* and in particular the plan’s vision “to provide an efficient and integrated freight transport system for the SEQ region”.

The existing freight demands and freight network and the region’s future challenges that are articulated in the strategy and have significance for the NLRT include:

- The SEQ region represents about 62 percent of the Queensland economy and has potential to assume an even greater role based on regional population forecasts (i.e. a population growth of 1 million persons over the next 20 years) and increasing economic development and trade.
- Population growth is a significant contributor to consumption and freight growth. Assuming household consumption grows by 4.5 percent, the current freight volume will almost triple by 2026. Industrial production will also grow and the volume of freight will increase to approximately 80 mt in 2026
- The Inner freight corridor provides the vital linkages to the outer freight corridors and to the key economic and commercial precincts in the region. It was estimated in 2002 that the amount of freight moved in this inner corridor was 39 mt.
- Growth in inter and intra urban freight movements is likely to have a significant impact on the performance of SEQ’s priority freight costs and the local road network with the following key locations recognised as likely to see increases in freight activity:
 - Brisbane CBD.
 - ATC driven by expansion of the Brisbane Airport’s passenger throughput and other commercial developments on airport land.

- Existing and new industrial precincts within the region and requiring cross city travel including Acacia Ridge, Ipswich, Virginia and Brendale.

The strategy highlights that traffic congestion imposes significant costs on the movement of freight by increasing travel time and vehicle operating costs. These costs will become a more prevalent issue for freight particularly in the morning and afternoon peak commuter period spreads and constraining the timing of freight movements and economic activity.

The Brisbane transport task is dominated by road based trans-urban movement of passengers and freight. While the demands on the network are geographically dispersed, the major flows are largely concentrated along the north-south and east-west axes connecting employment, trade and service centres.

Economic growth in the SEQ region is projected to exceed the national growth rate between 2.5 percent and 3 percent over the next 25 years, and the associated freight transport tonnages to support this growth is expected to increase by up to 5 percent per annum.

The ability of the metropolitan road network to meet the growing demand for cross city movement of people and freight is critical to the long term development of Brisbane. Currently increasing congestion particularly in the spreading peak periods is adversely impacting on road network efficiency and performance. Without road investment, this problem will be exacerbated over the next 20 – 25 years as the population and commercial activity in the region increases.

Brisbane is the key location for interregional, interstate and international economic activity in Queensland and accounts for over 11% of national GDP. In Queensland, Brisbane accounts for around 60 percent of GSP.

The ATC which encompasses the Brisbane Airport, Port of Brisbane, Brisbane Multimodal Terminal and other industrial / commercial activities contributed in excess of \$10.5 billion to the Queensland economy in 2004 and it is forecast to increase at 5 percent a year in the short term. Freight through the Port of Brisbane is predicted to increase from 26 million tonnes in 2005 to between 54 and 72 mt in 2025. Containers are predicted to increase from the current 800,000 twenty foot equivalents (TEUs) to between 2.3 million and 3.7 million TEUs in 2025.

Brisbane Airport forecasts a growth in annual passenger movements from the current 16 million to 35 million in 2025. The number of people working at the airport is projected to increase from 8,000 to exceed 40,000 people by 2025. The second runway, scheduled for completion in 2014, will be a significant catalyst for this forecast growth in economic activity.

3.4 Strategic Property Impacts

3.4.1 Background

The Northern Link corridor falls geographically within the western transit corridor. This corridor is focussed on the inner western city railway stations of Milton, Auchenflower, Toowong, Taringa and Indooroopilly. From a land use perspective, the western transit corridor services a large residential

population catchment and major retail centres (i.e. Indooroopilly Shoppingtown and Toowong), educational establishments (i.e. University of Queensland), health (i.e. Wesley Hospital and Toowong Private Hospital), and entertainment (i.e. Suncorp Stadium and Park Road).

The potential and actual impact of the Project on commercial and residential property values, investment and development within the project corridor has been considered. With the benefit of a buoyant economy driven by the resource and construction industries, the impact on the city and near city property market continues in the form of very low vacancy rates, high rental growth and difficulties for growing businesses looking for suitable accommodation.

Brisbane City Council and the State Government regional planning processes have identified the need to further develop urban centres outside the CBD, proposing a range of nodes or major centres around the city to relieve the pressure on CBD infrastructure, particularly transport infrastructure to and from the city.

The existing near city locations of the Urban Renewal Precinct (Fortitude Valley, Newstead and Bowen Hills), Milton/Toowong, Spring Hill and Inner South (South Brisbane/West End), are under accommodation pressure, with businesses choosing to locate in these areas for ease/access to parking, proximity to clients, lower rents and general amenity for staff and clients.

The impacts of the Northern Link project on private property have been detailed in Chapter 13 - Social Environment of this EIS, which identifies that a total of 116 properties would be acquired. In the context of the economic impact assessment therefore, the Project's stakeholders are those property and business owners whose properties or business premises are affected by the Project, and who may be caused to relocate as a result of the Project.

The Project would directly affect 85 residential properties and 11 commercial properties, comprising 24 individual businesses. In the Toowong precinct, the main commercial impacts would be at or near the northern side of Milton Road approaching the Toowong roundabout, with the Mitsubishi car dealership and the Woolworths Caltex service station being directly impacted. The commercial development on the south-east side of the Milton Road/Croydon Street intersection would also be impacted. This development comprises a real estate, health services (3), food/restaurant (2), retail (3), personnel services (2) and an office fit-out business. The bottle shop on the corner of Croydon Street and Sylvan Road would also be acquired.

The Kelvin Grove precinct would have minor commercial impacts with a take-away business on the corner of Kelvin Grove Road/Victoria Street impacted by this connection. This business is currently not operating.

All property acquisitions would be conducted under the *Acquisition of Land Act 1967*, which entitles an affected landowner (residential or commercial) to be compensated for the full market value of a property that is acquired. In the case of commercial property, the Act differentiates between businesses that are operated on premises owned in freehold by the business proprietor, and businesses that are operated on premises under lease. In all cases, the business proprietor is entitled to compensation under the Act for the cost of relocating the business, or for the value of the business,

whichever is the lower. Where the proprietor is also the owner of the freehold title to the premises, the proprietor is also entitled to be compensated for the full market value of the property.

It is generally expected that most of the businesses affected by the Project would find suitable alternative premises, notwithstanding that the motor vehicle dealership and the service station on Milton Road have specific location and land footprint requirements, which may impact on their capacity to find a suitable alternative site in the locality.

The existing near city locations of the Urban Renewal Precinct (Fortitude Valley, Newstead and Bowen Hills), Milton / Toowong, Spring Hill and Inner South (South Brisbane / West End), are under accommodation pressure currently, with businesses choosing to locate in these areas for ease / access to parking, proximity to clients, lower rents and general amenity and convenience for staff and clients alike.

The recent record low vacancy and high rents in Brisbane's CBD and near city markets has resulted in a greater interest in suburban office markets from developers, tenants and investors.

In the broader regional context, the Northern Link project would provide improved access to the expanding employment centres of the Brisbane CBD, Australia TradeCoast and the Western industrial corridor.

3.4.2 Commercial Property

Brisbane CBD

There are currently approximately 1.76 million square metres of office space in the Brisbane CBD. Underpinning demand for this space is the strong South East Queensland growth rate, resulting in vacancy rates at record lows, with an effective vacancy rate of only 0.07 percent in January 2008, a figure that is likely to tighten further during 2008. Despite a range of projects now underway, with 75,000m² to be added in 2008, no relief from the tight market is expected until at least the second half of 2009, with many of these spaces already pre-committed to tenants.

Office rents are also at record highs, with increases of between 35 and 40 percent over the year to September 2007, with over 100 percent increase since 2006, while capital values have increased by 150 percent over the same period. Business conditions suggest demand will continue to grow, with the continued strength of the mining and construction industries in particular.

Accordingly, the price of land continues to be driven higher in the CBD, with investors preferring the high returns of the office market to either residential or hotel development. Delays in new and refurbished supply entering the market, exacerbated by the general construction boom, have also contributed to rent increases and the reduction or disappearance of incentives to lease.

Considering the CBD's extremely low vacancy rates and premium rents, as well as the heavy pre-commitment of proposed new developments, a large number of potential CBD tenants will continue to choose the Brisbane fringe or near city suburbs as an alternative. With Brisbane offices and inner Brisbane apartments competing for the investor dollar, the next two years are unlikely to see this trend reversed.

The Brisbane CBD retail market has been strongly supported by the office market, with the expanded David Jones development and the Q & A Centre opening recently, as well as a proposed upgrade for the Wintergarden complex and Hilton Hotel and the Multiplex construction on the old Regent Theatre site. Specialty store and national chain vacancies are both relatively low at approximately 3 percent, with relatively high rents.

Near City

Vacancy rates in the near city precincts have been falling steadily since 2002, when they sat at 14 percent, to 2 percent in May 2008. Toowong had lowest vacancy rate of 0.1 percent, followed by Spring Hill and the Inner South (0.4 percent), Milton (0.9 percent) and the Urban Renewal precinct (3.4 percent).

These vacancy rates and parallel increasing rents are being driven by strong tenant demand, high business confidence, the state's resource boom and displacement from the CBD due to the extremely low vacancy rates there. Strong rental return has led to higher investor activity in these suburbs, with most new supply coming on-line in 2008 being in the inner or near city, rather than the CBD. However, Brisbane's near city market faces a significant supply challenge over the next two years, with the majority of new stock entering the market in 2008 already pre-committed.

The Urban Renewal Precinct is the largest near city commercial property centre, closely followed by Milton, Spring Hill and the Inner South (South Brisbane, Woolloongabba, East Brisbane, Kangaroo Point and West End). As much of the proposed new supply is in the Inner South, this would make it the second largest of the near city precincts, with a number of engineering and construction firms choosing to relocate to this area due to the proximity to large infrastructure projects.

Brisbane office space and inner city apartments are currently competing for the investment dollar, with the high returns and certainty of return skewing investment towards office developments. In addition, almost a quarter of the new apartment stock constructed in Brisbane since 2003 / 2004 has been held back for short stay rental or serviced apartment stock catering to the tourist sector. With high room rates and strong growth in occupancy levels, this has provided investors with a better return on what represents a substantial outlay.

Spring Hill

Spring Hill is one of Brisbane's largest near city office markets, characterised by older office and residential buildings. Within close walking distance of the CBD, this area is attractive to established businesses. With approximately 175,000m² of total office space, this is approximately 10 percent of the size of the total office space in the Brisbane CBD. There is minimal new development planned, due to a lack of available land.

Toowong

Toowong is a mixed-used precinct with retail, commercial and residential developments and approximately 75,000m² of office space. This is a relatively small office market which is approximately 5 percent of size of the total office space in the Brisbane CBD. Toowong's proximity to the University of Queensland, the Brisbane CBD and the Milton commercial precinct, along with

the availability of transport infrastructure including trains, buses and ferries, makes this an extremely tight market with very limited vacancies and very few new developments planned. This is a mixed-use precinct with retail, commercial and residential developments, in and around the Toowong Village location.

Inner South

The Inner South precinct comprises the suburbs of South Brisbane, West End, Woolloongabba, East Brisbane and Kangaroo Point, with approximately 166,000m² of office space. The area's easy access to the Brisbane CBD and the influence of urban renewal principles has resulted in a diverse and popular mixed-use precinct with a significant office component.

The Inner South is one of the fastest growing precincts, with substantial office developments under way, particularly in South Brisbane (Grey Street and surrounds). The recent announcement by the Brisbane City Council that building height limits will be relaxed in West End and Kurilpa (to between 15 and 30 storeys) may lead to future high-rise and mixed used developments in this area.

3.4.3 Urban Renewal Precincts

Inner northern

A number of expanding near city areas are also being developed, with Kelvin Grove Urban Village emerging as a new precinct, with Synergy and the Australian Red Cross Blood Service Headquarters as two new key developments. Other expanding near city areas include Hamilton, Herston and Albion, particularly with the Mill development, a new mixed-use precinct at the Albion train station.

The inner northern precinct, covering predominantly Fortitude Valley, Newstead and Bowen Hills, is the largest near city office precinct, with approximately 210,000m² of space, 25 percent of the total near city supply.

This precinct is significantly geographically dispersed and also takes in the suburbs of New Farm and Teneriffe. Brisbane City Council's Urban Renewal Task Force was successful in encouraging the conversion of former industrial buildings into mixed use residential and commercial and this is now marketed effectively as a feature of the area.

Mixed-use projects such as Emporium have prompted developers to consider this as an effective formula and large scale developments at Newstead and Fortitude Valley are following this trend. If over-supply does occur in the office market, developers may be able to resubmit their applications as residential instead, in order to meet the growing and lucrative residential apartment demand in this precinct.

Milton

The suburb of Milton is located at the geographic core of the Northern Link corridor. The area has been the subject of considerable change over the past 20 years because of its close proximity to the Brisbane CBD. The change has been brought about by increase in the number of commercial developments along Coronation Drive and Cribb Street (i.e. Coronation Drive Business Park) and the construction of a number of high density residential developments. Other key features of the corridor

include the ongoing development of the Park Road commercial and retail strip and the redevelopment of Suncorp Stadium.

The established office market of Milton has approximately 187,750 m² of office space, much of it constructed in the 1980s and 1990s, when the precinct's needs were driven by the service, engineering and technology industries. With views of Brisbane River along Coronation Drive and attractive commercial and retail facilities in pockets such as Park Road, this area also benefits from established transport infrastructure, such as rail, buses and ferries.

While these changes have transferred the suburb, there remains a number of locations within Milton that have been recognised for urban renewal over the next 20 years. In this regard, Urban Renewal Brisbane is currently developing the concept of a transit oriented community centred on Milton Railway Station.

A Precinct Plan is currently being prepared to promote the Milton Railway Station area as a location for higher density mixed use development. A number of development applications have been lodged or approved in recent years for residential apartments, hotels and commercial buildings to capitalise on the current Milton Local Plan. In this regard, the new Milton Station development by FKP is proposed to encompass a 30 storey residential building, comprising 214 apartments, 127 room 4.5 star hotel and 10 storeys of office space.

The current Milton Local Plan recognises the following attributes:

- The suburb's close proximity to the CBD and the unique level of amenity associated with its position on the Brisbane River;
- A strong employment hub characterised by a range of office, commercial, retail and small scale light industrial activities.
- Diversity of a mixed use environment and the emergence of the Park Road Centre as a key entertainment area.

Recent trends in the Milton property market highlight the following issues:

- Significant commercial activity and resulting employment growth has occurred in the business and communications sectors.
- A strong residential unit market has developed in Milton.
- There has been a decline in machinery, automotive servicing and household goods business as these activities have been replaced by higher value economic activities.
- The commercial market in Milton has benefited from the cumulative effect of record low vacancies in the Brisbane CBD area.

In the short to medium term, Milton will continue to provide an alternative location for offices and residential accommodation due to its location, public transport options and entertainment and recreational options.

Within the corridor, Milton is earmarked for development intensification to take advantage of the high level of accessibility from train, bus and ferry public transport and general close proximity to the city.

Based on NIEIR forecasts, Milton is predicted to increase its current employment base of approximately 17,600 persons to 23,500 employment opportunities in 2026. Similarly, Brisbane City Council City Shape proposes an increase of 1,000 residents by 2026.

The removal of extraneous traffic from the Milton area will provide a positive impact on the attractiveness and safety of the suburb and provide opportunities for further appropriate commercial and residential developments.

3.4.4 Residential property in the inner city

After several decades of population decline, the inner suburbs are attracting people back to live, with some areas experiencing growth of over 25 percent in the last 10 to 15 years. This growth has been focused strongly on the 20 to 54 year age groups, and in particular students, young professional workers, and middle-aged professionals. A major driver of this inner city population explosion is the rapid growth in new economy jobs in the advanced business services, information technology, education and health that are highly concentrated in the CBD, Milton, the Urban Renewal Precinct and South Brisbane.

Linked to the relocation of these types of businesses to inner city locations, rather than CBD leases, is the attraction of the inner city as a lifestyle choice for younger professionals and tertiary students. In particular, the development of the Urban Renewal Precincts has had a marked impact on the type and nature of housing in these areas, in particular the development of apartment buildings and complexes. At the same time, there has been a shift away from home ownership to private rental, with high investor interest in these areas and significantly high rents for residential property.

Both the Brisbane City Council and the Queensland State Government have been active in encouraging urban consolidation, with the Brisbane City Council encouraging in-fill housing development, and the master-planned redevelopment led by the Urban Renewal Task Force with its redevelopment projects that include conversion of the Teneriffe Woolstores to housing and the construction of major new medium density apartment projects in areas such as Newstead and Fortitude Valley.

The State Government has also been actively involved through massive infrastructure projects that have seen the development of precincts such as South Bank and the Roma Street Parklands. With the rising price of petrol and ever-increasing car parking fees in the CBD, public transport has become a focus of planning in the inner city, to address the needs of new residents who may not have – or want – access to private vehicles.

The State Government's South East Queensland Regional Plan recommends a number of planning initiatives intended to reduce urban sprawl and consolidate urban density in appropriate locations, including the inner and near city suburbs referred to in this report. Plans include the removal of height restrictions in the CBD and improved bus, rail and mass transit transport to and from near city locations such as West End, Fortitude Valley and Spring Hill.

New residential developments, particularly in the higher end of the market, are coming online over the next 12 months in the CBD, New Farm, Newstead (River Park and Gasworks) and West End.

3.4.5 Market Acceptance

Property issues and tunnel impacts

The existing projects underway in Brisbane such as the Clem Jones Tunnel or CLEM7 (formerly known as the North-South Bypass Tunnel) (under construction) and the Airport Link (nearing construction commencement) provide some basis for comparison for potential residential property issues and associated tunnel impacts. The impact of a large-scale project on residential property values is multi layered, with:

- direct impacts on affected properties that may be subject to compulsory acquisition resulting from the construction phase,
- indirect impacts on properties not subject to compulsory acquisition but nevertheless located in the vicinity of portals and/or ventilation stacks, and
- impact on resale value where a volumetric lot is recorded on the property's title resulting from the extent of a property's boundary above the tunnel.

Consultation processes relating to tunnel projects in Australia generally have identified the following issues of concern to property owners; the psychological impact of the 'feeling' of the tunnel below, the potential impact on resale value resulting from volumetric title or proximity to infrastructure, a reduction in passing traffic and therefore business and, conversely, traffic congestion as a result of traffic seeking to avoid the tolls.

Indirect impacts on local property may include reduced market value and reduced property appeal, although it would be difficult to directly attribute this to the Project. To date, there is limited evidence that the CLEM7 or the Airport Link Tunnel have negatively impacted property values, other than for those properties directly affected by resumption. This is discussed in detail in the following section.

Property Market Assessment

For comparison of market acceptance, the impact of the Airport Link project on property values has been analysed. The suburbs of Windsor, Lutwyche and Wooloowin encompass the area affected by the Airport Link Project. This property value assessment does not include the direct impacts of the project, such as property resumption (full, partial or volumetric), change of title, and easements.

Residential property impacts are felt in the market as soon as an infrastructure project is announced. Usually the impacts are greatest at the early stage as existing residents fear the worst. In this regard, the assessment of property prices was done over 10 years and with particular emphasis on 2006 and

2008, the period from the release of the Airport Link EIS to the award of the construction tender and commencement of early construction works.

RP Data from the last ten years has been analysed to identify if the announcement and subsequent approval of the project in 2006 and 2007 respectively has had a direct impact on the property values in the Windsor, Lutwyche and Wooloowin suburbs. This data has then been compared to property sale values for the Brisbane City LGA dataset. The Brisbane City LGA dataset has been used as a benchmark for analysis as it encompasses the entire Brisbane area, including the project area.

In general statistical usage, correlation or co-relation refers to the departure of two variables from independence. If the variables are independent then the correlation is 0. The closer the coefficient is to either -1 or 1, the stronger the correlation between the variables, with 1 denoting a positive dependence whereas an upward growth trend in one variable results in an upward growth trend in the other variable and -1 denoting a negative dependence, whereas an upward growth trend in one variable results in an equal downward growth trend in the over variable.

In terms of the property assessment, if the property sale prices of Windsor, Lutwyche and Wooloowin have a strong correlation (close to 1) with the Brisbane City LGA, then it could be said that the project has no evident impact on house prices in the study area.

House Prices

The following table outlines the correlation coefficients for median house prices over the past 10 years and more recently since the announcement of the project in 2006.

■ **Table 5 Houses - Correlation coefficient, median house prices (past 10 years)**

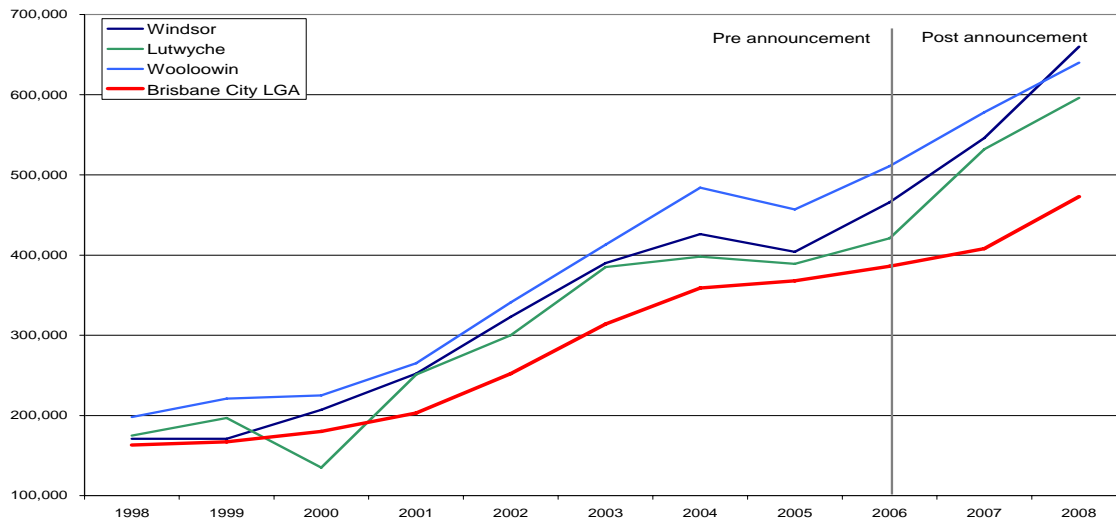
10 years	Windsor	Lutwyche	Wooloowin
Brisbane LGA	0.98	0.97	0.99

■ **Table 6 Houses - Correlation coefficient, median house prices (post 2006)**

2006 onwards	Windsor	Lutwyche	Wooloowin
Brisbane LGA	0.98	0.91	0.96

All three of the correlation coefficients are very close to 1. This means that the property values in the individual suburbs follow the trend of the Brisbane City LGA very closely. The figure below illustrates the property values over the past 10 years. It is of interest to note that pre-2006 and post-2006 growth trends of Windsor, Lutwyche and Wooloowin follow closely to the Brisbane City LGA, demonstrating that the announcement of the project had no evident impact on the house property values of the affected suburbs.

■ **Figure 10 Median House Prices (Past 10 Years)**



Unit/Apartment Prices

Table 7 and Figure 13 below outline the correlation coefficients and median unit price trends for the past 10 years for units respectively. Table 7 Correlation coefficient, median unit prices (past 10 years).

10 years	Windsor	Lutwyche	Woolloowin
Brisbane LGA	0.96	0.95	0.97

■ **Table 8 Correlation coefficient, median unit prices (post 2006)**

2006 onwards	Windsor	Lutwyche	Woolloowin
Brisbane LGA	1.00	0.98	0.94

While the correlation for unit prices is not as close to Brisbane City LGA property sale prices as it is for houses, it is still quite strong. Pre and post 2006 growth trends for unit prices following the same trend as the Brisbane City LGA, demonstrating that the announcement of the project had no evident impact on unit property values of the affected suburbs.

■ **Figure 11 Median Unit Prices (Past 10 Years)**

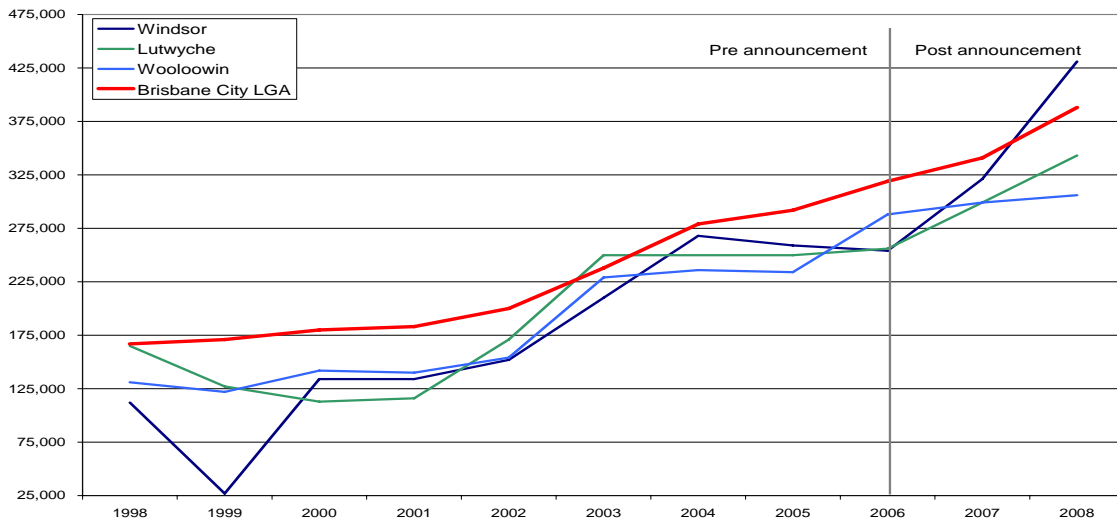


Figure 10 above illustrates the movement in median house prices over the past 10 years, while Figure 11 illustrates the same for the median price of units and apartments. It is of interest to note that pre-2006 and post-2006 growth trends for Windsor, Lutwyche and Woolloowin, for houses and units, follow closely that of the Brisbane City LGA. This demonstrates that the announcement of the project has had no evident impact on the property values for houses or units in the affected suburbs.

3.4.6 Effect of Volumetric Acquisition and Title

Volumetric lots may be acquired under the *Acquisition of Land Act 1967* in the same way as part takes of surface allotments. The acquisition in effect creates a new lot similar to a subdivision, where ownership of the new lot would vest in Council. The volumetric acquisition does not involve any change in the ownership of the land with the surface property owner no longer having any interest in the new subterranean lot created.

There may in some cases be a situation where, because of the shallow nature of the tunnel excavation works, there are some limitations over the use of the land at the surface where that use may impact on or damage the tunnel. However, given the depth of the sub-surface land normally required for road tunnels it would be unlikely that a volumetric acquisition would have any impact on a property owner's rights to develop the land in accordance with Brisbane City Council's prevailing town planning codes and policies.

Notwithstanding, there is little market evidence to guide the determination of the monetary value effect that a volumetric lot title may cause. Anecdotal evidence has been tendered that property owners perceive a loss in property value and property appeal vis-à-vis similar properties not subject to a volumetric title. The volumetric lot may discourage some buyers from bidding for a property containing a permanent subterranean title in a market where there are other properties available with no such title. In addition, it is likely that prospective purchasers of a property with a volumetric title in place would expect some form of price reduction. The monetary impact of a subterranean volumetric title would differ for each property depending on location, quality of the property and other specific factors directly attributable to the property.

4 Employment

The Project would create a large number of jobs in construction and operation. During construction, the Project would require a labour force equivalent of 450 full time people on-site for the full 45 month duration of the works. A breakdown of this figure is provided in Chapter 4, however it should be noted that the actual number of workers on site at any given time would vary depending upon the activities under way and the time of day.

The majority of the construction workforce would be drawn from the South East Queensland region. There may also be some specialist technical services/consultants who reside elsewhere in Australia who would work on the site for the duration of construction or as their services are required.

Surface works would generally be carried out during daytime hours only, except for infrequent tasks that require temporary or partial closure of main roads, which may be scheduled at night. Tunnelling work would continue 24 hours a day, seven days a week.

In its operational phase, the Project would generate the following ongoing employment:

■ Tunnel owner / operator	7 x full-time equivalents 4 x part-time equivalents
■ Owner / operator subcontractors / consultants	16 x full-time equivalents
■ Toll collection	49 x full time equivalents Increasing to 61 by 2026
■ Normal maintenance and operations	51 x full-time equivalents
■ Subcontractors	23 x full-time equivalents

5 Cost Benefit Analysis

5.1 Introduction

The economic assessment uses the NLRT Cost Benefit Analysis (CBA) model that has been specifically developed for the NLRT EIS reference case (i.e. Project Case). The Project Case comprises a straight through tunnel connection from the Western Freeway west of the Toowong roundabout to the Inner City Bypass (ICB) east of Kelvin Grove Road. Other direct connections to Milton Road at Toowong and Kelvin Grove Road at Kelvin Grove are also included in the Project Case. The CBA Model provides investment results to assess the economic viability of the Project Case in terms of travel time savings, vehicle operating costs savings, road safety savings, environmental and externality benefits. The measures of benefits and costs in the CBA reflect the concept of economic efficiency. An allocation of resources increases economic efficiency if the sum of the benefits accruing to those who gain by that allocation exceeds the sum of costs borne by those who lose. The quantification of the economic efficiency or alternatively economic viability can be expressed as Net Present Value (NPV), that is the calculation of net benefits (Present Value of benefits minus Present Value of costs) when the base case is compared to the project case over the assessment period, and Benefit Cost Ratio (BCR), which is the ratio of the total Present Value of benefits over the Present Value of costs.

■ Table 9 NLRT CBA investment criteria

Investment Criteria	Description
Net Present Value (NPV)	Calculation of the net discounted value (i.e. present value of benefits minus present value of costs) over the assessment period. A positive NPV indicates that the project is economically justified under the set of assumptions in the CBA.
Benefit Cost Ratio (BCR)	Ratio of the total present value of benefits over the present value of costs. BCR greater than 1.0 indicates that the project is economically justified under the set of assumptions in the CBA.
Present Value of Costs (PVC)	Represents the capital and operating costs over the assessment period after the allowance for discounting.
Present Value of Benefits (PVB)	Represents the discounted travel time benefits, vehicle operating costs benefits, road safety benefits and externalities benefits over the assessment period.

The benefits and costs that are included in the NLRT CBA model are those that have been monetised by using data from actual markets where available (i.e. capital costs (CAPEX), labour prices, vehicle operating prices etc). Austroads/DMR have provided road user costs parameter values while CAPEX project costs for Northern Link have been sourced from recently developed project cost schedules in constant 2008 prices. The CBA modelling results are not the sole determining factor of the worthiness of the project, but considered alongside other major social, environmental and planning related project impacts that have been identified in other studies within the context of the NLRT.

5.2 CBA Project Case Description

The Project Case provides a straight through connection from the Western Freeway west of the Toowong roundabout to the Inner City Bypass (ICB) east of Kelvin Grove Road. Other connections to Milton Road at Toowong and Kelvin Grove Road at Kelvin Grove are also included in the Project Case. The mainline tunnel is approximately 5.5 km in length, two lanes each way from the Western Freeway near the Toowong roundabout to the ICB at Kelvin Grove. Traffic connectivity to Kelvin Grove Road from the tunnel is provided in the Project Case, improving accessibility to the Brisbane CBD and the northern and western city fringe. At the western end of the tunnel, traffic connectivity will also be provided to the Toowong precinct.

From an economic perspective, the Northern Link aims to achieve the following:

- Improved transport efficiency (i.e. travel time savings, reduced vehicle operating costs, reducing congestion and enhancing road safety) for the community, business and transport suppliers;
- Improved journey time reliability of the network so that it will enhance the competitiveness of regional and state economies;
- Enhanced road connectivity to/from the western suburbs and Toowong and the CBD;
- Public transport benefits resulting from improved journey time for express buses using the tunnel;
- Wider economic impacts including better accessibility and corridor investment; and
- Noise, air quality, health (road safety) and other amenity improvement; and
- To obtain value for money from any public expenditure to be allocated to the Project.

The Project Case caters for regional and western suburbs traffic movements and offers the enhanced connectivity for travel associated with the inner west suburbs and key activity centres in Brisbane North, the Airport/ATC and the Brisbane CBD. It would function as an inner-western Brisbane bypass that would also provide a regionally significant transport role by improving accessibility from the population and industrial growth areas of the Western Corridor to key economic activity centres within the Brisbane region. It would be particularly beneficial for freight traffic, linking to the ICB and Airport Link, and providing a fast and efficient route to the ATC region north of the river including Brisbane Airport. It also provides improved connectivity to key activity centres such as Indooroopilly and Toowong and key specialist centres such as Royal Brisbane Hospital and University of Queensland.

Forecast traffic volumes for the Project Case are estimated at around 60,500 vehicles per average annual weekday in 2026. Surface roads in Brisbane's inner west suburbs are forecast to experience widespread traffic reductions which will relieve congestion at key bottlenecks and improve urban amenity. Key traffic impacts on the surface network include:

- Increases in traffic on the Western Freeway by 4 percent and the ICB by 21 percent;
- A combined reduction in traffic on Milton Road/Coronation Drive of 21 percent; and

- The proposed tunnel will carry 6 percent commercial vehicles, of which 36 percent is regional freight.

NLRT with the Inner City Bypass and the soon to be constructed Airport Link, will provide an improved cross-city freight route from the western areas of Brisbane to the Airport and the ATC. The Western Corridor and the ATC are the fastest growing industrial areas in the SEQ region. It is estimated that freight transport would benefit with savings of almost 30 minutes per day available for peak period journeys between the Western Corridor and the Airport and ATC North. The freight route via NLRT would also be approximately 10 percent shorter than via the Brisbane Urban Corridor, reducing road transport industry vehicle operating costs. Most importantly, NLRT would in turn be expected to reduce pressure on the heavily trafficked Brisbane Urban Corridor, as well as reducing travel times and operating costs for heavy vehicles serving the northern suburbs and the Western Corridor.

5.3 CBA modelling assumptions

5.3.1 Background

The most significant data inputs that impact on the CBA modelling are:

- CAPEX and OPEX cost estimates;
- Network traffic data for the Without Project and With Project Case for NLRT;
- Discount rate of 6 percent assumed for the Project Case reporting in accord with DMR guidelines for major road projects; and
- Sensitivity testing using 4 percent and 8 percent discount rates for risk adjusted P10, P50 and P90 CAPEX (i.e. the 10th, 50th and 90th percentile confidence levels for estimated CAPEX).

It is important to understand that CBA of transport projects does have limitations that are set by assumptions and the range of factors that can be monetised, these are listed in Table 11. The CBA does not and cannot measure and/or monetise everything of importance to decision makers and the public.

5.3.2 Costs inputs

Construction costs (CAPEX)

The CAPEX cash flow (in June 2008 constant dollars) used in the CBA modelling of the Project Case extends from 2009 to late 2013 and comprises the following:

- Land acquisition costs
- Preconstruction costs
- Non-construction costs
- Construction costs

- Risk

Table 10 below outlines the CAPEX requirements for the Northern Link Project Case for all risk adjusted levels. The P50 level represents that expected CAPEX and is adopted as the Project Case CAPEX. The remaining P10 (i.e. best case) and P90 (i.e. worst case) have been used in the CBA to model CAPEX sensitivity across the range of risk adjusted levels.

■ **Table 10 Project Case cash flow at P10, P50 & P90 risk adjusted CAPEX levels**

Year	2009	2010	2011	2012	2013	Total
P10	\$85.4 m	\$646.7 m	\$502.6 m	\$568.1 m	\$157.2 m	\$1,960.1 m
P50	\$85.4 m	\$674.3 m	\$520.6 m	\$585.4 m	\$172.9 m	\$2,038.7 m
P90	\$85.4 m	\$703.2 m	\$539.3 m	\$603.4 m	\$189.3 m	\$2,120.6 m

Operations & Maintenance costs (OPEX)

The operations and maintenance (OPEX) costs over the 45 year assessment life of the project total \$1,627 million. The OPEX schedule has been provided on an annual basis and is common to all the CBA modelling in the Project Case. The OPEX includes the following:

- Tunnel traffic management facilities, signage, roadway lighting, CCTV, utilities and radio broadcast;
- Fire and life safety, mechanical and electrical systems including tunnel ventilation, power supplies, fire response and protection facilities, communication and security systems and emergency egress;
- Plant management and control systems.

5.3.3 Traffic modelling inputs

The principal inputs into the Northern Link CBA model that are used to determine the net road user benefits and externalities over the assessment period result from the traffic modelling for the project.

The road network for the Northern Link traffic modelling is the Brisbane Strategic Transport Model (BSTM). Traffic network modelling results have been developed for the With (Project Case) and Without (Base Case) for Northern Link for the assignment years of 2014, 2016, 2021 and 2026. The Base Case network includes the CLEM7 (Clem Jones Tunnel, formerly referred to as the North-South Bypass Tunnel or NSBT) currently under construction and the soon to be constructed Airport Link project. The Project Case network includes the aforementioned projects and also the recently approved Hale Street link (HSL). The Project Case does not include the traffic impacts of the road/tunnel options identified in the Western Brisbane Transport Network Investigation (WBTNI) for the corridor between Stafford and Toowong / Mt Coot-tha.

The traffic modelling further segments traffic by light vehicles and heavy vehicles and by travel time during a 24 hour day (i.e. AM peak: 7am – 9am, Business hours: 9am – 4pm, PM peak: 4pm – 6pm, and Night off-peak: 6pm – 7am).

The key assumptions that underpin the traffic demand are the following:

- Toll is set at \$3.93 (in constant 2008 prices)
- Surface treatment includes the reinstatement of Coronation Drive bus lanes
- PIFU medium demographics has been adopted with Enhanced mode choice

An important feature of the traffic modelling is the differentiation in the traffic modelling outputs between proposed users of the Northern Link tunnel and non-users, namely all other network users. This approach has been adopted to accommodate the traffic impacts of induced demand resulting from the project.

Induced demand is defined as the additional demand for travel that occurs as a result of a decrease in the generalised cost of travel including both travel time and out of pocket vehicle operating costs. For the case of Northern Link, additional vehicle travel will result from the project and the consequential freeing up of surface road capacity, thereby inducing people to take new vehicle trips, longer trips and, subject to availability of public transport alternatives, shift to other modes.

The traffic modelling output for Northern Link users has been developed on the basis of the “rule of half”. This rule is an accepted method to account for induced demand and is generally described for each trip benefit as being equal to half the difference in the cost of travel (generalised cost of travel comprising travel time costs and vehicle operating costs) between the Base Case and the Project Case. This is because users are already receiving Base Case trip benefits which would otherwise be double counted in the Project Case. The non-users segment is the per trip benefit equal to the full difference between the Base Case and the Project Case.

Traffic demand for the With and Without Project Case from 2014 to 2026, including the segmentation by users and non-users of the network, is provided in Appendix B.

5.3.4 CBA modelling inputs and assumptions

The most significant inputs for the CBA model are the CAPEX estimates for the project case and network traffic data for the base case and project case. Other critical inputs include the parameter values to be used in the determination of road user benefits namely travel time benefits, vehicle operating costs benefits, road safety benefits and externalities benefits. The current DMR/Austrroads standards for these values are in 2007 (June) prices.

Table 11 provides a comprehensive list of items and assumptions used in the development of the Northern Link CBA model.

■ **Table 11 NLRT CBA model assumptions**

Item	Assumptions
Price Terms	CAPEX and OPEX costs and benefits are presented in real terms (i.e. constant June 2008 dollars).
CAPEX	CAPEX cash flow for the NLRT would commence in 2009 and be completed by end 2013. CAPEX is costed at P10, P50 and P90 risk levels; that is the 10 th , 50 th and 90 th percentile confidence levels for the CAPEX estimate, where P50 is the expected or likely CAPEX.
Operating and Maintenance (OPEX) Costs	OPEX cash flow has been provided and is presented from 2009 to 2053 for the NLRT Project Case.
Benefit Assessment Period	NLRT Project Case CAPEX starts 2009 and ends in 2013. Road user operations for the NLRT Project Case commence in 2013 and the post construction assessment period extends over 40 years to 2053.
Discount Rate (Project Case)	6% in line with current State guidelines. See also Sensitivity section below for other discount rates modelled.
Traffic Data	<p>Traffic assignment years for 2014, 2016, 2021 and 2026.</p> <p>Without Project Base Case and NLRT Project Case vehicle data by assignment years (i.e. Average Speed, VHT and VKT).</p> <p>Without Project Base Case and NLRT Project Case traffic data segmented by AM peak, PM peak, other business hours and other hours. Using Daily Traffic Profile data on a 24 hour basis from the local network.</p> <p>Vehicle segmentation by Light Vehicles (composition comprising private vehicles 77% and business vehicles 23%) and heavy vehicles.</p>
Traffic Modelling	<ul style="list-style-type: none"> • Toll = \$3.93(\$2008), HCV Toll multiplier = 2.00. • Surface treatment = Coronation Drive Bus Lanes . • PIFU Medium demographics with Enhanced mode choice
Average Travel Speed	Determined by traffic analysis for vehicle category and assignment years.
Annualisation	<ul style="list-style-type: none"> • 342 for light vehicles • 300 for heavy vehicles • Average 340 for all vehicles
Inter Assignment Year Interpolation	Linear average annual growth between traffic assignment years.

Item	Assumptions
Travel Time Parameter Values	<p>DMR/Austrroads endorsed values for Urban Travel Time 2007 has been used for CBA modelling. The values per occupant (person-hour) are as follows:</p> <ul style="list-style-type: none"> • Private Vehicle: \$11.62 • Business Light Vehicle: \$37.16 • Heavy Vehicle (3 axle): \$23.26
Vehicle Occupancy Rates	<p>The vehicle occupancy rates are as follows:</p> <ul style="list-style-type: none"> • Private Vehicle: 1.6 passengers • Business Light Vehicle: 1.4 passengers • Heavy Vehicle (3 axle): 1 passenger.
Vehicle Operating Cost (VOC)	<p>The vehicle operating cost model is used to determine VOC by vehicle category for the future base case traffic network. Model coefficients were taken from DMR/Austrroads standards 2007.</p>
Road Safety Benefits	<p>The inputs into the road safety benefits analysis are as follows:</p> <ul style="list-style-type: none"> • AADT VKT values used for With and Without Project Case • Accident cost values (2002 dollars) for local and freeway networks
Residual Value	<p>The residual value of the NLRT after 40 years of operation is assumed to be \$0.</p>
Sensitivity	<p>Sensitivity testing of P10, P50 and P90 risk adjusted CAPEX using:</p> <ul style="list-style-type: none"> • Discount rate of 4 percent • Discount rate of 8 percent
Decision Outputs	<p>The following CBA decision outputs have been delivered for the NLRT:</p> <ul style="list-style-type: none"> • Benefit Cost Ratio • Net Present Value • Present Value of costs • Present Value of benefits segmented by travel time benefits, VOC benefits, road safety benefits and environmental benefits.

5.3.5 Tolls as transfer payments

Tolls represent a means by which some of the benefits to the users of the project (as measured by their implicit willingness to pay for reduced travel time or improved safety) can be transferred in whole or in part (in the form of cash payments by the users) to the State or private company that operates the

facility. When tolls are proposed for a project such as the NLRT, the CBA accounts for the effect of such charges on future use of the facility, through the use of traffic modelling outputs that are underpinned by the setting of a toll (i.e. \$3.93 in the case of NLRT). In particular, the payment of a toll transfers the value of some of the time saving or other user benefit including out of pocket vehicle operating costs from the road user to the facility operator, thereby reducing the value of benefits realised by the road user. Consequently, a road user would typically use the facility less often if it were tolled than if it were not tolled, affecting future traffic demand, congestion and user benefits on the surrounding surface road network. The consistent economic approach is to include tolls as both a cost to road users and a benefit to the operator thereby cancelling out each other in any analysis.

5.4 CBA model results

5.4.1 CBA findings

The results from the CBA for the NLRT Project Case with a risk adjusted (P50) CAPEX of approximately \$2,039 million and OPEX of around \$1,627 million over the 45 year period at a discount rate of 6 percent are shown in Table 12.

■ **Table 12 NLRT Project Case P50 CBA findings (6 percent discount rate)**

Output	Value
Present Value of Costs (PVC)	\$2,311.1 m
Present Value of Benefits (PVB)	\$2,861.0 m
Net Present Value (NPV)	\$549.9 m
Benefit Cost Ratio (BCR)	1.2

Investment criteria that have been calculated for the NLRT Project Case in this CBA are NPV and BCR. The PV of Benefits has been segmented by benefit type, namely: Travel Time savings, Vehicle Operating Costs (VOC) savings, Road Safety savings and Environment/Externalities benefits. The PV of Costs refers to the present value of the capital investment and the annual operating and maintenance costs in line with the 45 year whole of asset life.

The NPV is the value of the discounted total future benefits minus discounted total future costs over the 45 year assessment period for the NLRT Project Case. On the basis of the assumptions that have been adopted, the CBA model returns a NPV of \$550 million over the life of the project and represents a strong economic justification for proceeding with the project.

The BCR is equal to the discounted total benefits over the concession period divided by the discounted total costs (i.e. CAPEX and OPEX). A ratio great than 1 indicates that the NLRT Project Case is economically viable in the context of the CBA although there maybe other non CBA factors (e.g. available program funding, social and environmental) which may also be considered to assess the full impact of the Project. A higher BCR indicates that the Project has greater economic merit.

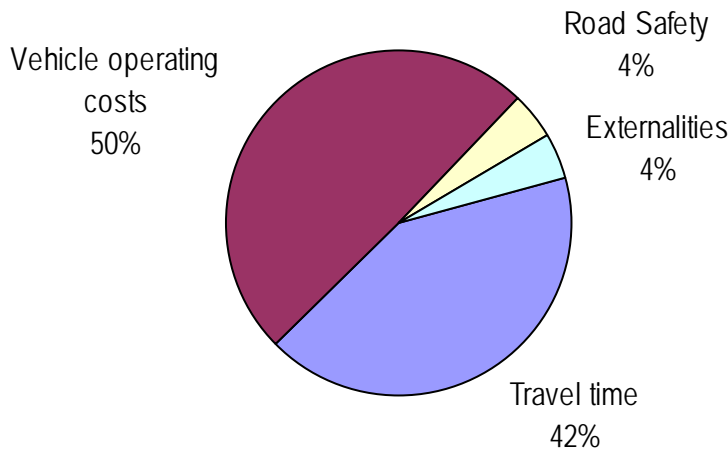
Applying the NLRT CBA model to the NLRT Project Case results in a BCR of 1.2. The BCR of 1.3 indicates that the project provides a 20 percent return over the discounted value of the investment for the 45 year assessment period for the project.

The breakdown of the discounted benefits by type is provided in Table 13.

■ **Table 13 NLRT Project Case discounted benefits by type**

Benefit	Present value	Percent of benefits
Travel time	\$1,195.2 m	41.8%
VOC	\$1,422.8 m	49.7%
Road Safety	\$125.4 m	4.4%
Externalities	\$117.6 m	4.1%
Total Discounted Benefits	\$2,861.0 m	100%

Table 13 and Figure 12 highlight the importance of VOC savings at \$1,422 million or 50 percent of total discounted benefits that will accrue to the future road network with the construction of the NLRT Project Case. Travel Time savings at \$1,195 million or 42 percent of all discounted benefits are also significant benefits to road users. Road Safety benefits and Environmental/Externalities benefits at \$125 million and \$118 million respectively, are smaller but nevertheless important benefits.



■ **Figure 12 Total benefits segmentation (percent)**

■ Table 14 NLRT Project Case CBA Summary Results, P50 and 6 percent discount rate (\$m)

Discounted Cash Flows	
Present value of costs	\$2,311.1
Present value of benefits	\$2,861.0
Net present value	\$549.9
Benefit-cost ratio	1.24

Discounted Costs	
CAPEX	\$1,813.4
OPEX	\$497.7
Total Discounted Costs	\$2,311.1

Discounted Benefits	
Travel time	\$1,195.2
Vehicle operating costs	\$1,422.8
Road Safety	\$125.4
Externalities	\$117.6
Total Discounted Benefits	\$2,861.0

1. Travel Time		Present Value
Private Light Vehicles		\$608.4
Business Light Vehicles		\$515.9
Heavy Vehicles		\$70.9
Travel Time Total		\$1,195.2

2. Vehicle operating costs (VOC)		Present Value
Light Vehicles		\$1,195.2
Heavy Vehicles		\$227.7
VOC Total		\$1,422.8

3. Road Safety		Present Value
Light and Heavy Vehicles		\$125.4
Road Safety Total		\$125.4

4. Externalities		Present Value
Noise		\$6.14
Air Pollution		\$42.0
Water Pollution		\$6.3
Greenhouse Gases		\$9.9
Nature & Landscape		\$5.3
Urban Separation		\$6.4
Upstream/Downstream		\$41.6
Externalities Total		\$117.6

5.4.2 Travel time savings

Estimation of expected changes in travel times is a key element to consider when determining the economic effects of transport projects, including an expansion of capacity of the road network through the upgrading of the existing road. Projects which improve traffic flows provide motorists with reduced journey time, less congestion in the network and enhanced network reliability that may result in time savings. These travel related time savings are assessed as having economic value in the context of CBA.

The larger proportion of the benefits accruing from the NLRT is comprised of travel time savings. These savings accrue to the occupants of light vehicles (private and business) whose time savings are multiplied by estimated values of travel time expressed in terms of dollars per hour. For private vehicles this value is \$11.62 per hour per person and for business \$37.16 per hour per person. The value of the travel time savings is therefore the dollar value multiplied by both the number of minutes saved per vehicle and the number of occupants per vehicle.

The same process is applicable to heavy vehicles segmentation with the driver / vehicle prescribed in travel time value per hour (i.e. \$23.26) and the freight component (i.e. \$11.27) similarly attracting a time value per hour because of the time dependent nature of the freight load.

The values that are prescribed per hour to driver, other occupants and freight are based on average weekly wages and freight transport costs. The method of calculation leads to the position that the proposed higher speed tunnel link will result in reduced network congestion, and significant travel time savings.

Travel time benefits equate to the net difference in user travel time costs between the Without Project Base Case and the NLRT Project Case. Travel time estimates for local network traffic are calculated using aggregates of:

- Travel speed for each vehicle class (light vehicles and heavy vehicle classes)
- Average annual daily traffic by vehicle class (AADT)
- Route distance
- Average occupancy by vehicle class
- Value of time per occupant and for freight by vehicle class.

The approach applied in this study uses Network Vehicle Hours Travelled (VHT) data for assignment years 2014, 2016, 2021 and 2026.

The data has been segmented by vehicle class (light vehicles and heavy vehicles) and by period of travel (morning peak 7 am – 9 am, afternoon peak 4 pm – 6 pm, business hours 9 am – 4 pm and other hours 6 pm – 7 am). The vehicle class ‘cars’ has been further delineated into light vehicles (private) and light vehicles (business).

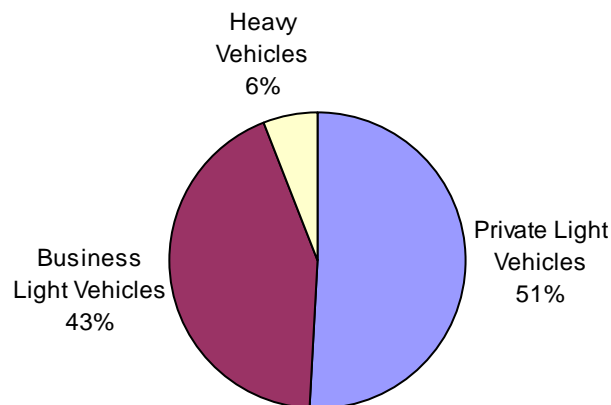
The significance of delineating by private/business purposes and peak and business/other hours is that each has a different occupancy rate per vehicle and, in the case of light vehicles (business – peak/business hours) and heavy vehicles (peak/business hours), a higher assigned economic parameter value (value of time).

Table 15 shows the travel time savings generated by the NLRT Project Case segmented by vehicle type.

■ **Table 15 Discounted travel time savings by vehicle type**

Vehicle segment	Present value (\$)	Percent of travel time savings (rounded)
Private Light Vehicles	\$608.4 m	51%
Business Light Vehicles	\$515.9 m	43%
Heavy Vehicles	\$70.9 m	6%
Travel Time Benefits Total	\$1,195.2 m	100%

Travel time savings represent the second largest economic net benefit to NLRT Project Case with a value over \$1,195 million in net present value terms. Private light vehicles are the largest contributor to travel time savings with 51 percent or \$608 million value over the 45 year assessment period.



■ **Figure 13 Travel time savings (percent) by vehicle type**

Reducing road costs for business increases their productivity. The savings estimate includes the costs of operating freight vehicles (i.e. heavy freight) and business cars (i.e. business light vehicles) including the times costs of drivers, their passengers and the freight component in the case of heavy vehicles.

The implementation of “just in time” manufacturing and delivery systems has heightened concerns that the city’s road system must be able to support increasingly efficient logistics management systems.

5.4.3 Vehicle operating costs (VOC) savings

Road projects can directly affect the cost to drivers of operating their vehicles by improving traffic flow conditions and by offering drivers better road conditions which optimise the running of their vehicles. VOC are based on a combination of variables including fuel and oil consumption, maintenance and repair, and capital depreciation, insurance costs, road condition and gradient and vehicle speed.

VOC parameter values and journey speed vehicle operating costs models which incorporate these values are periodically updated by ARRB with the latest being in the Austroads publication, Economic Evaluation of Road Investment Proposals – Unit Values for User Costs (Draft), Austroads 2007.

VOC savings following the commencement of road use post 2013 represent the largest economic net benefit to NLRT Project Case with a value over \$1,423 million in net present value terms.

5.4.4 Road safety benefits

Road safety benefits have been derived for both the users and non-users of the proposed Project Case. Non-user road safety benefits for the NLRT Project Case are derived for all vehicles by modelling average accident costs by the weighted average of the road types (local / sub-arterial, arterial and freeway) in terms of cost per million vehicle kilometres of travel (MVKT). The net difference for non-user road safety between the Without Project Base Case and the Northern Link Project Case is the road safety savings. In addition, road safety benefits have been calculated for the users of the project. The NLRT Project Case will be inherently safer because of the elimination of traffic controlled intersections and constant travel speed.

The generalised network road safety benefits for the NLRT Project Case are \$125 million or 4 percent of the total discounted benefits.

5.4.5 Externalities

There will be a range of direct and indirect impacts on the built and natural environments that can be considered and assessed in the CBA process. The environmental impacts that can be monetised and subsequently have implications for the CBA model are as follows:

- Noise
- Local air quality
- Water quality
- Greenhouse gas emissions
- Nature and landscape
- Urban separation
- Upstream and downstream costs

For this section of the CBA model it is assumed that both light vehicles and heavy vehicle traffic using the NLRT Project Case will specifically generate noise, local air quality, water quality, greenhouse gases, nature and landscape, urban separation and upstream and downstream cost benefits.

The following table provides the 2007 Austroads externality unit cost for urban passenger vehicles and urban freight vehicles. It is assumed that the average tonnage per heavy vehicle is 15 tonnes.

■ **Table 16 Externality unit costs - urban**

Externality	Passenger vehicle (cents per km)	Heavy vehicle (\$ per 1000 tonne km)
Noise	0.82	27.1
Local Air Pollution	2.54	158.93
Water Quality	0.38	23.84
Greenhouse Gas Emissions	2.00	49.5
Nature and landscape	0.05	17.68
Urban separation	0.59	25.93
Upstream/Downstream costs	3.42	164.99

The following table identifies the environmental savings by environmental type as a result of the NLRT Project Case.

■ **Table 17 Discounted externalities benefits**

Externalities benefit	Present value
Noise	\$6.1 m
Air Pollution	\$42.0 m
Water Pollution	\$6.3 m
Greenhouse Gas	\$9.9 m
Nature	\$5.3 m
Urban	\$6.4 m
Upstream/Downstream	\$41.6 m
Total externalities benefits	\$117.6 m

Externalities benefits account for approximately 4 percent of the total economic benefits to the project. In discounted terms, externalities savings are approximately \$118 million.

5.5 Sensitivity analysis

Sensitivity testing across all risk levels (P10, P50, and P90) has been undertaken in the NLRT CBA model using 4 percent and 8 percent discount rates.

The project case of CAPEX P50 at a discount rate of 6 percent has been included in the table to facilitate comparison of sensitivity test scenarios.

■ **Table 18 Sensitivity test of cost benefit analysis results (\$m)**

Sensitivity test	P10		P50		P90	
	NPV	BCR	NPV	BCR	NPV	BCR
4.0%	\$1,751m	1.7	\$1,680m	1.7	\$1,605m	1.6
6.0%	\$619m	1.3	\$550m	1.2	\$478m	1.2
8.0%	-\$40m	1.0	-\$106m	0.9	-\$175m	0.9

The findings from the sensitivity analysis are as follows:

- The discount rate of 4 percent returns a BCR of between 1.6 and 1.7 across all risk assessment levels and an NPV of between \$1,605 million and \$1,751 million, providing a sound economic justification for the proposed NLRT.
- The discount rate of 8 percent returns a BCR of between 0.9 and 1.0 across all risk assessment levels and an NPV of between -\$175 million and -\$40 million, indicating an economic viability slightly under the break even level at this upper discount rate.

For all sensitivity test scenarios, the economic results are lessened by the range of assumptions that are adopted and the range of benefits that can be monetised. It is more likely that the economic result NPV would be further improved by land development and improved amenity within the corridor directly influenced by the NLRT Project Case. See Appendix for a summary of all CBA results.

5.6 CBA Conclusions

The key conclusions from the NLRT CBA modelling results are as follows:

- The NLRT Project Case with a risk adjusted P50 capital cost of approximately \$2,039 million and a discount rate of 6 percent is estimated to return a BCR of 1.2 and NPV of \$550 million over the 45 year assessment period;
- The NLRT Project Case with at the P10 and P90 capital cost levels and a discount rate of 6 percent also returns an acceptable BCR and NPV at 1.3 (NPV of \$619 million) and 1.2 (NPV of \$478 million) respectively;
- The discount rate of 8 percent returns a BCR of between 0.9 and 1.0 across all capital cost risk assessment levels indicating a NPV slightly less than break even at this upper discount rate.
- VOC savings are the primary economic justification of the upgrade works contributing an estimated \$1,442 million in savings or 50 percent of the total discounted benefits. Travel time savings contributed significantly to the project amounting to \$1,195 million or 42 percent of the total discounted benefits. Road safety benefits at \$125 million or 4 percent of total discounted benefits and externalities at \$118 million or 4 percent of total discounted benefits comprised the remaining benefits;
- The NLRT Project Case is estimated to generate in excess of \$11 billion worth of undiscounted economic benefits over the life of the project in terms of travel time savings, vehicle operating costs, road safety savings and environmental savings; and

- Other non monetised benefits include some public transport travel time and waiting savings, some bus fleet operational efficiencies, land value capture along the corridor and a number of other secondary benefits that would serve to improve the benefits of the project and hence the BCR and NPV.

In conclusion, under the modelling assumptions that have been adopted, the CBA results at the P10, P50 and P90 risk adjusted capital cost levels and across the range of discount rates from 4 percent to 6 percent provide an acceptable economic justification to proceed with the NLRT Project Case.

5.7 Timing of Delivery

The issues of the timing of the Project's delivery and commercial viability have been addressed through the Business Case reporting process, which has been carried out separate to the EIS process. The EIS has included an economic evaluation of the Project that focuses on the road user related benefits that the Project will deliver as opposed to the commercial returns. Notwithstanding, the timing of the Project is being considered in recognition of a potential window of opportunity in late 2009/early 2010.

In addition, construction material prices have been increasing at a rate of 6% per annum in 2007/2008 while construction labour rates have been increasing by approximately 10% per annum. While forecasting on construction costs including materials and labour can be unpredictable due to unforeseen economic conditions, the total development costs for the Project could escalate between 5% and 10% per annum, making the Project considerably more expensive if put on hold. Most importantly, the early annual road user benefits, resulting in improved transport efficiency and enhanced road network connectivity that could be attributed to the project, would not be achieved, which would be to the detriment of Brisbane's and the region's economies.

6 Computable General Equilibrium Modelling

6.1 Introduction

The Centre of Policy Studies (CoPS) at Monash University to estimate the economic effects of the Northern Link project on the Queensland economy. This report details the method and results of this study.

The economy-wide effects of the proposed Northern Link have been estimated using the MONASH Multi Regional Forecasting (MMRF-GREEN) model of the Australian economy. MMRF-GREEN is a dynamic multi regional computable general equilibrium (CGE) model that captures the behaviour of economic agents in each Australian state and territory.

Results for Queensland are provided for the period 2009, when construction activities are scheduled to commence, to the end of the 40 year concession period in 2053. For the construction period, 2009 to 2013, the Queensland state results are also decomposed into the effects on South East Queensland (SEQ) and the rest of Queensland.

Section 5.2 provides a description of the set of simulations undertaken including the computation of the economic shocks imposed (i.e. direct costs and benefits) for each year of the simulation, and the underlying macroeconomic assumptions.

The model results for the economic effects of the Northern Link are presented in Section 5.3.

6.2 The Simulations

Simulation Design

In the assessment of the Northern Link, the MMRF –GREEN modelling simulations produce a baseline forecast for the Australian economy for the period 2009 to 2053. The MMRF-GREEN forecasts incorporates expectations concerning the movement of major macroeconomic variables (such as real GDP, real household consumption, real investment, real government expenditure and import volumes) over the period. Using this information, the model generates forecasts for a wide range of economic variables at the national, state and regional level.

For the baseline forecasting, the initial modelling does not incorporate the Northern Link project. The forecast is then repeated under the same assumptions as above, except that for this new forecast incorporates additional economic shocks designed to represent the incorporation of the Northern Link project. The new forecasts are then compared with the baseline forecasts. Results are reported as deviations (in percentage change terms) of the policy forecast from the baseline forecast for each year of the period 2009 to 2053. Thus the results show the effects on the economy of the construction and operation of the Northern Link over a 45 year period starting in 2009.

Exogenous Shocks

Estimates for direct costs and benefits of the Northern Link for the period 2009 to 2053 have been taken from the P50 risk adjusted capital costs and also the annual net benefits or costs identified in the

CBA. These figures consist of capital expenditure for each year between 2009 to 2013 in which the link is constructed; operating costs for each year from 2009 to 2053; and annual estimates for four major types of benefits from 2013 (the year in which construction activity is completed and the Link commences operations) to 2053. These benefits consist of the value of travel-time savings (distinguished between private and commercial cars), vehicle operating benefits, road safety benefits and environmental benefits.

These figures were used as the basis of the shocks imposed on the model over the simulation period. Capital expenditure was assumed to consist entirely of expenditure on the MMRF commodity, Construction, while operating expenses was assumed to consist entirely of expenditure on the commodity, Other Transport.

It was assumed that the capital and operating expenditures were funded by tolls on vehicles using the Northern Link. It was further assumed that these tolls were levied on the operation of three industries, Road passenger transport, Road freight and Private transport services. The third of these industries covers the operation of private motor cars by households. A single toll rate (in constant price terms) per vehicle using the Northern Link (both commercial and private) over the entire operating phase from 2014 to 2053. The toll rate was computed so that the net present value of toll revenue would equal the net present value of capital and operating expenditures at a discount rate of 6 per cent (all revenue and expenditure at constant prices).

Only the commercial vehicles component of time savings was modelled. It was assumed that these time savings reduced labour costs per unit of output. The labour savings were spread between Road Passenger Transport and Road Freight in accordance with their base year outputs. It is important when considering the results later in this report to keep in mind that we assume that just over half of the time saving (i.e. that by private motorists) is not modelled in this study as affecting economic activity. That is, we assumed that private motorists will use all of the time they save as leisure. The increased leisure is, however, a gain to household welfare. Thus when considering the gains to household we should combine the value of increased leisure time with the change in real household consumption.

Vehicle operating benefits covers savings in repairs, parts and fuel. These cost savings were distributed to Road Passenger Transport, Road Freight and Private Transport Services in proportion to their outputs. For each of these industries, their cost savings were spread across various categories of fuel saving (Petrol automotive, Diesel, LPG and Other petroleum), motor vehicle repairs (which falls to the industry Trade and hotels), and Cars & car parts, Other manufacturing, and Financial & business services in accordance with the particular industries base-year proportions for these purchases.

6.3 Overall Results

6.3.1 Context

Results shown are for each of the 45 years of the project. For the purposes of presenting the results, the initial four years, 2009 to 2013, are referred to as the construction phase of the project. The following 40 years 2014 to 2053 are referred to as the operating phase.

The following glossary is provided to assist with the interpretation of the following results:

- **Deviation from the baseline** means the percentage/dollar/job deviation from the baseline forecast result for that variable which comes about as a result of the construction and operation of the Northern Link. The baseline forecast assumes the Northern Link is not built.
- **Real values** refer to economic aggregates that have been appropriately deflated for changes in price levels.
- **Gross State Product (GSP)** is the value of final goods and services produced annually in a state (valued at market prices)
- **Value Added** of an industry is equal to the value of the primary factors employed by the industry. That is, value added is the difference between an industry's total output and its bought-in inputs (materials and services).
- **Consumption** refers to expenditure by households on goods and services (including the services of Other Transport which operates toll roads).
- **Investment** refers to formation of capital (i.e. the production of physical assets such as infrastructure, plant, machinery and equipment).
- An **average-time job** represents about 34 hours work a week (an average of part-time and full-time hours).

6.3.2 National results

Investment in the Northern Link is projected to be \$366 million in an average year of the construction phase. Nevertheless, with national employment held on its base case path Gross Domestic Product also remains very close to its base case path throughout the five-year construction phase (Figure 14). However, national real household consumption is negatively affected by the Northern Link as resources are diverted towards investment in the construction phase (Figure 15). In a typical year of the period, national real consumption (with the northern link) is about 0.07 per cent (\$433 million) below the baseline (without Northern link) forecast.

During a typical year of the 40-year operating phase national real GDP is about \$290 million above the baseline forecast. This is due mainly to productivity improvements associated with the operation of the Link.

6.3.3 Queensland results

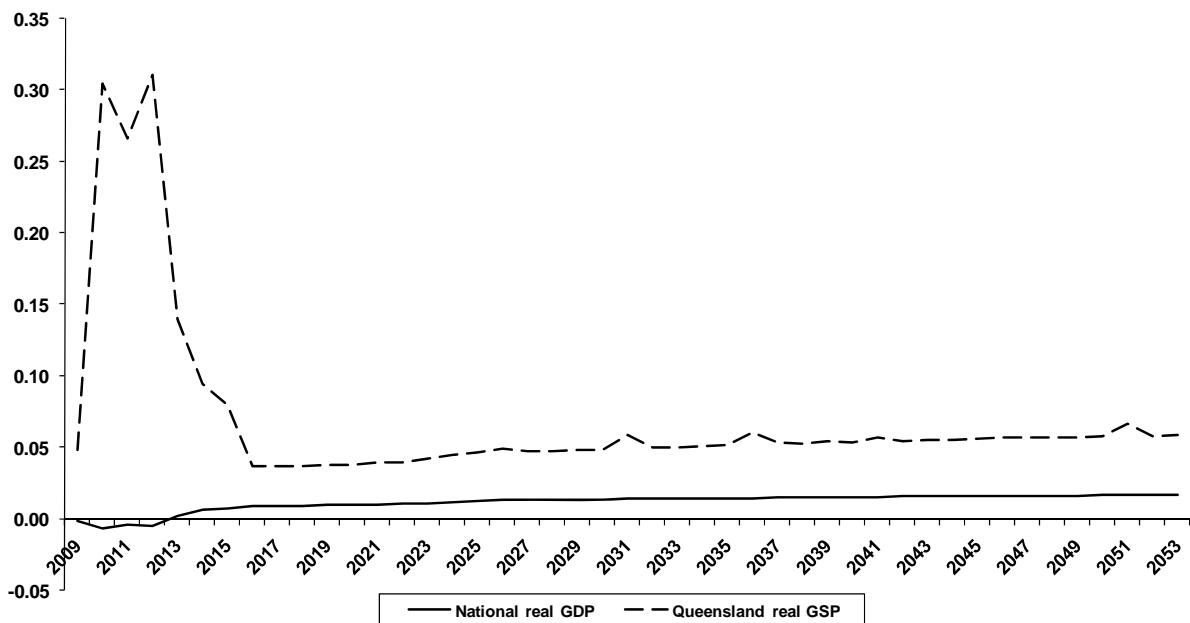
Queensland displays a different pattern of results. During the construction phase there is an increase in Queensland employment and gross state product, generated by construction of the Northern Link. While real consumption is squeezed Australia-wide as a result of the assumption that the project is financed in a macroeconomic sense from domestic savings, the residents of Queensland only contribute part of the saving (less than a fifth). This means that real household consumption increases in Queensland during the construction period. During the operating phase the results for Queensland

are more complex. While the benefits of the new Northern Link flow through in this period, Queensland households are now subject to a toll that reduces their capacity to buy normal goods and services. This means that Queensland real consumption (exclusive of expenditure on other transport via tolls) hardly deviates from its base case path (the deviation is only -\$1.5 million in an average operation year).

6.3.4 Queensland Real GSP

In a typical year of the construction phase (2009-13), real gross state product for Queensland deviates around 0.21 per cent (or \$355 million) above its baseline forecast value. This results from the direct expenditure on construction of the Northern Link, plus local multiplier effects.

In a typical year of the operating phase Queensland real GSP is projected to be almost \$169 million above the baseline forecast (or about 0.05 per cent) as a result of the Northern Link. This arises from the increased productivity arising from faster transport. However, with the lower labour requirements in the road transport industry (see Queensland Industry Sectors) and the repayment of debt to interstate lenders, the requirement for Queensland labour inputs in aggregate declines. As can be seen in Figure 14 below, this has a dampening effect on the increase in a typical year's GSP as the excess labour moves interstate.

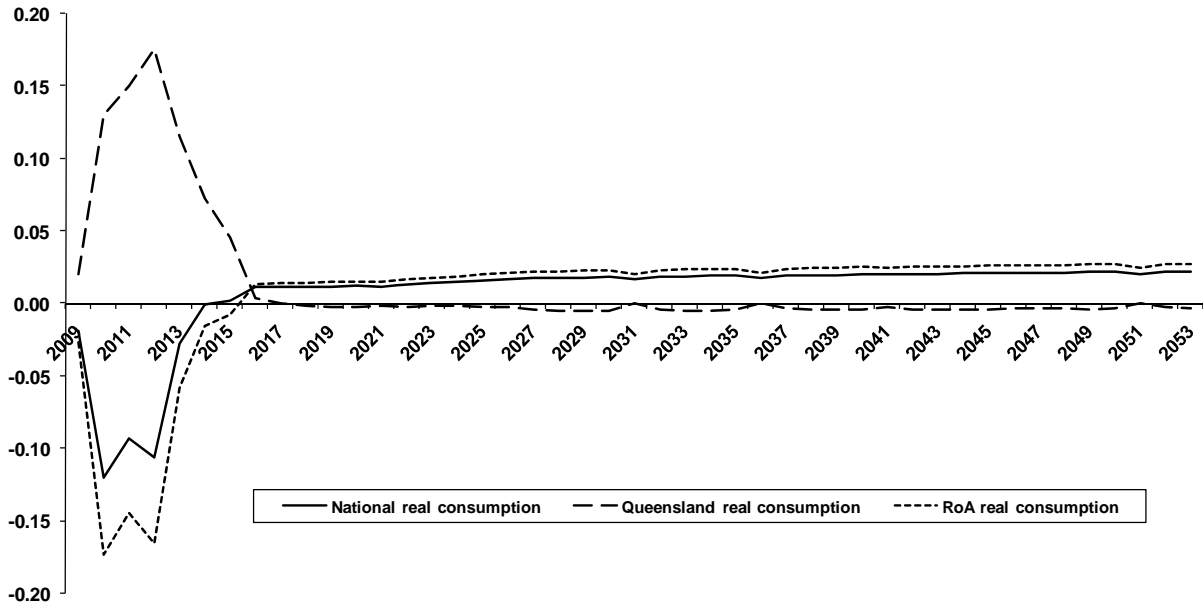


■ **Figure 14 Effect of Northern Link of /GSP (percentage deviation from baseline)**

6.3.5 Queensland Real Consumption

Queensland real household consumption is projected to be almost \$125 million (or 0.12 per cent) above baseline in a typical year of the construction phase. In a typical year of the operating phase Queensland real household consumption (excluding payment of tolls on the new road link) is projected to be around \$1.5 million above the baseline forecast for this variable.

It should be noted that care should be taken in using real household consumption as an indicator of household welfare. No account is taken in the modelling of time savings by private motorists, road safety benefits or externalities. Moreover, real consumption is the product of real consumption per Queensland households and the number of Queensland households. Both components are affected by Northern Link as Figure 15 reveals.



■ **Figure 15 Effect of Northern Link on Real Consumption (percentage deviation from baseline)**

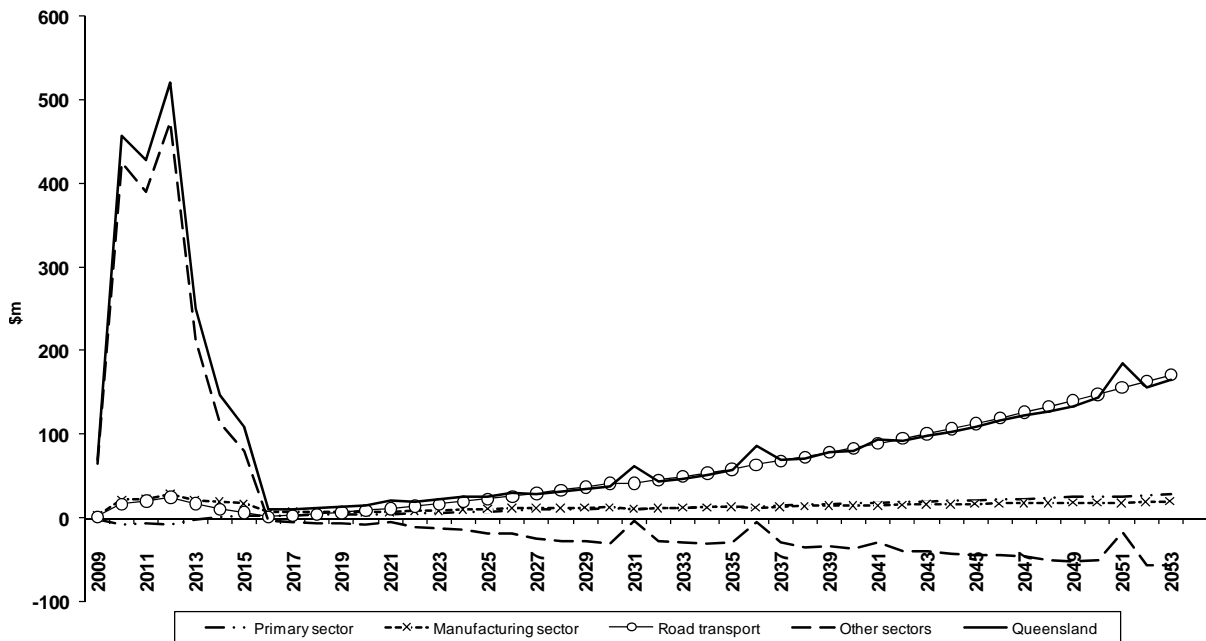
6.3.6 Queensland Industry Sectors

The effects of the Northern Link on four Queensland industry sectors are shown in Figures 16 Value-added and 17 Employment. During the construction phase it can be seen that all Queensland sectors are projected to experience positive effects from the Northern Link on value added and employment. The vast bulk of this is the contribution of Other sectors. In a typical year of the construction phase, two thirds of the positive deviation of \$313 million in that sector’s value-added comes from the Construction Industry. This industry, however, makes up only just over 50 per cent of the positive effects on Other sectors employment (1,946 out of 3,762 jobs in a typical construction-phase year), while Trade & Hotels (882) and Finance & Business Services (591) together make up 40 per cent of the positive effect on Other sectors’ employment.

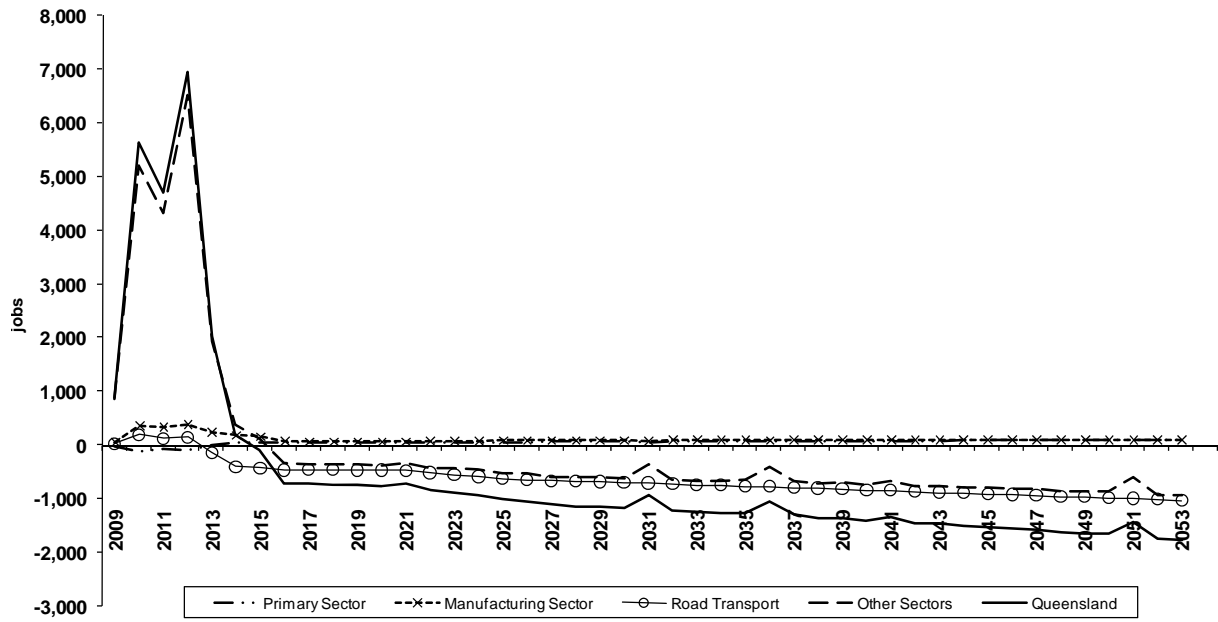
■ **Table 19 Impact of Northern Link on employment in South-East Queensland (average-time jobs)**

	2009	2010	2011	2012	2013
Primary Sector	-4	-20	-14	-16	1
Manufacturing	29	227	216	251	158
Utilities	2	10	6	6	0
Construction	383	2,541	1,948	3,821	1,036
Trade & hotels	192	1,240	1,027	1,190	316
Road transport	20	126	87	96	-82
Other transport	36	49	33	64	16
Other Services	140	884	856	962	390
Total SEQ	798	5,056	4,159	6,374	1,835
Rest Qld	107	580	546	586	214

During the operating phase there is a positive effect on the value-added of the Road Transport sector (\$65 million in a typical operating-phase year) due to the sector’s improved productivity that arises from time-savings and reduced vehicle operating costs. However, the time savings mean that a particular transport task can be done with fewer labour inputs. Impacts on different sectors are shown in the figures below.



■ **Figure 16 Impact of Northern Link on Queensland value-added by major sector**



■ **Figure 17 Impact on Queensland employment by major sector**

7 Economic Justification

World class roads will be required to ensure the efficiency and competitiveness of the Brisbane industry. The NLRT will enhance the economic efficiency of transport in the Brisbane road network, particularly between the western suburbs and Brisbane north/Australia TradeCoast (ATC) and at the same time providing broader economic benefits to industry and the community in Brisbane and the SEQ region. The NLRT is being proposed at a time of unprecedented growth in the SEQ and Queensland.

Forecasts prepared for the Brisbane's Economic Development Plan show the population of Brisbane Statistical Division will grow from 1.8 million persons in 2006 to 2.4 million in 2026. Employment will grow from 585,000 persons to about 1.2 million over the same period.

The suburbs or areas within the catchment of the NLRT, namely Brisbane Central Business District (CBD), ATC, Milton and the inner northern suburb of Herston figure prominently in the top 10 centres of future employment growth.

The CBA results at the P10, P50 and P90 risk adjusted capital cost levels and across the range of discount rates provide an acceptable economic justification to proceed with the NLRT Project Case. The NLRT Project Case adopted for the EIS with a risk adjusted P50 capital cost of approximately \$2,039 million and a discount rate of 6 percent is estimated to return a BCR of 1.2 and NPV of \$550 million over the 45 year assessment period.

VOC savings are the primary economic justification of the upgrade works contributing an estimated \$1,442 million in savings or 50 percent of the total discounted benefits. Travel time savings contributed significantly to the project amounting to \$1,195 million or 42 percent of the total discounted benefits. Road safety benefits at \$125 million or 4 percent of total discounted benefits and externalities at \$118 million or 4 percent of total discounted benefits comprised the remaining benefits. Other non monetised particularly land value capture along the corridor and a number of other secondary benefits that would serve to improve the economics benefits of the project.

The CGE modelling further highlights the economic effects of the Northern Link project on the Queensland economy. During a typical year of the construction phase (2009-13), additional real GSP for Queensland is estimated at \$355 million. Similarly, all Queensland sectors are projected to experience positive effects from the Northern Link on value added at \$313 million and employment of around 3800 average time jobs. In a typical year of the operating phase, Queensland real GSP is projected to be almost \$169 million extra as a result of the Northern Link. The CGE modelling for the NLRT provides positive economic impacts and aggregates for the Queensland economy.