Northern Link

5. Traffic and Transport

Northern Link

Phase 2 – Detailed Feasibility Study

CHAPTER 5

TRAFFIC AND TRANSPORT

- September 2008

Contents

Glossary

Technical Terms

Australia TradeCoast (ATC): A joint marketing initiative by the Queensland Department of State Development, Brisbane Airport Corporation, Port of Brisbane Corporation and Brisbane City Council. A primary purpose of the Australia TradeCoast is to market the 2,200 ha of vacant land north and south of the Brisbane River for general and transport-related industry purposes.

Brisbane Metropolitan Area: Brisbane and the surrounding area extending to Caboolture in the north, Beenleigh in the south, Ipswich in the west and Redlands in the east. Also known as the Brisbane Statistical Division (BSD).

Brisbane Strategic Transport Model (BSTM): A computerised, calibrated transport planning model that forecasts travel demand and traffic flows based on demographic and land use parameters and transport network characteristics.

Central Brisbane: The zone of extensively commercial and other activity in the centre of Brisbane, for this study designated as coinciding with City, Fortitude Valley, New Farm, Newstead, Spring Hill and Bowen Hills south. This area includes the Central Business District (CBD)

Central Business District (CBD): An area of extensive commercial, retail, finance and government activity located within an area that extends from Eagle Terrace (near William Jolly Bridge) to Kemp Place (near the Story Bridge) including all land to the south and east of Ann and Turbot Streets.

Commercial Vehicle (CV): Medium or heavy commercial vehicle commonly referred to as a truck, and specifically equivalent to an AustRoads Class 3 to Class 12 vehicle.

Dangerous Goods: Good defined under the Australian Dangerous Goods Code as either dangerous goods or too dangerous to be transported.

Degree of Saturation (X value): This is the calculated ratio between the demand flow rate and the capacity for each movement. When the maximum X value for any movement is above 95% then the intersection is regarded as over saturated or operating above its practical capacity. This means that it will take more than one cycle of the signals to progress through the intersection. X values above 1.0 typically indicate that several movements will fall within this category.

Demographics: Results from the study of the characteristics of human populations, such as size, growth, density, distribution, vital statistics and land use

EMME: A software transport-modelling package that is used widely for travel demand forecasting both in Australia and internationally

Full journey: A full journey for tolling purposes includes a movement between the west and east connections of Northern Link, and the respective return journey.

High Occupancy Vehicle (HOV): Vehicle carrying more than one occupant (generally two or more occupants), taxis or motorbike.

Induced Traffic Demand: The responses of the travelling public to improvements in network connectivity or reduced congestion. This can result in increased vehicle kilometres on the road network

Inner West Transport Study Area: A study specific area encompassing suburbs to the west of the CBD where local effects of the project require consideration. It includes the suburbs of Milton, Paddington, Auchenflower, Bardon, Toowong, Taringa, Indooroopilly and St Lucia. The boundaries of this area coincide with zones of the BSTM.

Level of Service (LOS): Traffic conditions as perceived by drivers. A key measure of the performance of the road network, it can be measured at a mid-block point or at an intersection.

Road Hierarchy: The classification of roads into major and minor routes to safely and efficiently manage the movement of people and goods while maintaining the liveability of urban areas. Council's draft Transport Plan 2006 – 2026 uses a five level hierarchy.

Select link plots: Highlight the distribution of origin and destinations of users of a particular road link selected for examination.

SIDRA: A computer analysis package that is a widely accepted tool for specifically assessing the operation of intersections.

TransApex: Brisbane City Council's proposed tri-axis based framework of strategic road connections that would allow Brisbane's cross-city travel movements to bypass the CBD and inner suburbs

Transit Lane: Lane available for travel by buses and other vehicles with a specified minimum occupancy eg T2 lane (2 or more persons) or T3 lane (3 or more persons)

Trip: A one-way journey by an individual using one or many transport modes.

Acronyms and Abbreviations

AADT	Annual average daily traffic
AWDT	Average Week Day Traffic
AM	Before noon
ATC	Australian TradeCoast
BCC	Brisbane City Council
BSD	Brisbane Statistical Division
BSTM	Brisbane Strategic Transport Model
CBD	Central Business District
CLEM7	Clem Jones Tunnel (previously known as the North-South Bypass Tunnel)
CV	Commercial Vehicle

DMR	Queensland Department of Main Roads
DOS	Degree of Saturation
E/B	Eastbound
GUP	Gateway Upgrade Project
HSL	Hale Street Link
ICB	Inner City Bypass
INB	Inner Northern Busway
Km/h	Kilometres per hour
LOS	Level of Service
N/B	Northbound
PIFU	Planning, Information and Forecasting Unit
PM	After noon
QT	Queensland Transport
RCM	RiverCity Motorways
S/B	South bound
SEQ	South East Queensland
SEQIPP	South East Queensland Infrastructure Plan and Program
SEQTS	South East Queensland Travel Surveys
SP	Stated Preference
T2 or T3	Transit Lane
TMP	Traffic Management Plan
TOD	Transit Oriented Development
VMS	Variable Message System
VHT	Vehicle hours travelled
VKT	Vehicle kilometres travelled
VOC	Vehicle operating costs

VPH	Vehicles per hour
W/B	West Bound
WBTNI	Western Brisbane Transport Network Investigation

5 Traffic and Transport

This chapter addresses the issues raised in Part B, Section 4 of the Terms of Reference (ToR) and provides an overview of the traffic and transport studies undertaken for the Project. The studies were undertaken by Sinclair Knight Merz-Connell Wagner Joint Venture (SKM CW JV) and the full report is provided as Technical Paper No. 1 - Traffic and Transport Technical Paper in Volume 3 of the EIS.

The overview describes the existing transport and its performance in terms of the regional and local road systems, public transport services and pedestrian and cycle facilities. The performance is assessed in terms of traffic demands, access requirements, travel speed and travel time, road capacity, intersection performance, interaction with public transport, tolling and road safety.

A description of the studies undertaken to forecast future traffic conditions together with a description of the traffic forecasting methodology is provided. The performance of the future road network is *generally reported for the year of opening 2014 and 2026, with the Project in place (effects of the proposal) and without (future base traffic conditions). The future performance is described in terms of traffic patterns and traffic flow, intersection and local and regional network performance, aggregate road network performance, public transport operation and road safety performance. The effects of the proposal also consider the implications of tolling on untolled route alternatives. The traffic and transport analysis includes the identification of the Project as a key element of a proposed new Brisbane Northern Urban Corridor including the Centenary Highway, Western Freeway, Inner City Bypass, Airport Link, East West Arterial and the Gateway Motorway.*

The transport implications of construction activities are assessed in terms of site traffic generation and access, effects of temporary and permanent traffic changes, workforce parking, effects on access to hospitals and impacts on public transport operations, pedestrian movement and cycling.

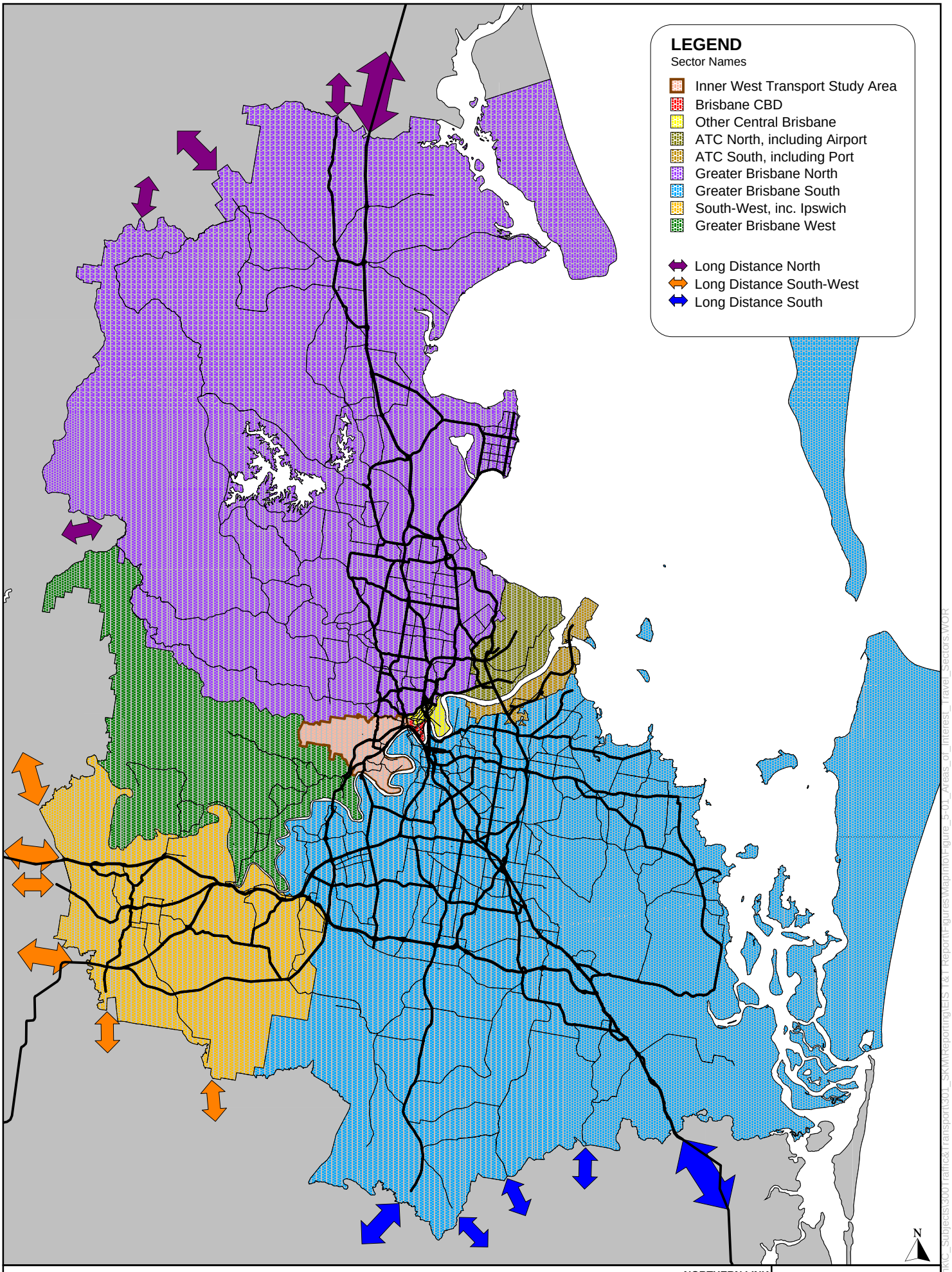
5.1 Approach and Methodology

5.1.1 Areas of Interest

Areas of interest, as shown in **Figure 5-1** and **Figure 5-2**, have been established beyond the EIS study corridor in order to enable an examination of the breadth of traffic and transport effects of Northern Link.

The following areas are considered in this report:

- central Brisbane – this area represents a grouping of key activity areas including extensive commercial and other activity in the centre of Brisbane, including the City, Fortitude Valley, New Farm, Newstead, Spring Hill and Bowen Hills South Statistical Local Areas (SLAs). This area includes the Brisbane CBD and the Other Central Brisbane area to the east of the CBD which enable the effects of the Project, particularly at its eastern connection, to be identified; and
- inner West Transport Study Area – this area, defined initially for the purposes of examination of the localised effects on traffic and transport of the Project, represents a project specific traffic investigation footprint that enables the existing conditions, future base conditions and the potential effects of the Project to be more satisfactorily described. It encompasses suburban areas to the west of the CBD where local effects of the Project require consideration and includes the suburbs of Milton, Paddington, Auchenflower, Bardon, Toowong, Taringa, Indooroopilly, St Lucia and parts of Herston and Kelvin Grove. The boundaries of this area have been selected to coincide with zones within the Brisbane Strategic Transport Model (BSTM) and it covers an area of 40km^2. Reference locations for reporting of traffic data in the Inner West Transport Study Area are shown in **Figure 5-3**.



LEGEND

State Strategic, Radial and Ring Roads

City Distributor Road

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 5-1

Areas of Interest and Travel Sectors

Northern Link

SKM Connell Wagner joint venture

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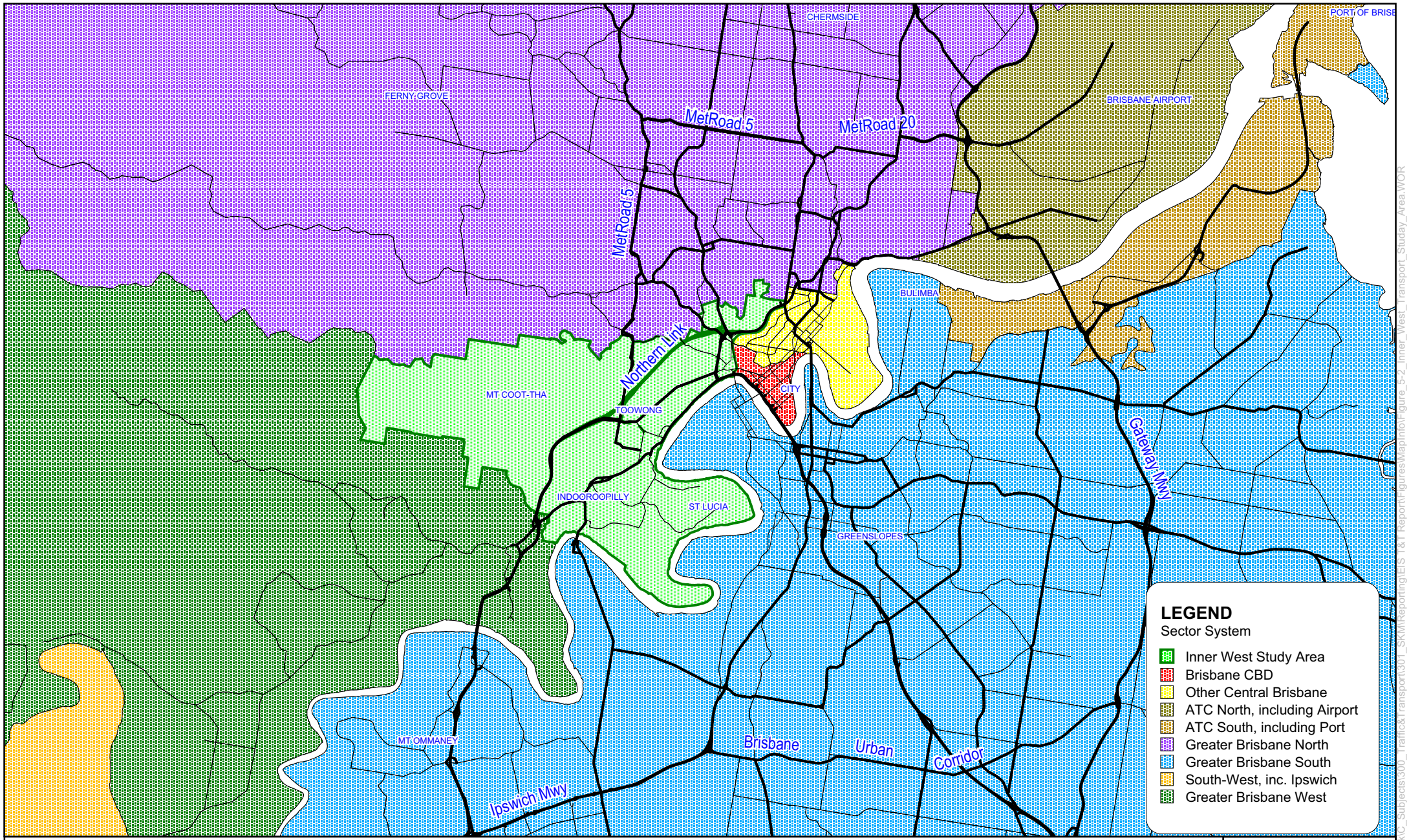

LEGEND

- Northern Link
- State Strategic, Regional and Ring Road
- City Distributor Road

Northern Link
Environmental Impact Statement

Figure 5-2

Inner West Transport Study Area

Northern Link
SKM Connell Wagner JOINT VENTURE

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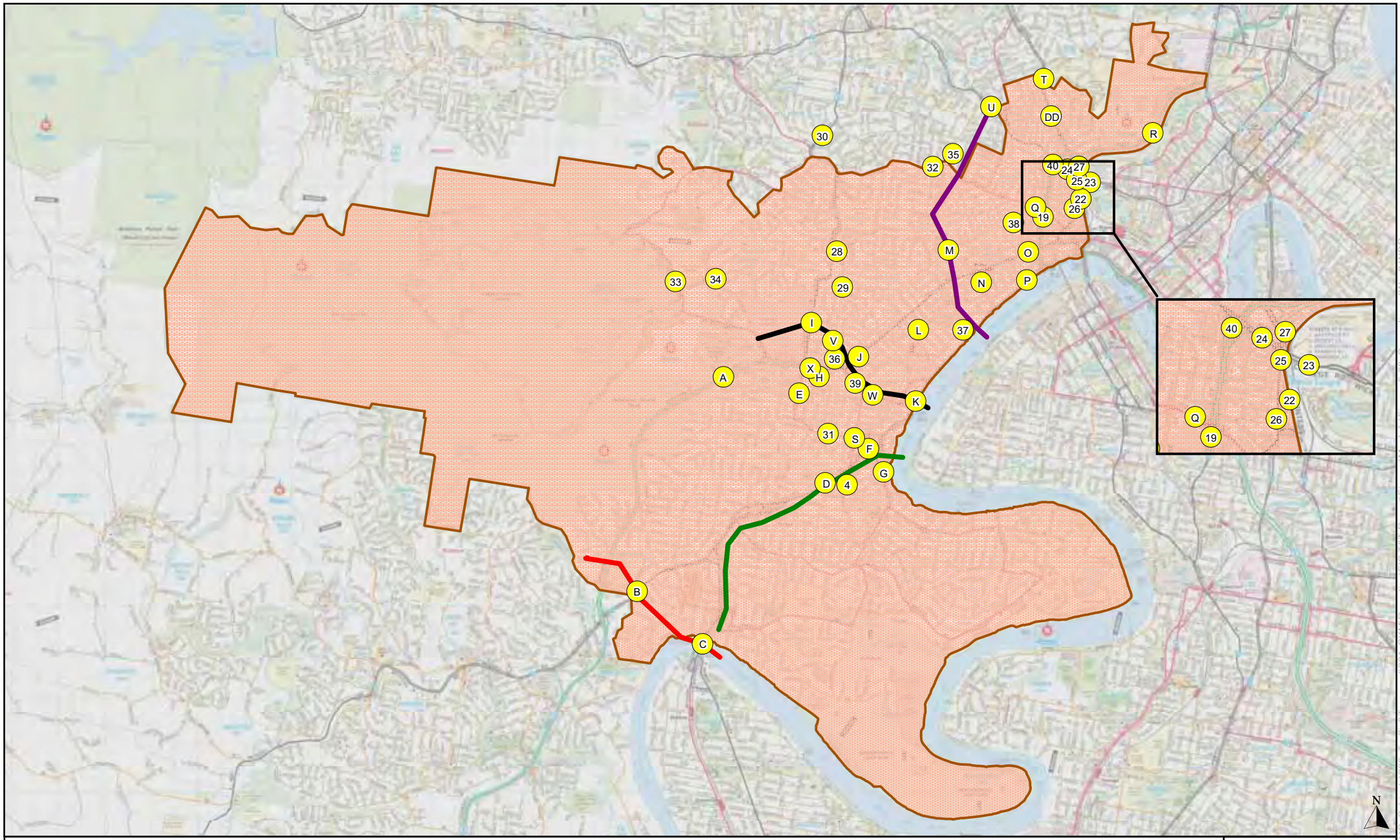


LEGEND

- Indooroopilly Screenline
- St Lucia & University Screenline
- Toowong Screenline
- Milton Screenline
- Reporting Points
- Inner West Transport Study Area

Northern Link
Environmental Impact Statement

Figure 5-3

Inner West Transport Study Area Reference Locations

- The Brisbane Metropolitan Area or Brisbane Statistical Division (BSD) – this area represents a standard defined geographic area used for examination of traffic and transport issues in the Brisbane context. The area includes the City of Brisbane and the surrounding area extending to Caboolture in the north, Beenleigh in the south, Ipswich to the west and Redland/Moreton Bay to the east. This enables consideration of strategic transport network implications of the Project as well as areas of influence outside the EIS study corridor, such as the CBD, the Australia TradeCoast (ATC), which includes Brisbane Airport and the Port of Brisbane, and most of the Western Corridor including Ipswich. It covers an area of 4,600km^2.

5.1.2 Traffic Modelling and Forecasting

In order to describe existing traffic and transport conditions a range of observed traffic and transport data was collected and used to develop and validate a strategic transport model for the Project. The data used covered the existing physical infrastructure and facilities as well as all modes and behaviour of travel within the transport network including car drivers and passengers, commercial vehicles, public transport and pedestrians and cyclists.

Observed traffic volumes and travel speeds and public transport demands have been compared to modelled results by supplementing observed data with information extracted from a validated base year model.

The models used to assist with the technical assessment of traffic and transport effects were:

- a strategic transport model termed the *Northern Link Traffic Model* based on the Brisbane Strategic Transport Model (BSTM). This model was used to forecast traffic conditions at specific years in the future, by modelling transport and traffic demand based on land use (in the form of demographic descriptors), travel characteristics, road infrastructure, public transport services and road tolls. The model was also used for predicting changes in travel demand, travel times, speeds and the operating level of the service of the road network with the Project, and comparing differences without, and with, the Project; and
- the intersection analysis tool *SIDRA* using data extracted from the strategic transport model to undertake local traffic modelling.

Forecasting of traffic demand has been carried out for the year of opening 2014 and for 2016, 2021 and 2026. Forecasted performance is generally reported for the year of opening 2014 and 2026.

Travel Demand

Travel demand by mode is influenced by a range of factors such as the demographic characteristics of the region and the Inner West Transport Study Area (**Figure 5-2**), land-use distribution and the transport system itself. These characteristics are discussed in the context of the Project.

Population and Employment

In 2007, the Brisbane Metropolitan area had a population of 1.88 million persons. Population growth rates in the region have been strong, averaging 2.0% pa over the last 10 years.

An estimated 58,800 persons lived within the Inner West Transport Study Area (**Table 5-1**) in 2007, with an overall population density of 1,500 persons/km^2. This is a greater density than the Brisbane Metropolitan Area average of 400 persons/km^2. The average household size of 2.1 persons in the Inner West Transport Study Area is lower than the metropolitan area average.

Employment in the area is summarised in **Table 5-1**. The Inner West Transport Study Area accounted for 6% of the region's employment in 2007 whereas Central Brisbane accounted for 15% of the 964,000 jobs within the Brisbane Metropolitan area. The ATC region is emerging as a significant future employment node for the region, particularly the ATC North precinct that includes Brisbane Airport.

Table 5-1 Existing (2007) Population and Employment

Parameter	Brisbane Metropolitan Area	Inner West Area
Total Persons	1,880,000	58,800
Area (km^2)	4,600	40
Density (persons/km^2)	400	1,500
Total Households	760,000	27,500
Person/Household	2.5	2.1
Total Employment	964,000	56,200
Central Brisbane Employment	146,000	N/a
ATC North Employment	33,600	N/a

Table Notes:
(1) PIFU Medium Series from SEQ Economic and Forecasting Study (2007).
(2) NIEIR employment opportunities SEQ Economic and Forecasting Study (2007).
(3) 2007 year data is interpolated.

Land Use and Trip Generators

A broad range of land uses within the local area and within the wider metropolitan area influence the demand for trip making in the Inner West Transport Study Area. Key land uses that directly influence through traffic demands within the Inner West Transport Study Area include:

- Central Brisbane, including the CBD;
- the Brisbane Airport and ATC region to the north east, key travel generators that attract traffic from the wider region and interstate, including via routes from the Cunningham and Warrego Highways to the south-west;
- the Royal Brisbane and Women's Hospital and Royal Children's Hospital at Bowen Hills, and Chermside Regional Centre to the north;
- the western residential suburbs of Brisbane including Brookfield, Kenmore, Chapel Hill, Fig Tree Pocket, Jindalee, Mount Ommaney, Westlake, Middle Park, and Seventeen Mile Rocks; and
- the Western Corridor, including Ipswich and Springfield to the south-west, inclusive of large rapidly growing commercial, residential and industrial areas.

Key land uses that generate travel demand within the Inner West Transport Study Area are listed below.

- *Residential land-uses*: the Inner West Transport Study Area is predominantly residential, varying widely in density. Higher density residential complexes occur along arterials such as Coronation Drive and Milton Road as well as in the vicinity of the rail line and the Toowong centre. The Brisbane River forming the eastern part of the study area has high density living along its frontage stretching from Coronation Drive to St Lucia and the UQ. High density residential areas are also located along Swann Road and Sir Fred Schonell Drive in St Lucia.
- *Kelvin Grove Urban Village* is a mixed land use complex located immediately adjacent to the north east boundary of the Inner West Transport Study Area. The Urban Village is bound by residential allotments to the south and north, by the QUT Kelvin Grove Campus and the Victoria Park Golf Course to the east and by Kelvin Grove Road to the west. Existing land uses within the Village include a Village Centre (supermarket, specialty shops, cafes, restaurants and four residential towers); Brisbane Housing Company housing lots; QUT childcare centre; QUT's Institute of Health and Biomedical Innovation; QUT facilities; and La Boite Theatre Company.

- Retail land-uses such as:
  - *Toowong centre* is situated approximately 4km west of the Brisbane CBD and is denoted as a Major Centre in the SEQ Regional Plan. Toowong Village has a gross lettable area of approximately 46,300sqm and 1, 650 car parks that are used by visitors to Toowong Village, and also includes a 'park and ride' facility for rail commuters. Access to the Toowong Village car parks is constrained as it can only be accessed from either Sherwood Road or Lissner Street. The arterials of Benson Street, High Street and Coronation Drive currently cater for traffic generated by Toowong Village and Toowong centre;
  - *Indooroopilly centre* is located 6km to the west of Brisbane CBD. It is a Principal Activity Centre in the SEQ Regional Plan. The Indooroopilly shopping centre is visited by some 13 million people per year and has a total retail area of approximately 81,400sqm and 3,700 car parks. Indooroopilly shopping centre is therefore a significant generator of vehicular traffic during trading hours, with key traffic access routes via Moggill Road and Coonan Street; and
  - *Park Road* entertainment precinct, linking Milton Road to Coronation Drive. Proposals currently exist for urban renewal of Milton Railway station, which include a transit-orientated development over the station.
- Educational land-uses such as:
  - *The University of Queensland (UQ)* at St Lucia is a major generator of private vehicle and public transport trips within the Brisbane region. In 2007 the St Lucia campus had 4,300 staff (full-time equivalent) and 34,500 students. The campus provides 5,800 car parks controlled by permits issued to staff and students subject to availability. During term times, UQ generates a significant degree of counter-peak direction traffic demands on the bus, rail and road links from the CBD through the Inner West Transport Study Area;
  - *Queensland University of Technology (QUT)* has a total population of over 40,000 students and 3,500 staff. QUT has a major campus in Kelvin Grove and can be accessed from both Kelvin Grove Road (via Musk Avenue and Blamey Street) and the Inner City Bypass (left in and left out only via Victoria Park Road). The campus is a 15-minute walk from the Roma Street Transit Centre. Car parking is limited with 1,100 spaces available. There are just over 800 public car parks available to students, visitors and staff that operate on an hourly or daily fee basis; and
  - *Schools and colleges* throughout the Inner West Transport Study Area that generate trips during term times, before and after school hours. In 2007 there were 4,200 primary enrolments and 4,400 secondary enrolments.
- *Industrial Land Uses* generating freight and work trips within the study area include Castlemaine XXXX Brewery and sites located to the east of the bus depot at Toowong;
- *The Wesley Hospital* is located on the corner of Coronation Drive and Chasely Street in Auchenflower and employs over 1,900 full and part-time staff and serves more than 75,000 patients a year. Recent studies[1] reported that the hospital has a provision for approximately 1,200 car parks and these operate at capacity between 11am and 3pm each day. In January 2007, Brisbane City Council approved Stage 1 of a five year master plan to expand and modify the function of the hospital. Stage 1 includes an additional 480 car parks

[1] Proposed Car Park Expansion & Medical Suites, Wesley Hospital, Auchenflower, Traffic Engineering Report, TTM Consulting (Qld) Pty Ltd, March 2006

through the expansion of the existing multi-level car park. The additional car parks would provide an increased parking supply rate and this may reduce local parking pressures; and

- The *Suncorp Stadium* was redeveloped in 2003 and has an all seated capacity of 52,500. It is located in Milton, less than 2km from the CBD. As only 200 car parks are available patrons are encouraged to use public transport to access the stadium. Hence, a stadium Transport Management Plan (TMP), which maximises public transport for travel to and from the Stadium, was developed to manage the additional pedestrian and general traffic in and around the stadium on event days.

5.2 Description of the Existing Transport Network

5.2.1 Road Hierarchy and Function

The existing road network hierarchy within the areas of interest for the Project include roads of national interest as defined by the AusLink Road network shown in **Figure 5-4**, and the existing regional road hierarchy for Brisbane, shown in **Figure 5-5** including within the Inner West Transport Study Area shown in **Figure 5-6**.

National Road Network

The national or 'AusLink' road transport network in Brisbane shown on **Figure 5-4** is intended to provide for national and inter-regional trips for people and freight and includes:

- Pacific Motorway - Logan Motorway to the Gateway Motorway;
- Gateway Motorway - Pacific Motorway to Gympie Arterial Road;
- Port of Brisbane Motorway - Gateway Motorway to Lytton Road to the Port;
- Ipswich Motorway - Cunningham Highway and Warrego Highway to Granard Road; and
- Granard Road, Riawena Road, Kessels Road, and Mt Gravatt-Capalaba Roads (commonly known as Brisbane Urban Corridor or BUC) to the Gateway Motorway.

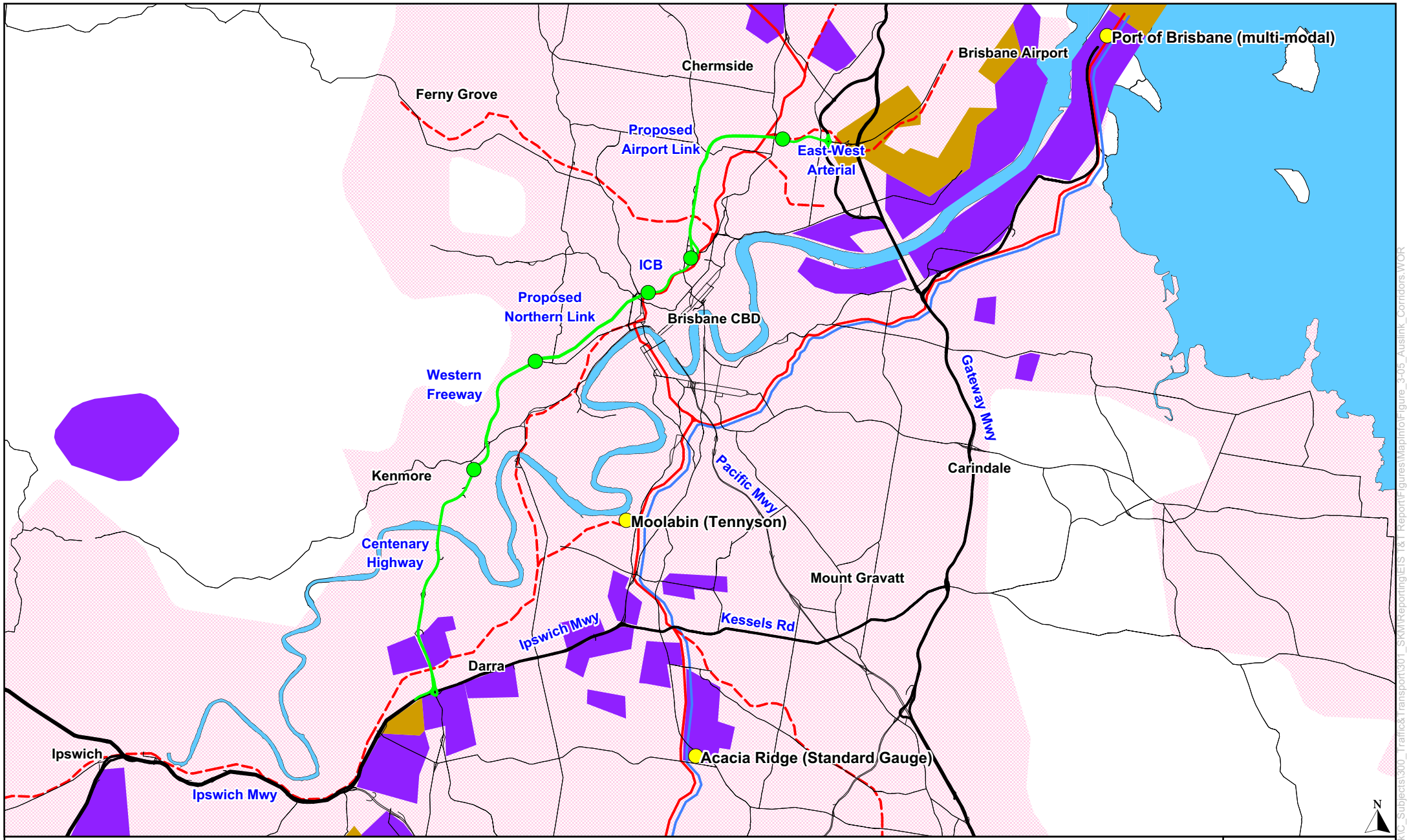
The national route from the region's western gateway is via the Brisbane Urban Corridor (BUC). The BUC is a highly congested route comprising a sequence of interrupted flow urban arterial roads directly abutting and serving a range of local, urban land uses.

State Strategic Road Network (Motorways)

The regional road hierarchy shown on **Figure 5-5** is defined in the *Draft Transport Plan for Brisbane 2006 – 2026* which adopts a five-tier road hierarchy, and is characterised by a strong radial road network, with arterial roads operating radially from the Central City area (including the CBD) to the outer Brisbane suburbs.

The Centenary Highway and Western Freeway are State Strategic roads forming part of the Western Arterial Road, a state controlled (DMR) route between Springfield and Kedron. These network elements provide connections for long distance travel between metropolitan areas and access to key activity centres, employment areas and principal terminals of non-road based modes. These roads essentially connect the Brisbane CBD with regional centres. They also allow regional manufacturing and export industries to access the ATC.

There are gaps in the motorway network serving the west, in particular, lack of high quality connectivity from the Western Freeway to the CBD, Pacific Motorway, regional routes to the north of Brisbane and the ATC. There is a lack of high quality freight routes (primary freight routes) connecting the Western Corridor to the north, to the CBD and for cross-city freight. This results in freight using the secondary and tertiary freight routes that are located in the Inner West Transport Study Area.



LEGEND

Road Network
- AusLink Corridor
- Other Road
- Potential AusLink Brisbane North Urban Corridor

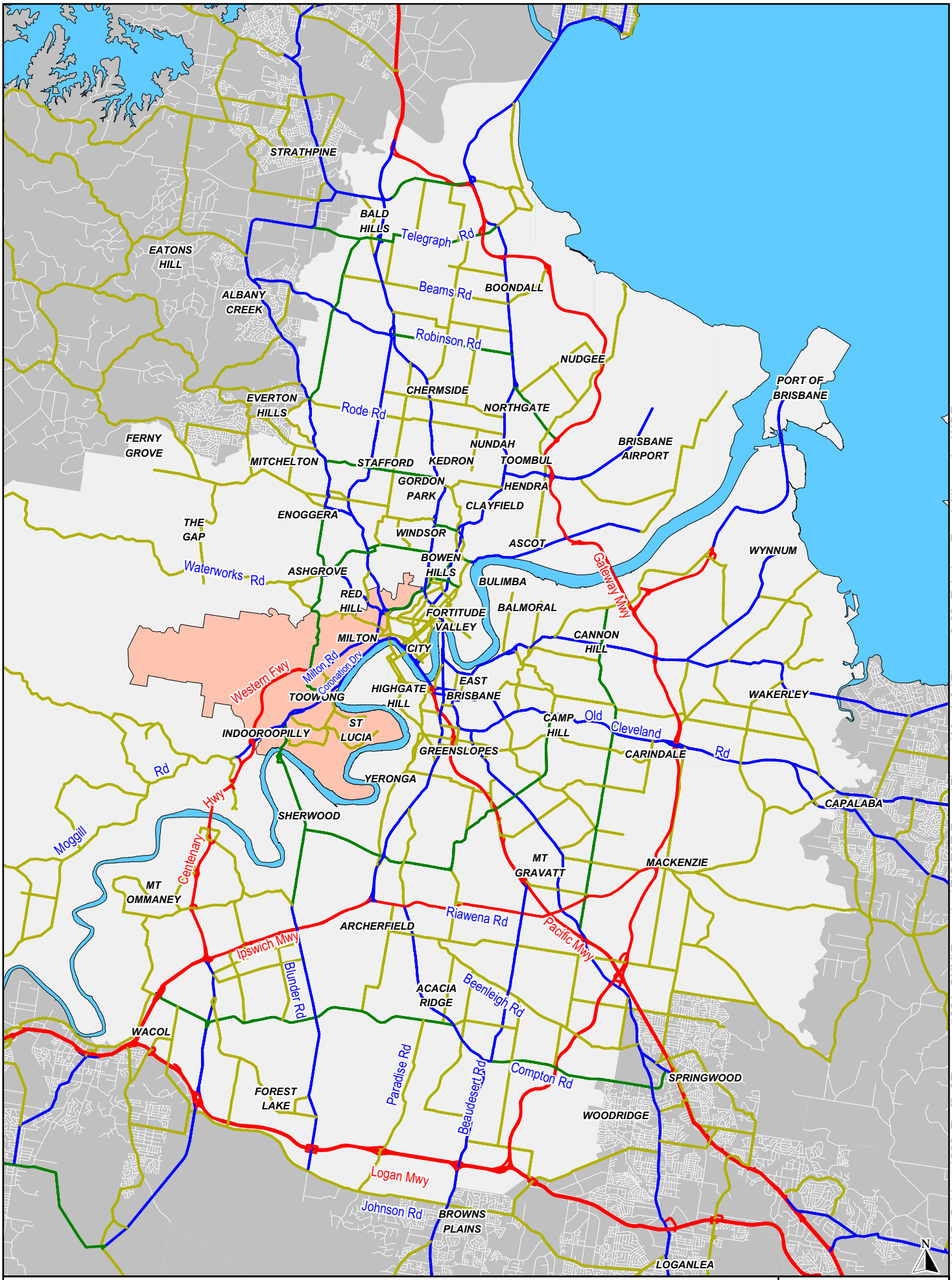
Rail Nework
- AusLink Rail Network - Standard Gauge
- AusLink Rail Network - Narrow Gauge
- Other Rail Line
- Freight Terminal

- Built up area
- Industrial Zoning, Feb 2006
- Future Industrial Land

Northern Link
Environmental Impact Statement

Figure 5-4

AusLink Transport Corridor in Brisbane



LEGEND

- City Distributor
- Regional Radial
- Regional Ring
- State Strategic
- Inner West Transport Study Area
- Brisbane City
- Other Local Authorities

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 5-5

Existing Road Hierarchy

Northern Link
SKM Connell Wagner JOINT VENTURE

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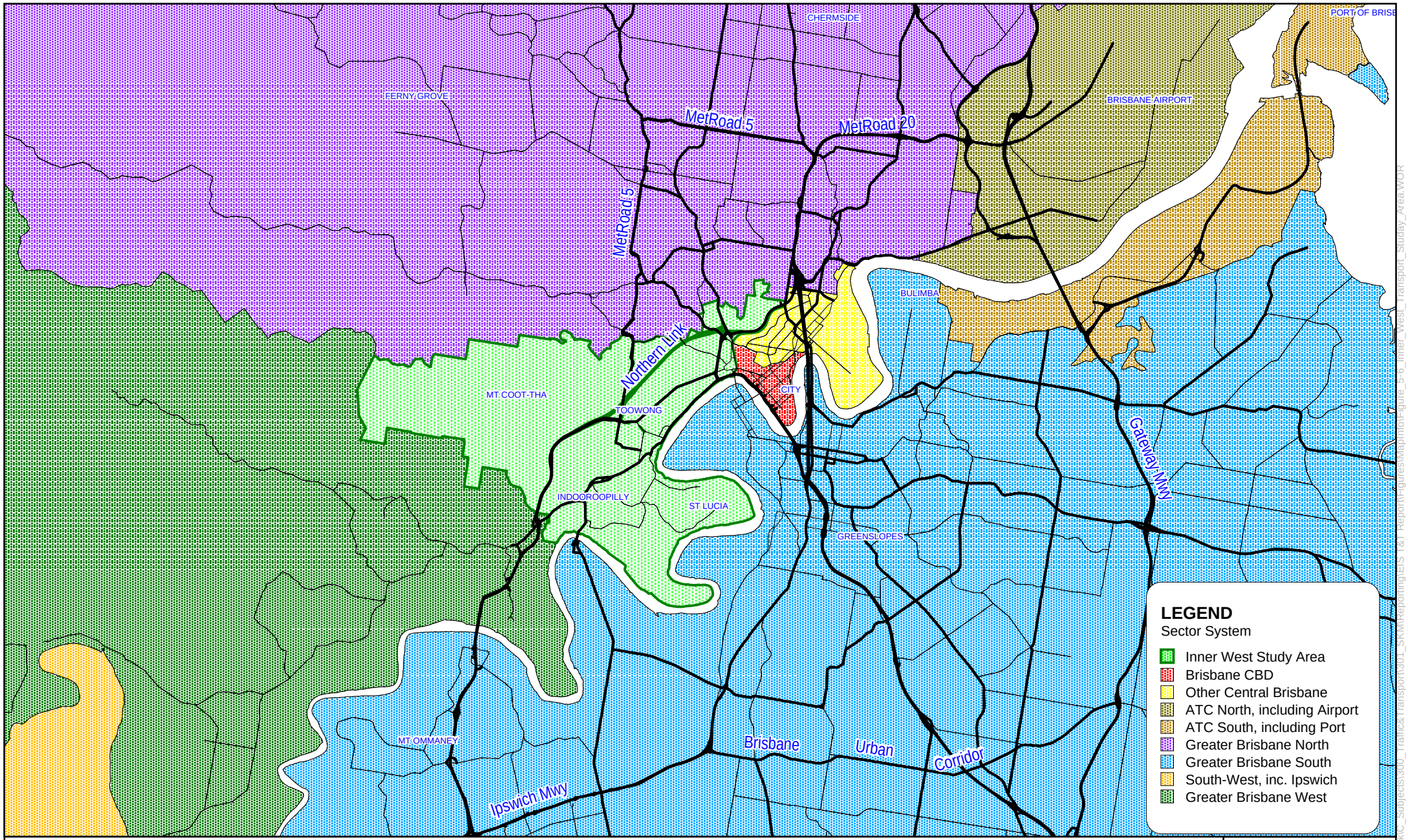

LEGEND

- Northern Link
- State Strategic, Regional and Ring Road
- City Distributor Road

Northern Link
Environmental Impact Statement

Figure 5-6

Inner West Transport Study Area

Northern Link

SKM Connell Wagner JOINT VENTURE

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The key State Strategic motorway within the Inner West Transport Study Area is the Western Freeway, being a continuation of the Centenary Highway from Moggill Road runs to the Mt Coot-tha Road/Toowong Roundabout. The Western Freeway comprises of a divided 4-lane carriageway, has shoulders for each direction and a posted speed limit of 90km/h and provides connectivity from Toowong to Indooroopilly and Kenmore areas as well as suburbs to the south across the Brisbane River. The Western Freeway is designated as a secondary freight route.

Regional Ring (Arterial)

Frederick Street, Rouen Road, Boundary Street, Macgregor Terrace, Jubilee Terrace form part of a north-south regional ring road and part of the Queensland Department of Main Roads (DMR) controlled Western Arterial Road (MetRoad 5). These elements of the network provide for movement in the metropolitan area that is not focussed on the CBD, such as connections between surrounding local authorities and significant employment areas. These roads have significant freight function.

MetRoad 5 from Frederick Street at the Toowong Roundabout to Stafford Road is a Regional Ring Road and is a secondary freight route that goes through and beyond the study area. It runs from Springfield to Kedron to provide a notional western bypass route within Brisbane City to connect to the Gympie Arterial (connecting to the northern regional route) and the East-West Arterial (serving the Airport and ATC).

Key regional ring arterials within the Inner West Transport Study Area include:

- *Frederick Street* - Frederick Street is part of the state controlled MetRoad 5 and provides a north-south connection from the Toowong Roundabout to the north-west suburbs. It is designated as a secondary freight route. A one-lane flyover is provided for the Frederick Street to Western Freeway movement. Frederick Street is undivided and has one lane in each direction. Right turn movements to side roads are generally provided for through ghost islands. Access to residential properties and kerbside parking is provided along part of the eastern kerb;
- *Sherwood Road/Miskin Street* - these are regional ring roads that provide a connection between the Toowong Roundabout and the Toowong Centre at High Street. The section of Sherwood Road between High Street and Jephson Street provides direct access to the Toowong Village car parks and ground level car parking for a super market. Frontage properties are retail and commercial. The western section of Sherwood Road and Miskin Road are generally residential and provide access to the Toowong Roundabout and hence the regional and State road network. They are undivided two-lane roads with on-street parking provision; and
- *Inner City Bypass (ICB)* - the ICB is an inner city regional ring road connecting Hale Street at Red Hill to Lutwyche Road, Abbotsford Road and Kingsford Smith Drive at Breakfast Creek. The ICB is a six lane divided arterial with speed limits varying between 60 and 80km/h. The ICB provides a high speed uninterrupted connection between the inner western and the north-eastern suburbs of Brisbane, bypassing the CBD.

Regional Radial (Arterial)

Coronation Drive, Milton Road and Moggill Road are key east-west regional radial roads. Kelvin Grove Road and Musgrave Road are key regional radial roads between the CBD and northern suburbs. These key radial links cater for a mix of commuter, cross-city and local traffic with connections between the inner city, major residential communities and surrounding local authorities. They connect to the intra-state road network and reduce pressure from shorter distance trips. These links also have a significant public transport line haul and freight function.

Key regional radial arterials within the Inner West Transport Study Area include:

- *Milton Road* - Milton Road, shown in **Figure 5-7** is an east-west regional radial road between the CBD and the Toowong Roundabout. It runs generally parallel to Coronation Drive, along the northern side of the rail corridor. It is designated as a secondary freight route in the Brisbane City Council future freight hierarchy. At the eastern end, Milton Road connects to Hale Street for CBD bypass traffic via the ICB. Milton Road is a key route between the western suburbs and a variety of cross-city locations, as well as the CBD. It also provides access to Suncorp Stadium, which during events generates a high level of bus traffic and pedestrian movement.

  Milton Road is undivided and has two lanes per direction. Along the length of Milton Road there are a number of priority (stop or give way controlled) and traffic signal controlled intersections. The movements that are permissible at a number of these intersections vary by time of day with a number of right turn movements banned during peak periods. Frontage access is provided to a number of residential, commercial and industrial properties along Milton Road. Between 7am and 7pm on weekdays Milton Road is a clearway. At other times on-street parking opportunities are limited despite the clearway not being in operation.

- **Figure 5-7 Milton Road approaching Croydon Street**

- *Coronation Drive* - Coronation Drive is an east-west regional radial connection that runs alongside the Brisbane River between the CBD to Toowong. At the CBD, Coronation Drive connects to Hale Street, the Riverside Expressway, Roma Street and William Jolly Bridge. At Toowong, Coronation Drive connects to Moggill Road via High Street and to Sir Fred Schonell Drive and Gailey Road via Benson Street and Brisbane Road. A typical view of Coronation Drive is shown in **Figure 5-8**.

  Coronation Drive has five traffic lanes that operate under a tidal flow system that maintains two lanes of traffic in each direction and a third lane in the peak direction. Indented bus bays are provided on both sides of the road. It is designated as a tertiary freight route in the Brisbane City Council *Draft Transport Plan for Brisbane 2006 – 2026*. The majority of its intersections are traffic signal controlled with a minor number of priority intersections that are restricted to left in/left out movements. Access to frontage properties from Coronation Drive is limited.

- **Figure 5-8 Coronation Drive North of Park Road**

- *Moggill Road* - Moggill Road is an east-west regional radial road between Toowong and Moggill via Taringa and Indooroopilly. It is designated as a tertiary freight route in the Brisbane City Council future freight hierarchy. Moggill Road is generally undivided and has two lanes per direction. Moggill Road forms an interchange with the Western Freeway with both north and southbound ramps provided. Traffic movements on Moggill Road to and from side roads are a mix of traffic signal and priority control. Access is provided from Moggill Road to a number of residential, commercial and retail properties that include the Indooroopilly Shopping Centre.
- *High Street* - High Street forms the link between Moggill Road and Coronation Drive at Toowong. High Street is a divided road with two lanes in each direction. Access to Toowong Village is provided via the signalised intersection with Sherwood Road. Frontage on High Street includes a number of commercial, retail, entertainment, restaurant and café/bar properties.
- *Hale Street* - Hale Street is a north-south regional ring road that has a dual function, acting both as an arterial route and as the continuation of the Pacific Motorway (Riverside Expressway) to the northern suburbs. Hale Street is designated as a primary freight route. It intersects with the eastern end of Coronation Drive at its southern end and with the Inner City Bypass, Kelvin Grove Road and Musgrave Road at its northern end. Hale Street is a divided dual carriageway with two through clearway lanes in both directions with a third lane (in both directions) facilitating merges and diverges including from Milton Road and Caxton Street. Grade separated interchanges are provided. The terminal intersection with Coronation Drive is signalised with a grade-separated overpass provided for right turn movements to the north on Hale Street from the Riverside Expressway.
- *Kelvin Grove Road* - Kelvin Grove Road is a north-south regional radial road between Normanby Five Ways at Red Hill, and Alderley, passing through Kelvin Grove and Newmarket as part of State Route 77. At Newmarket Kelvin Grove Road becomes Enoggera Road. Kelvin Grove Road is a divided road with three lanes per direction that includes peak direction T3 lanes between Victoria Street and Windsor Road. It is designated as a secondary freight route in the Brisbane City Council future freight hierarchy. Due to the divided nature of Kelvin Grove Road, movements to other roads are facilitated through signalised intersections, right turn pockets or restricted to left in and left out movements only. The movements that are permissible at a number of these intersections vary by time of day with a number of right turn movements banned during peak periods. Frontage access is provided to a number of residential, commercial and industrial properties along Kelvin Grove Road. At the southern end of Kelvin Grove Road connectivity is provided with the ICB and Hale Street and via an underpass of the Normanby Five Ways

intersection to Countess Street and the CBD at Roma Street. Northbound traffic from the CBD accesses Kelvin Grove Road from Petrie Terrace at the Normanby Five Ways intersection.

- *Musgrave Road* - Musgrave Road is a regional radial road from Normanby Five Way and extends to become Waterworks Road as part of State Route 31 that serves the suburbs of Red Hill, Ashgrove and The Gap. South of the Normanby Five Way Musgrave Road becomes College Road. Musgrave Road is generally undivided and has two lanes per direction. At the signalised intersection of Normanby Five Ways the CBD can be accessed via a right turn into Countess Street or straight through using College Road. North facing ramps provide access with Hale Street (going west), to the Inner City Bypass (going east), and to Kelvin Grove Road (northbound only). The ICB connection is used by traffic from the CBD using College Road and Petrie Terrace to access Musgrave Road, via the Kelvin Grove Road north on ramp, and then through Victoria Street and Windsor Road. Musgrave Road is designated as a tertiary freight route in the Brisbane City Council future freight hierarchy.

City Distributor (Suburban)

City distributors provide a direct connection between the radial arterial routes or act as major connection between arterial routes and nearby residential areas. They include Sylvan Road and Croydon Street, Jephson Street, Gailey Road, Swann Road and Lambert Road. These roads provide connections between communities and Major Centres. They also connect major land uses to the Regional network and can have both a public transport priority function and freight function.

Key city distributors (suburban) roads within the Inner West Transport Study Area include:

- *Land Street* - Land Street is a four lane divided carriageway that provides a short connection between Sylvan Road and Coronation Drive. Intersections with Sylvan Road, Patrick Lane and Coronation Drive are all signalised. The right turn movement from Land Street to Coronation Drive is not permitted. Frontage access on Land Street is minimal;
- *Sylvan Road (between Coronation Drive and Croydon Street)* – the city distributor section of Sylvan Road provides a two-way connection between Croydon Street (accessing Milton Road) and Coronation Drive at Toowong. Sylvan Road is an undivided road with generally one lane in each direction and has on-road cycle lanes. On-street parking is provided along much of its length. Sylvan Road provides access to the Toowong Shopping Centre via Bennett Road. The western section of Sylvan Road, between Jephson Street and Milton Road, is a local road which has been traffic calmed and is more residential in nature. It is not possible to turn right into Sylvan Road from Coronation Drive and this movement is provided via Land Street. It is possible however to turn right from Milton Road into the local road section of Sylvan Road near the Toowong roundabout. The right turn movement from Sylvan Road to Milton Road at this location is not permitted and this movement is provided via the Croydon Street intersection with Milton Road;
- *Jephson Street/Croydon Street* - Jephson Street and Croydon Street are city distributors that provide a north-south connection between Moggill Road/High Street and Milton Road. The frontages of these roads are generally a mix of low and medium density residential. Access to Toowong Centre is provided from Jephson Street via Sherwood Road and Lissner Street. Both Jephson Street and Croydon Street are generally undivided four-lane roads with limited provision for on-street parking. Brisbane City Council has been progressively implementing development set-backs along the corridor as property re-development occurs to allow potential future widening of this route;
- *Sir Fred Schonell Drive, Gailey Road, Brisbane Road, Bensen Street* – these form part of the city distributor network providing connectivity between the UQ at St Lucia and Toowong, including the CBD via Coronation Drive. They compose an undivided four-lane road with on-street parking restrictions during peak periods. Intersections with side roads are a mix of traffic signal and priority control;

- *Swann Road, Hawken Drive, Lambert Road* - these are city distributors, which are generally undivided two-lane roads with on-street parking provisions. Intersection control is generally by priority control or roundabouts. These provide access between St. Lucia and Indooroopilly from Moggill Road and also between St Lucia and the southern suburbs via the Walter Taylor Bridge;
- *Petrie Terrace, Countess Street, Upper Roma Street* - Petrie Terrace, Countess Street and Upper Roma Street are city distributors that form a one-way system between the regional radial roads that feed into the eastern side of the CBD such as Milton Road, Musgrave, Road, Kelvin Grove Road and the Inner City Bypass. They are designated as tertiary freight routes. Four traffic lanes are generally provided with clearway restrictions during peak periods. Signalised intersections are provided to control traffic movements. A contra flow bus lane has been provided between Caxton Street and Roma Street that can also be accessed by bus movements from Milton Road. The William Jolly Bridge via Saul and Skew Streets that connect with Upper Roma Street facilitates cross-river connections; and
- *Latrobe Terrace, Given Terrace, Caxton Street* - this east-west city distributor provides a radial connection from the west via Macgregor Terrace (MetRoad 5) in Bardon, to the CBD via Petrie Terrace and Countess Street. Caxton Street has north facing ramps that connect to Hale Street. These city distributors are generally undivided two-lane roads that pass through the residential suburbs of Paddington and Red Hill. Much of the length of this route is fronted by retail properties and hence there is a significant provision for on-street parking, bus stops and pedestrian activity. Intersections with side roads are generally priority control with a greater degree of signalisation on Given Terrace and Caxton Street.

Local Streets

Key local streets within the Inner West Transport Study Area include:

- *Park Road* - Park Road provides a two-way connection between Milton Road and Coronation Drive. It has a four lane undivided carriageway, although on-street parking reduces this to one lane in each direction during off-peak periods. Park Road can be accessed from either direction from Coronation Drive but only from the outbound approach from Milton Road as there is right turn ban from Milton Road inbound. Right turns from Park Road into Coronation Drive and Milton Road are banned. It is generally a four-lane undivided road, however, on street parking in selected areas to serve abutting retail and commercial land-uses, effectively reducing operation to one lane in each direction; and
- *Mt Coot-tha Road, Sir Samuel Griffith Drive, Simpsons Road* - These routes are generally undivided two-lane roads. They provide access from Toowong to Mt Coot-tha and Bardon. Generally there is no frontage activity along these roads with a minor number of side roads. The exception of this is Simpsons Road to the north of Bardon that is residential in nature.

There are also a number of local roads within the Inner West Transport Study Area including Park Road, Baroona Road, Haig Road, Heussler Terrace and Castlemaine Street that provide a transitional function between the movement of people and goods and the local access function.

Existing Traffic Volumes

Daily traffic volumes for 2007 on key roads within the Inner West Transport Study Area are shown in **Table 5-2** and across four screenlines in **Table 5-3**. The location of the counts on the key roads (Reporting Points) and the screenlines are shown in **Figure 5-3**.

Table 5-2 Existing (2007) Traffic Volumes (Two-Way Totals)

Reporting Points[2]	Road	Location	AWDT[3]	AADT[4]
State Strategic				
BB	Centenary Highway	Centenary Bridge	86,800 [a]	76,300[a]
A	Western Freeway	North of Moggill Road Interchange, Indooroopilly	76,500	71,200
Regional Radial				
B	Moggill Road	East of Russell Terrace, Indooroopilly	40,700	37,800
D	Moggill Road	East of Brisbane Boys College Entrance	38,500	35,800
F	High Street	West of Benson Street, Toowong	32,400	30,100
J	Milton Road	East of Croydon Street, Toowong	52,900	49,200
X	Milton Road	West of Croydon Street, Toowong	54,900	51,300
K	Coronation Drive	West of Land Street, Auchenflower	62,600	58,200
O	Milton Road	East of Castlemaine Street, Milton	51,500	47,900
P	Coronation Drive	East of Cribb Street, Milton	90,100	83,800
T	Kelvin Grove Road	North of School Street, Kelvin Grove	50,500	47,000
U	Musgrave Road	West of Cochrane Street, Paddington	31,400	29,200
Regional Ring				
R	Inner City Bypass	Landbridge, Spring Hill	79,200	73,700
19	Hale Street	South of Caxton Street, Petrie Terrace	76,900	71,500
C	Walter Taylor Bridge	Indooroopilly	32,500	30,200
E	Miskin Street	North of Ascog Terrace, Toowong	10,500	9,700
I	Frederick Street	South of Victoria Crescent, Toowong	33,500	31,100
City Distributor				
G	Brisbane Street	North of Josling Street, Toowong	37,100	34,500
H	Sylvan Road	East of Milton Road, Toowong	8,400	7,800
Q	Caxton Street	West of Hale Street, Paddington	22,900	21,300
S	Jephson Street	North of Sherwood Road, Toowong	13,000	12,100
31	Sherwood Road	West of Jephson Street	5,400	5,000
Local Streets				
L	Eagle Terrace	West of Roy Street, Auchenflower	4,100	3,800
M	Haig Road	West of Barona Road, Milton	6,500	6,000
N	Park Road Mid-block	North of Gordon Street, Milton	12,100	11,300
36	Morley Street[c)]	North of Milton Road, Toowong	3,900	3,600
	Gregory Street[(b)]	Between Morley Street and Musgrave Street, Toowong	2,300	2,100

Table Notes: Source: 2007 Northern Link Traffic Model except as otherwise noted; (a) Volumes from validated model are within 5-10% of DMR permanent count data; (b) BCC 2005; (c) 2007 traffic count;

[2] The Reporting Points and associated reference identifications are identified on **Figure 5-3**.

[3] Average Week Day Traffic – average of the five working days.

[4] Annual Average Daily Traffic – average over the full weak including Saturday and Sunday.

- **Table 5-3 Existing (2007) Traffic Volumes across screenlines**

Screenline	East/Northbound (AWDT)	West/Southbound (AWDT)	Two way total (AWDT)
1 – Indooroopilly	80,000	82,400	162,400
2 – St Lucia & University	38,600	35,200	73,800
3 - Toowong	86,000	88,200	174,200
4 – Milton	99,800	105,700	205,500

Table Note: Source: 2007 Northern Link Traffic Model

The Western Freeway carries approximately 77,000 vehicles per weekday. The weekday peak hour flows on the Western Freeway are 3,000vph in the eastbound direction in the morning and 3,500vph westbound in the evening peak period. The variation of traffic flow by hour and direction on a weekday is shown in **Figure 5-9** and the variation by day throughout a week is shown in **Figure 5-10**.

The Inner City Bypass carries approximately 80,000 vehicles each weekday. During the morning peak hour the ICB carries over 2,800vph in the eastbound direction and over 3,200vph in the westbound direction. In the evening peak it carries just under 2,800vph eastbound and under 3,500vph westbound.

Coro nation Drive, east of Cribb Street, carries approximately 90,000 vehicles per weekday. Further west, in the vicinity of Land Street, Coronation Drive carries approximately 63,000 vehicles per weekday. Coronation Drive experiences peak periods in both directions during both the AM and PM peak periods due to the major traffic generator of the UQ at St Lucia to the west of Coronation Drive and the Brisbane CBD to the east.

Milton Road, east of Croydon Street, carries over 51,000 vehicles per weekday. It carries 2,000 vph in the eastbound direction in the morning peak and also carries 2,000 vph in the westbound direction in the evening peak period.

Kelvin Grove Road carries approximately 50,500 vehicles per weekday north of School Street and Musgrave Road carries approximately 30,700 vehicles per weekday west of Cochrane Street.

Overall network daily traffic volumes shown on **Figure 5-11** illustrate the volumes of over 60,000 vehicles per day on Coronation Drive and over 50,000 vehicles per day on Milton Road represent a major proportion of the traffic task within the network in Inner West Brisbane. This demonstrates their significance within the broader network of the metropolitan area.

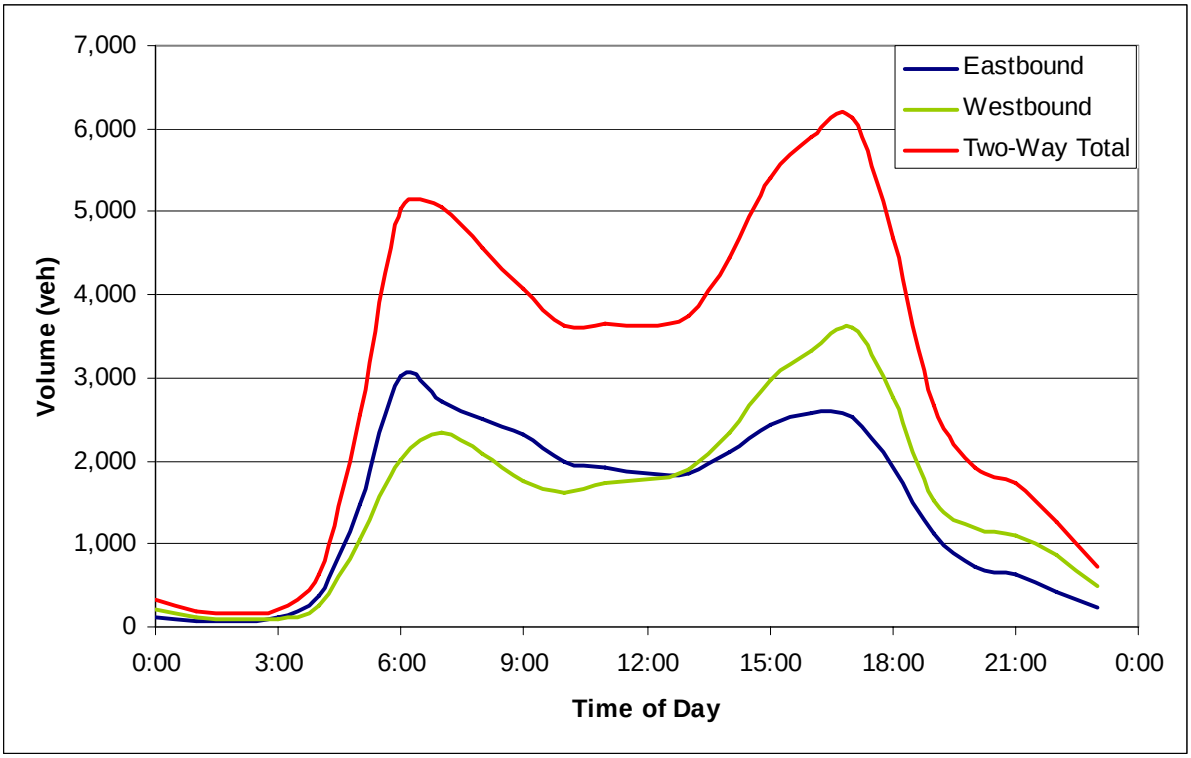
Peak Hourly Traffic Volumes

Existing peak hour traffic volumes on major routes within the Inner West Transport Study Area are shown below in **Table 5-4**. Typically, the morning peak is found to be of a shorter time period whilst the evening peak is more extended. It can be seen that peak hour traffic is typically around 15% of the total weekday traffic.

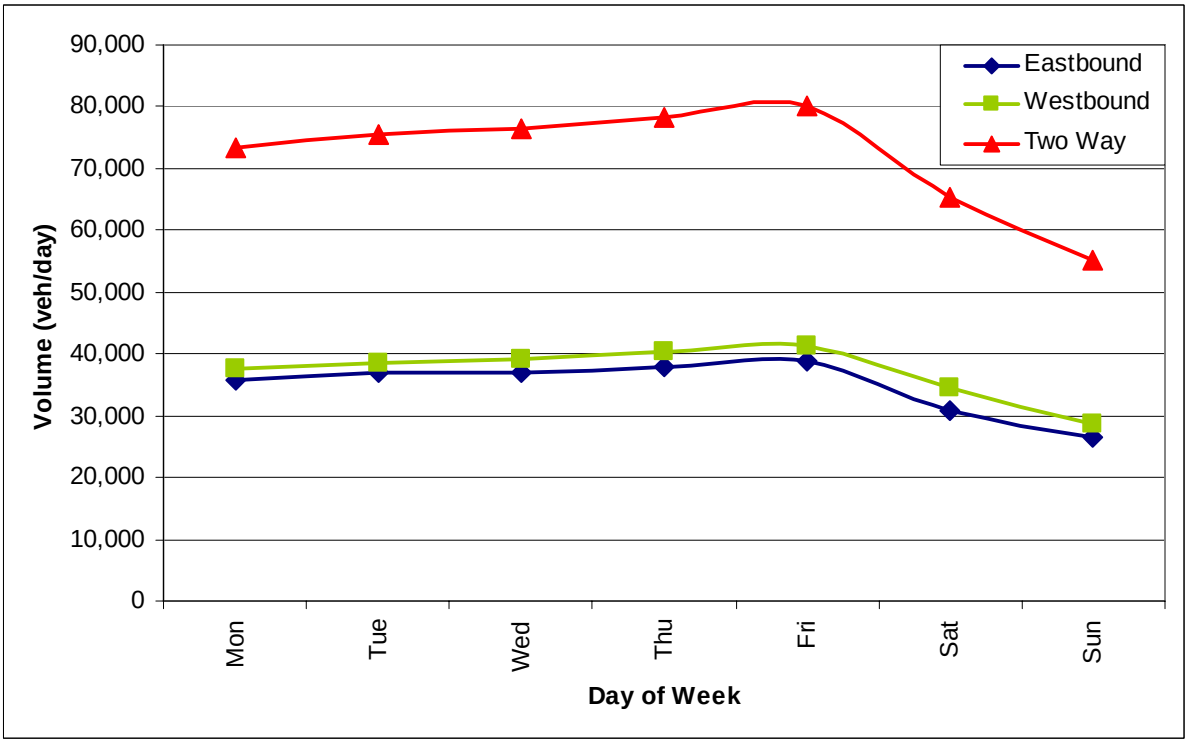
5.2.2 Traffic Composition

Motorways and arterial routes typically carry the higher proportions of commercial and/or industrial traffic, whereas suburban and district roads cater for lower truck volumes. The commercial vehicle percentages for a cross-section of roads within the Inner West Transport Study Area are tabulated in **Table 5-5**. This table shows the high proportion of commercial vehicles that use not only the State and Regional roads but also City Distributors and Local Streets.

- **Figure 5-9 Western Freeway Weekday Temporal Traffic Profile**



- **Figure 5-10 Western Freeway Weekly Traffic Flow Profile**



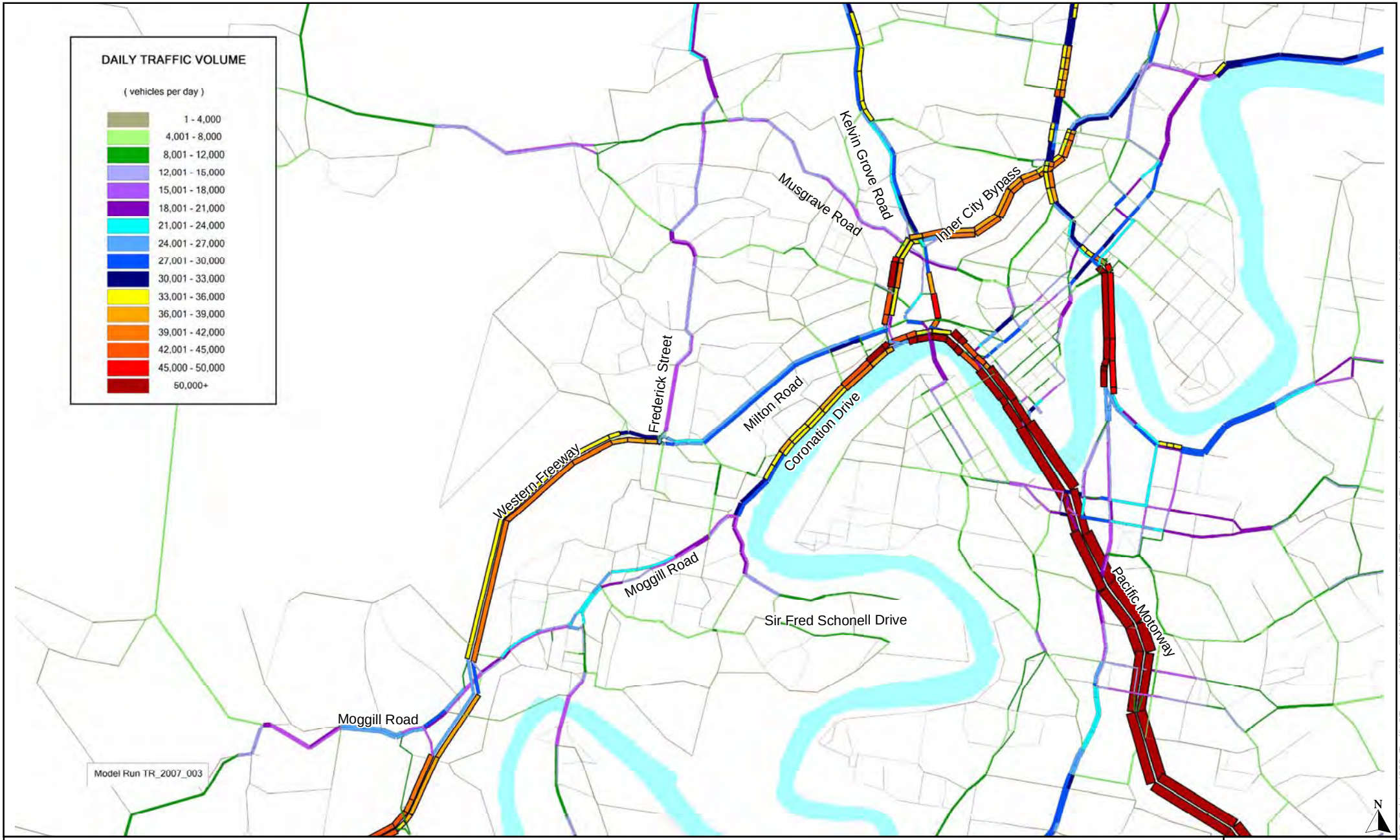


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Figure 5-11

Existing (2007) Average Weekday Traffic Volumes

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Table 5-4 Existing (2007) Peak Hour Two-way Traffic Volumes

Reporting Points[5]	Road	Location	AM Peak (2h)	PM Peak (2h)
State Strategic				
BB	Centenary Highway	Centenary Bridge	13,500 (15%)	14,100 (16%)
A	Western Freeway	North of Moggill Road Interchange, Indooroopilly	10,000 (13%)	12,800 (17%)
Regional Radial				
B	Moggill Road	East of Russell Terrace, Indooroopilly	6,400 (16%)	6,700 (16%)
D	Moggill Road	East of Brisbane Boys College Entrance, Toowong	5,800 (15%)	5,600 (15%)
F	High Street	West of Benson Street, Toowong	4,300 (13%)	4,100 (13%)
J	Milton Road	East of Croydon Street, Toowong	6,600 (12%)	7,800 (15%)
X	Milton Road	West of Croydon Street, Toowong	6,500 (12%)	7,600 (14%)
K	Coronation Drive	West of Land Street, Auchenflower	9,600 (15%)	8,800 (14%)
O	Milton Road	East of Castlemaine Street, Milton	8,400 (16%)	9,000 (17%)
P	Coronation Drive	East of Cribb Street, Milton	11,400 (13%)	12,900 (14%)
T	Kelvin Grove Road	North of School Street, Kelvin Grove	6,200 (12%)	7,100 (14%)
U	Musgrave Road	West of Cochrane Street, Paddington	5,200 (17%)	6,300 (12%)
Regional Ring				
R	Inner City Bypass	Land bridge, Spring Hill	12,300 (15%)	12,500 (16%)
19	Hale Street	South of Caxton Street, Petrie Terrace	10,200 (13%)	10,400 (14%)
C	Walter Taylor Bridge	Indooroopilly	5,000 (15%)	5,100 (16%)
E	Miskin Street	North of Ascog Terrace, Toowong	1,900 (18%)	1,600 (16%)
I	Frederick Street	South of Victoria Crescent, Toowong	4,500 (14%)	4,700 (14%)
31	Sherwood Road	West of Jephson Street, Toowong	800 (15%)	1,200 (22%)
City Distributor				
G	Brisbane Street	North of Josling Street, Toowong	6,100 (17%)	6,000 (16%)
H	Sylvan Road	East of Milton Road, Toowong	1,000 (12%)	1,400 (17%)
Q	Caxton Street	West of Hale Street, Paddington	3,600 (16%)	4,100 (18%)
S	Jephson Street	North of Sherwood Road, Toowong	2,700 (20%)	2,500 (19%)
Local Streets				
L	Eagle Terrace	West of Roy Street, Auchenflower	700 (18%)	1000 (24%)
M	Haig Road	West of Barona Road, Milton	1,100 (17%)	1,400 (22%)
N	Park Road Mid-block	North of Gordon Street, Milton	2,000 (16%)	1,400 (11%)
36	Morley Street[(b)]	North of Milton Road, Toowong	600 (15%)	700 (18%)
	Gregory Street[(a)]	Between Morley and Musgrave Street Toowong	360 (16%)	620 (27%)

Table Notes: Source: 2007 Northern Link Traffic Model except as otherwise noted – (a) BCC 2005; (b) 2007 traffic count

[5] The Reporting Points and associated reference identifications are also identified on **Figure 5-3**.

Table 5-5 Existing (2007) Average Weekday Commercial Vehicle and Bus Percentages

Reporting Points[6]	Road	Location	% Bus	% CV[c]
State Strategic				
BB	Centenary Bridge		0.1%	5.9%
A	Western Freeway	North of Moggill Road Interchange, Indooroopilly	0.2%	4.7%
Regional Radial				
J	Milton Road	East of Croydon Street, Toowong	0.6%	6.6%
X	Milton Road	West of Croydon Street, Toowong	0.2%	5.5%
K	Coronation Drive	West of Land Street, Auchenflower	1.3%	6.1%
B	Moggill Road	East of Russell Terrace, Indooroopilly	0.4%	1.7%
D	Moggill Road	East of Brisbane Boys College Entrance, Toowong	1.4%	6.0%
F	High Street	West of Benson Street, Toowong	2.0%	6.8%
O	Milton Road	East of Castlemaine Street, Milton	1.1%	8.5%
P	Coronation Drive	East of Cribb Street, Milton	1.0%	6.7%
T	Kelvin Grove Road	North of School Street, Kelvin Grove	0.9%	5.1%
U	Musgrave Road	West of Cochrane Street, Paddington	0.0%	2.4%
Regional Ring				
R	Inner City Bypass	Land bridge, Spring Hill	0.0%	11.0%
19	Hale Street	South of Caxton Street, Petrie Terrace	0.0%	8.6%
C	Walter Taylor Bridge	Indooroopilly	0.3%	4.6%
E	Miskin Street	North of Ascog Terrace, Toowong	1.3%	3.8%
I	Frederick Street	South of Victoria Crescent, Toowong	0.0%	3.9%
City Distributor				
G	Brisbane Street	North of Josling Street, Toowong	0.9%	3.5%
H	Sylvan Road	East of Milton Road, Toowong	1.9%	3.6%
Q	Caxton Street	West of Hale Street, Paddington	1.4%	6.1%
S	Jephson Street	North of Sherwood Road, Toowong	0.2%	5.4%
Local Streets				
L	Eagle Terrace	West of Roy Street, Auchenflower	0.0%	2.4%
M	Haig Road	West of Barona Road, Milton	0.4%	4.6%
N	Park Road Mid-block	North of Gordon Street, Milton	0.2%	7.4%
36	Morley Street[(b)]	North of Milton Road, Toowong	0.0%	1.7%
36	Gregory Street[(a)]	Between Morley Street, and Musgrave Street, Toowong	0.0%	0.5%

Table Notes: Source: 2007 Northern Link Traffic Model except as otherwise noted.
(a) BCC 2005; (b) 2007 traffic count; (c) Vehicle type has been based on the AustRoads (2004) as follows: Cars and light vehicles – Classes 1and 2, Commercial Vehicles – Classes 3 to 12[7].

[6] The Reporting Points and associated reference identifications are also identified on **Figure 5-3**.


Class 3
Two Axle Truck

[7] The term CV in the context of this report refers to medium and heavy commercial vehicles (commonly referred to as trucks) and is equivalent to AustRoads vehicle classes 3 to 12. The AustRoads classification system is based on number and spacing of axles. Class 3 is specifically designated by AustRoads as a two-axle truck (depicted to the left). Classes 1 and 2 are short vehicles (axle spacing <=3.1m eg: cars, 4WDs, standard utes etc with and without trailers). Classes 4 to 12 comprise multi-axle and articulated vehicles.

5.2.3 Traffic Demands and Movement Patterns

The following graphics and sector travel analysis illustrate the origin and destination of traffic movements served by the Coronation Drive and Milton Road corridors. The analysis is based on the travel sectors identified within the Brisbane Metropolitan Area shown as areas of interest on **Figure 5-1**.

Users of Coronation Drive

Daily travel patterns using Coronation Drive are shown graphically in **Table 5-6**.

- **Table 5-6 Coronation Drive Daily Traffic Patterns**

From \ To	Inner West	Central City	West Brisbane	Airport/ATC North/Eagle Farm	North Brisbane	South of Brisbane River	Total
Inner West	2% (1%)	8% (16%)	-	1% (4%)	10% (5%)	21% (18%)	43% (44%)
Central City	9% (16%)	-	1% (-)	-	-	2% (1%)	12% (17%)
West Brisbane	-	2% (-)	-	-	-	3% (1%)	6% (1%)
Airport/ATC North/Eagle Farm	2% (4%)	-	-	-	-	1% (3%)	3% (7%)
North Brisbane	10% (5%)	-	-	-	-	2% (5%)	12% (10%)
South of Brisbane River	19% (16%)	2% (1%)	1% (1%)	- (2%)	1% (4%)	1% (-)	24% (23%)
Total	41% (41%)	12% (17%)	2% (2%)	2% (6%)	12% (9%)	30% (26%)	100%

Trip Type Key:

- Radial or Central City related travel
- Cross-City travel
- Airport/ATC North travel
- Local travel

Table Notes:
Source: 2007 Northern Link Traffic Model
(x%) - % commercial vehicles

The travel sectors used include:

- Inner West – origins and destinations within the Inner West Transport Study Area;
- Central City – origins and destinations within the Brisbane CBD and other Central Brisbane travel sectors;
- West Brisbane - origins and destinations within the Greater Brisbane West travel sector;
- Airport/ATC North/Eagle Farm - origins and destinations within the ATC North travel sector;
- North Brisbane - origins and destinations within the Greater Brisbane North travel sector; and
- South of Brisbane River - origins and destinations within the Greater Brisbane South, the South West (including Ipswich) and the ATC South travel sectors.

The travel patterns identified have been broken down into four trip types (shown as different colours), being:

- Local travel - with origins and destinations within the Inner West Transport Study Area;
- Radial or Central City related travel - with travel to and from the Central City from and to West Brisbane and South of the Brisbane River;

- Cross-City travel - with travel from the Inner West, North Brisbane, West Brisbane or South of Brisbane River to North Brisbane or South of the Brisbane River and visa versa; and
- Airport/ATC North travel - with travel to and from the ATC north travel sector.

The total trips types shown in **Table 5-6** are:

- Local travel (Inner West Transport Study Area) – 2% all traffic, (1% commercial vehicles);
- Radial or Central City (including CBD) related travel – 24% all traffic, (33% commercial vehicles);
- Cross city travel (West, North and South) – 69% all traffic, (53% commercial vehicles); and
- ATC North/Airport travel – 5% all traffic, (13% commercial vehicles).

The analysis indicates that Coronation Drive has a minor role for local trips (within the Inner West) and for travel to and from the ATC North/Airport. Daily travel demand to and from the CBD (radial) is reasonably significant and is largely derived within the local area (17% of the 24% total). The majority of the traffic on Coronation Drive however is cross-city, and largely between the inner western suburbs and the south (40% of the 69% total) and the north (20% of the 69% total). This is supported by **Figure 5-12** that shows the main feeder roads to Coronation Drive are the Pacific Motorway for trips between the inner west and the south east, Moggill Road and the city distributors within St Lucia for trips between the inner west and the Central City, the south-east and the north, and Kelvin Grove Road and Kingsford Smith Drive between the inner west and the north. This clearly illustrates that Coronation Drive, which is an inner urban arterial road, has a significant role for cross-city trips.

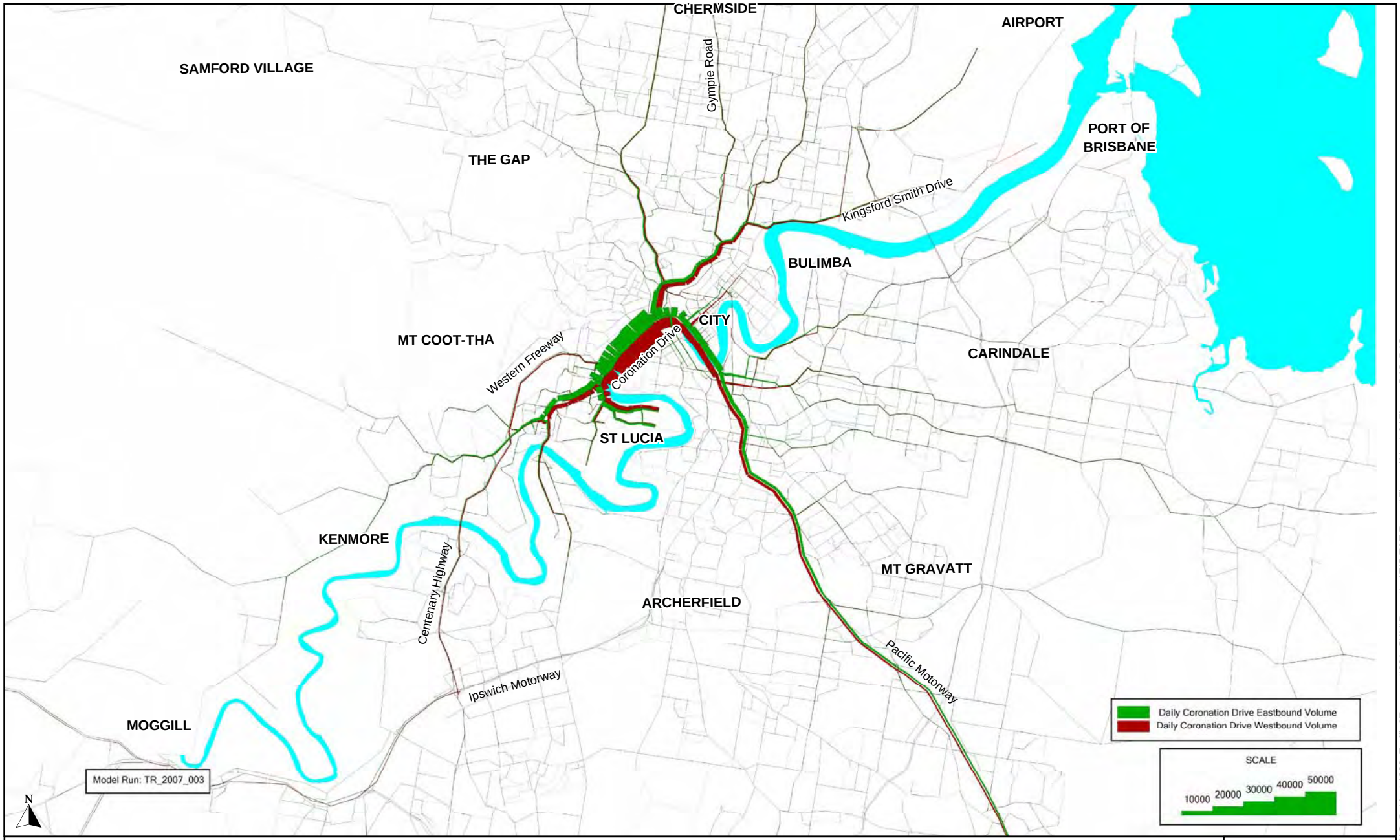

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Figure 5-12

Existing (2007) Daily Travel Patterns Coronation Drive

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Users of Milton Road

Daily travel patterns using Milton Road are shown graphically in **Table 5-7**.

Table 5-7 Milton Road Daily Travel Patterns

From \ To	Inner West	Central City	West Brisbane	Airport/ATC North/Eagle Farm	North Brisbane	South of Brisbane River	Total
Inner West	1% (2%)	3% (7%)	-	1% (3%)	6% (5%)	4% (8%)	14% (24%)
Central City	2% (7%)	-	4% (1%)	-	-	7% (1%)	13% (9%)
West Brisbane	-	3% (-)	-	2% (1%)	3% (2%)	3% (4%)	11% (7%)
Airport/ATC North/Eagle Farm	1% (2%)	-	1% (1%)	-	-	8% (6%)	10% (10%)
North Brisbane	3% (4%)	-	3% (2%)	-	-	8% (10%)	14% (16%)
South of Brisbane River	6% (10%)	6% (1%)	5% (4%)	9% (6%)	10% (11%)	3% (2%)	38% (34%)
Total	13% (25%)	11% (9%)	14% (8%)	11% (10%)	19% (17%)	32% (31%)	100%

Table Key:

Radial or Central City related travel
Cross-City travel
Airport/ATC North travel
Local travel

Table Notes:

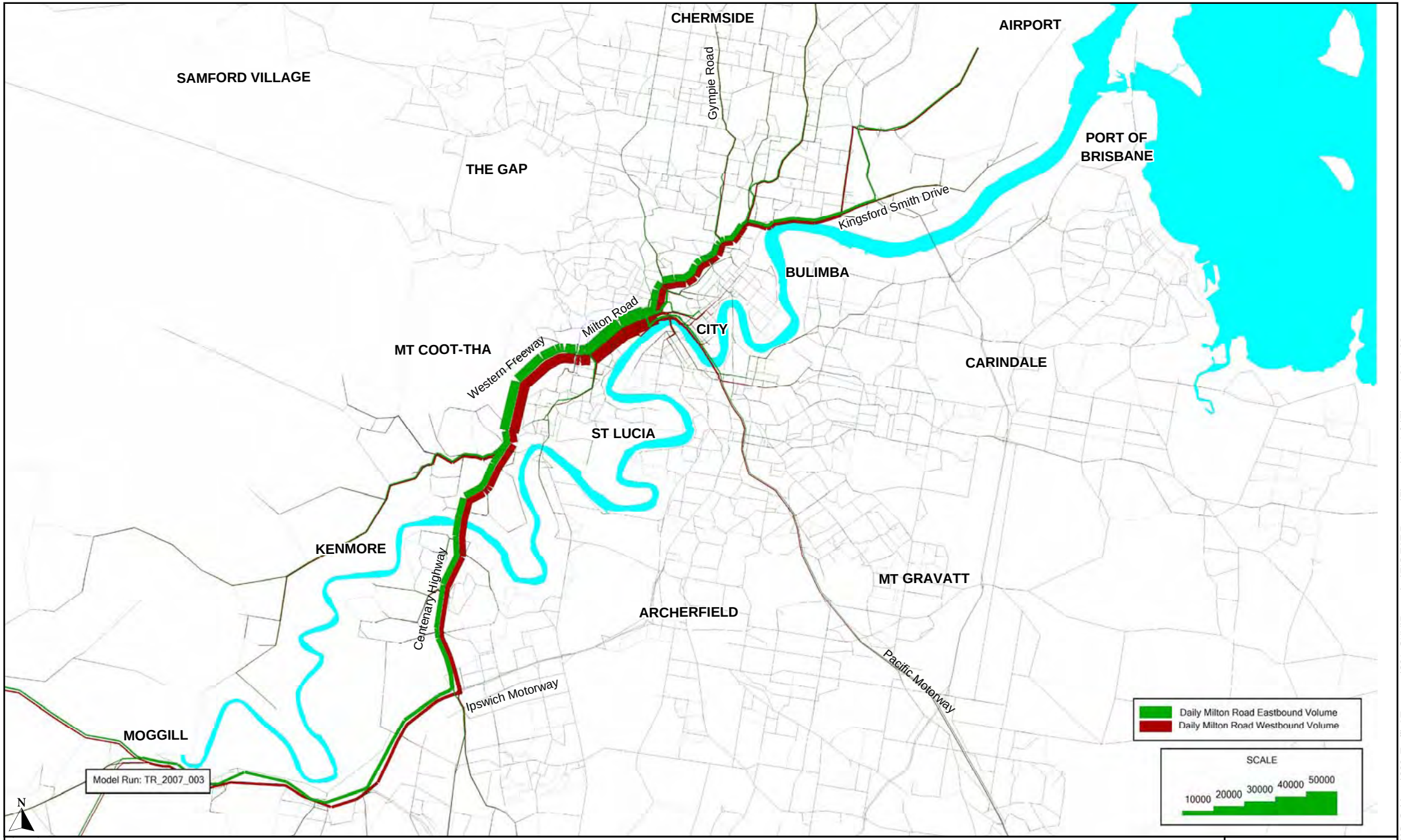
Source: 2007 Northern Link Traffic Model
(x%) - % commercial vehicles

The total trips types on Milton Road are:

- Local travel (Inner West Transport Study Area) – 1% all traffic, 2% commercial vehicles;
- Radial or Central City (including CBD) related travel – 24% all traffic, 18% commercial vehicles;
- Cross city travel (West, North and South) – 53% all traffic, 61% commercial vehicles; and
- ATC North/Airport travel – 22% all traffic, 19% commercial vehicles.

As for Coronation Drive, Milton Road also has a minor role for local trips and a significant role for cross-city and radial/CBD related travel. However, Milton Road also has a significant role for trips to and from the ATC North and Airport. Daily travel demand to and from the CBD (radial) is similar to Coronation Drive but is more widely distributed, with only 5%, of the 24%, total to and from the Inner West (with a significantly reduced commercial vehicle proportion) and the majority being from South of the Brisbane River (13%). The majority of the traffic on Milton Road, as for Coronation Drive is cross-city. This is also more evenly distributed with the larger proportion being between the north and the south (18% of the 54% total).

This is supported by **Figure 5-13** that clearly shows the main cross feeder for Milton Road being the Western Freeway and the Centenary Highway to and from the south and the ICB/Kingsford Smith Drive to and from the north, including the Brisbane Airport. This highlights the strategic role that this inner urban regional radial road has in supporting both radial and cross city traffic movements to and from south west of Brisbane and as distinct from Coronation Drive which supports a more inner west radial and cross city function to the south-east and north.



Northern Link
Environmental Impact Statement

Figure 5-13

Existing (2007) Daily Travel Patterns Milton Road

Northern Link

SKM Connell Wagner JOINT VENTURE

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5.2.4 Bus Services and Facilities

The three main forms of public transport in Brisbane are bus, rail and ferry. All of these major forms of public transport exist within or close to the Inner West Transport Study Area. Bus routes, rail lines and stations and ferry terminals are shown in **Figure 5-14**.

Bus Network and Services

The Brisbane bus network is mainly radial, consistent with the road network, although the expanding busway network and the use of integrated ticketing allows users to interchange between services to facilitate cross-city travel. Bus services utilise major radial arterial routes as well as the Inner Northern Busway and South East Busway to reach the Brisbane CBD, with most services terminating in the Queen Street Bus Terminal or on Adelaide Street.

A number of regional centres such as Garden City, Chermside, Indooroopilly and Toombul act as interchanging hubs for orbital, local and radial bus services.

The major bus corridors within the Inner West area are Coronation Drive and Milton Road with Moggill Road and the UQ feeding the two major routes. The Eleanor Schonell Bridge provides a direct bus link over the Brisbane River to the UQ from the eastern and southern suburbs.

Coronation Drive Bus Services

The majority of Coronation Drive bus routes service the entire corridor whilst some exit at Land Street and Park Road. During the two hour AM peak period (7am to 9am), seventy-one (71) buses pass Sylvan Road towards the Brisbane CBD, an average of a bus every 1.7 minutes. The total number of buses using Coronation Drive is over 800 at Sylvan Road on a week day. Three of the bus services on Coronation Drive enter the Inner Northern Busway at its Upper Roma Street access.

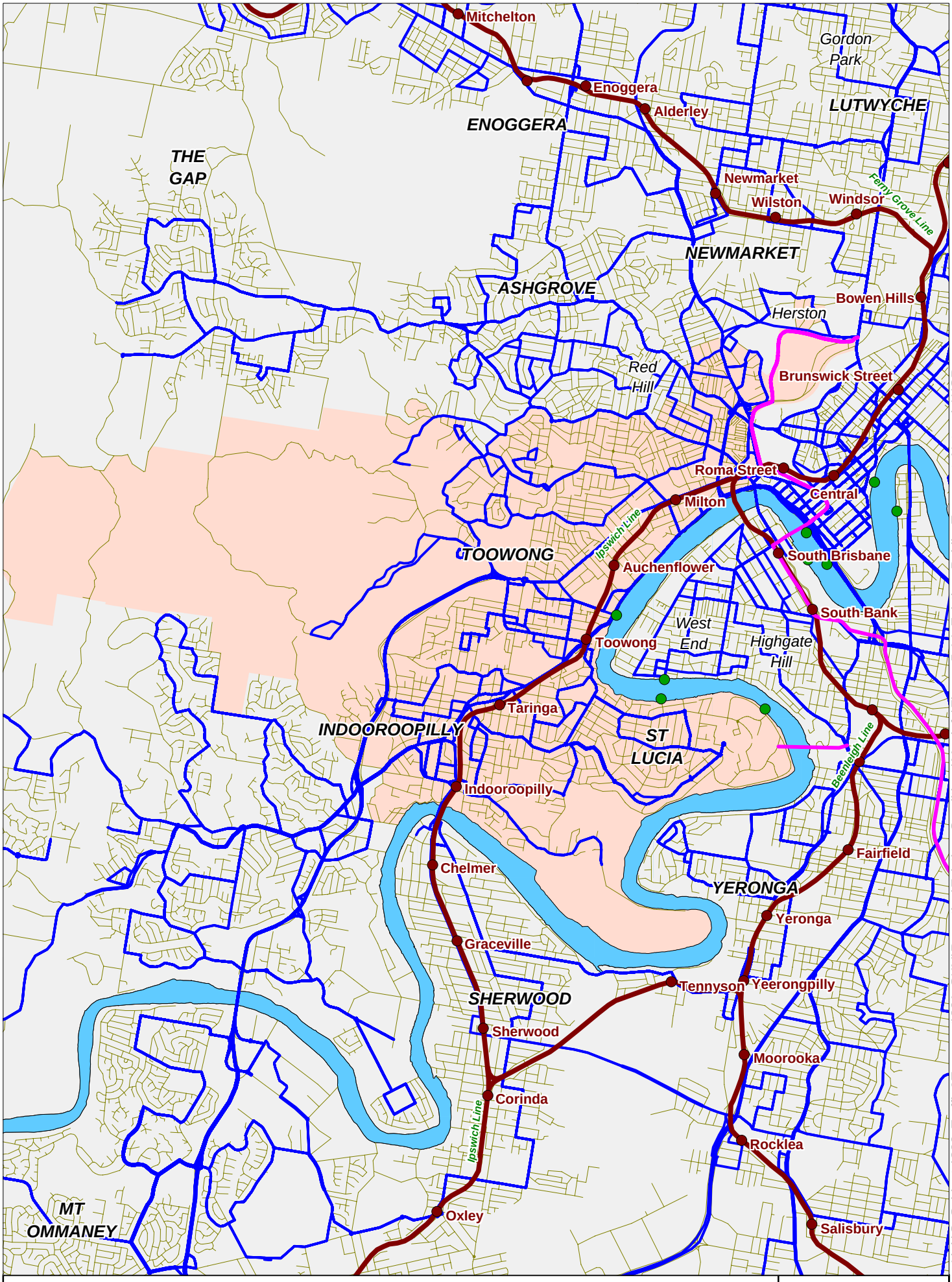
The major generators of public transport trips for Coronation Drive are the Toowong Centre shopping/commercial area and UQ. Trips to more regional centres like Indooroopilly are also quite significant.

Milton Road Bus Services

Eight bus routes utilise Milton Road to reach the CBD, of which six use the Western Freeway to navigate from south of the Brisbane River to Milton Road. Five of the Milton Road bus routes use the Inner Northern Busway from its access on Upper Roma Street. In the AM two hour peak period, 18 buses uses Milton Road to reach the CBD or the equivalent of one bus every 2.4 minutes.

Construction of the Boggo Road Busway and the first section of the Eastern Busway have commenced and when completed in 2009 will link the Eleanor Schonell Bridge, and hence the UQ, to the South East Busway.

To the north east of the Inner West area Kelvin Grove Road and Musgrave Road are major bus corridors that serve northern suburbs. Kelvin Grove Road provides access to the Inner Northern Busway at the Normanby Busway Station via Ithaca Street. There are a number of bus stops on Kelvin Grove Road of which most are in bus bays. Musgrave Road is also a bus route however the Inner Northern Busway cannot be accessed from Musgrave Road.



LEGEND

- Inner West Transport Study Area
- City Cat Jetties
- Rail Stations
- Rail Network
- Bus Network
- Busways

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 5-14

Existing (2007) Public Transport Network

Northern Link
SKM Connell Wagner JOINT VENTURE

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Kelvin Grove Road Bus Services

Currently 13 bus routes operate on Kelvin Grove Road that provide services between the CBD and the northern suburbs. Five of these routes utilise the Inner Northern Busway via the connection from Kelvin Grove Road to the Busway via Ithaca Street. There are also two QUT Campus shuttles that provide shuttle services for students and staff between the QUT Kelvin Grove Campus and the QUT campuses at Gardens Point and Carseldine.

The Kelvin Grove – Gardens Points shuttle (Route 391) operates on a 15 minute service frequency and enters the Kelvin Grove campus via the ICB at Victoria Park Road and leaves the campus via Kelvin Grove Road at Musk Avenue. For 2009 there are advanced plans to increase the frequency to a 10 minute service and this will result in 136 buses entering the campus via Victoria Park Road and exiting via Musk Avenue.

The Kelvin Grove – Carseldine shuttle serves the Kelvin Grove Road Campus via the Busway Station and operates on an hourly frequency in both directions. This shuttle service will cease to operate in December 2008 with the closure of the Carseldine Campus that will result in 2,000 students and 160 staff being relocated to the Kelvin Grove Campus.

Kelvin Grove QUT Busway Station

Four high frequency bus services to and from the city, and one operating between Normanby and the Tenerife Ferry, stop at the Kelvin Grove QUT Busway Station.

Musgrave Road Bus Services

Over 210 bus services operate on Musgrave Road (south of Scott Street) with 22 services operating during the two hour morning peak period. Routes 350 and 352 access the Inner Northern Busway at Upper Roma Street.

Major Bus Infrastructure

The key items of bus infrastructure facilities in the inner west are listed below.

- Eleanor Schonell Bridge – provides a direct bus link from UQ to the eastern and southern suburbs giving passengers considerable time savings compared to previous bus routes via river crossing in the CBD or at Indooroopilly.
- The Inner Northern Busway – runs along the eastern edge of the Inner West Transport Study Area and has recently been extended from its old access at the intersection of Countess Street and Roma Street to provide a direct connection for buses from Herston to the Queen Street Bus Terminal in the heart of the CDB. There are busway stations at Kelvin Grove QUT, Normanby, Roma Street Rail Station, King George Square and connecting with the Queen Street Bus Terminal. The extension includes a new entry on Upper Roma Street which enable bus services from Milton Road, Caxton Street and the Walter Taylor Bridge to access the busway.
- The Busway Stations that are provided at Normanby and QUT Kelvin Grove enables passengers in the Kelvin Grove and Red Hill suburbs to access Busway services. There is also a bus access point at the intersection of Kelvin Grove Road (northern approach) and Ithaca Street to the Inner Northern Busway at the Normanby Busway Station. This access enable bus services on Kelvin Grove Road to take advantage for the Inner Northern Busway for travel to the CBD.
- Upper Roma Street and Petrie Terrace contra-flow bus lanes – the contra-flow bus lanes allow city bound buses from Caxton Street and Milton road to avoid the Petrie Terrace/Countess Street one-way system; and
- Bus Interchanges at Indooroopilly, UQ and the Suncorp Stadium Bus Station (event only use).
- Indooroopilly Bus Interchange is located on the south west side of the Indooroopilly Shopping Centre at the intersection of Musgrave Road and Station Road. The bus interchange has the 3 distinct stopping bays each capable of holding up to three buses. There is additional layover space at the entrance to support approximately three more buses. Musgrave Road provides access to the interchange from the north with a

bus priority signalised intersection at Station Road/Musgrave Road provided at the south for smooth exiting of buses.

In addition there are a number of indented bus bays along Milton Road, Coronation Drive, Kelvin Grove Road and Musgrave Road.

Bus Priority Measures

Bus priority measures are usually provided to improve travel times and/or increase reliability of travel times for bus services. T3 lanes are provided on Kelvin Grove Road north of Blamey Street that operate in the peak direction. As previously mentioned buses can access the Inner Northern Busway from Kelvin Grove Road at Ithaca Street and therefore bypass any traffic congestion to access the CBD. Bus lanes or T3 lanes are not provided on Coronation Drive and Milton Road.

5.2.5 Ferry Services and Infrastructure

In the Inner West Transport Study Area there are fast ferry services (CityCat) that operate from pontoons at UQ, Guyatt Park (St Lucia) and Regatta (Toowong). The CityCat service provides a direct cross-river connection to West End from Guyatt Park and UQ. Services continue downstream to the City and onwards to Bretts Wharf (Hamilton). The first weekday service from UQ is at 5.57am and the last service is at 10:34pm. CityCat services generally operate at 20 minute headways during peak periods and 30 minute headways during off-peak periods.

5.2.6 Rail Services and Infrastructure

Rail Network and Services

Rail stations and rail lines within the Inner West Transport Study Area are shown in **Figure 5-14**. The Ipswich line, which connects Ipswich and the western suburbs to the CBD, is the only service to operate within the Inner West Transport Study Area. The Ipswich line serves stations at Indooroopilly, Taringa, Toowong, Auchenflower and Milton. There are a total of four tracks that are shared with freight services.

In the morning peak there are two express services. One stops at Indooroopilly and Toowong and the second stops at Indooroopilly and Milton rail stations. In the evening peak period there is one express service that only stops at Milton and Indooroopilly stations. During off-peak periods all services stop at each station. Saturday services are generally one train every 30 minutes and Sunday services provide one train every hour for all rail stations.

Rail Infrastructure

Rail infrastructure includes rail, vehicular and pedestrian bridges, tunnels and rail stations. The layout and design of stations varies predominantly due to constraints associated with geographical location and infrastructure and land uses surrounding the rail station and the standards applicable in the period when they were built or upgraded. At all rail stations the four rail tracks are served by either one central island platform and two side platforms or two island platforms.

Only Toowong, Auchenflower and Milton provide wheel chair access to the station platforms by either ramps or lifts. Pay phones, toilets and help points are provided at all rail stations.

The rail stations at Auchenflower and Taringa have limited off-street parking provision and Milton rail station has no off-street car parks. The lack of off-street parking at these stations results in on-street parking occurring on the adjacent local streets and the extent of this on-street parking has been increasing over time.

Indooroopilly rail station is currently under going a significant upgrade that will transform the station into a more accessible, attractive, and safe destination. The works commenced in November 2007 and are due to be completed by December 2008.

The Toowong rail station forms part of the Toowong Village building and multi-level car park. Pedestrian accessibility is through Toowong Village and can be confusing from the external road network or car park. Bus services stop on both High Street and Benson Street so integration of rail and bus services is not direct. A designated commuter car park for Toowong rail station is accessible from Benson Street (Coronation Drive). The provision of off-street parking is inadequate for the current level of usage of the station and the overflow is accommodated by nearby streets such as Augustus Street.

The rail station is located to the immediate north of Wesley Hospital and can be accessed from both the north and south of the rail line via Auchenflower Terrace and Lang Parade respectively. The station infrastructure is dated and disabled persons access to all platforms is by ramps from the pedestrian overpass of the railway tracks. Interchange with bus services is poor with the closest bus stops on Milton Road and Coronation Drive.

Milton rail station was subject to an upgrade that was completed in 2003 in conjunction with the redevelopment of Suncorp Stadium. Works included widening platforms and improving pedestrian linkages from the platforms to the stadium to cater for stadium crowds. However, pedestrian access from the northern side of Milton Road is problematic especially near the Baroona Road/Park Road intersection. The closest bus stops on Milton Road are to the west of Park Road.

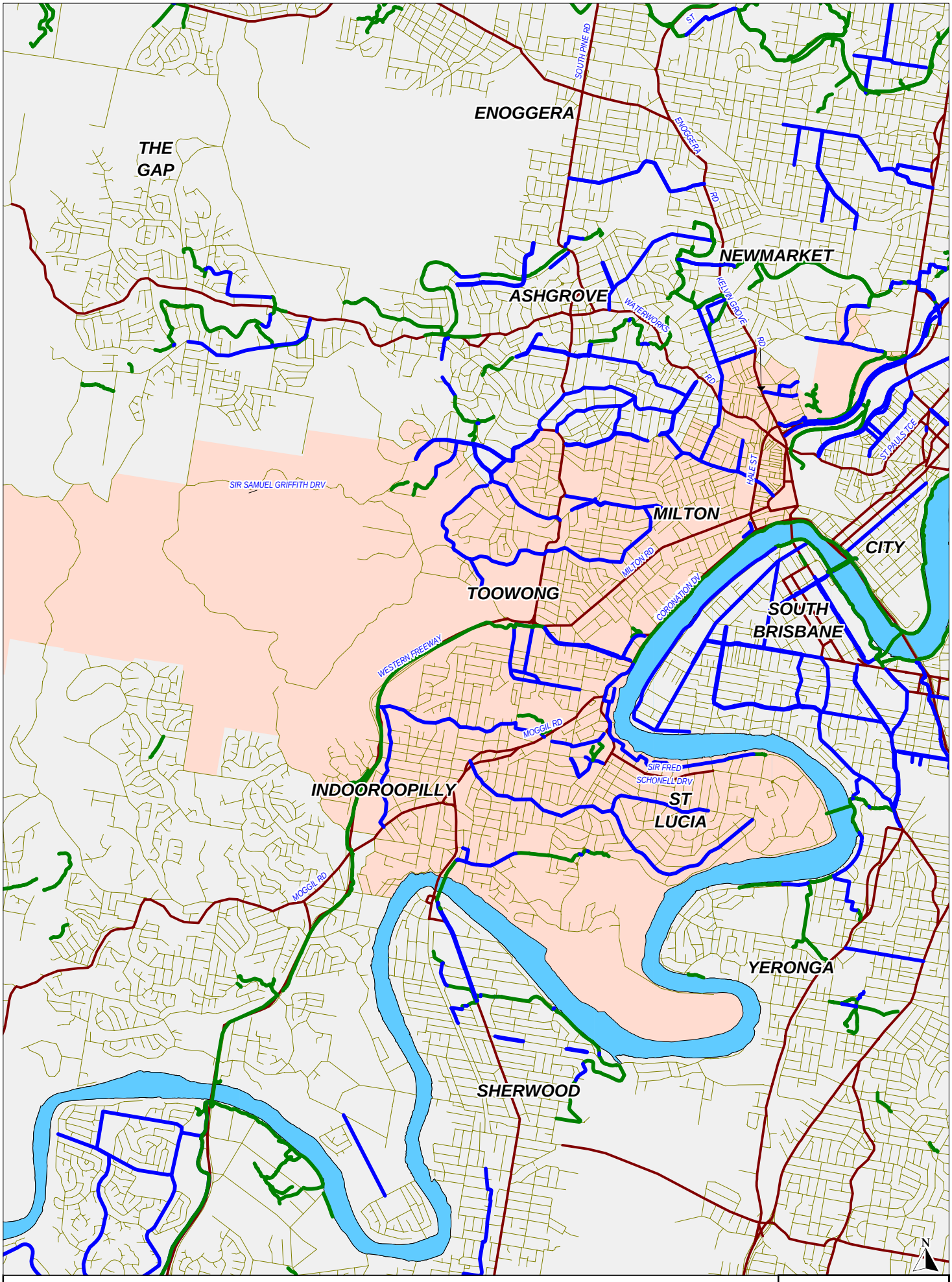
5.2.7 Pedestrian and Cycle Infrastructure and Use

The pedestrian and cycle networks within the Inner West Transport Study Area aim to provide connectivity between the origins and destinations within the area and beyond. The pedestrian network is characterised by footpaths adjacent to nearly all major roads whereas the cycle network is characterised by a combination of on and off road bike paths/lanes. Pedestrians can also use the majority of the off-road bikeways. The on and off road cycle paths are detailed in **Figure 5-15**.

Off road bike paths exist along the length of the eastern side of the Western Freeway on a grade separated and fenced off section of the corridor. At the eastern end of the Western Freeway the bikeway connects with the on-road bikeways on Sylvan Road.

Future upgrades to the area by DMR include the Western Freeway Roundabout Cycle and Pedestrian Bridge that will be located to the south of the Mt Coot-tha Road roundabout. The overpass will connect with the existing Western Freeway bikeway at Anzac Park and will cross over the Western Freeway before continuing along Mt Coot-tha Road. This is a DMR initiative and is expected to be complete in 2008/09.

Parallel to Coronation Drive, pedestrian and cyclists are catered for by the grade separated Bicentennial pedestrian and bikeway. It provides safe off-road connectivity from St Lucia and Toowong to the CBD. Access points are spaced evenly for its duration with city access available at Queen Street and tunnels underneath Coronation Drive at the Oxley River Restaurant, Land Street and Cribb Street.



LEGEND

- Inner West Transport Study Area
- Motorways and Arterial Routes
- Other Roads
- Off Road Bikeway
- On Road Bikeway

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 5-15

On and Off Road Cycle Paths within the Inner West Transport Study Area

Northern Link

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The major components comprising the off road cycle network are discussed below. They include the Bicentennial Bikeway and the recently opened Eleanor Schonell Bridge.

- *Bicentennial Bikeway* (**Figure 5-16**) - a pedestrian/cycle shared use off-road facility next to the Brisbane River from Toowong to the CBD. Access points are provided along Coronation Drive opposite Sylvan Road, Land Street (via subway), Lang Parade (via subway), Park Road and Cribb Street (via subway). On road bikeways connect the Bicentennial bikeway to the UQ and the Western Freeway bikeway at the Toowong Roundabout.
- **Figure 5-16 Bicentennial Bikeway at Park Road access, Milton**

- *Western Freeway/Centenary Highway Bikeway* – this is an off-road bikeway that runs parallel to the Western Freeway and Centenary Highway from the Toowong Roundabout to south of the Brisbane River via a bikeway at the Centenary Bridge. On road bikeways on Sylvan Road connect this facility to the Bicentennial Bikeway via an underpass of Coronation Drive that is accessed via Land Street.
- *Jack Pesch Bridge Pedestrian and Bike Bridge (Indooroopilly)* – this off-road facility is parallel to the Walter Taylor Bridge at Indooroopilly. On-roade bikeways provide connectivity to St. Lucia and to suburbs south of the Brisbane River.
- *Eleanor Schonell Bridge* (**Figure 5-17**) - this facility provides a cross-river bus connection between UQ and Dutton Park as well as a segregated pedestrian and bikeway. This facility connects with off-road facilities in Dutton Park.
- **Figure 5-17 Eleanor Schonell Bridge, St Lucia**

- The *Normanby Pedestrian and Cycle Link* (**Figure 5-18**) - opened in 2007 and improves pedestrian and cycle access between Brisbane's CBD and the inner west and northern suburbs. This link connects the cycle and pedestrian network at Normanby Five-ways to the Roma Street Parkland, Albert Street in the city and the Inner Northern Bikeway. It provides a safe and accessible pathway through the heavily trafficked Normanby Fiveways intersection.

- **Figure 5-18 Normanby Pedestrian and Cycle Link, Kelvin Grove**

- The provision of a number of *cycle parking facilities* in Toowong, Paddington, Indooroopilly, a new 'cycle pod' at the Guyatt Park CityCat terminal and cycle lockers at Indooroopilly, Taringa and Toowong rail stations.

Pedestrian and cycle surveys were conducted in 2007 to assess the level of usage of the major bikeways in the Inner West Transport Study Area. The number of pedestrians and cyclists during the weekday morning peak period using the Bicentennial, Landbridge, the Western Freeway off-road bikeway and the William Jolly Bridge on road bikeways are in **Table 5-8**.

- **Table 5-8 Pedestrian and Cyclist Activity – Morning Peak Period 2007**

Locations	Morning Peak Period			
	Cyclist	Pedestrians	Total	Time
Bicentennial Bikeway	1083	460	1543	6:10-9:00
Eleanor Schonell Bridge	414	519	933	6:00-9:30
Landbridge	179	172	351	6:00-9:00
Jack Pesch Bridge Pedestrian and Bike Bridge (Indooroopilly) (1)	625	61	686	5:30-9:30
Western Freeway Bikeway(1)	286	n/a	286	6:00-9:00
William Jolly Bridge (Northbound)	217	184	401	5:45-9:30

Table Notes:

Source: Bicycle Queensland 2008.

(1) Data collected in 2006

The surveys show that all connections are well used by pedestrian and cyclist commuters. The Coronation Drive Bikeway has a significantly higher level of usage then any other bikeway in the study area. Data collected by Brisbane City Council in 2006 showed that while commuter traffic during the week is significant, recreational use of this route is greater. All routes surveyed (in 2006) showed stronger weekend use then weekday, showing the significant recreational use of pedestrian and cyclist facilities.

In general there are more cyclist than pedestrian users on all the paths, for both the average weekday and weekend.

The location of the Western Freeway Bikeway in relation to nearby suburbs and shopping centres and the distance between access points means that it has significantly lower levels of pedestrian traffic as compared to cyclist.

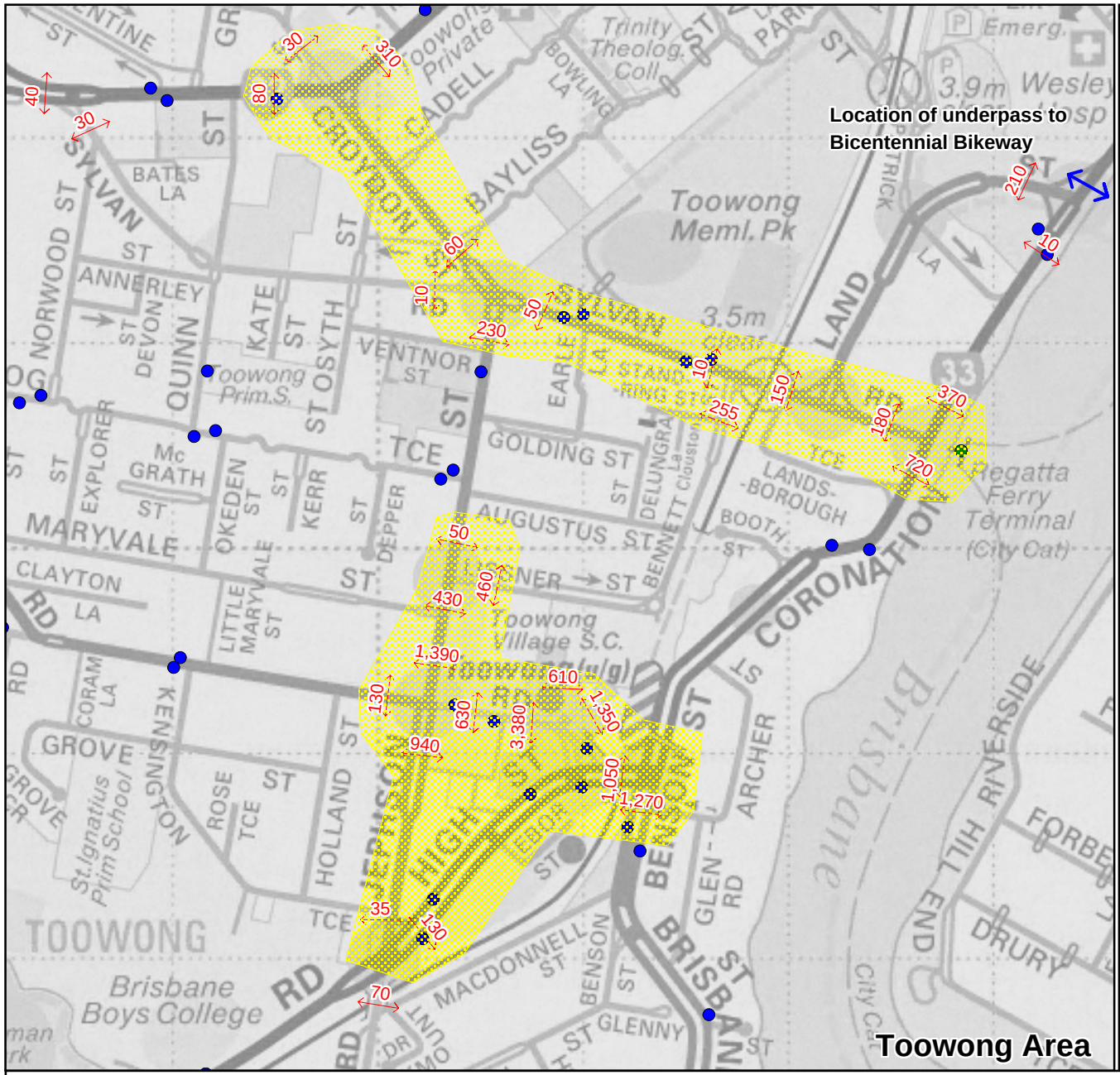
Usage of Pedestrian Crossings

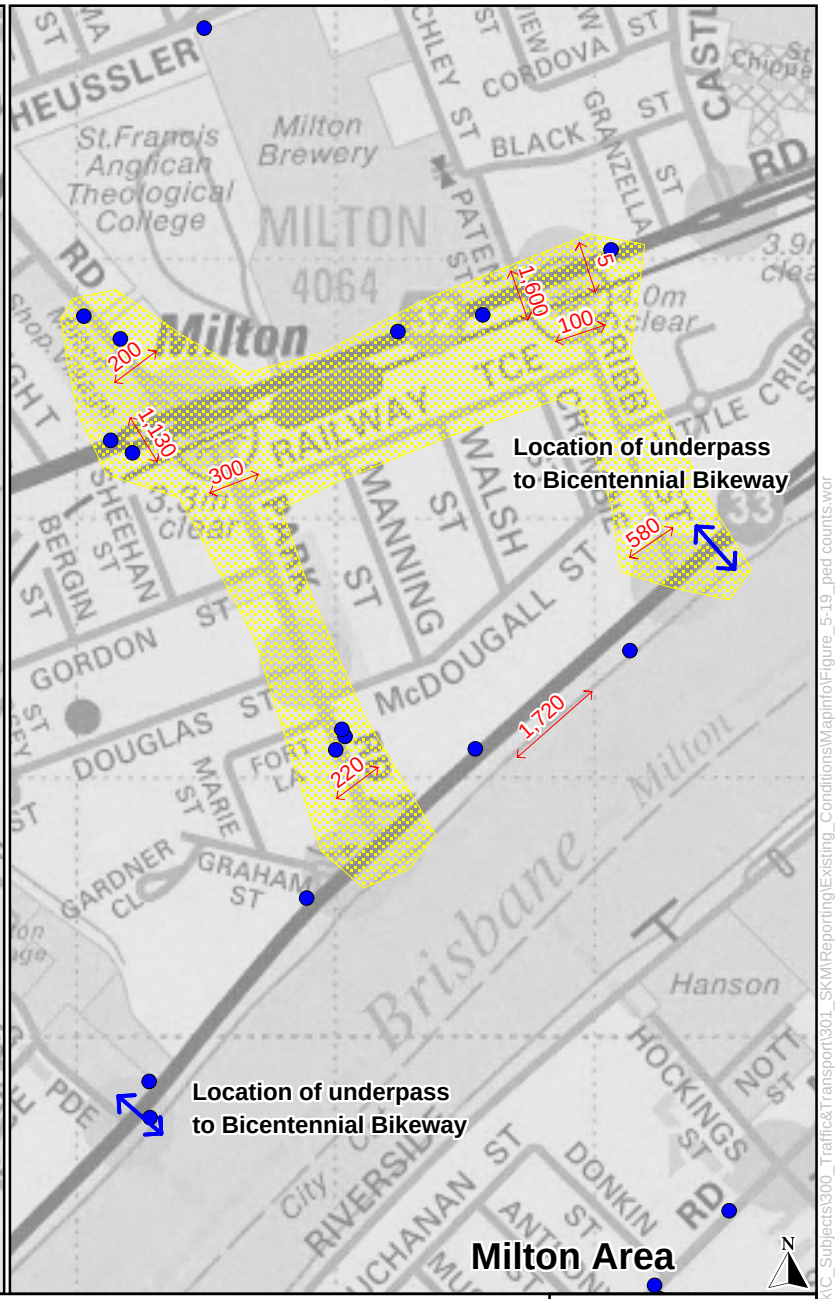
Pedestrians using the crossing facilities at a number of intersections were also surveyed on a typical weekday in October 2007. The number of pedestrians crossing at intersections in Toowong and Milton are shown in **Figure 5-19**. This shows a significant number of pedestrian crossings in the Toowong area, focused around the shopping centre and railway station, bus stops and the Regatta Ferry terminal. In Milton pedestrian activity is focused on the railway station and the commercial and retail areas as well as towards the Coronation Drive bikeway.

Examples of typical average weekday pedestrian flows at key locations are as follows.

- On Milton Road approximately 1,100 pedestrians crossing at Park Road and 1,600 at Cribb Street.
- On Coronation Drive at Sylvan Road at the Regatta Ferry terminal approximately 1,000 pedestrian crossings.
- In the vicinity of Toowong Village approximately 1,300 pedestrian crossings of Benson Street, 1,000 of High Street and 3,400 of Sherwood Road.
- At the intersection with Sherwood Road over 2,000 pedestrians cross Jephson Street.
- Approximately 400 pedestrians cross Milton Road at the signalised intersection of Milton Road/Morley Street/Croyden Street, with 80% of pedestrians using the eastern signalised crossing and 20% using the western crossing.
- Approximately 550 pedestrians cross Kelvin Grove Road at the intersection with Blamey Street on a typical weekday and with mid block crossings also typically observed south of Blamey Street.

This data shows that within the Inner West Transport Study Area there are strong pedestrian demands to cross the regional radial roads.





LEGEND

- xxx — Typical 12 hour (2007) pedestrian weekday volume
- Pedestrian / cycle underpass
- Bus stop
- CityCat Terminal
- Key area of pedestrian activity

Northern Link
Environmental Impact Statement

Figure 5-19

Pedestrian Movements at Intersections

Northern Link
SKM Connell Wagner JOINT VENTURE

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5.2.8 Freight

Freight movements in the study area are limited to articulated vehicles and there are no B-Double routes. The Western Freeway, Milton Road and MetRoad 5 are designated as secondary freight routes and Coronation Drive and Moggill Road are designated as tertiary freight routes.[8] There is a lack of high quality freight routes (primary freight routes) connecting the Western Corridor to the north, to the CBD or for cross-city freight. This results in freight using the secondary and tertiary freight routes that are located in the Inner West Transport Study Area.

Local land uses that generate freight movements include:

- the Castlemaine XXXX brewery in Milton with freight vehicles using a route via Black Street and Castlemaine Street to access Milton Road; and
- the Mt Coot-tha Quarry predominantly uses a route to Eagle Farm via Milton Road, Hale Street and the ICB with a smaller proportion using the Western Freeway for trips to the west.

5.2.9 Tolling

There are currently no toll routes located within the Inner West area. Within the Metropolitan area, the Gateway Motorway and Logan Motorway are the two main toll routes. A toll is also required to use the Moggill Ferry, which connects Brisbane's south western suburbs situated north of the Brisbane River with Ipswich. The toll values for private vehicle and commercial vehicle use are shown in **Table 5-9**.

Table 5-9 Existing Toll Locations and Values

Toll Road (Location)	Cars and Light Vehicles	Commercial Vehicle (Classes 3 and above)
Gateway Bridge	$2.90	$7.20
Gateway (Kuraby)	$1.90	$4.50
Logan Motorway (Stapylton Road)	$2.00	$4.50
Logan Motorway (Loganlea Road)	$1.20	$3.20

Table Note: Toll values as of 1 July 2008, expressed in 2008 dollars including GST. Source: Queensland Motorways, 2008.

A number of toll roads are either currently under construction or due to commence construction in Brisbane. These projects include the duplicated Gateway Bridge as part of the Gateway Upgrade Program, CLEM7, the Airport Link and the Hale Street Link. **Table 5-10** shows the expected first year of operation of these facilities and the associated toll value expressed in June 2008 dollars.

Table 5-10 Future Toll Roads and Values

Toll Road (Location)	Year of opening	Cars and Light Vehicles	Commercial Vehicle (Classes 3 and above)
CLEM7	2011	$3.93	$10.41
Airport Link (NS)	2012	$4.24	$11.23
Airport Link (EW)	2012	$3.18	$8.42
Hale Street Link	2011	$2.40	$6.37

Table Note: Toll values expressed in 2008 dollars including GST.

[8]The Draft Transport Plan for Brisbane 2006-2026

5.2.10 Emergency Services

Police stations within the study area are located at:

- 343 Moggill Road, Indooroopilly – left in left out only.

Fire services within the study area are located at:

- 26 Whitmore Street, Taringa

No ambulance stations are located within the study area. The Wesley Hospital operates a 24 hour emergency ward that accepts ambulances. Ambulance services operate to and from the Royal Brisbane Hospital complex immediately east of the Inner West Transport Study Area in Herston.

5.3 Transport Network Performance

5.3.1 Traffic Demands and Growth

Traffic Demands and movement patterns through the local and regional road network have been described in the existing transport network in **Section 5.2.3** above.

A review of historic transport planning studies has enabled comparison of historic traffic volumes on Milton Road, Coronation Drive and the Western Freeway. This is shown in **Table 5-11** for the years 1964, 1987 and 2007. This historic data illustrates the sustained strong growth in travel demand in the Inner West Transport Study Area over the past 40 years. During that period the only significant corridor capacity improvement has been the Coronation Drive tidal flow scheme implemented in 2002.

- **Table 5-11 Historic Traffic Volumes**

	1964[(1)]	% Growth per annum	1987[(2)]	% Growth per annum	2007[(3)]
Coronation Drive	30,000	1.6%	43,000	3.3%	82,000
Milton Road	17,200	2.3%	29,000	3.4%	57,000
Total on Coronation Drive and Milton Road	47,200	1.9%	72,000	3.3%	139,000
Western Freeway	n/a	n/a	33,000	4.3%	77,000

Table Notes:

(1) Average weekday traffic – Brisbane Transportation Study, Wilbur Smith and Associates (1965)
(2) Weekday traffic – Brisbane Traffic Study, Brisbane City Council, 1989. BSD population in 1986 = 1.15M
(3) Volumes surveyed in October 2007

Over the last 20 years the population in the Brisbane Metropolitan Area has increased by 60%, however traffic volumes using Coronation Drive and Milton Road have doubled (or increased by 100%), with a daily traffic increase on the Western Freeway during the same period of over 130%. Peak hour demands through the Toowong roundabout have increased by 30% in the morning peak (to 5,500 vehicles per hour) and 60% in the evening peak (to 6,200 vehicles per hour) over the same period, and high demands have spread through longer periods of the day.

5.3.2 Local Access and Operational Requirements

Local Accessibility

A number of features of the regional road network shown in **Figure 5-5** have resulted in restrictions being placed on local traffic access at many priority (un-signalised) and signalised intersections.

The Coronation Drive tidal flow system and the high volume of traffic that uses it has led to some restrictions on priority movements on and off of Coronation Drive. Right turns to and from Coronation Drive are permitted only at signalised intersections with priority intersections limited to left-in and left-out movements only.

Properties that have frontages on Coronation Drive are generally accessed from the local street network. The few properties that do have driveway access directly to Coronation Drive are left in and left out access only.

Milton Road has a mix of nine (9) signalised and fifteen (15) priority controlled intersections. A number of turn bans are in place in order to maintain the through traffic flow on Milton Road during peak periods. These bans are usually relaxed during off peak periods in order to provide higher levels of accessibility to the surrounding residential and commercial areas.

The majority of residential and office properties that have direct driveway access to Milton Road are restricted to left turn in and out only. Whilst these restrictions optimise the performance of Milton Road as a regional radial road for commuters and through-traffic, local accessibility is severely compromised and the road network illegible to drivers who are not familiar with the area.

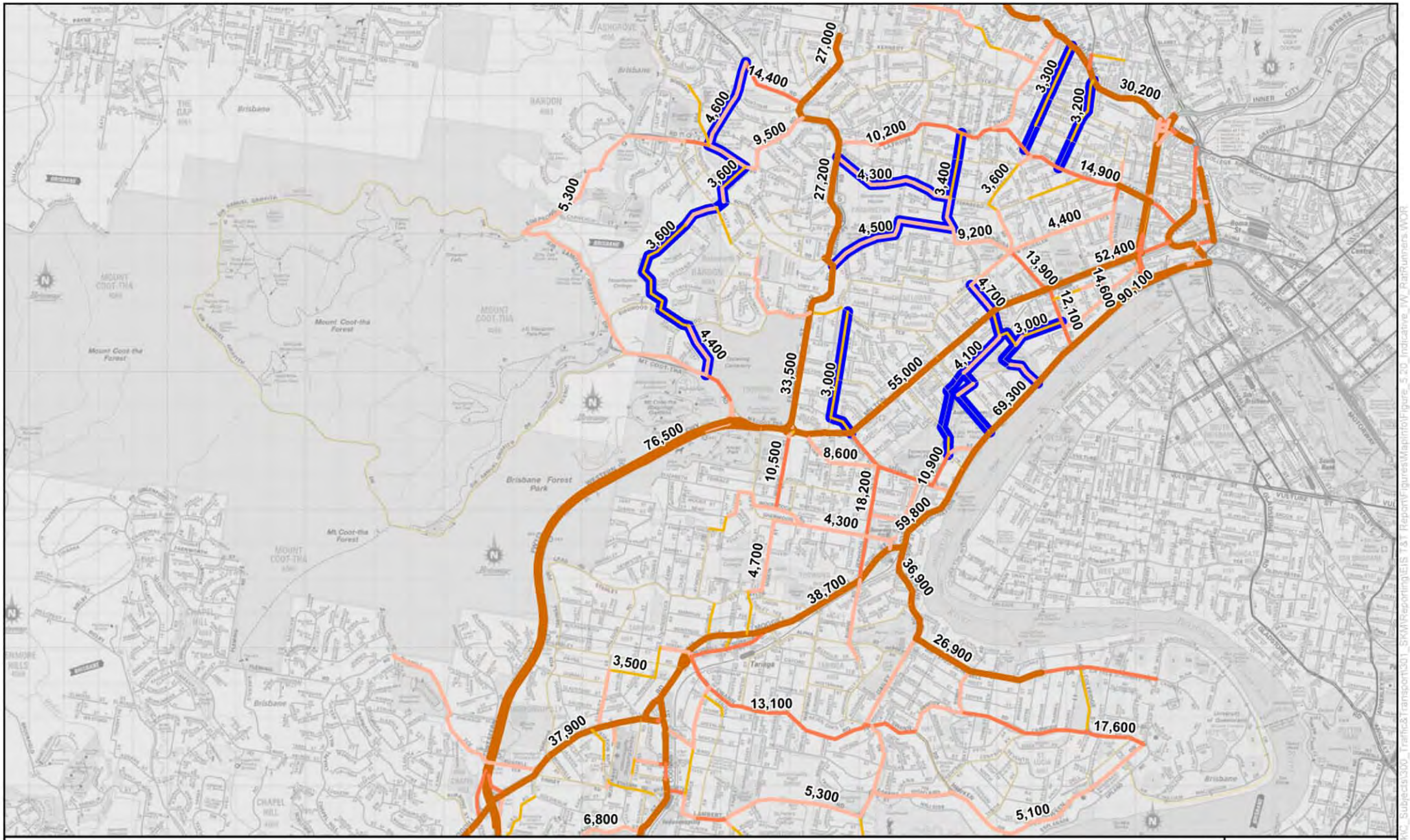
The high traffic volumes, presence of a central median, the width of Kelvin Grove Road (three traffic lanes in each direction) and free flow merges with the Inner City Bypass and Hale Street has led to restrictions to movement between Normanby Five Ways and Prospect Terrace in the northbound directions. All local streets and property accesses are left in and left out access only.

There are competing needs for road space within the inner west that can add to congestion and restrict use of the surrounding land use. Examples include:

- High Street, Toowong – High levels of commuter and through-traffic that pass through a shopping area where demands are high for on-street loading and parking, bus stops, access to car parks, public transport and pedestrian activity;
- Sherwood Road, Toowong – A shopping street with competing needs for access to shops and commercial buildings, on-street parking and loading, pedestrian activity, bus stops, through trips between Toowong and Milton Road and access to residential areas;
- Moggill Road, Indooroopilly – Provides an arterial function and access to the major regional traffic generator - Indooroopilly Shopping Centre;
- Park Road, Milton – Demand for parking and street use of cafés, restaurants and shops compete with the linkage that Park Road provides between Coronation Drive and Milton Road;
- Kelvin Grove Road – A regional radial road that also provides access to the Kelvin Grove Urban Village and to cater for pedestrian, bus stops and cyclists; and
- Residential streets, Auchenflower – Residential needs of these streets compete with parking and access demands to the Wesley Hospital.

The effect of existing congestion on the regional network and the associated low travel speeds on them encourages traffic to use the local street network for trips that do not have an origin or destination within or close to a defined local area. It is generally recognised that flows of 3,000 vehicles per day or more may create environmental problems in residential streets. Most residents would consider 4,000 vehicles per day as a traffic nuisance[9]. Local streets that suffer from extraneous through traffic in the Inner West Transport Study Area have been identified and are shown in **Figure 5-20**.

[9] National Association of Australian State Road Authorities; Guide to Traffic Engineering Practice TEC-10 (1982)



LEGEND

2007 Weekday Daily Two Way Volumes (TR_2007_003)

- 20,001 to 90,200
- 20,000 to 100,000
- 4,001 to 10,000
- 3,001 to 4,000
- 0 to 3,000
- Local routes used by extraneous through traffic.

Northern Link
Environmental Impact Statement

Figure 5-20

Inner West Traffic Volumes

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Morley Street, Gregory Street, Valentine Street and Musgrave Street in Toowong provide vehicular access to properties but also provide the opportunity for through traffic to by pass the Frederick Street roundabout and hence impact on the amenity of the area.

In Kelvin Grove there is no connection from the Inner City Bypass (westbound) to Musgrave Road and traffic accessing Red Hill must do so via Ithaca Street, Kelvin Grove Road and then Victoria Street. Victoria Park Road also provides a convenient left-in and left out access with the ICB for the residents of Normanby Terrace and the Kelvin Grove Urban Village.

The demand for on-street parking in the Inner West Transport Study Area is increasing, being generated by several factors.

- Multiple car ownership at residential properties that do no not have sufficient capacity for off-road parking of all vehicles.
- Increasing densification of residential areas leading to an increase in the number of vehicles owned within the area.
- Office development within the Inner West Transport Study Area.
- Parking demand associated with the QUT Kelvin Grove Campus that has been developed for public transport as the major mode of travel. There is limited off street parking at QUT with 1,100 spaces and no specific allocation for students. The campus is part of the Brisbane Central Parking Area. The local streets to the immediate west and north of the campus, which are not in the Brisbane Central Parking Area, experience a significant demand for on-street parking associated with the campus. An additional 2,000 students and 160 staff will re-locate to the QUT Kelvin Grove Campus following the closure of the Carseldine Campus in December 2008, increasing travel pressures to the campus.
- Car parking associated with the UQ at St Lucia.
- Car parking associated with the Wesley Hospital.
- There is a growing trend for commuters to drive and then park on-street close to public transport nodes within the study area before completing the commuting journey to the CBD by bus or rail.

5.3.3 Traffic Speeds and Travel Times

Travel Speeds and Travel Times

Average travel time and speed data along Coronation Drive was assessed between Sylvan Road and Cribb Street and for Milton Road between Morley Street/Croydon Street and Castlemaine Street. **Table 5-12** displays the average travel times and speed through six-travel time runs conducted on a typical weekday in the AM (7-9 AM) and PM (4-6 PM) peak periods.

- **Table 5-12 Average 2007 Weekday Travel Times and Travel Speeds**

Parameter	Morning Peak (7-9 AM)				Evening Peak (4-6 PM)			
	Coronation Drive		Milton Road		Coronation Drive		Milton Road	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Average Time (min)	8:42	2:54	5:00	7:00	3:48	2:42	5:18	6:42
Average Speed (km/h)	12.3	36.1	27.9	19.9	28.3	39.5	26.4	21.0

Table Note: Source: 2007 Travel Time Surveys

Table 5-12 shows that during the AM and PM peak periods the traffic speed is significantly below the posted speed of 60km/h on both roads. Milton Road is slower in the outbound AM peak rather than the PM peak and

Coronation Drive faster in the outbound PM peak than AM peak. These results could be attributed to differing road characteristics of the inbound and outbound directions and in the case of Coronation Drive, the tidal flow system allowing greater lane capacity for the peak flow direction and hence greater variability in travel time and speed.

Both Coronation Drive and Milton Road have significant fluctuations in travel times and speed within the peak periods indicative of the unstable flow characteristics of both roads as shown in **Table 5-13**.

Table 5-13 Travel Times and Travel Speed Variability

Parameter	Morning Peak (7-9 AM)				Evening Peak (4-6 PM)			
	Coronation Drive		Milton Road		Coronation Drive		Milton Road	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Time Range (min)	2:12 – 16:24	2:36 – 3:24	4:12 – 6:12	4:30 – 17:54	2:06 – 5:24	2:30 – 3:06	4:18 – 5:48	3:06 – 10:30
Speed Range (km/h)	6.5 – 49.4	31.0 – 40.4	22.6 – 33.5	7.8 – 31.3	19.8 – 50.6	33.9 – 42.2	24.2 – 32.7	13.3 – 45.5

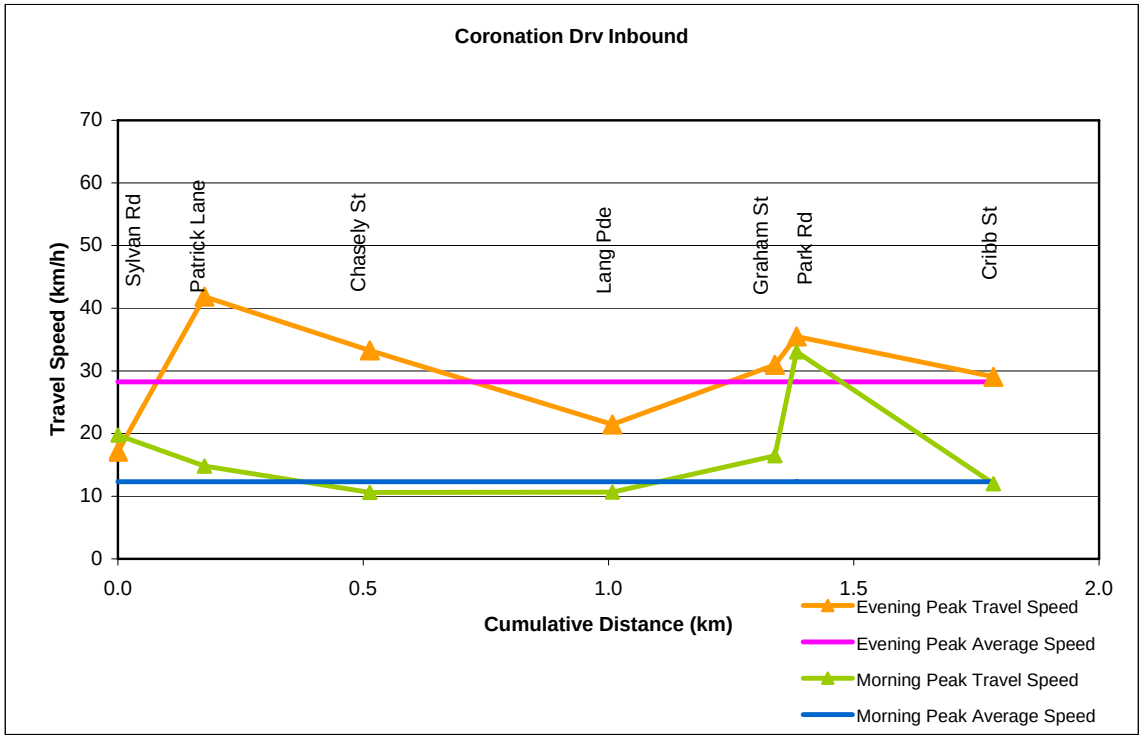
Table Note: Source: 2007 Travel Time Surveys

This variability for both roads is shown graphically in the following figures. **Figure 5-21** and **Figure 5-22** show the variation in the average travel speed along Coronation Drive in the inbound and outbound directions. Both the AM and PM periods show a similar trend with the traffic flow slower towards Lang Parade and increasing to/from Patrick Lane, likely to be a result of intersection delay.

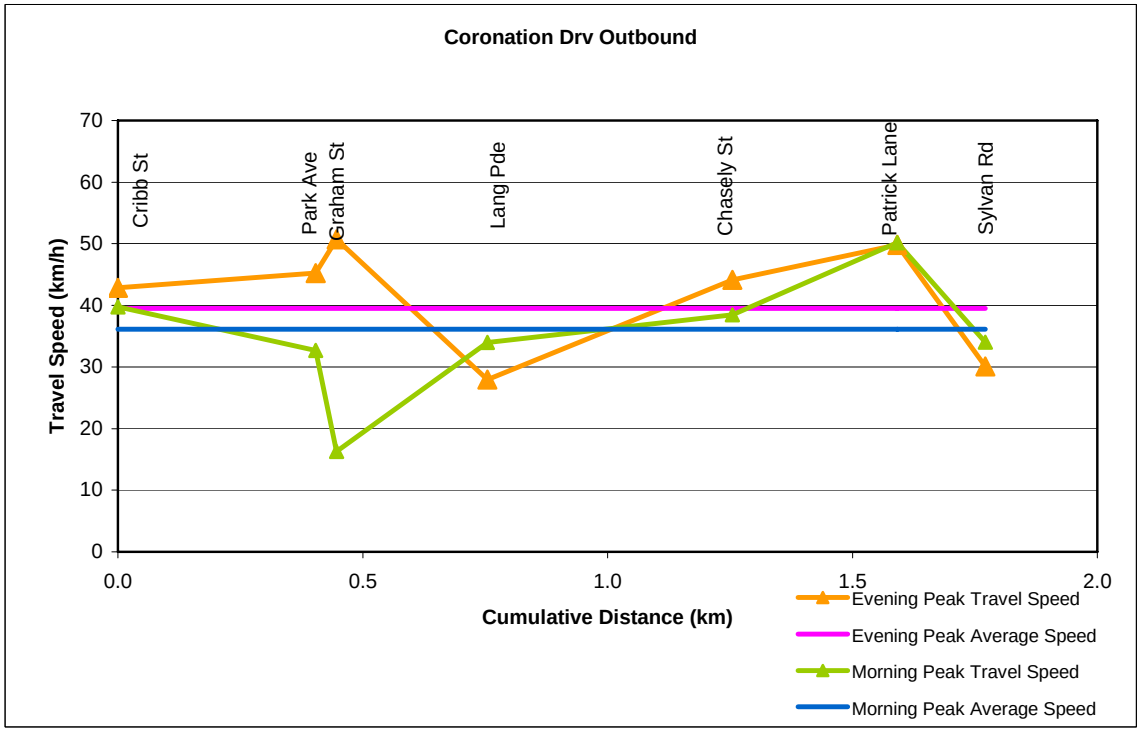
Figure 5-23 and **Figure 5-24** show the variation in the average travel speed along Milton Road. For the inbound direction traffic flow is close to the posted speed (60km/h) through Park Avenue and Weinholt Street gradually decreasing towards Cribb Street and Castlemaine Street. These delays would be partly due to traffic signals. The outbound direction in the AM period follows a similar pattern to the inbound direction in the AM peak period - that of the slowing of traffic flow around Cribb Street and more free-flowing conditions towards Park Avenue. The PM peak displays the opposite, with more free flowing conditions towards Baroona Street and slower conditions towards Park Avenue.

In summary both Coronation Drive and Milton Road have travel speeds that are significantly lower than the signed speed limit of 60km/h and average travel times significantly fluctuate. This is symptomatic of unstable flow characteristics on both roads.

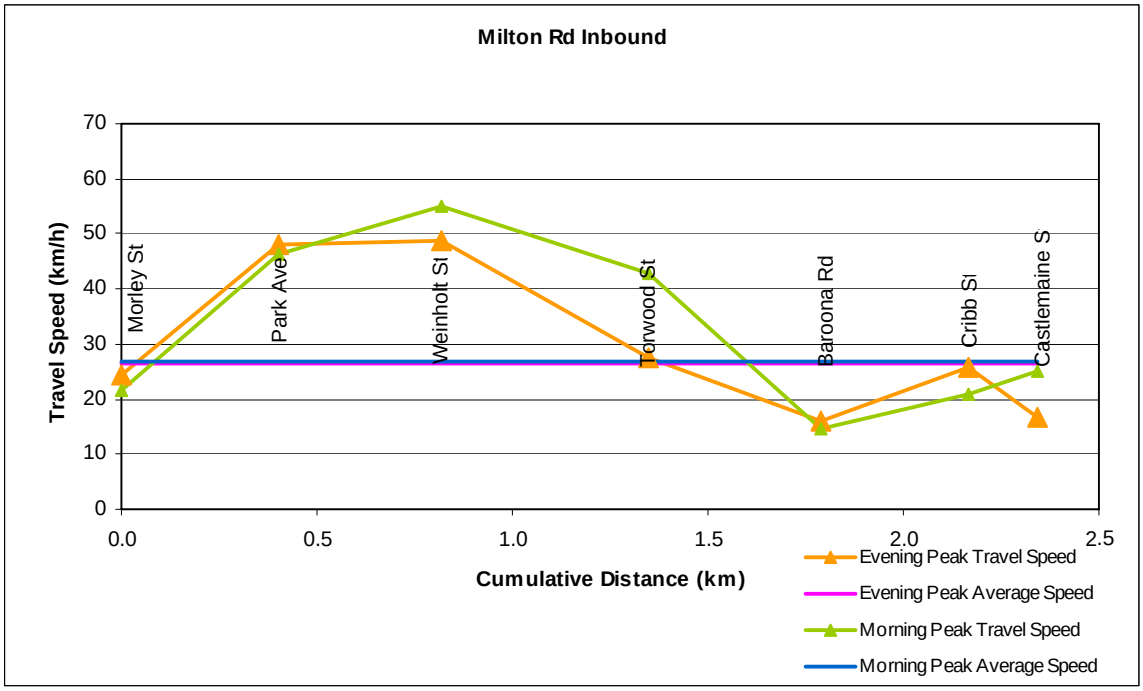
- **Figure 5-21 Existing (2007) Coronation Drive inbound peak period and average travel speeds**



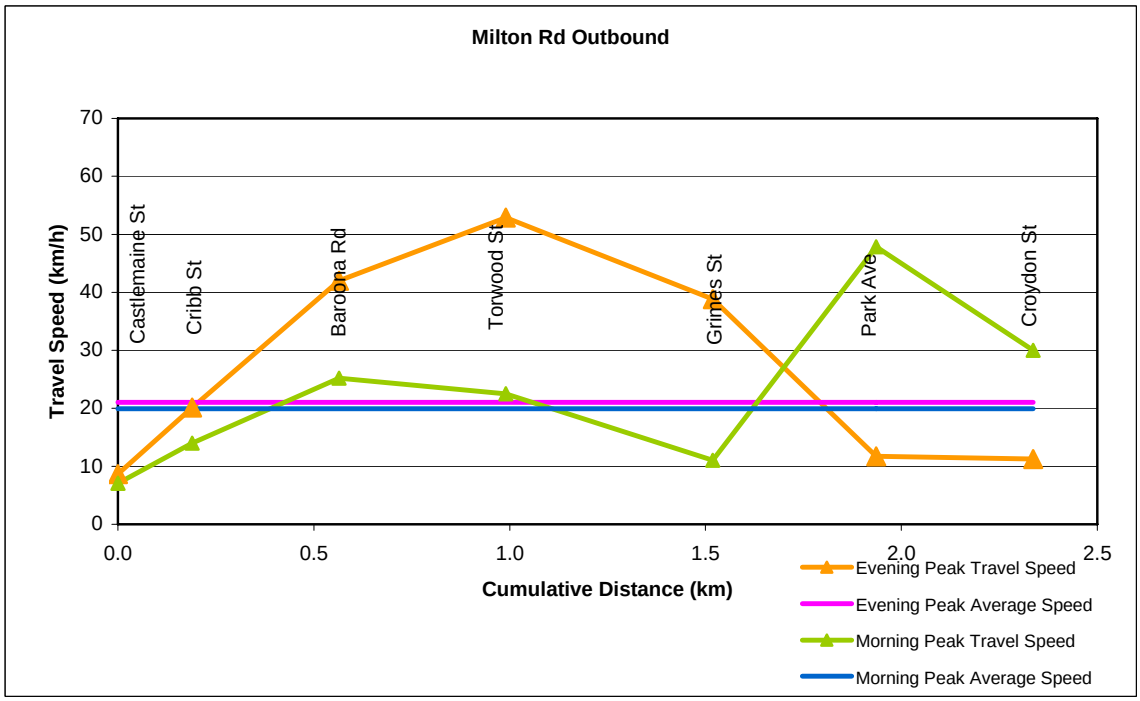
- **Figure 5-22 Existing (2007) Coronation Drive outbound peak period and average travel speeds**



- **Figure 5-23 Existing (2007) Milton Road inbound peak period and average travel speeds**



- **Figure 5-24 Existing (2007) Milton Road inbound peak period and average travel speeds**



5.3.4 Road Capacity and Level of Service

Level of Service (LOS) is a key measure of the performance of the road network. It can be measured at a mid-block point or at an intersection, and provides an assessment of the operation as performance of the road network in terms of conditions experienced by drivers.

The LOS for roads within the study area has been determined for existing conditions for the base year 2007 using travel speed as the defining measure for urban arterial roads with interrupted flow. As travel speeds decrease from the optimum free-flow condition, the LOS to road users deteriorates. The LOS range is from A (very good) to F (congested). **Table 5-14** describes the characteristics of each category.

Table 5-14 Roadway Mid-Block Level of Service Criteria

Level of Service	Criteria
Level of Service A	Generally free flow conditions with operating speeds usually about 90% of the free flow travel speed for the particular class of arterial. Vehicles are unhindered in manoeuvring in the traffic stream and stopped delay at junctions is minimal.
Level of Service B	Relatively unimpeded operation with average travel speeds about 70% of the free flow speed for the particular class. Manoeuvring in traffic stream is only slightly restricted and stopped delays are low.
Level of Service C	Stable operating conditions with manoeuvring becoming more restricted. Longer queues and/or adverse signal coordination may contribute to lower average travel speeds of about 50% of the free flow speed for that class.
Level of Service D	Conditions border on a range in which small increases in flow can significantly increase junction delay and reduce travel speed. Travel speeds are about 40% of the free flow speed.
Level of Service E	Conditions are characterised by significant junction delays and travel speeds of 33% of free flow speeds or lower. Contributing factors may be adverse signal progression, closely spaced signals and extensive queuing at critical junctions.
Level of Service F	Traffic flow at this level is very low speed for the road class, 25% to 33% of the free flow speed. Signalised junctions will be severely congested with extensive queuing and delay.

Table Note: Source: Austroads (1998) Roadway Capacity

The existing mid-block LOS for the study area road network during the AM peaks is shown in **Figure 5-25** and the PM peaks in **Figure 5-26**.

Within the Inner West Transport Study Area during both the AM and PM peak periods all of the regional roads (Moggill Road, Milton Road, Coronation Drive, Frederick Street, Musgrave Road, Kelvin Grove Road and Hale Street) have several mid-block segments in both directions that operate at LOS E or F. Lower order roads such as Park Road, Baroona Road, Sylvan Road, Sherwood Road and Coonan Street also have several mid-block segments in both directions during both peaks that operate at LOS E or F.

This information illustrates that road traffic throughout the Inner West Transport Study Area is congested with the critical period volume/capacity ratio being close to or over nominal capacity on many roads.

These levels of congestion not only result in delays and excessive journey time for local trips but also for the significant number of motorists that use the regional roads in the Inner West Transport Study Area for strategic trips.

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Figure 5-25

Existing (2007) AM Peak Period Level of Service

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Figure 5-26

Existing (2007) PM Peak Period Level of Service

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5.3.5 Interchange and Intersection Operation

Within the Inner West Transport Study Area there are over 75 signalised intersections. Examples of routes where vehicles encounter a number of signalised intersections and can experience significant delay in congested conditions are listed below.

- Russell Terrace (Indooroopilly) to William Jolly Bridge via Moggill Road and Coronation Drive - 23 signalised intersections.
- From Toowong Roundabout to Roma Street via Milton Road - 12 signalised intersections.

The Level of Service (LOS) and Degree of Saturation (DOS) for key intersections within the Inner West Transport Study Area have been calculated using the intersection modelling package SIDRA. This was done either using 2007 traffic count data or traffic flows derived from the validated model.

The intersection LOS is based on average delays for all vehicles using an intersection over a given time period, typically a two hour peak period as shown in **Table 5-15**.

- **Table 5-15 Intersection Level of Service Criteria**

Level of Service (LOS)	Average Intersection Delay (seconds)
A	0-10
B	10-20
C	20-35
D	35-55
E	55-80
F	80+

Table Note: Source: Transport Research Board, 2000. Highway Capacity Manual.

The Degree of Saturation (or X value) is the calculated ratio between the demand flow rate and the capacity for each movement. When the maximum X value for any movement in the intersection is above 95%, then the intersection is regarded as over-saturated or operating above its practical capacity. This means that it will take more than one cycle of the signals to progress through the intersection. X values above 1.0 typically indicate higher congestion and delays with conditions more sensitive to small changes in demand.

The performance of a selection of the key intersections within the study area during peak periods is tabulated in **Table 5-16**. Key findings include:

- Over-saturated, congested traffic conditions occur during peak periods at several intersections along Coronation Drive, which is a regional radial road. Examples of intersections with a LOS greater than D, coupled with a very high degree of saturation, include the intersections with Cribb Street, Land Street, and Hale (Boomerang) Street. As the traffic signals give priority to traffic on Coronation Drive delay to the side road traffic is very high;
- On the Milton Road corridor there are 9 signalised and 15 priority controlled intersections. Congestion occurs at several locations with LOS greater than D at the intersections at Cribb Street, Park Road, Croydon Street, and Eagle Terrace;
- The Toowong roundabout that forms a major connection with Milton Road, Frederick Street and Mt Coot-tha Road is operating at or over nominal capacity during both peak periods;
- The regional roads on the north-east corner of the study area, Musgrave Road and Kelvin Grove Road, have a number of intersections that are over or close to capacity; and

- Brisbane City Council bus services use the regional roads so these are also subjected to the congested intersections on Coronation Drive, Milton Road and Kelvin Grove Road in particular.

Table 5-16 Existing Intersection Performance 2007

Intersection	Authority	Peak	Cycle Time	Max DOS (x)	LOS
Coronation Drive					
Coronation Drive/Cribb Street	BCC	AM	150	0.89	C
	BCC	PM	150	1.19	F
Coronation Drive/Hale Street	BCC	AM	150	0.77	B
	BCC	PM	150	0.97	D
Coronation Drive/Land Street	BCC	AM	150	0.69	B
	BCC	PM	150	0.88	C
Coronation Drive/Sylvan Road	BCC	AM	150	0.82	C
	BCC	PM	150	0.61	B
Coronation Drive/Lang Parade	BCC	AM	150	0.92	C
	BCC	PM	150	0.88	C
Coronation Drive (Benson Street)/High Street	BCC	AM	150	0.88	C
	BCC	PM	150	0.88	D
Milton Road					
Milton Road/Cribb Street	BCC	AM	120	0.99	D
	BCC	PM	120	1.34	F
Milton Road/Park Road/Baroona Street	BCC	AM	120	1.06	F
	BCC	PM	120	0.99	D
Milton Road/Croydon Street	BCC	AM	120	0.83	C
	BCC	PM	120	0.91	D
Milton Road/Frederick Street (Toowong Roundabout)	DMR/BCC	AM	n/a	0.83	F
	DMR/BCC	PM	n/a	0.80	E
Sylvan Road					
Sylvan Road/Land Street	BCC	AM	75	0.57	C
	BCC	PM	75	0.43	C
Jephson Street					
Jephson Street/Croydon Street/Sylvan Road	BCC	AM	120	0.80	D
	BCC	PM	120	0.91	D
Jephson Street/Lissner Street	BCC	AM	120	0.23	B
	BCC	PM	120	0.43	C
Jephson Street/Sherwood Street	BCC	AM	120	0.45	C
	BCC	PM	120	0.62	D
Moggill Road					
Moggill Road/High Street/Jephson Street	BCC	AM	120	1.00	C
	BCC	PM	150	1.00	C

Intersection	Authority	Peak	Cycle Time	Max DOS (x)	LOS
Kelvin Grove Road					
Kelvin Grove Road/Herston Road	BCC	AM	150	0.71	B
	BCC	PM	160	0.88	C
Kelvin Grove Road/Lorimer Terrace	BCC	AM	150	0.73	B
	BCC	PM	160	0.91	D
Kelvin Grove Road/Prospect Terrace	BCC	AM	150	0.72	B
	BCC	PM	160	0.90	C
Kelvin Grove Road/Blamey Street	BCC	AM	150	0.75	B
	BCC	PM	160	0.62	A
Kelvin Grove Road/Musk Avenue (Lower Clifton Terrace)	BCC	AM	140	0.56	B
	BCC	PM	160	0.59	B
Kelvin Grove Road/Ithaca Street	BCC	AM	120	0.69	C
	BCC	PM	120	0.74	C
Kelvin Grove Road/College Street/Musgrave Road (Normanby 5 Ways)	BCC	AM	120	0.96	D
	BCC	PM	120	0.92	D
Musgrave Road					
Musgrave Road/Hale Street Off Ramp	BCC	AM	120	0.61	B
	BCC	PM	120	0.74	C
Musgrave Road/Hale Street On Ramp	BCC	AM	120	0.40	A
	BCC	PM	120	0.80	A
Musgrave Road/Windsor Road	BCC	AM	120	0.90	C
	BCC	PM	120	1.02	F
City Connections					
College Road/Gregory Terrace	BCC	AM	120	0.56	B
	BCC	PM	120	0.62	C
Wickham Terrace/Leichardt Street	BCC	AM	120	1.00	B
	BCC	PM	120	0.49	B
Leichardt Street/Upper Edward Street	BCC	AM	90	0.88	D
	BCC	PM	90	1.00	B
Countess Street/Secombe	BCC	AM	130	0.87	C
	BCC	PM	120	0.62	B
Countess Street/Roma Street/Upper Roma Street	BCC	AM	120	1.00	C
	BCC	PM	120	1.34	F

Table Notes:

Traffic volumes extracted from the Northern Link Traffic Model
Max DOS (x) - the reported maximum degree of saturation all approaches
LOS – Average delay for all vehicles at the intersection

5.3.6 Public Transport Performance

The SEQ Travel Survey in 2003/04 indicated that for the Brisbane Metropolitan Area:

- Motorised trip making accounted for 80% of all travel (Per Person Trips) internal to the Brisbane Metropolitan Area;
- Public transport trip use accounted for further 8% of travel; and
- Around 12% of travel demand was represented by walking and cycling.

Key mode share characteristics for the Inner West Transport Study Area are:

- Motorised trip making accounted for 65% of all travel internal to the Inner West Transport Study Area;
- Public transport trip use accounted for further 16% of travel; and
- Around 19% of travel demand was represented by walking and cycling.

Figure 5-27 shows the existing public transport patronage (bus, rail and ferry), and illustrates the strong role of rail in servicing public transport demands in the Inner West Transport Study Area. The following patronage for 2007 is achieved in Milton:

- 37,000 daily rail passenger trips; and
- 25,100 daily bus passenger trips, which includes 16,100 trips on Coronation Drive and 1,800 trips on Milton Road.

Daily station usage for the three major rail stations is shown in **Table 5-17**. Observed 2007 daily rail patronage west of Roma Street rail station is shown in **Table 5-18**. Indicative peak period patronage on the segment between Milton and Roma Street is 12,400 passengers in the morning peak period and 9,700 in the evening peak period.

Table 5-17 Average Weekday Rail Station Usage

Station	AM		PM	
	Boarding	Alighting	Boarding	Alighting
Indooroopilly Station	1,300	900	300	1,000
Taringa Station	600	200	100	500
Toowong Station	800	1,200	400	700
Auchenflower Station	600	300	200	400
Milton Station	500	1,300	400	300

Table Notes: Source: Queensland Rail, 2007

Table 5-18 Peak Period Rail Patronage

Station	To City	From City
Milton Station - Roma Street Station AM	10,000	2,300
Milton Station - Roma Street Station PM	2,400	7,400
Total	12,400	9,700

Table Note: Source: Queensland Transport, 2007

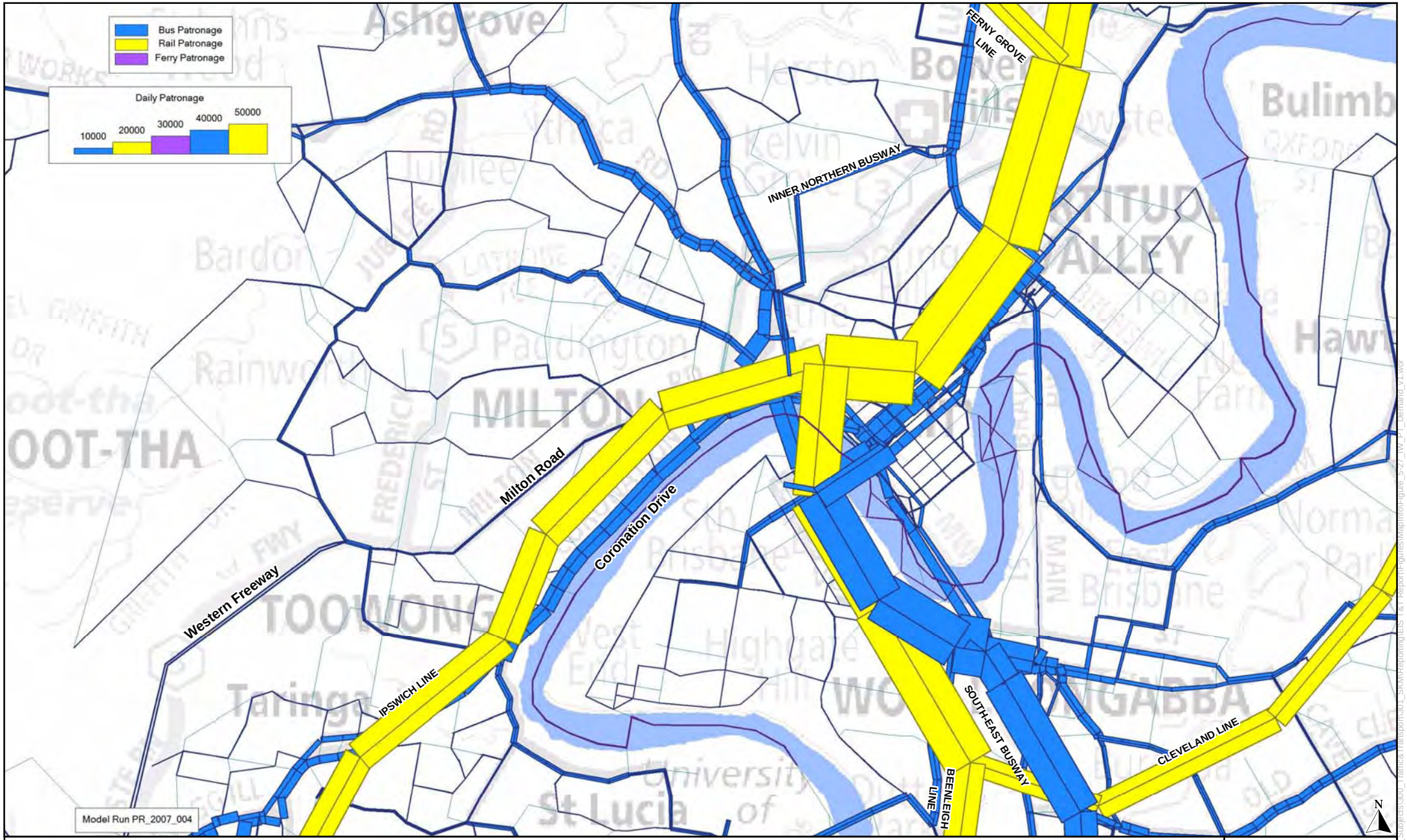

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Figure 5-27

Existing (2007) Average Weekday Inner West Transport Area Public Transport Demands

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Bus travel demands (illustrated on **Figure 5-27**) while not as high as rail, indicate a strong use of this mode of public transport with currently 16,100 daily bus passenger trips on Coronation Drive and 1,800 trips on Milton Road.

Coronation Drive services are predominant, serving the western suburbs and the centres of Toowong and Indooroopilly. Bus services provide routes to areas such as St. Lucia and Kenmore that are not served by the rail network with interchange possible at Toowong and Indooroopilly.

Table 5-19 and **Table 5-20** provide the average and variable bus travel times and speed for bus services along Coronation Drive and Milton Road for the peak direction and for the same sections of roadways as reported previously for private vehicles for direct comparison. The bus travel time data was retrieved for all services that run along these two corridors for the AM and PM peak periods.

- **Table 5-19 Observed Average (2007) Travel Times and Travel Speeds for Bus Services**

	Morning Peak (7-9 AM) (Travelling Eastbound)					Evening Peak (4-6 PM) (Travelling Westbound)				
	Coronation Drive			Milton Road		Coronation Drive			Milton Road	
Services	All Stops	Limited Stops	Rocket	All Stops	Rocket	All Stops	Limited Stops	Rocket	All Stops	Rocket
Average Time (min)	9:13	8:59	-	7:57	6:01	5:18	5:35	-	10:38	9:11
Average Speed (km/h)	11.6	11.9	-	17.4	22.9	20.1	19.1	-	13.0	15.0

Table Note: Source: BCC, 2007

- **Table 5-20 Minimum and Maximum Travel Speed Variability (2007) for Bus Services**

	Morning Peak (7-9 AM) (Travelling Eastbound)					Evening Peak (4-6 PM) (Travelling Westbound)				
	Coronation Drive			Milton Road		Coronation Drive			Milton Road	
Services	All Stops	Limited Stops	Rocket	All Stops	Rocket	All Stops	Limited Stops	Rocket	All Stops	Rocket
Time Range (min)	3:29-10:06	4:29-12:14	-	5:23-11:03	4:48-6:45	4:43-6:45	5:18-5:58	-	6:54-12:54	6:21-11:31
Speed Range (km/h)	10.06-30.7	8.7-23.8	-	12.5-25.6	20.4-28.7	18.6-22.6	17.9-20.2	-	10.7-20.0	12.0-21.7

Table Note: Source: BCC, 2007

Bus services run at a longer travel time and slower speed than general traffic particularly on Milton Road and Coronation Drive in the outbound direction during the evening peak period. Currently, neither Milton Road nor Coronation Drive provide transit lanes that could improve bus travel times.

The extension to the Inner Northern Busway, on the other hand, provides:

- improved travel times between the Queen Street Bus Station and Upper Roma Street - a reduction of up to nine minutes during normal traffic and up to 20 minutes in congested times;
- improved bus connections between the CBD, and the western, northern and southern suburbs;
- reduced inner city traffic congestion;

- improved consistency and reliability of bus services;
- features an underground turn facility, which will increase efficiency of bus operations;
- improved integration with the Transit Centre, the Roma Street Rail Station and bus services;
- features a modern underground station in King George Square; and
- increased capacity for growth of future bus services in the city centre.

5.3.7 Cycle and Pedestrian Network Connectivity

The cycle network is closely aligned to the road network and is radial in nature – the major links branching out from the CBD towards the outer suburbs. Thus, for the inner west transport study area it provides reasonable connectivity for those links connecting in the east - west direction. Connections in the north-south direction are more limited and this is one of the current shortcomings of the cycle network in this area.

The pedestrian network, like the cycle network, provides reasonable connectivity throughout the Inner West Transport Study Area. Locations of high pedestrian movements are concentrated around the major shopping and employment centres, universities, schools and public transport connections.

Despite the quality of both on and off road facilities, there are a number of deficiencies in both the cycle and pedestrian networks. These deficiencies lessen the attractiveness of these networks deterring potential users. These key deficiencies are summarised below:

- Segregation caused by high traffic flows, wide carriageway widths and limited crossing opportunities on Coronation Drive, Milton Road, Frederick Street, Moggill Road, Musgrave Road and Kelvin Grove Road so restricting pedestrian connections and access to bus stops, rail stations and other destinations;
- The Western Freeway forms a major barrier to pedestrian and cycle movement. Within the Inner West Transport Study Area pedestrian and cyclists can only cross the Western Freeway at the over bridge provided by Waverly Road (Taringa) and the under-bridges provided by Russell Terrace and Moggill Road (both at Indooroopilly);
- There are currently no formal pedestrian and cycle crossing opportunities between the end of the Western Freeway at Mt Coot-tha Road and the signalised intersection of Milton Road and Croydon Street;
- Pedestrian and cycle connectivity from Kelvin Grove to the CBD is via the traffic dominated Normanby Five Ways intersection. This is due to the barrier to pedestrian and cycle movement caused by the Inner City Bypass, Inner Northern Busway and the railway such that there are no other pedestrian and cycle connections from Kelvin Grove to the CBD;
- Breaks in connectivity in the pedestrian and cycle networks for example where cycle lanes end and do not connect onto additional cycles lanes/cycle paths;
- Long traffic signal cycle times for pedestrians wishing to cross major arterial roads;
- Limited crossing points at signalised intersections forcing pedestrians to use crossing points that may not be direct;
- Limited use of grade separation throughout the Inner West Transport Study Area that could facilitate and enhance pedestrian and cyclist movements;
- Poor provision of pedestrian routes and crossing locations at the Petrie Terrace, Countess Street, Upper Roma Street one-way system;
- Unpleasant walking and cycling environment created by the high traffic volumes and number of commercial vehicles using the radial arterials of Coronation Drive, Milton Road, Moggill Road, Kelvin Grove Road and Musgrave Road;

- The hilly topography in the Inner West Transport Study area can discourage the take-up of walking and cycling; and
- Usage of pedestrian and cycle network in hours of darkness may be limited due to a lack of lighting and personal safety concerns.

There are a number of committed pedestrian and cycle projects in the short to medium term. The major works are detailed below:

- Work on a new bikeway in St. Lucia along *Hillside Terrace* has commenced, with a three-meter wide pathway between Carawa Street and Tarcoola Street. Stage 2 of the bikeway will complete the link to University of Queensland;
- Due to the high use of the *Bicentennial Bikeway* and concerns relating to pedestrian and cyclist safety Brisbane City Council have recently carried out an investigation to widen and provide separation between bikes and pedestrians on the Bicentennial Bikeway. Implementation is scheduled as a staged construction commencing in the 2008/09 financial year. As an interim measure Council is undertaking a review of signage and pavement markings on the bikeway with the aim to increase the awareness of both pedestrians and cyclists and reinforce the shared pathway responsibilities of users. This review should lead to new signs and pavement treatments on the shared path section of the bikeway between William Jolly Bridge and Toowong. The review is currently being undertaken with signage and pavement markings to be installed by the end of the current financial year;
- The proposed *Hale Street Link* would include a 3.6m wide cycleway on the western side of the bridge and a 3.6m wide pedestrian footpath on the eastern side of the bridge. This would provide a new cross river facility that would also link directly into the Bicentennial Bikeway;
- *City West* describes the western part of Brisbane's CBD. The City West Strategy addresses issues such as connectivity and the public domain. The City West Strategy includes safer, more direct and more frequent pedestrian crossings, including crossing on Upper Roma Street between Countess Street and Milton Road, North Quay/Saul Street between Roma Street and William Jolly Bridge, and a scramble crossing at Milton Road/Petrie Terrace/Upper Roma Street intersection;
- The recently completed *Caxton – Roma Street pedestrian link* passes through the Police Barracks redevelopment at City West. The project will deliver a pedestrian link with the capacity to enable better management of the Suncorp Stadium post-event pedestrian traffic and improve pedestrian access between the Caxton Street precinct and the western fringe of the CBD to complement the vision of the City West Master Plan. This link will be operation when the Police Barracks redevelopment is completed towards the end of 2008; and
- The *Western Freeway Roundabout Cycle and Pedestrian Bridge* is a DMR scheme to build a safe north-south crossing for cyclists and pedestrians at the Toowong end of the Western Freeway. The new crossing will link the Western Freeway Bikeway at Toowong with the Botanic Gardens and Mt Coot-tha Road so making it safer and easier for people to access facilities in the adjoining area such as Mt Coot-tha Botanic Gardens, Anzac Park, the Western Freeway Bikeway and Toowong State School. The bridge is due to be completed in 2008/2009. Thus this infrastructure will greatly increase the connectivity of cyclists and pedestrians wishing to access Mt Coot-tha Road.

As discussed previously, a shortcoming of the cycle network is its radial pattern leading from the CBD to the outer suburbs. Queensland Transport has developed the SEQ Principal Cycle Network Plan. This report reviews the SEQ cycle network and identifies the key links that are lacking and so preventing a cohesive

network. It presents a series of maps detailing both the existing and future principal cycle routes for the greater Brisbane area.

In the Inner West Transport study area is a future proposed north-south principal route along Frederick Street, Rouen Road and Boundary Roads. Milton Road and Moggill Road are future principal cycle routes. In the Kelvin Grove area there are proposed principal routes along Kelvin Grove Road and Musgrave Road. These strategies as well as the projects outlined above will go some way to address the issues outlined under previous section. The principal and future cycle routes can be seen in **Figure 5-28**.

5.3.8 Road User Safety

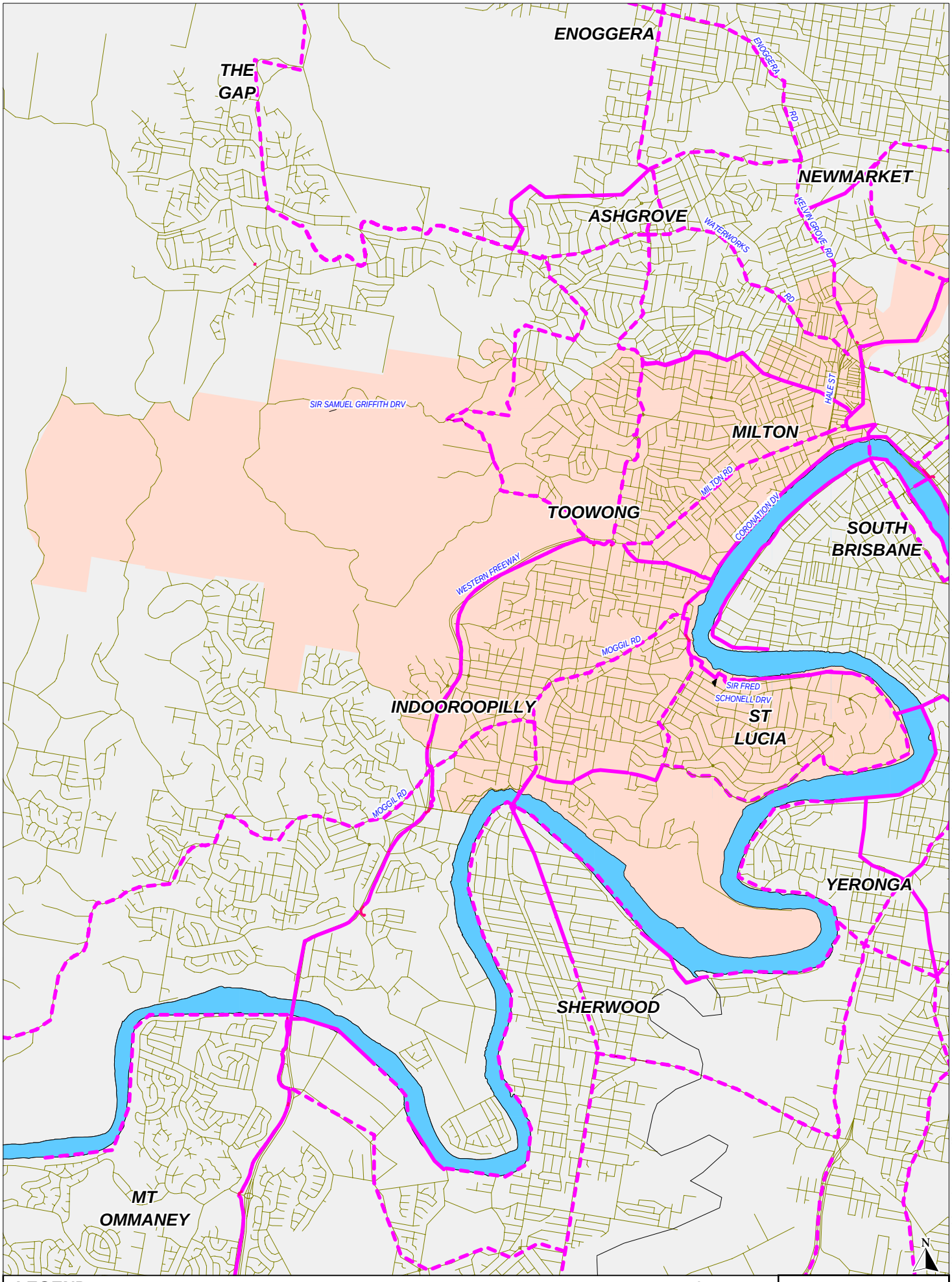
A five-year crash history (June 2001-June 2006) for the Inner West Transport Study area has been reviewed. The crash history contains all accidents that required a police presence and includes location, date, weather conditions, accident type, and severity. Some of the key statistics from the analysis are listed below.

- 2,573 crashes occurred over the five year period from 2001 to 2006 in the Inner West Transport Study Area.
- A total of eight fatal crashes occurred, of which four involved pedestrians and one involved a cyclist.
- Within the Inner West Transport Study Area 10% of the crashes occurred on Coronation Drive, 7% on Milton Road and 5% on Moggill Road. These three roads account for almost 25% of the total crashes within the Inner West Transport Study Area.
- The split between intersection and mid block crashes was 50%.
- 80% (1,969) of crashes within the area involved more than one vehicle.
- Within the Inner West Transport Study Area, 120 pedestrian related crashes have been recorded. This was 4.8% of the total number of crashes that occurred, which is similar to the Brisbane local government area average of 4.7%.

Intersection Crashes on Key Routes

The following intersection crashes on key routes between 2001 to 2006 were identified.

- On Coronation Drive, of a total of 257 crashes, 101 occurred at intersections. Pedestrians were involved in 3% of intersection accidents and no fatalities were recorded. The signalised intersection with Cribb Street accounted for over 25% of crashes, with angle and rear-end crashes being the predominate crash type.
- On Milton Road, of a total of 188 crashes, 54 occurred at intersections (not including the Toowong Roundabout). Pedestrians were involved in 3% of intersection accidents and no fatalities were recorded.. The priority intersection with Sylvan Road had 12% of the intersection crashes with over half of these involving vehicles turning right from Milton Road to Sylvan Road.
- On Moggill Road, of a total of 126 crashes, 67 occurred at intersections. Intersections that accounted for over 10% of the crashes were those with Russell Terrace, Whitmore Street and Woodville Street. These three intersections are all signalised. One pedestrian accident was recorded on the analysed section of Moggill Road.
- On Frederick Street, Rouen Road, Boundary Road there was only one crash at an intersection on Frederick Street (not including the Toowong Roundabout), one on Rouen Road and thirteen on intersections on Boundary Road. A crash with a fatality occurred at the intersection of Boundary Road and Hebe Street.



LEGEND

- Inner West Transport Study Area
- Existing Principal Route
- Future Principal Route
- Other Roads

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 5-28

Existing and Future Principal Cycle Routes - Inner West Transport Study Area

Northern Link

SKM Connell Wagner JOINT VENTURE

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- There were 22 recorded crashes at the Toowong Roundabout. 15 of them were associated with the Frederick Street approach and the major types were sideswipe, angle and rear-end crashes. No pedestrian accidents have been recorded at the Toowong Roundabout during the five year period.
- 97 crashes occurred on Coonan Street, of which 74 occurred at intersections. Thirty four of these were at the roundabout system formed with Moggill Road and 25 occurred at the signalised intersection with Westminster Road.

The most frequent cause of mid-block crashes was rear end collisions, which contributed between 40% and 60% of accidents on the tabulated routes.

Crash Rates

The highest crash rates were on Coonan Street, Rouen Road and Boundary Road.

Assessment of the high crash rates on these routes indicates the following features.

- The majority of the crashes that occurred on Coonan Street were at the intersections of Westminster Road or Moggill Road. Rear end and angle crashes accounted for 46% and 30% respectively of the crashes that occurred on Coonan Street.
- Rouen Road and Boundary Road form part of the Metropolitan Route 5. Rear end crashes and hitting objects (no other car involved) were the main forms of crashes on these roads. Around 60% to 80% of all crashes were of these two types of crashes.
- On Coronation Drive, rear end collisions were the predominant crash type (56%), followed by angle crashes (20%), mostly right turning vehicles colliding with through movements at intersections. While 60% of crashes were considered to be mid-block accidents it can be noted from their position that for the most part they are within 150m of an intersection.
- The major cause of crashes occurring on Milton Road was similar in nature to Coronation Drive with rear end accidents accounting for 52% of all crashes.

Crashes involving pedestrians and cyclists

Pedestrian and cyclist crashes account for 4.8% of the total accidents in the Inner West Transport Study Area. Locations within Toowong, Petrie Terrace and Paddington have a concentration of crashes involving pedestrians and cyclists.

In the Toowong area there was a concentration of crashes in the vicinity of Toowong Village. Along Coronation Drive, between Booth Street and High Street, there were nine cycle crashes during the five year period.

Pedestrian accidents at Petrie Terrace, Caxton Street and Given Terrace were generally associated with alcohol and the high degree of pedestrian activity, which is associated with the entertainment nature of these locations. In the Caxton Street precinct there were 12 pedestrian crashes and along Given Terrace near Gutherie Street there were five pedestrian crashes over the five year period.

Pedestrian and cyclist fatalities account for five of the eight fatalities that occurred within the Inner West Transport Study Area during the 5 year period examined. Of these crashes, the majority were in the 17 to 24 age bracket.

5.4 Traffic Forecasting Methodology

The traffic forecasting model developed and applied in the study uses computer-based models to forecast road traffic demand based on land use (in the form of demographic descriptors), travel characteristics, road infrastructure, public transport services and road tolls.

The following years were modelled:

- 2014 – the Northern Link opening year;
- 2016 and 2021 – interim years to assist in the assessment of demand trends; and
- 2026 – the forecast year for which key inputs were available.

The Northern Link Traffic Model is underpinned by the Brisbane Strategic Transport Model (BSTM) as updated in 2005, which is widely accepted as the most up to date traffic-forecasting model for Brisbane. The BSTM provides average weekday travel demand forecasts for the Brisbane Metropolitan Area (or the ABS Brisbane Statistical Division (BSD)) up to and including the year 2026.

The Northern Link Traffic Model includes use of updated existing road network database for the Northern Link study corridor; updating of descriptions and timing of future road infrastructure projects in consultation with Brisbane City Council, DMR and QT; and incorporation of updated future demographic forecasts developed from the SEQ Economic and Employment Forecasting Study (PIFU and NIEIR, 2007).

5.4.1 Scope and Validity of the Northern Link Traffic Model

A representation of the major components of the Northern Link Traffic Model is given in **Figure 5-29**, showing the primary model inputs and outputs. The various components are briefly discussed below with a more detailed discussion of the Northern Link Traffic Model development in *Technical Paper No. 1 – Traffic and Transport Technical Paper* (and its *Appendix C*) in Volume 3 of this EIS.

Trip Generation Model

The trip generation model estimates the quantum and nature of average weekday travel associated with land use throughout the Brisbane Metropolitan Area. A trip within the model refers to travel from one location to another and is estimated within the model by deriving the number of trips produced and attracted to traffic zones. Data on Brisbane travel behaviour have been used to develop relationships that calculate the number of trips to and from zones for various purposes (eg: shopping, work etc) based on zonal demographic descriptors.

Within the model, travel by all modes is calculated for an average weekday, including walk and cycle trips, public transport, private vehicle trips and commercial vehicle travel.

Some zones contain land uses that are focussed travel generators, examples being hospitals, shopping centres, universities and the Brisbane Airport. Forecast traffic demand for these special generators has been calculated outside the model from suitable data sources and applied as controls on the modelled trip generation for the relevant traffic zones.

Trip Distribution Model

The trip distribution model links the estimated trips produced at each traffic zone with trips attracted in other traffic zones, for a wide range of travel purposes (eg: home to work, home to shopping, business travel). The model considers the balance between the location of these trip ends and the cost of travel (in terms of time, distance, parking charges, and tolls) between them, for all locations within Brisbane. The output of the distribution model is a set of travel demand matrices that detail the number of trips from each traffic zone to all other traffic zones for various trip purposes.

Commercial vehicle (CV) travel is treated separately to reflect the specific travel patterns exhibited by trucks. Observed data on commercial-vehicle origins and destinations (Queensland Transport, 2004) forms the basis of this part of the model, and is factored to represent future travel demands using relationships based on employment quantum and distribution.

Time Period Model

The time period model splits the total daily travel into separate AM and PM peak periods and the off-peak period of the day. Time period proportions are based upon data from the 2003/04 SEQ Travel Survey and traffic counts. Dividing the travel into these time periods allows more accurate estimation of travel behaviour changes throughout the day and the effects of traffic congestion during peak periods.

Mode Choice Model

The mode choice model uses a current estimate of public transport travel throughout the Brisbane Metropolitan Area (7.9% for 2007 as identified in **Table 5-25**), and comparisons of road network performance and public transport service changes to estimate changes in public transport patronage. The effect of future improvements in public transport infrastructure and services planned by TransLink (QT) has been incorporated in the model, and a resultant enhanced public transport modal share of approximately 10.8% of motorised travel for the Brisbane Metropolitan Area by 2026 is forecast. Person trips by private transport are further factored by vehicle occupancy averages by trip purpose (observed in SEQ travel surveys) to convert the total person private travel into private vehicle trips.

Induced Demand Model

The method selected to incorporate induced traffic effects within the Northern Link Traffic Model utilises an elasticity approach to estimate a new future travel private vehicle demand matrix. Many of these induced traffic effects are not catered for within standard strategic transport models. Research of techniques used in the UK and New Zealand was carried out and the method selected as most appropriate for this project has utilised (with some customisation) techniques documented in the New Zealand Project Evaluation Manual (Land Transport New Zealand, 2003). The methodology utilises an elasticity approach to estimate a new future travel private vehicle demand matrix using elasticity formula. This induced demand model has been applied as a standard inclusion when applying the Northern Link Traffic Model, to give a consistent upper estimate of travel expected for all forecasting years.

Trip Assignment including Toll Route Choice

Driver route choice behaviour is simulated as a trade off between time, distance and toll for the route alternatives between the start and end locations for a trip. Traffic is split into toll users and non-toll users, taking into account travel distance, total time (including intersection delays) and the value of tolls along the route based on data obtained from a survey of the catchment areas where people make trips in the corridors that Northern Link is likely to serve. The parameters applied in the model reflect average driver behaviour with respect to the willingness to pay a toll to improve travel time, avoid congestion and use higher quality roads during different periods of the day. The resulting traffic estimates on the road network segments represent future traffic demands that can be critically compared on individual sections of the network or as a global total measure of network performance.

Public Assignment Transport Model

The model produces estimates of public transport trips in addition to the road vehicle demands and assigns this demand to a representation of the public transport (rail, bus, ferry) services to produce public transport patronage estimates. In a similar manner to the road traffic assignment, detailed and network-wide statistics are produced for use in assessment of project effects.

Figure 5-29

Northern Link Model Components

Model Validation and Sensitivity Testing

For the Project, a base year (2007) model was validated within the Northern Link corridor against observed 2007 traffic count and journey time information. In addition to the base year model validation, a range of sensitivity tests were undertaken to check the model's predictive stability with respect to:

- changes in road network description including new roads and changes in link and intersection details;
- changes in public transport service provision and the effect on public transport patronage;
- changes in toll charges, both for private and commercial vehicles;
- changes in toll and route choice behaviour parameters; and
- changes in demographics (land use).

The validation checks and sensitivity tests undertaken have verified that the model described above is capable of producing traffic estimates of sufficient accuracy and sensitivity for use in this study.

5.4.2 Demographic and Land Use Inputs

A key input to the Northern Link Traffic Model is base and forecast demographics for the entire modelled area at traffic zone level. The zonal information used by the model includes population, education enrolments, and employment.

Up to date medium and high series demographic data sets were established for demographic forecasts of population and employment within the area covered by the BSTM. The previous Brisbane Long Term Infrastructure Plan (BLTIP) demographic data set (prepared in 2005) was used to represent the low series demographic data set for sensitivity testing.

Table 5-21 gives the population and employment projections for the Brisbane Metropolitan Area with the overall estimates of person trips for the medium series population scenario used as the basis for the EIS traffic modelling. Employment is forecast to increase by over half a million in the Brisbane Metropolitan Area between 2007 and 2026. Such significant growth in population and employment is forecast to lead to a sustained growth rate in trip making at an average of 1.6% per annum to 2026, which is an increase in over two million total weekday person trips compared to 2007.

- **Table 5-21 Brisbane Metropolitan Area Population Forecasts**

Year	Population (1)	Employment (1)	Total Person Trips (2)
2007	1,879,800	963,800	6.5 million
2014	2,126,300	1,185,100	7.4 million
2016	2,196,900	1,236,600	7.6 million
2021	2,369,700	1,373,100	8.2 million
2026	2,533,400	1,484,100	8.8 million

Table Notes:
(1) Medium Series: PIFU and NIEIR forecasts – SEQ Economic and Employment Forecasting Study (2007/08).
(2) Trips by all modes including walk/cycle.

The Brisbane Metropolitan Area currently accounts for about two-thirds of the South East Queensland region's population. Brisbane City's population share of the region is currently 35% of the total. Brisbane City also dominates as the major employment centre for the region. Growth in the Western Corridor, Ipswich, is predicted to be much higher than occurred in the past. There is also a reliance on infill development within Brisbane City, with much of the growth to be centred on public transport infrastructure.

The predicted population figures for the region and both the Brisbane City Council and Ipswich City Council areas are shown in **Table 5-22.** The region will continue to experience rapid employment growth with Brisbane City dominating as the major employment centre for the region.

- **Table 5-22 – Predicted Population for Brisbane and Ipswich to 2026**

Area	2007	2014	2016	2021	2026	% Change 2007 - 2026
Brisbane	996,000	1,076,000	1,097,000	1,136,000	1,164,000	17%
Ipswich	154,000	210,000	229,000	286,000	348,000	126%
SEQ	2,840,000	3,255,000	3,377,000	3,677,000	3,960,000	39%

Table Notes:
(1) PIFU Medium Series from SEQ Economic and Forecasting Study (2007).

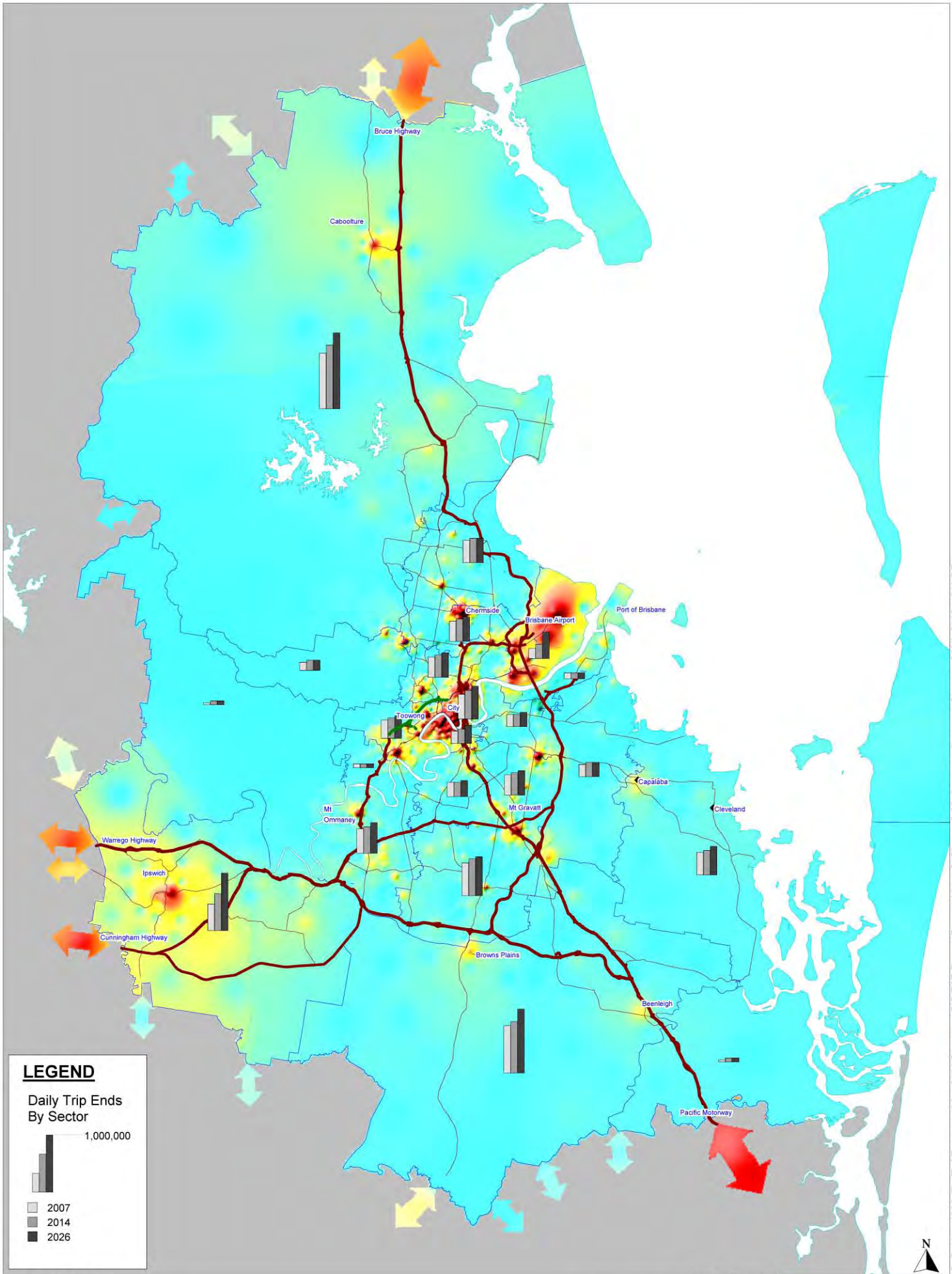
As land use and growth patterns vary across the Brisbane Metropolitan Area, this will result in changes to travel demands and the distribution of trip ends. **Figure 5-30** shows clearly the distribution of land uses that will generate the greatest density of trip ends and the change in trip ends forecast over the period between 2007 and 2026. The figure indicates the significant growth areas in travel demand forecast within the inner west suburbs of Brisbane. There is also a clear focus for increased road travel demand associated with the Western Corridor, ATC region that includes Brisbane Airport and the Port of Brisbane and activity centres such as the CBD, Toowong and Indooroopilly. The resultant pattern of employment distribution for the metropolitan area and the Western Corridor will be more decentralised than the current situation and the importance of a high-quality, high-speed transport connections between these major economic drivers to the regional, State and national economies is evident.

5.4.3 Travel Behaviour and Trends

Current household travel behaviour and historic trends have been examined by a comparative analysis of trip generation and modal use characteristics in the Inner West area using the results of the 1992 and the 2003/04 SEQ Travel Surveys. Results of the comparative analysis are shown in **Table 5-23**.

Key characteristics of travel behaviour and trends are listed below.

- The trip rate per household is 9.5 trips per day and is similar to the metropolitan average.
- Daily trip rates per household for the Inner West Area have reduced during the period 1992 to 2004. This is a similar trend to the metropolitan region.
- Private vehicle usage accounts for 65% of trips. This is lower than the metropolitan average of 80%.
- The use of public transport within the Inner West Area is greater than the average for the metropolitan area with a 16% public transport mode share compared to the metropolitan average of 8%.
- Walking and cycling is also proportionally higher in the Inner West Area compared to the metropolitan region (19% compared to 12%).
- Over the period 1992 to 2004 key mode changes in the inner west are:
  - Car has remained constant.
  - Public transport growth from 9% to 16%.
  - A decline in relative walk and cycle use from 27% to 19%.
- The breakdown of trip purpose in the inner west is similar to the metropolitan region.



LEGEND

Trip End Density Change
(2007 - 2026) Trip Ends per square km

25,000
10,000
5,000
0

Northern Link
State Strategic Road
Radial/Ring Road
Travel Sector Boundary

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 5-30

Forecast Trip End Growth: 2007 to 2026

Northern Link
SKM Connell Wagner JOINT VENTURE

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- **Table 5-23 Travel Behaviour Trends from SEQ Household Travel Survey 2003/04 and 1992**

Parameter	1992 SEQHTS			2003/04 SEQHTS		
	Metro Region	Brisbane City Council	Inner West Area	Metro Region	BCC	Inner West Area
General						
Total Persons	1.2 million	0.7 million	44,400	1.6 million	0.9 million	67,000(2)
Total Households	0.5 million	0.3 million	20,000	0.6 million	0.35 million	27,900(2)
Persons/Household	2.73	2.56	2.2	2.62	2.54	2.41(2)
Trips/HH	10.5	10.2	10.7	9.4	9.2	9.5
Trips/Person	3.85	4.00	4.83	3.61	3.61	3.97
Mode Choice						
Vehicle Driver	52%	51%	44%	56%	55%	48%
Vehicle Passenger	26%	24%	20%	24%	22%	17%
Walk	13%	14%	23%	11%	11%	17%
Cycle	2%	2%	4%	1%	1%	2%
Public Transport	7%	9%	9%	8%	10%	15%
Vehicle Occupancy	1.50	1.47	1.45	1.42	1.40	1.35
Trip Purpose						
Home Based Work	15%	16%	17%	18%	19%	18%
Home Based Shopping	18%	18%	18%	19%	19%	21%
Home Based Education	14%	13%	10%	16%	14%	12%
Home Based Social	9%	10%	12%	13%	14%	18%
Home Based Other	11%	10%	8%	5%	5%	4%
Work Based Other	4%	4%	5%	11%	11%	13%
Work Based Shopping	5%	5%	8%	4%	4%	5%
Work Based Work	6%	6%	5%	4%	3%	2%
Non Home Based	18%	17%	18%	10%	9%	8%

Table Notes:

Source: SEQ Household Travel Survey 1992 and SEQ Travel Survey 2003/04
(1) Does not comprehensively cover public transport travel to external locations.
(2) Demographic estimated for travel survey at that time.

5.4.4 Future Road Network Improvements

In order to forecast future conditions within the Project, assumptions need to be made regarding the traffic and transport network at future critical dates. Details of planned or potential future projects and their timing were compiled from anticipated capital works programs (including SEQIPP), and an agreed list for network modelling developed in consultation with DMR and Brisbane City Council.

The major road transport projects relevant to the Project at the time of the study were the Clem Jones Tunnel (CLEM7)[10], Airport Link, Hale Street Link, Gateway Upgrade Project, Ipswich Motorway upgrade and the

[10] Formerly known as the North-South Bypass Tunnel (NSBT).

upgrading of the Centenary Highway/Western Freeway to include transit lanes between the Ipswich Motorway and Toowong. These projects were all included in the traffic modelling, both 'with' and 'without' the Project.

Key base future network projects included in the model, and their anticipated timing are listed below.

- The CLEM7 which is currently under construction and operational as a toll road in 2011.
- The Gateway Upgrade Project (GUP) to reflect contemporary planning, inclusive of south facing ramps from Kingsford Smith Drive. The project is assumed to be in operation by 2011.
- Airport Link has been coded to match the project description within the Airport Link EIS (2006) assuming inclusion of the Northern Busway in interim form before 2026 and final form post 2026. Airport Link is assumed to be operating as a toll road in 2012. Note that the Northern Link traffic modelling for the EIS was undertaken prior to the announcement of the preferred Airport Link tender in late May 2008 and the approval of the changed project in July 2008. The Changed Project had an associated forecast increase of 6% change from the Airport Link EIS Reference Project forecast in 2026[11].
- The Airport Roundabout upgrade involving the replacement of the current grade separated roundabout with a new grade separated interchange, has been included in all networks post 2012. This was consistent with DMR planning investigations in progress at the time of the Northern Link modelling. It is noted that implementation of this project has also been announced in conjunction with the preferred Airport Link tender and subsequent approval of the Airport Link Changed Project.
- The Hale Street Link has been coded as a new 4 lane, 2 way bridge connection from the intersection of Hale Street/Coronation Drive in Milton to South Brisbane with configuration consistent with the Hale Street Link Modification Report (April 2008). Hale Street Link is assumed to open as a toll bridge by 2011.
- Ipswich Motorway Upgrade has been coded as a 6 lane upgrade between Rocklea and Riverview to be in place by 2012.
- A preliminary planning study is in progress by DMR for the proposed Centenary Highway and Western Freeway transit lane project identified within SEQIPP. Although this investigation has not been finalised, based upon advice provided by DMR, for the purposes of modelling within the EIS this project has been coded as an upgrading from 4 to 6 lanes inclusive of a single T2 lane each way between Mt Coot-tha Road and approximately at Warrender Street, Darra. No upgrading over the Centenary Bridge has been assumed. Implementation in 2016 has been assumed.

Currently, Coronation Drive has a total of 5 traffic lanes and operates on a tidal flow basis with 3 traffic lanes in the peak direction. Reductions in demand on the Coronation Drive corridor, with the Project, could allow for reallocation of lane designations to improve public transport operations. For example, tidal flow bus lane or T3 lane (ie: inbound in the AM peak and outbound in the PM peak) could be re-introduced, or alternatively a continuous inbound T3 lane could be designated from Toowong to Milton, west of Hale Street, with two through lanes of traffic operating in each direction during all time periods. Within the traffic modelling for the EIS with the Project, the tidal flow lane has been designated as a bus lane. Model sensitivity testing indicates that similar strategic traffic impacts with the Project would be expected if Coronation Drive were to operate with a continuous inbound T3 lane and 2 traffic lanes in each direction.

[11] Airport Link – Request for Project Change, May 2008

5.4.5 Alternative Future Scenarios for Strategic Modelling

Toll Value Assumptions and Tolling Effects

Toll values have been included in the road network description as a monetary charge on particular road segments representing existing or proposed toll collection points. The value of tolls on Northern Link and other TransApex toll facilities at the proposed year of opening, 2014, were modelled as:

- Northern Link tolls (2008 dollars including GST):
  - $3.93 for light vehicles, $7.86 for commercial vehicles.
- Airport Link tolls (2008 dollars including GST):
  - full (north-south) journey – $4.24 for light vehicles, $11.23 for commercial vehicles; and
  - partial (east-west) journey – $3.18 for light vehicles, $8.42 for commercial vehicles.
- CLEM7 toll (2008 dollars including GST):
  - $3.93 for light vehicles, $10.41 for commercial vehicles.
- Hale Street Link toll (2008 dollars including GST).
  - $2.40 for light vehicles, $6.37 for heavy vehicles

A common basic perceived toll dollar value has been calculated for each year for use in the model. This calculated value takes into account the assumption that tolls would rise with CPI, and increases in average wages (spending power) slightly higher than CPI.

The effect of changes in Northern Link tolls was tested within the toll choice model development and application. Changes in tolls were tested for independent movements on the facility across a range of toll levels. As expected, as the toll was increased, Northern Link forecast volumes decreased with the sensitivity declining over time, as congestion impacts on route choice are widespread. The model's elasticity to toll for the Northern Link journeys in the 2026 peak period, for example, is between -0.23 and -0.24 (ie: between 2.3% and 2.4% less traffic on Northern Link for a toll increase of 10%). Toll sensitivity in the off-peak periods was greater due to reduced congestion (elasticity of -0.27 in 2026).

Vehicle Operating Costs

As described above, the trip distribution model considers the balance between the location of trip ends and the cost of travel (in terms of time, distance, parking charges, and tolls) between them, for all locations within Brisbane. The number of trips between two traffic zones is estimated to be directly proportional to the number of trip productions in the production zone and attractions in the attraction zone, and inversely proportional to the cost of travel between the zones. Commercial vehicle (CV) travel is treated separately to reflect the specific travel patterns exhibited by trucks and is based on observed data on commercial-vehicle origins and destinations, and is factored to represent future travel demands using relationships based on employment quantum and distribution.

The sensitivity of vehicle operating cost inputs to the model over the life of the Project was also simulated in a model test by doubling the weight applied to route distance within the toll choice assignment model path cost calculation. This explores a potential response to rise in fuel prices. The effect generally across the study area was a consolidation of traffic on the more direct routes. As a result, traffic transferred from longer bypass routes (eg: Gateway Motorway) in favour of more direct routes such as via CLEM7 and Airport Link. The overall forecast traffic volumes on Northern Link were found to be similar to those forecast with standard operating cost assumptions.

Enhanced Public Transport Services and Mode Share Scenario

Improvements in public transport services for each of the forecasting years 2014, 2016, 2021 and 2026 have been incorporated into the Northern Link future scenarios (refer **Table 5-25**). This was done based on advice from TransLink using their detailed forward planning being undertaken consistent with the TransLink Network Plan and SEQIPP initiatives. Modelling the effects of these service plans and projects for the future time horizons yields the enhanced public transport mode share scenario.

Key service planning assumptions incorporated in the incremental mode choice model to establish the enhanced mode share scenario are as follows.

- General improvement to bus frequencies for existing bus services, increasing by 6% per annum up to 2016 and by 4.4% per annum from 2016 to 2026.
- Inclusion of the Northern Busway service patterns and frequencies, with interim busway data up to 2021 and full busway for 2026.
- Inclusion of the Eastern Busway service patterns and frequencies from 2016. Existing services with increased frequencies were assumed prior to 2016.
- Other new future year bus services data, as provided by TransLink was included (eg: Eleanor Schonell Bridge services).
- Queensland Rail future service patterns and frequencies were revised in line with TransLink's *Rail Services and Infrastructure Requirements Study (2007)* report, including Springfield rail services.

5.4.6 Induced and Suppressed Demand Model

The opening of a major transport infrastructure facility such as Northern Link can produce several responses from the travelling public. The responses catered for within the Northern Link Traffic Model include:

- changes in travel route – catered for in the trip assignment sub-model;
- travel to new destinations for the same trip purpose - catered for in the trip distribution sub-model;
- changes in journey start times – changes in travel start time to exploit improved peak travel times are separately accounted for within the induced demand sub-model;
- changes from other modes (public transport, cycling and walking) to private vehicle - addressed via use of a separate mode choice sub-model;
- changes in vehicle occupancy - changes in this characteristic are accounted for within the induced demand sub-model;
- changes in the frequency of some journeys and making entirely new journeys - these suppressed demand effects are catered for within the induced demand sub-model; and
- changes in the pattern of land use - land use patterns are used as fixed inputs, as these reflect the desired vision under the South East Queensland Regional Plan.

The induced demand model was run for each time period and forecast year to provide revised demand matrices ready for use in the toll choice model time period assignments.

Table 5-24 gives estimates of the change in total average weekday vehicle demand.

- **Table 5-24 Daily Induced Private Vehicle Demands**

	Base Analysis without Induced Travel	Network with the Project
Year	Total Daily Demand Across Brisbane	Induced Demand Across Brisbane
2014	4,636,600	20,200 (0.44%)
2016	4,757,800	18,100 (0.38%)
2021	5,143,800	19,900 (0.39%)
2026	5,460,100	23,100 (0.42%)

Table Note: (1) Results are based on model runs using medium series demographic projections (SEQ Economic and Employment Forecasting Study 2007/08), and enhanced mode share.

The assessment demonstrates that low levels of induced demand across Brisbane in the order of 0.4% are forecast in a network that includes Northern Link.

Results from the induced demand assessment indicated that traffic increases vary across Brisbane, with a concentration where the Project has the most direct effect on congestion levels.

Induced demands are also forecast to vary by time of day. The Project provides most congestion relief within the peaks and, as such, the travel induced in these periods is greater than during off-peak periods. Overall induced demands within the Metropolitan Area in the AM peak across the forecast years are in the range 0.5% to 0.6% of the base demand. PM peak induced demand is in the range 0.6% to 0.8%, and the off-peak induced demand is in the range 0.2% to 0.5%.

5.4.7 Model Outputs

Outputs from the traffic and transport modelling for use in the assessment of project effects have been prepared using the Northern Link Traffic Model for scenarios 'with' and 'without' the Project. They include:

- estimates of future traffic volumes on individual roads within the network, for both untolled and tolled roads;
- traffic volumes (total and commercial vehicles) for peak periods, off-peak times and aggregated to average weekday volumes;
- intersection turning movements during peak periods for use in assessment of local traffic operations;
- travel times and operating LOS on routes within the network;
- additional specific traffic data requirements requested by the specialists preparing environmental assessments on air quality and noise. These included more detailed temporal traffic flow breakdowns, estimates of heavy vehicle proportions and bus estimates; and
- network wide statistics, disaggregated by road type and vehicle class, including vehicle–kilometres of travel, vehicle hours of travel and network speed, for use in economic assessments.

5.5 Future Traffic Conditions without Northern Link

5.5.1 Future Demand for Motorised Travel

The future demand for motorised travel without the Project has been forecast for the Brisbane Metropolitan Area for the years 2014, 2016, 2021 and 2026. This analysis incorporates public transport trips and the effects of significant enhancements to the public transport network. The travel demand in 2007 has also been identified from the model so as to provide a base case comparison.

Table 5-25 summarises the growth in travel demand at the metropolitan level.

Table 5-25 Forecast Growth in Weekday Motorised Travel Demand in Metropolitan Area

Parameter	2007	2014	2016	2021	2026
Total Person Trips by Motorised Travel Modes (includes public transport trips)[1]	5,884,000	6,690,000	6,910,000	7,464,000	7,986,000
Public Transport Trips	464,000	599,000	670,000	742,000	866,000
% PT Trips[2]	7.9%	9.0%	9.7%	9.9%	10.8%
Car/Light Vehicle Trips	3,879,000	4,385,000	4,498,000	4,855,000	5,150,000
Commercial Vehicle Trips (heavy vehicles)	210,000	251,000	261,000	288,000	310,000
Total Vehicle Trips	4,089,000	4,636,000	4,759,000	5,144,000	5,460,000
% Growth in Vehicle Trips compared to 2007		13%	16%	26%	34%

Table Notes:

Source : Northern Link Traffic Model
(1) Totals include travel from within area to and from locations outside the Brisbane metropolitan area.
(2) % Public Transport is expressed as a proportion of person trips by motorised modes

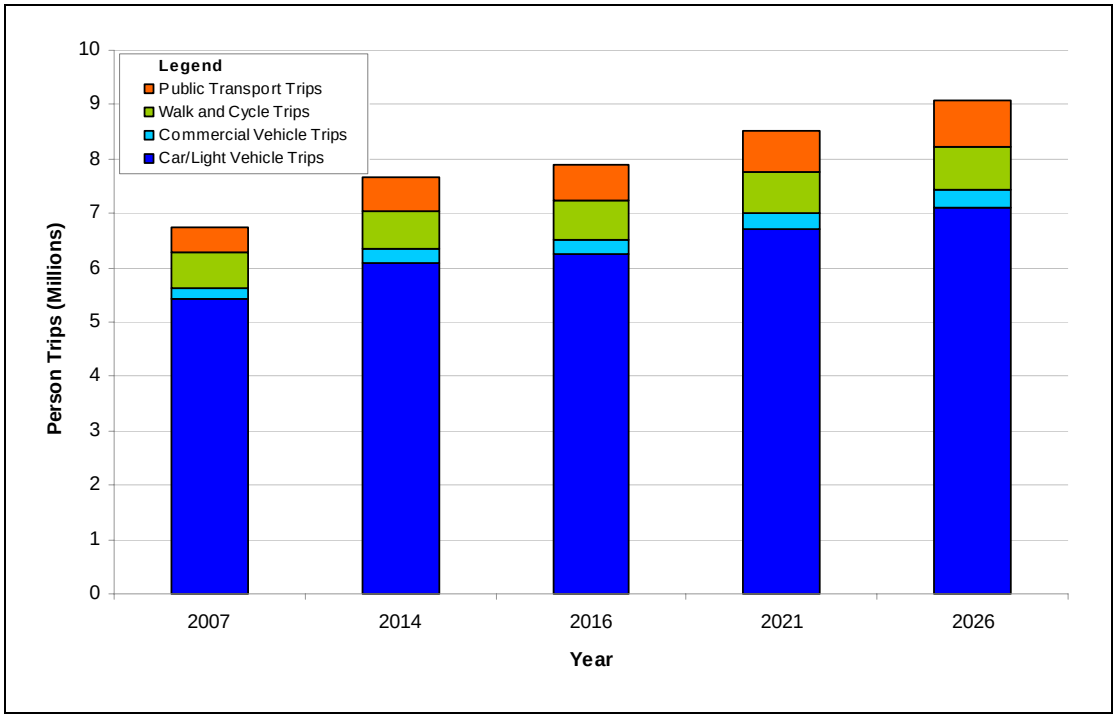
The effect of proposed public transport initiatives, either planned or under consideration by Brisbane City Council and State, has been incorporated in the estimation of future travel demand, as transport planning needs to encourage less reliance on private vehicle travel. These forecasts show that even with significant growth in public transport mode share from a current level of 7.9% to an enhanced 10.8% of motorised travel in 2026 a sustained growth in vehicle travel demand is forecast at the Brisbane Metropolitan Area level.

The alternative approach, to assume a continuation of current trend of public transport use, was examined as a sensitivity test. By 2026 the increased public transport patronage associated with an enhanced mode share scenario, would represent almost a doubling of current levels to over 860,000 public transport trips per weekday. The associated reduction in vehicle trips in the network (compared to trend proportions of public transport use) would be 3 to 4%.

Despite forecast gains in the public transport mode share there will be significant growth in total vehicular trips that will need to be catered for within the Brisbane Metropolitan Area from just over 4 million weekday vehicle trips in 2007 to almost 5.5 million in 2026. This forecast increase is equivalent to growth in vehicular trips of 34% from 2007 to 2026, which is equivalent to per annum growth of 1.5%. Over the same period growth in commercial vehicle trips is forecast to increase by 48% or 2.1% per annum.

Figure 5-31 summarises the estimated growth in the travel task (in terms of person trips) by the various travel modes – vehicle, public transport, and walk/cycle travel. This demonstrates how travel demand is forecast to grow in a sustained manner across all modes.

- **Figure 5-31 Forecast Growth in Average Weekday Travel Demand Within Brisbane Metropolitan Area (Person Trips)**



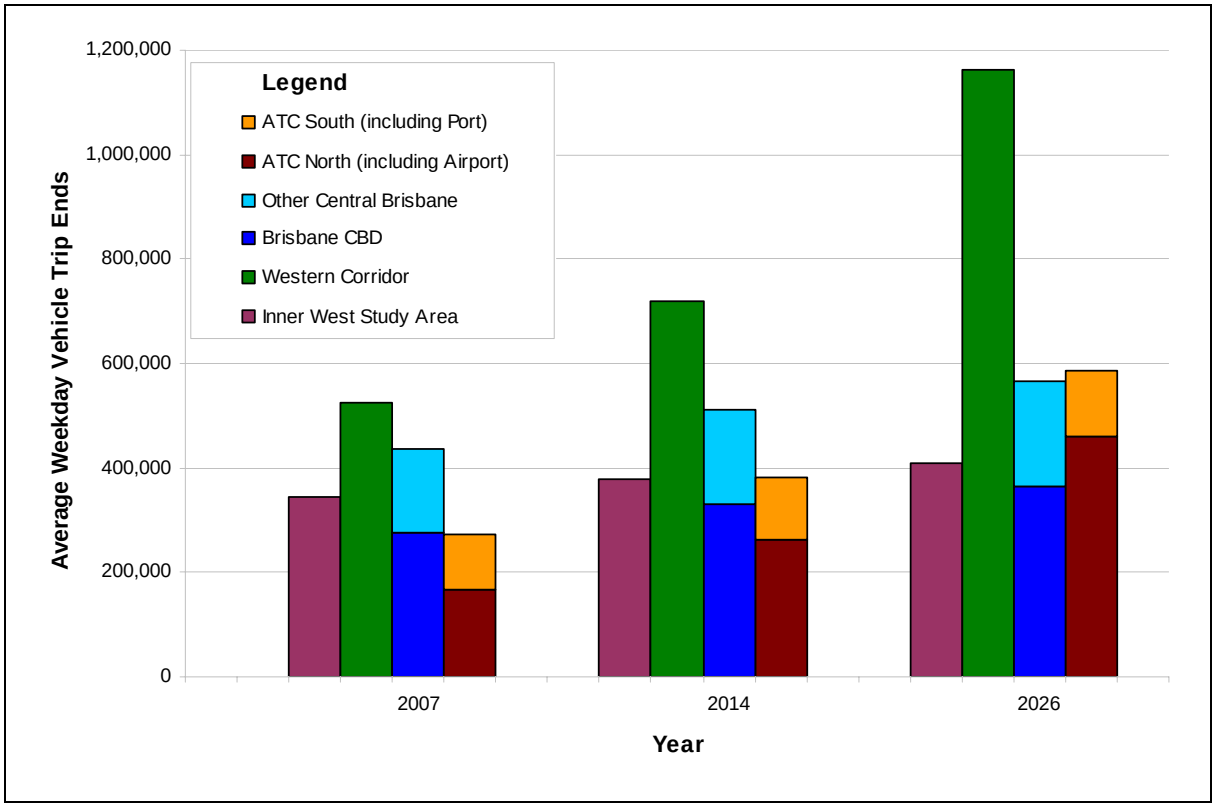
The assessment provides a perspective on the significance of the increased quantum of vehicular travel demand to be catered for within the wider Brisbane Metropolitan Area. A specific assessment has also been carried out of the forecast growth in travel demand to key travel generators that could benefit from the Northern Link Project. **Figure 5-32** illustrates the growth in vehicle travel demand to the Northern Link catchment areas. Growth in vehicle travel demand within these catchments from 2007 to 2026 is expected to be:

- Inner West Transport Study Area – 18%;
- Central City – 30%;
- Australia Trade Coast North– 178%; and
- Western Corridor – 122%.

With respect to the Inner West Transport Study Area, north-south traffic movements at its southern gateways (illustrated as the Indooroopilly screenline in **Figure 5-3**) are forecast to increase by over 18% between 2007 and 2026, a sustained growth rate of over 1.0% per annum. Traffic movements within the Study Area (illustrated as the Toowong screenline in **Figure 5-3**) are forecast to grow by almost 25% for the same period, which is a growth rate of 1.5%. This illustrates the significant forecast increase for vehicle trips throughout the Inner West Transport Study Area for the future scenario without the Project.

These growth rates are similar for commercial vehicle movement, indicating that the adverse effects of truck travel through the surface network in the Inner West Transport Study Area will become even more significant over time.

- **Figure 5-32 Forecast growth in vehicle travel demand to Northern Link catchment areas**



5.5.2 Future Traffic Volumes

Average weekday traffic volumes have been forecast in **Table 5-26** for roads in the Brisbane Metropolitan Area for the years 2014, and 2026 for a road network that does not incorporate the proposed Northern Link. The existing (2007) average weekday daily traffic volumes from **Table 5-2** have also been provided in order to indicate a percentage figure for the forecast growth in traffic volumes over these years for the identified roads.

Figure 5-33 and **Figure 5-34** show the forecast volumes on the road network without Northern Link for 2014, and 2026 due to growth in the demand for key travel movements.

Table 5-26 Forecast Traffic Growth on Key Roads Without Northern Link

Hierarchy	Reporting Point	Road	Location	2007	Average Weekday Traffic			
					2014		2026	
					Forecast Volume	% Growth [1]	Forecast Volume	% Growth [1]
State Strategic								
	A	Western Freeway	North of Moggill Road Interchange, Indooroopilly	76,500	90,100	18%	105,200	38%
Regional Radial								
	B	Moggill Road	East of Russell Terrace, Indooroopilly	40,700	42,200	4%	47,000	15%
	D	Moggill Road	East of Brisbane Boys College Entrance, Toowong	38,500	47,000	22%	50,100	30%
	F	High Street	West of Benson Street, Toowong	32,400	35,000	8%	37,300	15%
	J	Milton Road	East of Croydon Street, Toowong	52,900	64,500	22%	68,200	29%
	X	Milton Road	West of Croydon Street, Toowong	54,900	61,400	12%	63,900	16%
	K	Coronation Drive	West of Land Street, Auchenflower	62,600	70,300	12%	74,000	18%
	O	Milton Road	East of Castlemaine Street, Milton	51,500	68,200	32%	72,500	41%
	P	Coronation Drive	East of Cribb Street, Milton	90,100	92,100	2%	96,400	7%
	T	Kelvin Grove Road	North of School Street, Kelvin Grove	50,500	45,700	-10%	51,400	2%
	U	Musgrave Road	West of Hale Street	31,400	30,000	-4%	31,200	-1%
Regional Ring								
	R	Inner City Bypass	Landbridge, Spring Hill	79,200	108,000	36%	116,900	48%
	19	Hale Street	South of Caxton Street	76,900	84,100	9%	83,500	8.6%
	C	Walter Taylor Bridge	Indooroopilly	32,500	33,800	4%	33,800	4%
	E	Miskin Street	North of Ascog Terrace, Toowong	10,500	10,200	-3%	10,800	3%
	I	Frederick Street	South of Victoria Crescent, Toowong	33,500	33,900	1%	37,400	12%
City Distributor								
	G	Brisbane Street	North of Josling Street, Toowong	37,100	43,100	16%	45,900	24%
	H	Sylvan Road[2]	East of Milton Road, Toowong	8,400	5,500	-35%	6,300	-25%

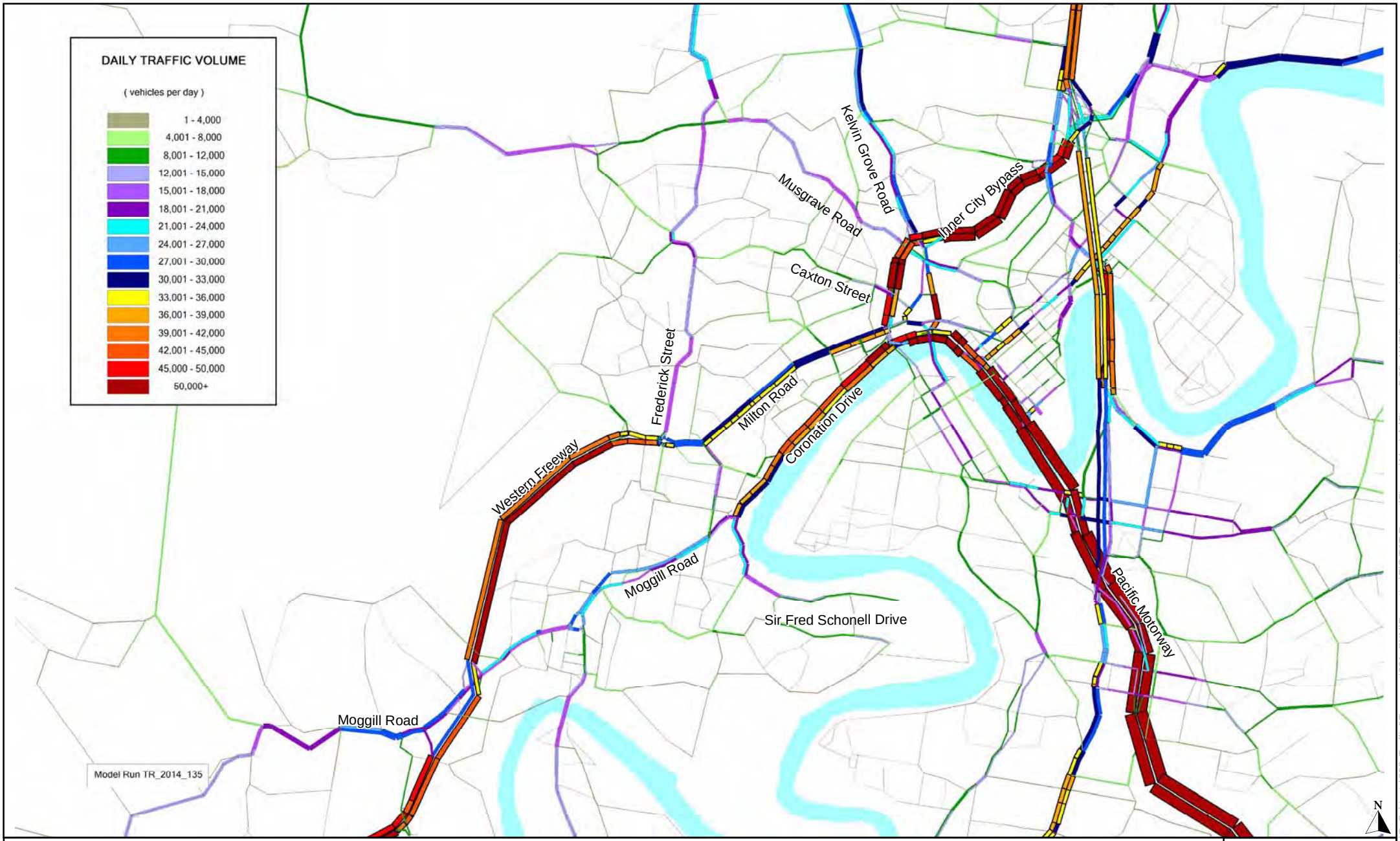
Hierarchy	Reporting Point	Road	Location	2007	Average Weekday Traffic			
					2014		2026	
					Forecast Volume	% Growth (1)	Forecast Volume	% Growth (1)
	Q	Caxton Street	West of Hale Street, Paddington	22,900	33,700	47%	38,900	70%
	S	Jephson Street	North of Sherwood Road, Toowong	13,000	22,500	73%	23,700	82%
	31	Sherwood Road	West of Jephson Street	5,400	6,000	11%	7,900	46%
Local Streets								
	L	Eagle Terrace	West of Roy Street, Auchenflower	4,100	6,600	61%	9,100	122%
	M	Haig Road	West of Barona Road, Milton	6,500	12,600	94%	14,500	123%
	N	Park Road Mid-block	North of Gordon Street, Milton	12,100	15,000	24%	19,000	57%
	36	Morley Street	North of Milton Road	3,900	6,300	62%	6,700	72%

Table Notes:

Source: Northern Link Traffic Model

(1) Percentage growth compared to 2007

(2) Decrease in traffic volume forecast on Sylvan Road from 2007 to 2014 would be due to closure of the right turn from Milton Road to Sylvan Road



Northern Link
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Figure 5-33

2014 Average Weekday Traffic Volumes Without Northern Link

Northern Link

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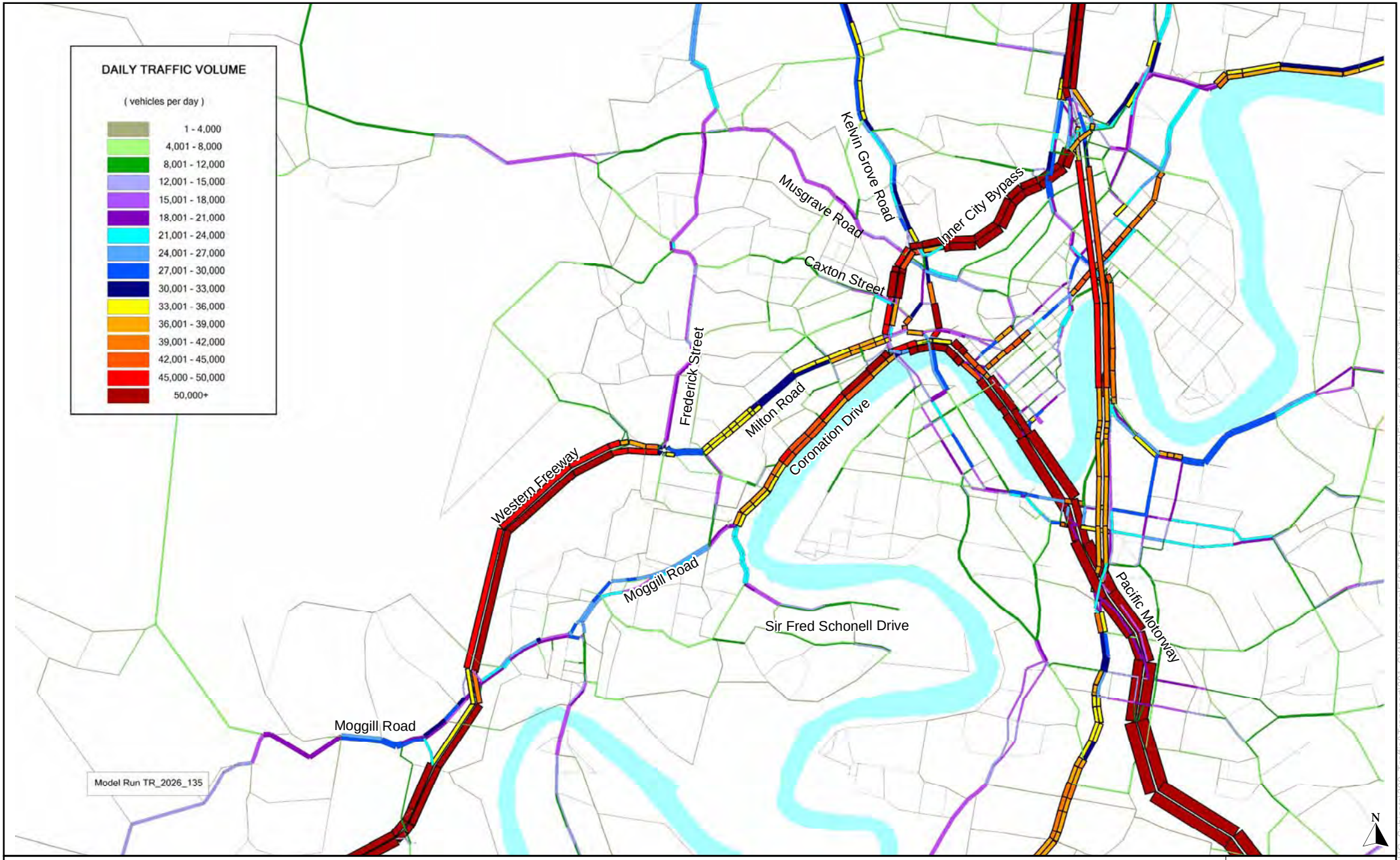

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Figure 5-34

2026 Average Weekday Traffic Volumes Without Northern Link

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Traffic growth characteristics evident from these forecasts are listed below.

- Traffic on the Western Freeway is forecast to grow by almost 30% from 76,500 vehicles per day currently to 105,200 vehicles per day by 2026. It is noted that with the future upgrading of the Western Freeway (assumed within the modelling from 2016 onwards as an additional lane in each direction operating as a T2 transit lane), the Western Freeway is forecast to have suitable capacity west of the Mt Coot-tha roundabout.
- Milton Road would experience traffic growth of almost 30% from 51,500 vehicles per day in 2007 to 72,500 vehicles per day in 2026. Very congested conditions are forecast on many sections of Milton Road in both directions during both peak periods in 2026.
- Coronation Drive is also forecast to experience very congested conditions on the majority of its length during both peak periods and in both directions by 2026. The amount of traffic is forecast to increase from 90,100 vehicles per day to 96,400 vehicles per day by 2026 (north of Cribb Street). The small increase of 7% reflects that Coronation Drive is already operating close to capacity.
- Major traffic growth is forecast on Moggill Road at Toowong where up to 23% growth is forecast. Traffic growth on Moggill Road at Indooroopilly is forecast to be lower at only 4% 2014.
- Traffic growth on the ICB is forecast to be 32% with a traffic volume of 117,000 vehicles per day by 2026. It is noted that by 2014 the CLEM7 and the Airport Link projects would be operational and these projects will have free flow connectivity with the ICB.

Significant growth in demand is forecast on the east-west regional radial roads through the Inner West Transport Study Area without the Project. Examples include:

- traffic on Frederick Street is forecast to grow by 10% to 37,400 vehicles per day by 2026; and
- traffic reductions of 11% and 2% on Kelvin Grove Road and Musgrave Roads respectively are forecast for 2014. This is due to the traffic redistribution effect of the opening of major road infrastructure such as CLEM7 and Airport Link projects prior to 2014 on north-south movements in the corridor. These projects provide alternative routes for traffic that currently uses Kelvin Grove Road and Musgrave Road. By 2026 the quantum of traffic forecast to use Kelvin Grove Road is 51,400 vehicles per day being a 2% increase on current levels. The amount of traffic forecast to use Musgrave Road in 2026 is slightly lower than the current volume of 31,400 vehicles per day.

Significant increases in traffic are forecast on city distributors and local streets throughout the Inner West Study Area. Examples of forecast traffic increases include:

- Caxton Street - a growth of 70% or 16,000 vehicles per day to 38,900 vehicles per day by 2026;
- Jephson Street - a growth of 82% or 10,700 vehicles per day to 23,700 vehicles per day;
- Eagle Terrace and Haig Road both have increases of over 120% from current traffic volumes of around 5,000 vehicles per day by 2026; and
- Park Road - a growth of 57% or 12,100 vehicles per day to 19,000 vehicles per day by 2026.

5.5.3 Future Travel Times and Speeds

Travel times on key strategic routes are shown in **Table 5-27** for regional and cross city routes and in **Table 5-28** for Inner West and central city routes for both the AM and PM peak periods. The travel time routes are shown in **Figure 5-35**.

Table 5-27 Travel Times and Speeds for Regional and Cross City Routes

Travel Time Routes (refer to Figure 5-35 for travel time routes)		Direction	2007		2014		2026	
			(min)	(km/h)	(min)	(km/h)	(min)	(km/h)
AM Peak Hour								
D (7-8)	Western Corridor to Airport	Eastbound	69	59	58	67	70	55
E (9-10)	Indooroopilly to Chermside	Eastbound	34	35	35	33	42	28
F (5-8)	Toowong to Airport - Milton Road	Eastbound	29	42	28	41	40	28
F (5-8)	Toowong to Airport - Coronation Drive	Eastbound	30	40	29	40	38	30
PM Peak Hour								
D (7-8)	Western Corridor to Airport	Westbound	71	57	59	66	70	55
E (9-10)	Indooroopilly to Chermside	Westbound	34	34	37	32	44	26
F (5-8)	Toowong to Airport - Milton Road	Westbound	29	44	32	38	34	36
F (5-8)	Toowong to Airport - Coronation Drive	Westbound	30	53	34	35	39	31

Table Notes:
Source: Northern Link Traffic Model

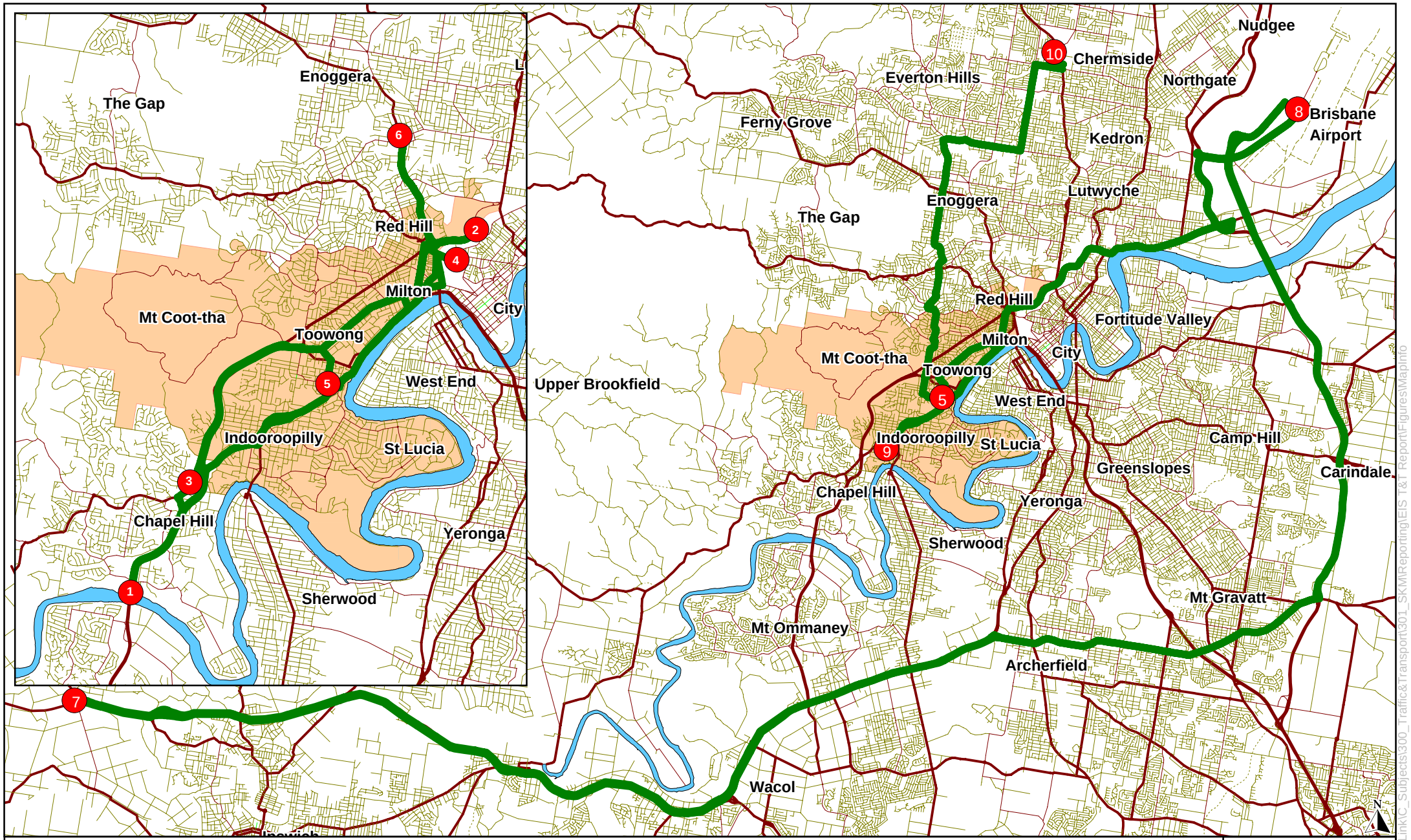
The travel time analysis shows that in the future both regional cross city trips and trips between the inner west suburbs and the central city will deteriorate as increases in travel demand lead to worsening levels of congestion. Some regional cross city trips are able to benefit in early years from other future infrastructure projects such as GUP, CLEM7 and Airport Link, which are all due to be operational prior to 2014. However in the absence of other major works, these benefits would be eroded over time.

Table 5-28 Travel Times and Speeds for Inner West and Central City Routes

Travel Time Routes (refer to Figure 5-35 for travel time routes)		Direction	2007				2014				2026			
			via Coronation Drive		via Milton Road		via Coronation Drive		via Milton Road		via Coronation Drive		via Milton Road	
			(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)
AM Peak Hour														
A (1-2)	Centenary Bridge to Land Bridge	Eastbound	21	34	20	38	24	30	23	33	26	27	28	27
B (3-4)	Chapel Hill to Spring Hill	Eastbound	19	27	18	30	21	24	20	26	24	21	26	20
C (5-6)	Toowong to Newmarket	Eastbound	14	28	14	30	16	25	16	26	18	22	21	20
PM Peak Hour														
A (1-2)	Centenary Bridge to Land Bridge	Westbound	20	36	18	42	24	31	20	37	28	26	20	38
B (3-4)	Chapel Hill to Spring Hill	Westbound	19	27	17	31	22	23	20	28	28	18	21	26
C (5-6)	Toowong to Newmarket	Westbound	16	27	15	28	19	23	16	26	23	19	17	25

Table Note:

Source: Northern Link Traffic Model



LEGEND

- Inner West Transport Study Area
- Travel Time Route via Surface Route
- State Strategic and Regional Roads
- Other Roads

- 1–2 Route A: Centenary Highway to Inner City Bypass Landbridge
- 3–4 Route B: Chapel Hill to Sping Hill
- 5–6 Route C: Toowong to Newmarket
- 7–8 Route D: Western Corridor to ATC/Airport
- 9–10 Route E: Indooroopilly to Chermside
- 5–8 Route F: Toowong to Airport/ATC

Northern Link
Environmental Impact Statement

Figure 5-35

Travel Time Routes

Northern Link

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5.5.4 Local Traffic Network Performance

As defined in Section 5.3.5 for the 2007 base case, the forecast Level of Service (LOS) and Degree of Saturation (DOS) of relevant network intersections without the Project is provided in **Table 5-29** below.

- **Table 5-29 Intersection Performance without Northern Link – 2014 and 2026**

Intersection	Peak	2007 LOS	2014		2026	
			Max DOS (X)	LOS	Max DOS (X)	LOS
Coronation Drive/Cribb Street	AM	C	0.92	C	1.04	F
	PM	F	1.21	F	1.24	F
Coronation Drive/Lang Parade	AM	C	1.06	F	1.14	F
	PM	C	1.07	F	1.10	F
Coronation Drive/Land Street	AM	B	0.72	B	0.77	C
	PM	D	0.95	D	1.03	E
Coronation Drive/Sylvan Road	AM	B	0.66	B	0.63	A
	PM	B	0.67	B	0.72	B
Coronation Drive (Benson Street)/High Street	AM	C	0.88	C	0.93	C
	PM	D	0.89	D	0.91	D
Milton Road/Cribb Street	AM	D	1.06	F	1.09	F
	PM	F	1.11	F	1.11	F
Milton Road/Park Road/Baroona Street	AM	F	1.07	F	1.07	F
	PM	D	0.99	D	1.01	E
Milton Road/Croydon Street	AM	C	0.94	D	1.02	E
	PM	D	1.00	E	0.99	E
Milton Road/Frederick Street (Toowong Roundabout)	AM	F	0.78	E	0.79	C
	PM	E	1.14	D	1.09	D
Sylvan Road/Land Street	AM	C	0.78	C	1.00	C
	PM	C	0.52	C	0.51	C
Jephson Street/Croydon Street/Sylvan Road	AM	D	3.27	F	3.56	F
	PM	D	1.19	F	1.41	F
Jephson Street/Lissner Street	AM	B	0.59	B	0.63	B
	PM	C	0.74	C	0.72	C
Jephson Street/Sherwood Street	AM	C	0.95	E	1.03	F
	PM	D	0.97	E	1.19	F
Moggill Road/High Street/Jephson Street	AM	C	1.01	F	1.06	F
	PM	C	1.00	D	1.00	D
Kelvin Grove Road/Herston Road	AM	B	0.66	B	0.65	B
	PM	C	0.82	C	0.81	C
Kelvin Grove Road/Lorimer Terrace	AM	B	0.77	C	0.89	C
	PM	D	0.87	D	0.91	D
Kelvin Grove Road/Prospect Terrace	AM	B	0.81	C	0.80	C

Intersection	Peak	2007 LOS	2014		2026	
			Max DOS (X)	LOS	Max DOS (X)	LOS
	PM	C	1.00	E	1.03	F
Kelvin Grove Road/Blamey Street	AM	B	1.00	E	1.00	E
	PM	A	0.68	B	0.68	B
Kelvin Grove Road/Musk Avenue/Lower Clifton Terrace	AM	B	0.53	B	0.63	B
	PM	B	0.68	B	0.69	B
Kelvin Grove Road/Ithaca Street	AM	C	0.87	D	0.77	C
	PM	C	0.73	C	0.89	D
Kelvin Grove Road/College Street (Normanby 5 Ways)	AM	D	1.14	F	1.16	F
	PM	D	1.01	F	0.99	E
Musgrave Road/Hale Street Off Ramp	AM	B	0.57	B	0.58	B
	PM	C	0.63	C	0.62	C
Musgrave Road/Hale Street On Ramp	AM	A	0.97	C	1.00	C
	PM	A	1.16	F	1.13	F
Musgrave Road/Windsor Road	AM	C	1.03	F	1.04	F
	PM	F	1.01	E	1.00	E
College Road/Gregory Terrace	AM	B	0.69	B	0.77	C
	PM	C	0.67	C	0.66	C
Wickham Terrace/Leichardt Street	AM	D	1.00	B	1.00	B
	PM	B	0.47	B	0.71	C
Countess Street/Secombe Street	AM	C	0.86	C	0.87	C
	PM	B	0.49	B	0.52	B
Leichardt Street/Upper Edward Street	AM	B	0.87	D	0.88	D
	PM	B	1.00	B	1.00	B
Countess Street/Roma Street/Upper Roma Street	AM	C	1.00	C	1.00	D
	PM	F	1.31	F	1.21	F

Table Note:
Source: Peak period volumes extracted from Northern Link Traffic Model

Examples of highly congested intersections in the network are listed below.

- The Coronation Drive intersections with Cribb Street and Lang Parade are forecast to have highly congested conditions during both peak periods. To effectively manage queuing, signal settings are likely to need to be adjusted to allow priority for the major through movements on the Coronation Drive corridor which will present challenges to the capacity of the counter peak direction of the Coronation Drive Tidal Flow system.
- Milton Road corridor will worsen over time. Significant levels of congestion are forecast to be experienced at the intersections of Cribb Street, Park Road, and Croydon Street during both the morning and evening peak periods.

- The intersections on Jephson Street that provide connectivity with Moggill Road, Sherwood Street and Croydon Street are forecast to be operating over capacity by 2026 with the intersection with Croydon Street and Moggill Road having exceeded capacity by 2014.

Little change is forecast for the LOS of the signalised intersections on the Kelvin Grove Road, Musgrave Road and Spring Hill corridors. As identified previously, forecast increases in traffic along these corridors from 2007 to 2026 are very minor as traffic re-distributions that relieve north-south surface traffic in these corridors are forecast with the implementation of Airport Link.

5.5.5 Public Transport Network Performance

As reported in **Table 5-25**, growth in public transport trips is forecast to almost double from 464,000 in 2007 to 866,000 in 2026.

Figure 5-36 show the forecast public transport demands for 2026 for the Inner West Transport Study Area. Compared to the existing situation it can be seen that the pattern of public transport trips in 2026 is similar to 2007 (**Figure 5-27**) but the quantum of public transport travel is much greater. Key differences to note are a significant increase in bus trips in the northern and eastern corridors, which are due to the proposed Northern and Eastern Busways.

Table 5-30 reports the forecast bus passenger and rail passenger trips in 2014 and 2026 along with 2007 trips. This shows that bus passenger trips are forecast to grow by 66% and rail passenger trips by 71%. This increases total public transport trips by 69% to 104,500 in 2026. This is equivalent to an annual growth rate of 2.8%. This growth rate is significantly greater than the annual growth rate of 1.5% forecast for private vehicle trips in the Inner West Transport Study Area.

The growth in public transport trips of 69% by 2026 within the Inner West Transport Study Area is less than that forecast of 86% for the Brisbane Metropolitan Area. This is because public transport usage within the Study Area is already strong, and whilst service improvements are proposed, no major public transport infrastructure initiatives are currently programmed for implementation within the rail or bus network within the study area.

Table 5-30 Future average weekday public transport usage at Milton

Location	2007	2014 forecast trips	% Growth[1]	2026 forecast trips	% Growth[1]
Coronation Drive bus passenger trips	16,100	26,300	63%	27,600	71%
Total bus passenger trips[2]	25,100	37,700	50%	41,600	66%
Rail trips	36,700	45,300	23%	62,900	71%
Total	61,800	83,000	34%	104,500	69%

Table Notes:

Source: 2007 Northern Link Traffic Model
Percentage growth compared to 2007
Includes patronage of bus services using Milton Road and Given Terrace

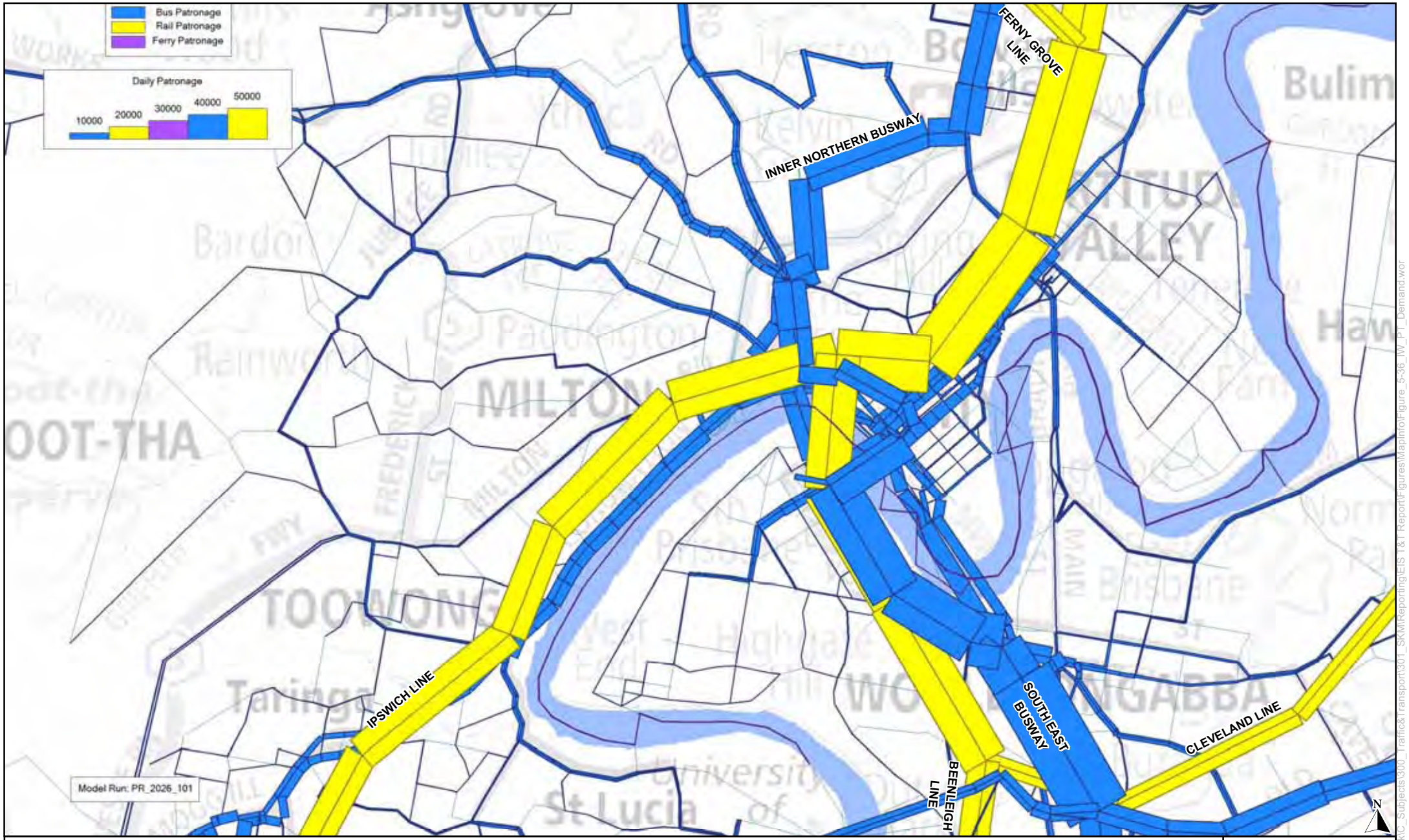

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Figure 5-36

2026 Inner West Average Weekday Public Transport Demand

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5.6 Effects of Northern Link

5.6.1 Forecast Demand for Northern Link

Table 5-31 summarises the forecast Northern Link traffic use. Average weekday traffic flows of 57,000 vehicles per day in 2014, (with 39,000 during the ramp up stage), and 75,900 vehicles per day in 2026 in the Northern Link mainline tunnel are forecast.

Table 5-31 Northern Link Overall Traffic Use Summary – Average Weekday

Project Element	2014 Daily[1] [2]	2026 Daily[1]	2026 AM Peak vph	2026 PM Peak vph	2026 % CV[3]
Eastbound tunnel	29,900	39,200	3,200	3,000	5.0%
Westbound tunnel	27,100	36,700	2,300	3,000	5.9%
Total Northern Link	57,000 (39,900)	75,900	5,500	6,000	5.4%

Table Notes:

(1) Average Weekday Traffic Volumes.
(2) 2014 model volumes exclude adjustment for ramp-up effects. At opening, volumes would be typically 70% of the traffic model forecast and these adjusted volumes are indicated in brackets below the modelled volume. Ramping up to the modelled 2014 volumes would typically occur over an 18 month to 2 year period.
(3) CV = medium and heavy commercial vehicles as per AustRoads Class 3 and above.
(4) Forecast based on toll of $3.93 expressed in $2008 including GST.

The overall forecast network daily traffic demand for Northern Link in 2014 and 2026 is displayed in **Figure 5-37** and **Figure 5-38** respectively. Both of these figures display the significant volume of traffic that Northern Link would carry in relation to other major roads and in a regional context.

Effect of Toll on Demand for Northern Link

The implementation of a toll on Northern Link would discourage some potential users who judge that the travel time savings and other benefits provided by the facility would not equal or exceed the cost of the toll. The extent of toll avoidance would be directly related to the importance of reliability of an individual journey together with the cost and attractiveness of alternate routes.

The effects of the toll at four future years, 2014, 2016, 2021 and 2026 has been assessed using a toll value of $3.93 (including GST) in 2008 dollars, with future year tolls indexed to rise in line with the Consumer Price Index. The traffic modelling indicates that in 2014 that approximately 32% of potential Northern Link users would not be prepared the toll (and would choose to remain on surface roads), however as travel times on alternative routes increase by 2026 this would decline to 25% as users perceive that greater benefits in travel time savings can be realised by using the toll road facility.

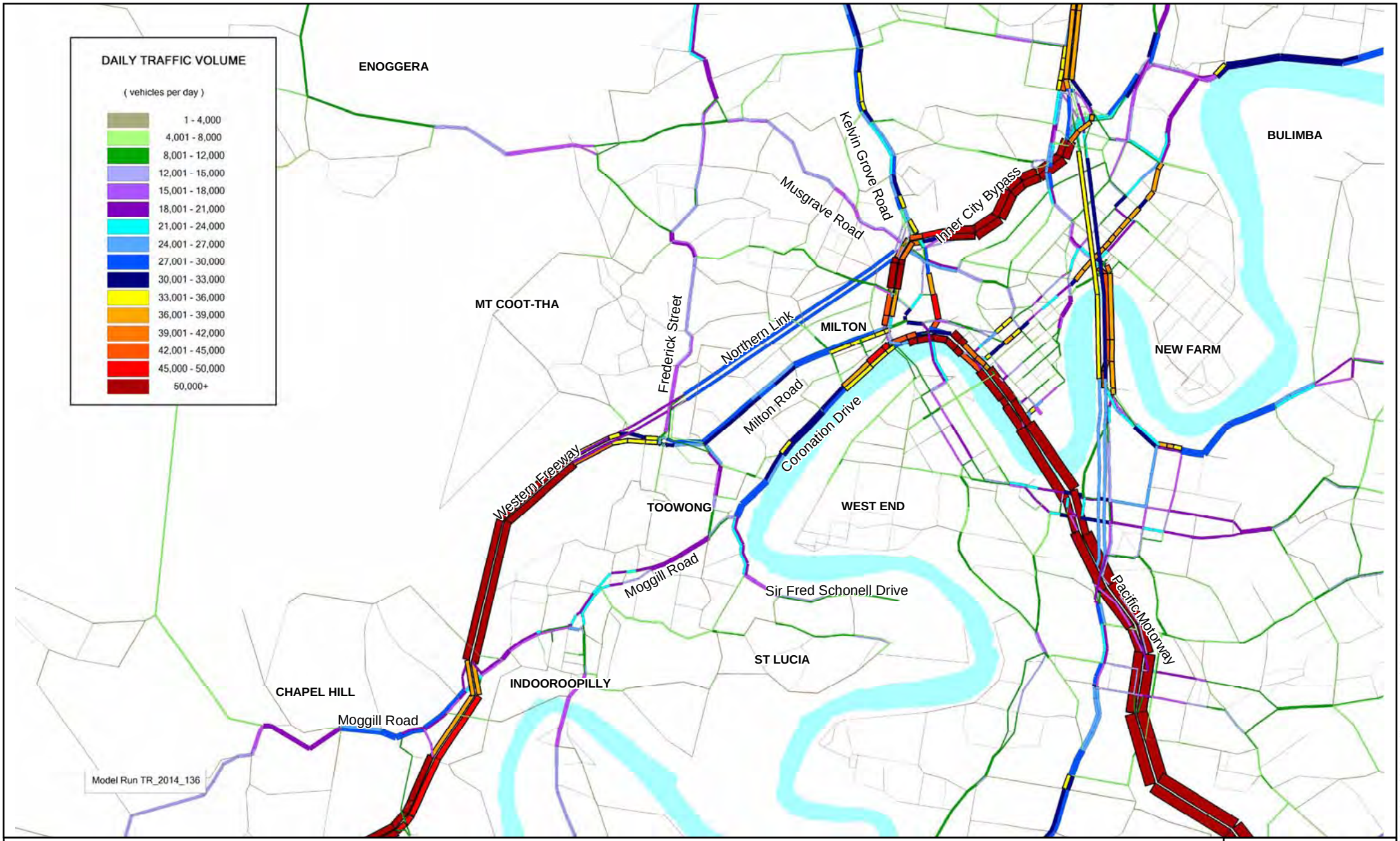

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Figure 5-37

2014 Average Weekday Traffic Volume with Northern Link

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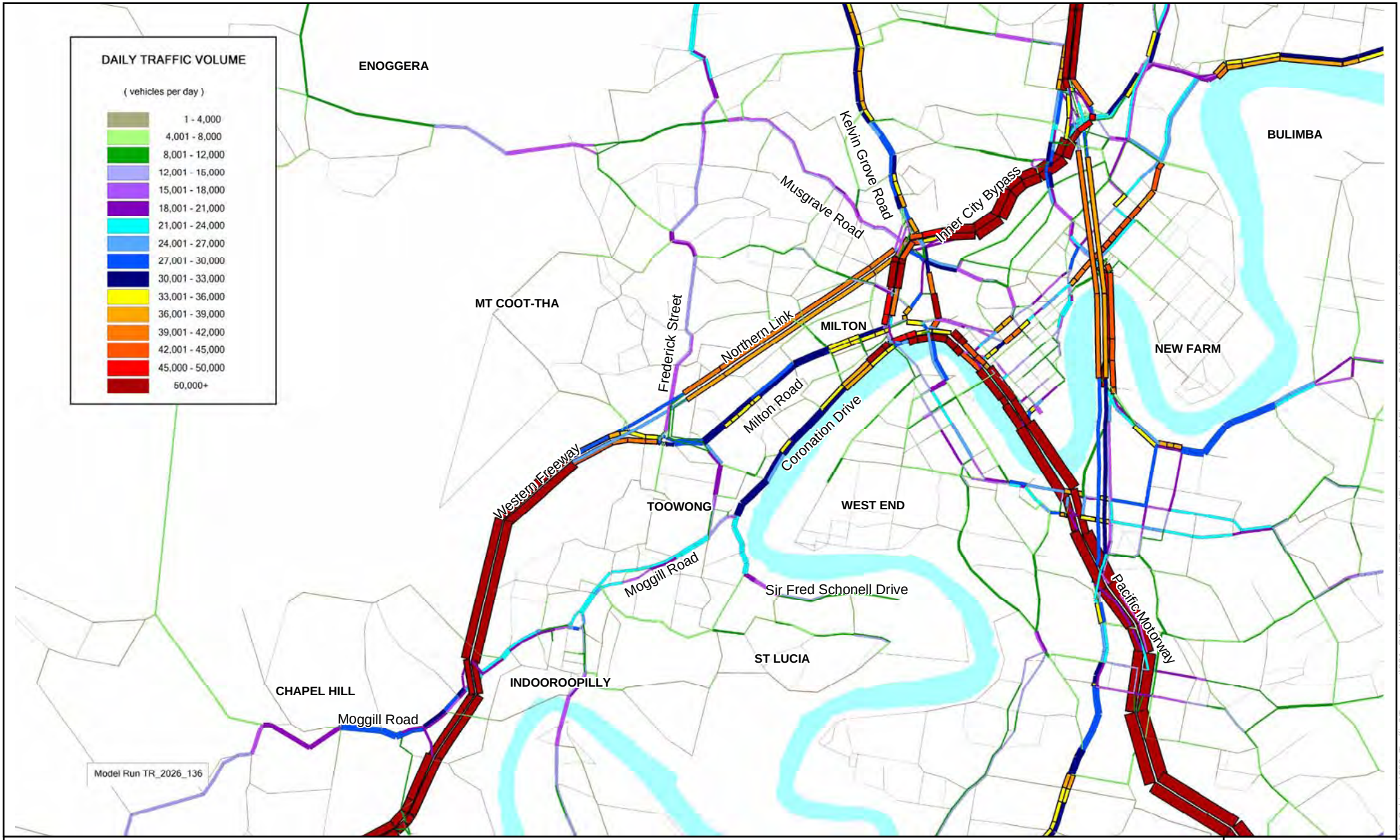

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Figure 5-38

2026 Average Weekday Traffic Volumes with Northern Link

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5.6.2 Function of Northern Link

To examine the traffic function of the Project an analysis of the forecast travel patterns and geographic distribution of travellers has been undertaken. **Figure 5-39** shows the traffic routes for vehicles that would use the Northern Link tunnel.

The forecast daily travel patterns are summarised in **Table 5-32** based on travel sectors illustrated previously in **Figure 5-1**. The forecast daily traffic use of Northern Link in 2026 can be summarised into four trip types:

- local travel – 1% all traffic, <1% commercial vehicles;
- radial or Central City (including CBD) related travel – 19% all traffic, 5% commercial vehicles;
- cross city travel – 60% all traffic, 63% commercial vehicles; and
- ATC North/Airport travel – 21% all traffic, 32% commercial vehicles.

This analysis shows that the Northern Link tunnel would predominantly carry cross city travel, representing 60% of all trips, with a further 21% of trips associated with travel to the ATC. This breakdown illustrates that the Northern Link would fulfil an important function as part of a network of cross-city connections between the western suburbs and Western Corridor to the northern and eastern suburbs of Brisbane that includes the major economic activity centre of the ATC North precinct.

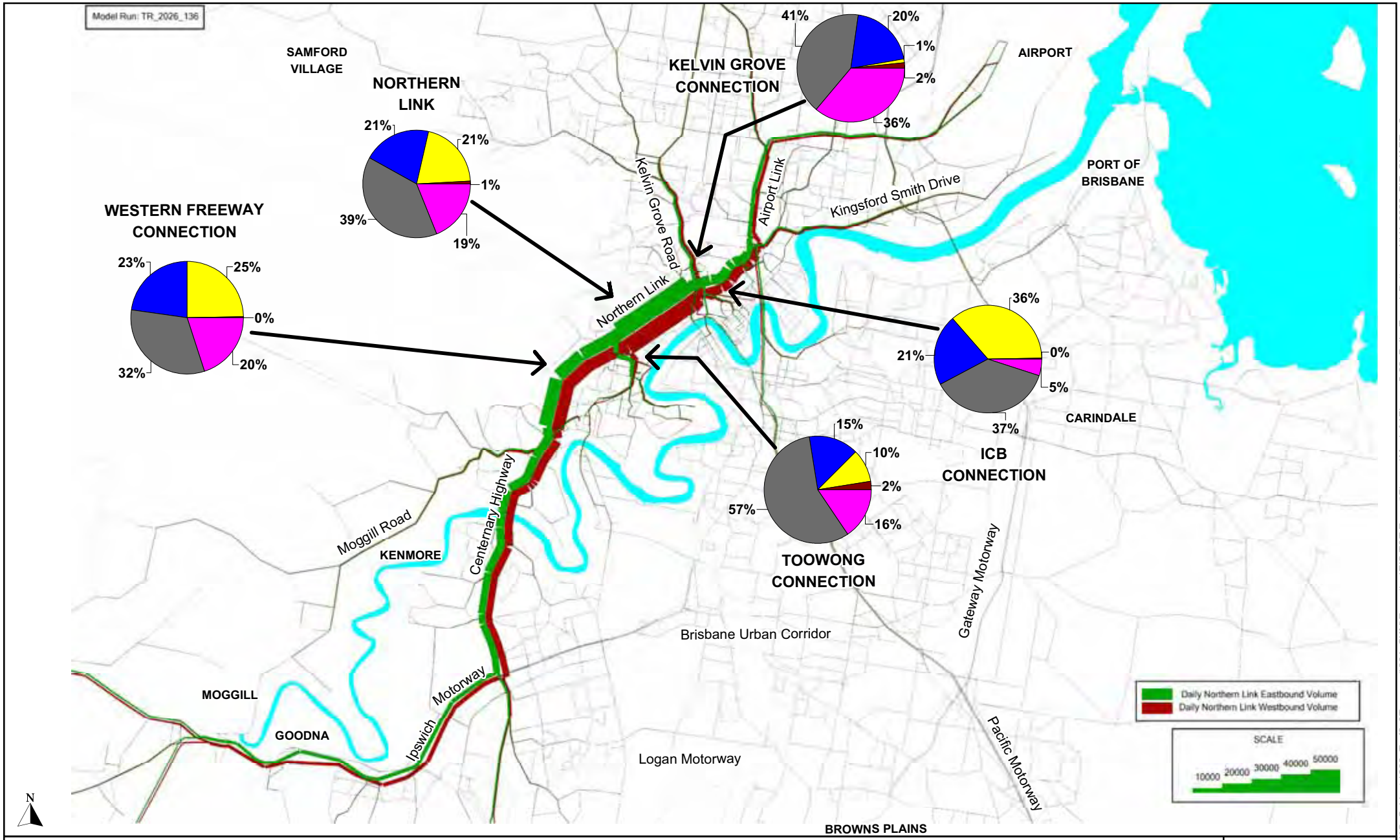
Radial travel would be a secondary function, accounting for less than 20% of all trips through Northern Link. Northern Link would provide a network option for trips to the central city area from the western suburbs and the Western Corridor, relieving some commuter traffic demands of the arterial routes carrying bus services and would allow the potential for bus priority measures to be re-instated on Coronation Drive.

- **Table 5-32 Daily Travel Patterns for Northern Link Traffic (2026)**

From \ To	Inner West	Central City	West Brisbane	Airport/ATC North/Eagle Farm	North Brisbane	South of Brisbane River	Total
Inner West	- (-)	3% (1%)	- (-)	1% (4%)	8% (3%)	5% (1%)	18% (9%)
Central City	1% (1%)	- (-)	2% (-)	- (-)	- (-)	5% (1%)	9% (2%)
West Brisbane	- (-)	2% (%)	- (-)	1% (2%)	3% (2%)	2% (1%)	9% (5%)
Airport/ATC North/Eagle Farm	2% (6%)	- (-)	1% (2%)	- (-)	- (-)	8% (9%)	11% (18%)
North Brisbane	8% (5%)	- (-)	3% (2%)	- (-)	- (-)	10% (23%)	21% (30%)
South of Brisbane River	4% (2%)	5% (2%)	2% (1%)	8% (8%)	11% (22%)	3% (1%)	33% (36%)
Total	16% (15%)	10% (3%)	8% (6%)	10% (14%)	22% (27%)	33% (36%)	100%

Table Key:

Radial or CBD related travel
Cross-City travel
Airport/ATC North travel
Local travel
(x%) - % commercial vehicles



LEGEND

Pie charts show daily trip type for each connection

- Cross city travel to south of Brisbane River
- Cross city travel to/from north of Brisbane River
- Radial or CBD related travel
- Airport / ATC North travel
- Local travel

Northern Link
Environmental Impact Statement

Figure 5-39

2026 Daily Travel Patterns for Northern Link (select links)

Northern Link

SKM Connell Wagner JOINT VENTURE

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Function of the Northern Link connections

Table 5-33 details the overall forecast daily and peak hour traffic use of the Northern Link connections, and separately reports the forecast use of the on and off ramps at the eastern and western connections.

Table 5-33 Northern Link Connections Traffic Summary – 2026 Average Weekday

Project Element	Daily Traffic 2026	%	AM Peak vph	PM Peak vph
Western Connections (on-ramps)				
Western Freeway (west facing on-ramp)	27,800	71%	2,300	1,900
Milton Road (east facing on-ramp)	940[1]	2%	100	100
Croydon Street (east facing on-ramp)	10,500	27%	800	1,000
Total Western Connection Traffic (on ramps)	39,200	100%	3,200	3,000
Western Connections (off-ramps)				
Western Freeway (west facing off-ramp)	26,500	72%	1,500	2,000
Croydon Street (east facing off-ramp)	10,200[2]	28%	800	1,000
Total Western Connection Traffic (off-ramps)	36,700	100%	2,300	3,000
Eastern Connection (on-ramps)				
ICB (east facing on-ramp)	19,400	53%	1,500	1,500
Kelvin Grove Road (north facing on-ramp)	8,000	22%	500	600
Kelvin Grove Road (south facing on-ramp)	2,500	7%	100	300
Musgrave Road (south facing on-ramp)	6,800	18%	200	600
Total Eastern Connection Traffic (on-ramps)	36,700	100%	2,300	3,000
Eastern Connection (off-ramps)				
ICB (east facing off-ramp)	22,500	57%	1,700	1,900
Kelvin Grove Road (north facing off -ramp)	8,000	21%	600	600
Kelvin Grove Road (south facing off -ramp)	8,700	22%	900	500
Total Eastern Connection Traffic (off-ramps)	39,200	100%	3,200	3,000

Table Notes:

Forecast based on full journey toll of $3.93 and expressed in $2008 including GST.
(1) Forecast entry traffic to Northern Link using east facing on-ramp of 940 vpd in 2026 comprises 360 vpd approaching from Morley Street via right turn, with 580 vpd from Milton Road east.
(2) Forecast exit traffic from Northern Link to Croydon Street includes 140 vpd proceeding to Morley Street and 110 vpd proceeding to Milton Road east via indirect routes.

The western connections would consist of ramps to and from the Western Freeway, Milton Road and Croydon Street. The Western Freeway would cater for 71% of the traffic that enters Northern Link at its western connection with 27% accessing from Croydon Street. Only 2% of entry traffic at the western connection would enter from Milton Road (including traffic from the residential precinct north of Milton Road, which would be able to enter Northern Link from Morley Street).

The eastern connections would consist of the ICB, Kelvin Grove Road and the on ramp from Musgrave Road. The straight through connection to and from the ICB would cater for over half of the traffic movement at the eastern connection. Movements to and from the south, which would include central city area users, as well as traffic to other destinations including South Brisbane, would account for approximately 22% of the Northern Link traffic at the eastern connection. Movements to and from Kelvin Grove Road north would account for approximately 21% of Northern Link use.

Figure 5-40 and **Figure 5-41** illustrate the indicative travel patterns for traffic that would use the Toowong connecting ramps and the Kelvin Grove connecting ramps respectively for Northern Link trips.

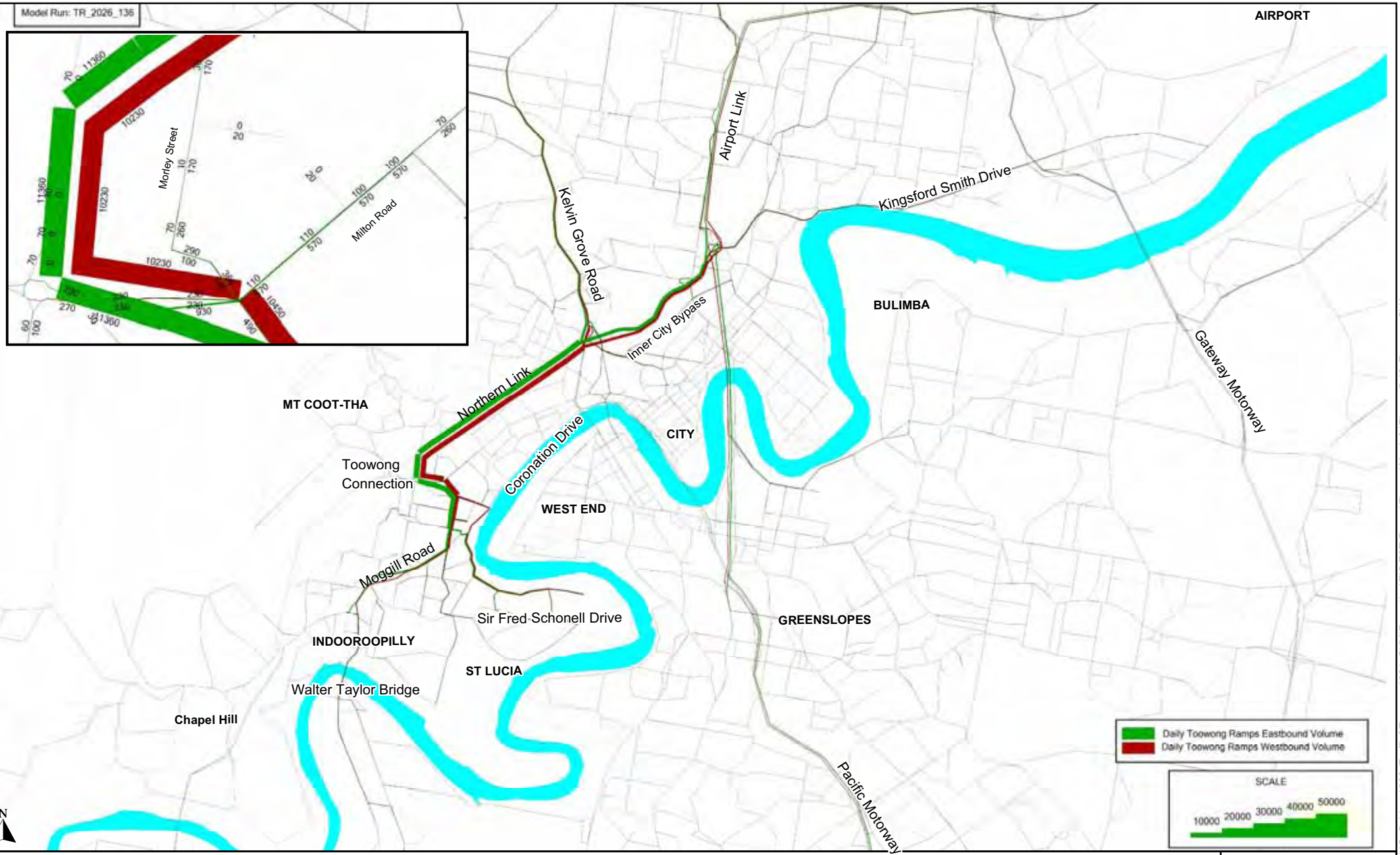

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Figure 5-40

Northern Link Daily Travel Pattern for the Toowong Connection

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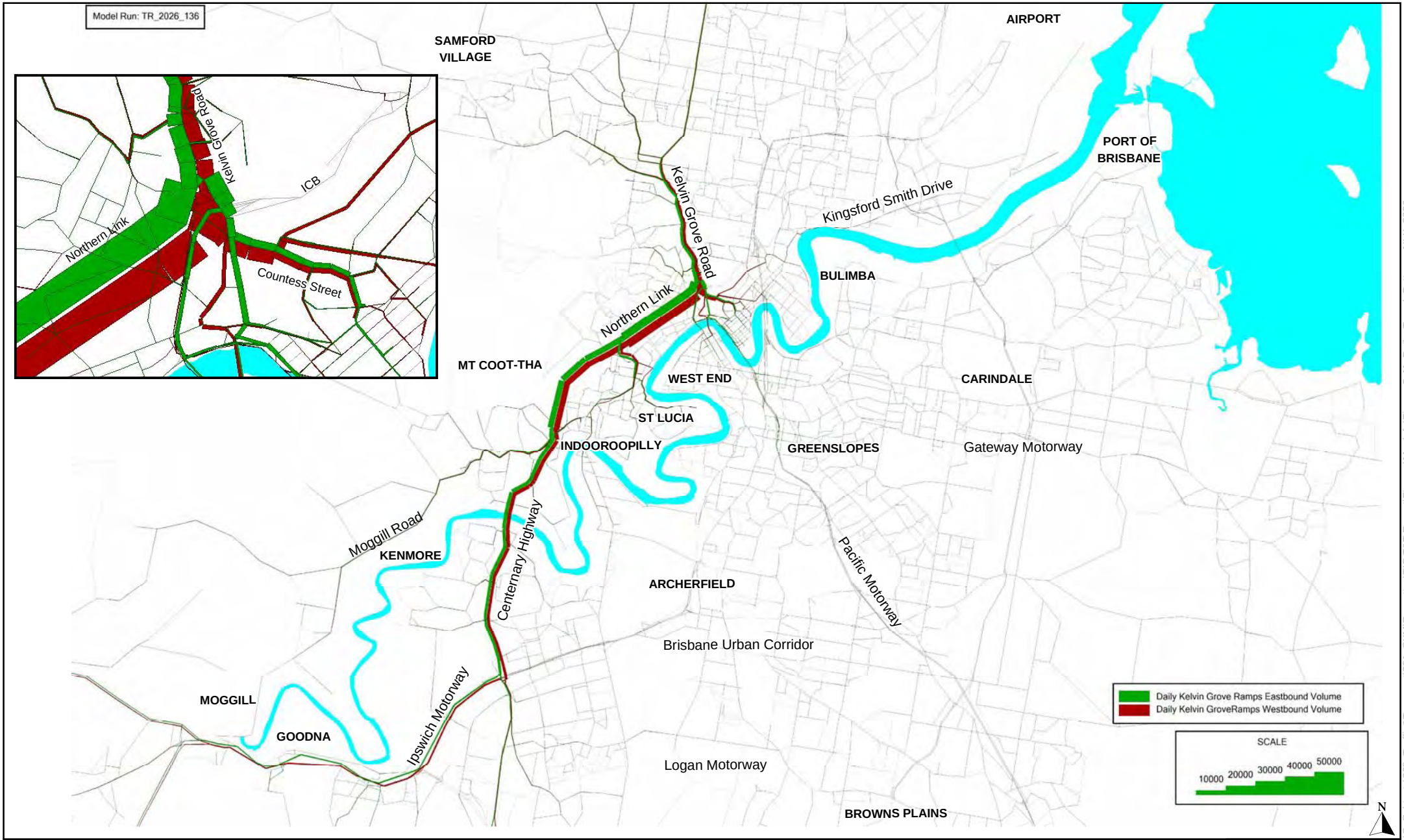

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Figure 5-41

Northern Link Daily Travel Patterns for the Kelvin Grove Connection

The overall daily travel patterns for Northern Link shown in **Figure 5-39** for traffic accessing Northern Link from the Western Freeway, ICB, Toowong and Kelvin Grove connections show that:

- most traffic from the Western Freeway using Northern Link would also use the ICB (55%). A further 15% would travel on Kelvin Grove Road to access the Brisbane northern suburbs, and the remaining 30% would use the south-facing ramps. Over half of the Western Freeway users of Northern Link would have travelled from the Western Corridor via the Ipswich Motorway or Centenary Highway; and
- over 90% of the Northern Link users travelling via the ICB would be for cross-city travellers proceeding to use Airport Link/Lutwyche Road, Kingsford Smith Drive or crossing to the south of the river via routes such as CLEM7. Approximately 40% of these travellers would be associated with the Western Corridor or regional locations, travelling via the Ipswich Motorway or Centenary Highway.

For the Toowong connecting ramps, **Figure 5-40** illustrates that:

- the key travel movement for these ramps would between the major activity centre at Toowong (40%), with most users proceeding to the ICB and Kelvin Grove Road north;
- traffic use from the St Lucia area would account for about 30% of the Toowong ramp use;
- 20% to 25% of traffic would be associated with local users from the Taringa area;
- approximately 7% of users would be from suburbs immediately south of the Walter Taylor Bridge;
- the Toowong ramps are not strongly used by central city traffic, but are more strongly linked to travel between cross-city destinations via Airport Link, Kingsford Smith Drive and CLEM7; and
- there would be minimal use of Milton Road or the adjacent local network to the north for travel access to Northern Link, less than 1,000 vpd and 300 vpd for entry traffic and exit traffic respectively.

For the Kelvin Grove connecting ramps, **Figure 5-41** illustrates a balanced distribution between the north and south facing ramps is forecast. Over 70% of users of these ramps would travel west via the Western Freeway.

5.6.3 Regional Traffic Volume and Flow Effects

Forecast changes in weekday traffic volumes on the regional road network are presented in **Table 5-34** and illustrated in **Figure 5-42**. This supports the travel pattern assessment and again illustrates that the major component of the traffic function of Northern Link would be associated with strategic and intra regional travel. Traffic volume effects are forecast beyond the corridor due to regional traffic re-distributing to alternative routes to access the facility, and in some case these offer beneficial reductions in total traffic use of regional routes.

Table 5-34 also identifies the forecast traffic volume impacts on other elements of the Brisbane toll road network, namely Gateway Bridge, Logan Motorway, CLEM7, Airport Link and Hale Street Link.

Traffic flow with the Project is illustrated in Figure 9-14 to Figure 9-17 of Technical Paper No 1 in Volume 3. These figures show the forecast Level of Service (LOS) in 2014 and 2026 during the peak periods, providing an assessment of traffic flow conditions as perceived by drivers. Key findings are listed below.

- Beyond the immediate area of the Project, few key routes experience significant traffic increases.
- The highest increase is on the Western Freeway-Centenary Highway corridor, where a moderate increase of 12% in 2014 and 16% in 2026 is forecast at the Centenary Bridge. At the four lane Centenary Bridge average weekday traffic demands with the Project are forecast to rise to 137,400 in 2026. Increases of this

magnitude would be within the anticipated traffic lane capacities along this route, which has been assumed to be upgraded by 2016 to add a T2 lane in addition to the existing 2 lanes in each direction[12], although widening of the bridge has been excluded. By 2026, the traffic flow conditions on the Western Freeway are forecast as LOS C. With peak spreading in the network over the next 20 years, it is considered not unreasonable to assume that a four lane cross-river facility could carry an AWDT of up to 140,000 vehicles per day.

- The Inner City Bypass would experience increases in average weekday traffic in the order of 20% (compared to the without Project scenario) resulting in 143,000 vehicles per average weekday by 2026. This is within the traffic carrying capacity of this 6-lane road link. Traffic flow conditions of LOS A are forecast.
- The strategic model indicates negligible overall traffic change within the Airport Link/Lutwyche Road corridor although a small redistribution in demand (5% to 6% in 2026) between relative demands on Lutwyche Road and Airport Link is forecast. This is likely to be influenced by the balance of flows through the Airport Link/ICB/CLEM7/Lutwyche Road interchange at Bowen Hills. It should be noted that the traffic modelling preceded the finalisation of the Airport Link tender process and the Airport Link Changed Project may re-dress this issue.
- A small reduction (-9% in 2026) in traffic use of Hale Street Link is forecast with the Project, with Northern Link reinforcing the use of the motorway standard links using ICB and CLEM7 for longer distance cross-river travel.
- Traffic volumes on the Walter Taylor Bridge in Indooroopilly are not changed by Northern Link, although some users of this link would re-distribute to travel via Northern Link rather than the Moggill Road corridor.
- Sound traffic relief would be expected on several regionally important corridors, particularly by 2026 (when decreases of 7% to 21% are forecast), including the Ipswich Motorway east of the Centenary Highway, Riverside Expressway, CLEM7, Ipswich Road and Fairfield Road. The relief offered to the Riverside Expressway, as well, flows on into traffic reductions through the CBD, particularly Ann and Turbot Streets.
- Sound traffic reductions are forecast on the congested MetRoad 5 corridor, with a decrease of 14% traffic forecast on Jubilee Terrace in 2026 and -11% on Frederick Street due to increased connectivity for cross-city travel.

In summary, the assessment indicates that no specific broader road network upgrades to mitigate congestion points with the project operational are triggered, although it is noted that an underlying assumption incorporated with the traffic modelling is that implementation of the Centenary Highway transit lane project identified within SEQIPP occurs, and that this is operational by around 2016.

[12] Centenary Highway Transit Lanes, Ipswich Motorway to Toowong project (identified in SEQIPP)

Table 5-34 Volumes on Key Surface Roads in the Regional Network

Road	Location	Average Weekday Traffic						
		2007	2014			2026		
			Without NL	With NL	% Difference	Without NL	With NL	% Difference
State Strategic Roads								
Centenary Highway	Centenary Bridge	86,800	98,300	110,400	12%	118,500	137,400	16%
Western Freeway	South of Mt Coot-tha Road	76,500	90,100	114,500	27%	105,200	137,800	31%
Ipswich Mwy	at Oxley Creek, Oxley	93,700	122,700	110,800	-10%	143,000	125,200	-12%
Logan Mwy	at Oxley Creek, Larapinta	23,500	46,500	45,500	-2%	77,100	75,300	-2%
Kessels Road	E of Lowndes Street, Coopers Plains	62,300	68,700	67,000	-2%	68,300	66,500	-3%
Gateway Mwy	at Gateway Bridge	105,800	170,000	170,500	0%	238,300	239,100	0%
Airport Link	in Main Line Tunnel	X	80,800	77,500	-4%	102,600	97,900	-5%
East-West Arterial	E of Widdop Street	28,800	95,600	94,400	0%	129,300	128,700	0%
Regional Radial Roads								
Pacific Mwy	at Captain Cook Bridge	164,000	166,500	166,700	0%	169,400	168,200	-1%
Riverside Expressway	N of the Merivale Bridge	96,000	102,800	97,500	-5%	103,400	101,900	-2%
Kelliher Road	S of Ipswich Mwy, Darra	36,200	38,300	38,800	1%	89,300	92,600	4%
CLEM7	at Brisbane River	X	71,700	66,800	-7%	92,100	79,100	-14%
ICB	Land Bridge	79,200	108,000	126,000	17%	116,900	143,100	22%
Hale Street Link	at Brisbane River	X	20,900	19,200	-8%	27,600	25,000	-9%
Gympie Road	N of Broughton Road, Kedron	63,400	93,600	94,900	1%	103,000	103,400	0%
Lutwyche Road	N of Stoneleigh Street, Lutwyche	60,600	46,500	49,600	7%	47,100	50,100	6%
Kingsford Smith Drive	E of Cooksley Street, Hamilton	62,400	62,200	62,900	1%	70,800	71,200	1%
Regional Ring Roads								
Stafford Road	E of Beaconsfield Terrace, Kedron	19,200	37,300	37,500	1%	41,900	41,900	0%
Coonan Street	at Walter Taylor Bridge	32,500	33,800	33,800	0%	33,800	33,900	0%
Ipswich Road	N of Gainsborough Street, Moorooka	31,800	47,700	37,500	-21%	56,100	44,500	-21%
Jubilee Terrace	N of Coopers Camp Road, Ashgrove	27,700	29,900	25,900	-13%	32,600	27,900	-14%
City Distributor Roads								
Fairfield Road	N of Sherwood Road, Yeerongpilly	17,400	22,500	20,500	-9%	31,000	23,900	-23%

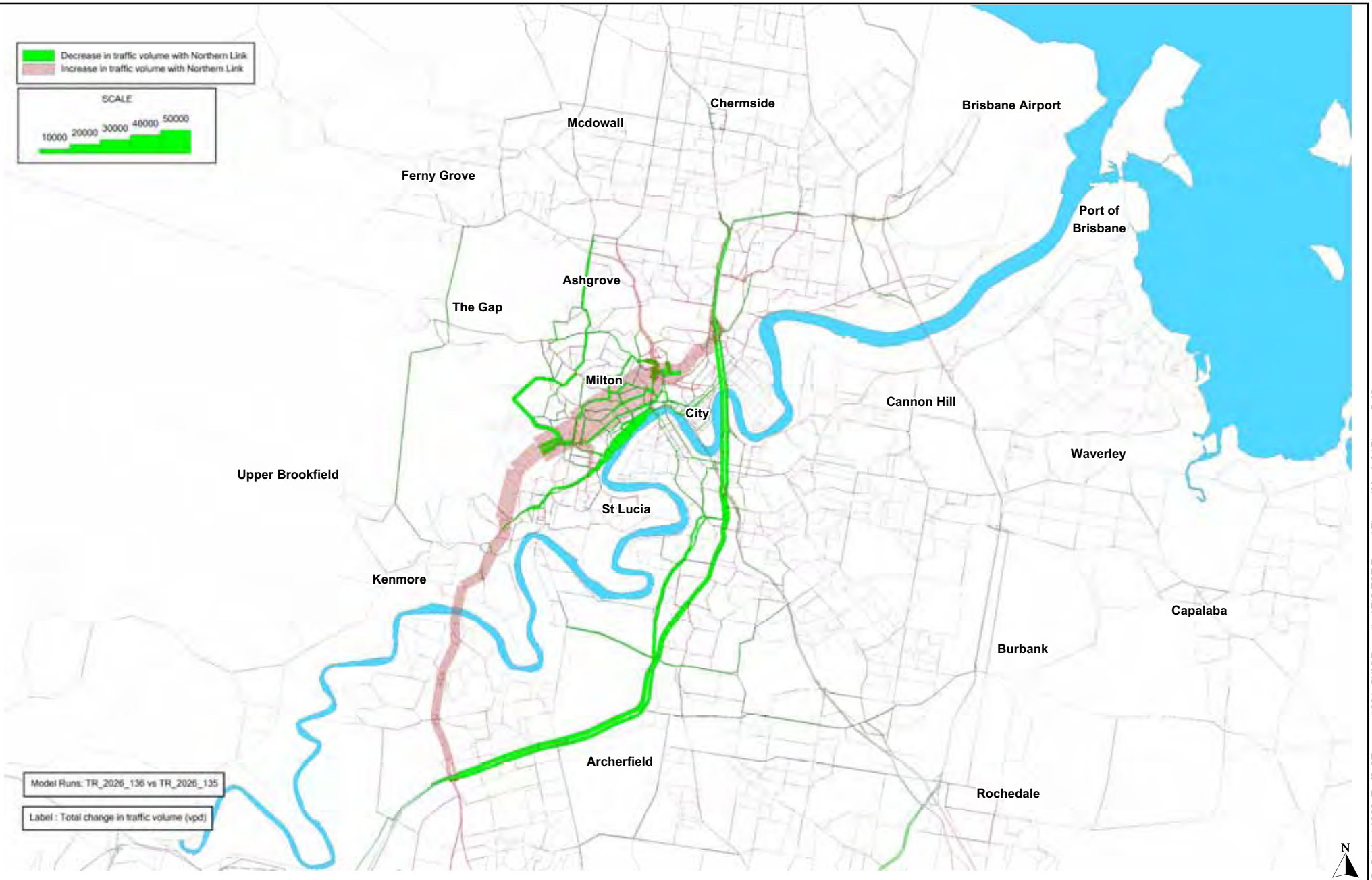

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Figure 5-42

2026 Regional Traffic Volume Changes with Northern Link

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5.6.4 Traffic Volume and Flow Effects on Connecting Roads

The forecast effect on average weekday daily traffic volumes on connecting roads for the years 2014, 2016, 2021 and 2026 and the percentage change, without and with the Project, is summarised in **Table 5-35**.

Table 5-36 reports the forecast peak period traffic for 2026 with and without the Project.

The forecast traffic volume effects at a corridor level are illustrated in **Figure 5-43** and **Figure 5-44** for 2014 and 2026 respectively.

Traffic flow with the Project is illustrated in Figure 9-14 to Figure 9-17 of Technical Paper No 1 in Volume 3. These figures show the forecast Level of Service (LOS) in 2014 and 2026 during the peak periods, providing an assessment of traffic flow conditions as perceived by drivers.

Key findings of assessment of effects on connecting roads at the western end of the Project are listed below.

- The main feeder route at the western end of the Project would be the Western Freeway. In 2014, average weekday traffic on the Western Freeway north of Moggill Road is forecast to reach 114,500 vpd with Northern Link. This is similar to the traffic levels carried during 2007 on the four lane section of the Gateway Motorway north of Kingsford Smith Drive (112,000 AWDT). By 2026, an increase in traffic to 138,000 vehicles per day is forecast, representing a 31% increase compared to the without Project scenario. Overall demands are however within the anticipated traffic lane capacities along this route, which has been assumed to be upgraded by 2016 to add a T2 lane in addition to the existing 2 lanes in each direction[13].
- Approximately 40% of the traffic using the Western Freeway would be associated with Northern Link and there would be a substantial reduction in volume of Western Freeway traffic that would pass through the Mt Coot-tha and Toowong roundabouts. This would generally improve travel conditions for commuter and local traffic use of this part of the network, and relieve pressure for use of local network for extraneous through traffic use of local roads (rat-running).
- Croydon Street and Jephson Street are forecast to experience increases in average weekday traffic in 2026 compared to the without Project scenario. Increases range from 60% on Croydon Street to 28% on Jephson Street. To facilitate these increases in traffic volume widening of Croydon Street from an undivided four lane road to a divided six lane road has been incorporated with upgrades to the intersections of Milton Road/ Croydon Street/ Morley Street and Croydon Street/ Jephson Street/ Sylvan Road. Jephson Street is a four-lane City Distributor and Council has been actively preserving set-backs along this corridor over a number of years as re-developments occur in order to progressively improve the traffic capacity of this route.
- Forecast traffic reductions compared to without the Project scenario would be experienced on Sylvan Road (between Coronation Drive and Croydon Street) in 2026 in the order of 23%.
- Morley Street is forecast to experience traffic reductions when compared to the scenario without the Project, in the order of -25% in 2026, although traffic levels are forecast to increase in the future due to growth in population and activity. It can be seen from **Figure 5-44** that a similar reduction is forecast for

[13] Centenary Highway Transit Lanes, Ipswich Motorway to Toowong project (identified in SEQIPP)

Gregory Street. This is due to the relief of traffic pressures on major routes in the area such as Frederick Street and at the roundabout. **Figure 5-44** illustrates the decreases in traffic volume on the Frederick Street corridor.

Table 5-35 Volumes on Key Connecting Roads to the Project - Comparison without and with the Project

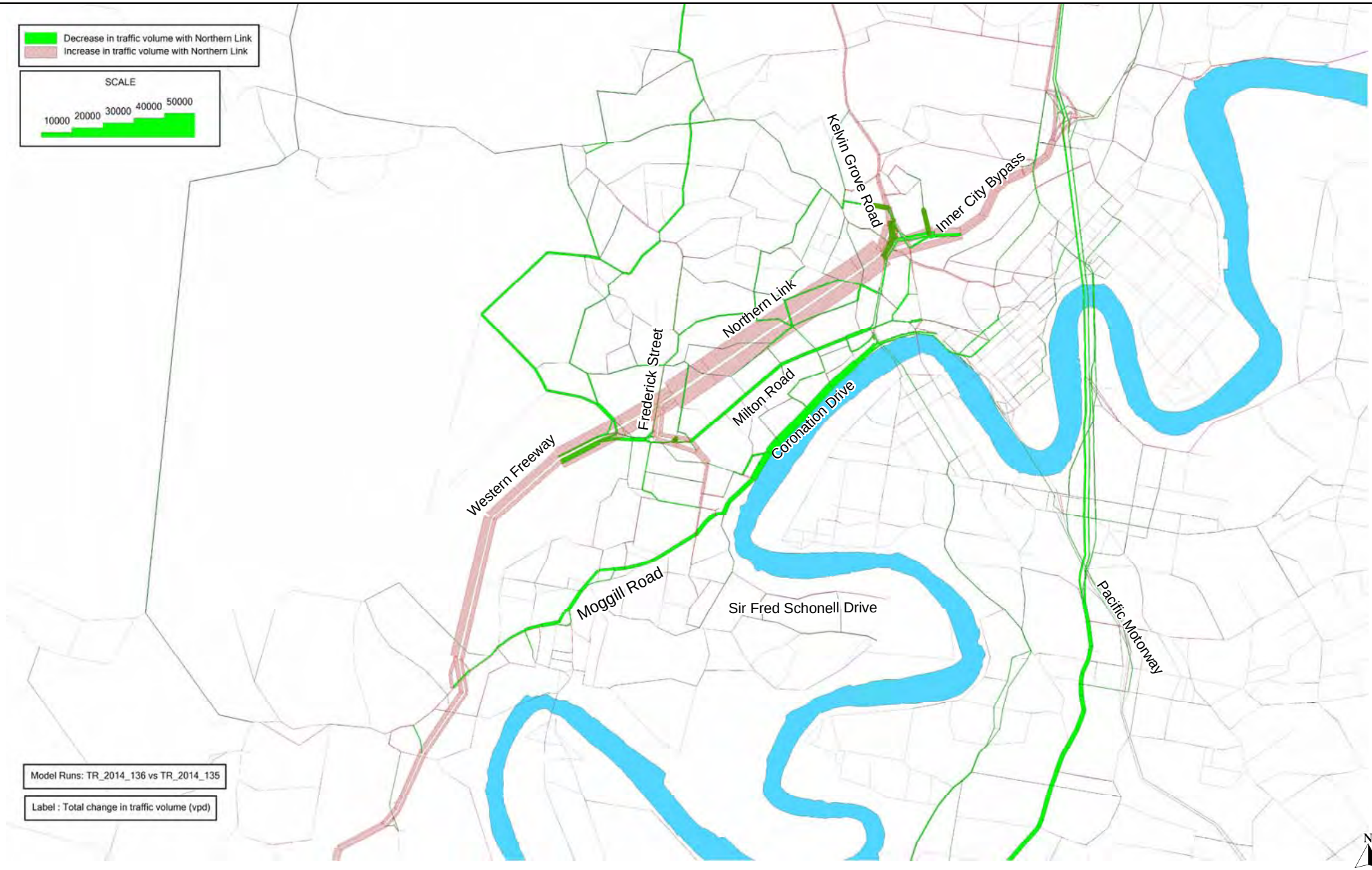
Reporting Point	Road	Location	2007	Average Weekday Traffic											
				2014			2016			2021			2026		
				Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
Western Connection															
A	Western Freeway	South of Mt Coot-tha Road	76,500	90,100	114,500	27%	98,800	124,500	26%	100,900	130,700	30%	105,200	137,800	31%
BB	Centenary Bridge		86,800	98,300	110,400	12%	108,100	120,800	12%	110,700	127,400	15%	118,500	137,400	16%
39	Croydon Street	South of Milton Road	12,000	28,100	43,000	53%	28,800	42,600	48%	28,400	43,600	54%	28,700	45,900	60%
36	Morley Street	North of Milton Road	3,900	6,300	4,600	-27%	6,600	4,700	-29%	6,400	4,600	-28%	6,700	5,000	-25%
S	Jephson Street	North of Sherwood Road	13,000	22,500	27,900	24%	22,700	27,700	22%	23,300	28,900	24%	23,700	30,400	28%
W	Sylvan Road	South of Croydon Street	10,900	13,500	12,500	-7%	14,500	12,000	-17%	15,000	12,000	-20%	15,500	12,000	-23%
4	Burns Road	East of railway	4,400	5,100	5,800	14%	5,300	6,200	17%	5,300	6,200	17%	5,500	6,200	13%
Eastern Connection															
R	ICB	Land Bridge	79,200	108,000	126,000	17%	111,300	129,200	16%	113,800	135,400	19%	116,900	143,100	22%
DD	Kelvin Grove Road	South of Blamey Street(1)	53,000	50,800	59,300	17%	52,500	59,900	11%	56,300	67,700	20%	57,700	67,400	17%
T	Kelvin Grove Road	North of School Road	50,500	45,700	51,400	12%	46,800	51,800	11%	50,100	59,300	18%	51,400	58,600	14%
27	Kelvin Grove Road	South of Ithaca Street	35,300	35,900	37,600	5%	37,200	38,600	4%	40,600	39,500	-3%	40,400	40,500	0%
25	Kelvin Grove Road	off ramp to College Road	5,000	7,400	9,000	22%	7,500	9,300	24%	9,000	10,500	17%	9,300	11,800	27%
23	College Road	East of 5 ways	31,600	41,100	45,300	10%	43,900	47,300	8%	47,300	51,400	9%	48,600	54,700	13%
24	Musgrave Road	West of 5 ways	32,900	34,100	37,100	9%	36,300	39,300	8%	36,400	41,200	13%	35,900	41,600	16%
26	Petrie Terrace	South of 5 ways (one-way northbound)	12,900	16,000	13,600	-15%	17,000	16,100	-5%	18,000	17,800	-1%	20,200	18,500	-8%
22	Countess Street	South of College Road (one-way southbound)	37,300	36,700	37,700	3%	38,400	37,800	-2%	41,400	38,100	-8%	40,800	39,300	-4%
40	Musgrave Road loop to NL, KGR and ICB	West of Hale Street (one-way from Musgrave Road)	5,000	6,700	9,700	45%	6,800	10,700	57%	6,800	12,900	90%	7,300	13,400	84%

Table Note: (1) Volumes reported for this link are based on model run with left-in left-out to Victoria Park Road from ICB retained.

Table 5-36 2026 Peak Period Volumes on Key Connecting Roads to the Project - Comparison without and with the Project

Reporting Point	Road	Location	2 hour average weekday morning peak period volumes						2 hour average weekday evening peak period volumes					
			Eastbound			Westbound			Eastbound			Westbound		
			Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
Western Connection														
A	Western Freeway	South of Mt Coot-tha Road	7,000	10,600	51%	6,300	8,000	27%	6,300	9,100	44%	9,900	10,900	10%
BB	Centenary Bridge		8,900	10,000	12%	7,400	8,400	14%	6,800	8,700	28%	10,300	10,700	4%
39	Croydon Street	South of Milton Road	2,700	3,800	41%	2,700	3,000	11%	2,800	4,200	50%	2,200	3,300	50%
36	Morley Street	North of Milton Road	200	200	0%	900	700	-22%	200	100	-50%	1,200	900	-25%
S	Jephson Street	North of Sherwood Road	3,300	3,100	-6%	1,900	2,100	11%	1,800	2,300	28%	2,600	3,200	23%
W	Sylvan Road	South of Croydon Street	1,800	1,400	-22%	400	400	0%	800	600	-25%	1,900	1,200	-37%
D	Moggill Road	South of Jephson Street	4,500	3,400	-24%	2,000	2,000	0%	2,300	2,200	-4%	4,300	4,500	5%
4	Burns Road	East of railway	600	500	-17%	800	600	-25%	500	500	0%	400	500	25%
Eastern Connection														
R	ICB	Land Bridge	7,000	9,400	34%	9,700	11,300	16%	8,700	11,300	30%	8,100	9,800	21%
DD	Kelvin Grove Road	South of Blamey Street(1)	2,600	3,800	46%	4,600	4,800	4%	4,700	5,400	15%	3,700	4,300	16%
T	Kelvin Grove Road	North of School Road	2,100	3,200	52%	4,200	4,200	0%	4,600	4,700	2%	2,800	3,200	14%
25	Kelvin Grove Road	off ramp to College Road	-	-	-	2,600	2,600	0%	-	-	-	400	600	50%
27	Kelvin Grove Road	South of Ithaca Street	500	800	60%	4,300	4,200	-2%	2,300	2,500	9%	3,800	3,900	3%
23	College Road	East of 5 ways	5,000	5,000	0%	2,300	2,600	13%	1,700	1,900	12%	5,600	5,800	4%
24	Musgrave Road	West of 5 ways	2,800	2,900	4%	2,200	2,400	9%	800	1,000	25%	5,800	6,100	5%
26	Petrie Terrace	South of 5 ways (one-way northbound)	2,000	1,900	-5%	-	-	-	3,600	3,400	-6%	-	-	-
22	Countess Street	South of College Road (one-way southbound)	-	-	-	6,100	6,000	-2%	-	-	-	4,300	4,400	2%
40	Musgrave Road loop to NL, KGR and ICB	West of Hale Street (one-way from Musgrave Road)	700	1,000	43%	-	-	-	1,900	2,300	21%	-	-	-

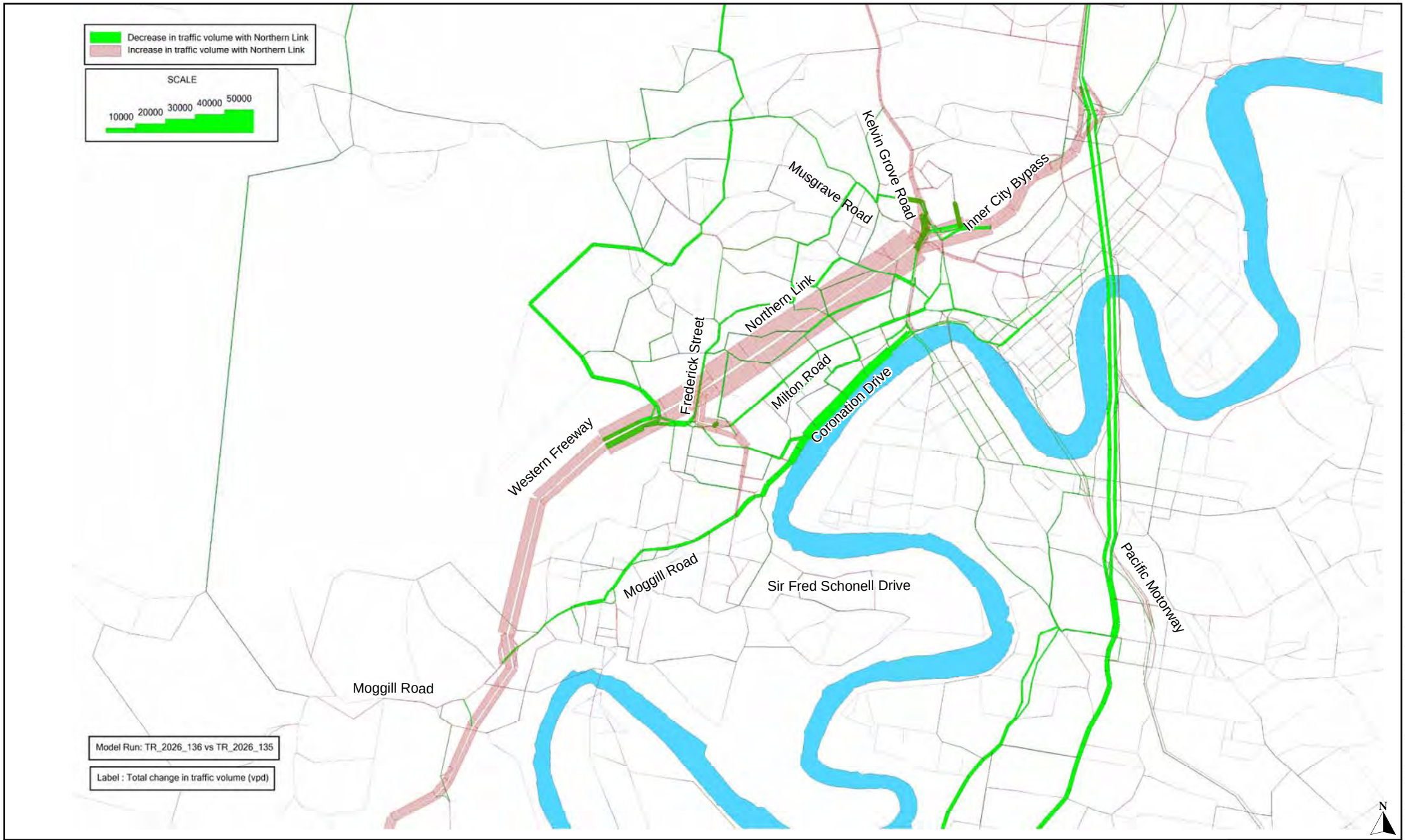
Table Note: (1) Volumes reported for this link are based upon supplementary modelling undertaken for the final EIS concept design that mains the existing left in and left out access at Victoria Park Road.



Northern Link
Environmental Impact Statement

Figure 5-43

2014 Corridor Traffic Changes with Northern Link



Northern Link
Environmental Impact Statement

Figure 5-44

2026 Corridor Traffic Volume Changes with Northen Link

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Key findings from this assessment of effects on connecting roads for the eastern end of the Project are listed below.

- The Inner City Bypass would be a key feeder route with forecast increases in average weekday traffic in the order of 20% (compared to the without Project scenario) resulting in 143,000 vehicles per average weekday by 2026. This is within the traffic carrying capacity of this 6-lane road link. Peak direction increases of traffic are forecast of the order of 30% for the section of the ICB immediately east of the Project connection, however no significant effect on the mid-block level of service is forecast. Weaving movements can be accommodated satisfactorily with the proposed connection layout.
- Kelvin Grove Road, immediately north of the Kelvin Grove Road connection, is forecast to experience a 20% increase in daily traffic by 2026. It is noted that this route will experience some relief of traffic growth effects due to the introduction of Airport Link into the network in 2012. The impacts of peak period traffic increases can be managed with the proposed Project connection works at Kelvin Grove Road. Traffic changes on Kelvin Grove Road diminish rapidly to the north of the study area.
- Some traffic is added to the network associated with the Kelvin Grove south facing ramps however Kelvin Grove Road south of the connection would experience little change in forecast traffic demand. This would occur because there would be a compensating reduction in traffic achieved via westbound traffic use of the north facing ramps. This traffic would otherwise travel via Countess Street or ICB to Milton Road or Coronation Drive.
- Musgrave Road, between College Road and Hale Street is forecast to experience a 13% increase in average weekday traffic by 2026 associated with the loop that would connect Musgrave Road with Hale Street, Kelvin Grove Road and the Northern Link. West of this connection with Hale Street, Musgrave Road is forecast to experience traffic reductions. There would be no significant effect on the level of service.
- Average weekday traffic increases of less than 15% are forecast for College Road by 2026. The off ramp from Kelvin Grove Road (southbound) to College Road is forecast to experience traffic increases, with manageable peak period changes.
- The forecast effects of the Project diminish quite rapidly to the south with minimal (5% or less) weekday traffic changes (either increases or reductions in traffic) on Countess Street and Petrie Terrace due to overall traffic re-rerouting effects.

Based on the assessment described above, the following modifications would be needed on access and link roads to the project to ensure its effective operation:

- Widening of Croydon Street from an undivided four lane road to a divided six lane road with upgrades to the intersections of Milton Road/ Croydon Street/ Morley Street and Croydon Street/ Jephson Street/ Sylvan Road.
- Implementation of the proposed Project connection works at Kelvin Grove Road including modification of the signalised intersection of Kelvin Grove Road/Musk Avenue and Kelvin Grove Road/Blamey Street.

In conjunction with these modifications, the Traffic Management Plan for the Project would address the need for signal co-ordination to accommodate increased traffic on connecting routes where multiple signalised intersections occur such as Croydon Street-Jephson Street, Kelvin Grove Road and Musgrave Road.

5.6.5 Effects on Local Roads

Improved amenity on many roads in the inner west suburbs would be likely, due to forecast traffic reductions with the Project. Forecast effects on local roads are shown in **Table 5-37** and **Table 5-38** and graphically in

Figure 5-43 and **Figure 5-44**. Examples of the forecast effect of the Northern Link in 2026 compared to the scenario without the Project include:

- sound reduction in traffic on the Milton Road-Coronation Drive radial road corridors, and other roads used by east-west traffic, with a 19% to 24% reduction by 2026 in the network across the Toowong and Milton screenlines respectively. This includes traffic reductions of up to 22% on Coronation Drive and 9% on Milton Road. These routes represent the untolled alternative routes to Northern Link within the inner west area;
- the Toowong activity centre would benefit from traffic reductions including a forecast decrease by 27% at High Street to 27,400 vehicles per day in 2026, lower than existing traffic levels;
- traffic on Moggill Road through Toowong would reduce by 13%, and at Indooroopilly by 5%;
- as the Project would have a wider effect on route choice within the network, a range of heavily trafficked regional ring roads in the broader Western Brisbane area are forecast to experience traffic reductions and improved operation. Examples at 2026 include Frederick Street (-11%) and Jubilee Terrace (-14%), which are components of Metroad 5, and Miskin Street (-12%) and Sherwood Road (-24%) to the west of Jephson Street;
- significant daily traffic reductions on many City Distributors such as Sylvan Road south of Croydon Street (-23%), Caxton Street (-19%) and Latrobe Terrace (-15%). The traffic reductions on these streets should lead to improved amenity particularly as these streets typically provide a function for active transport and public transport trips, access to properties and local streets. Caxton Street and Latrobe Terrace pass through shopping and entertainment precincts so improved amenity would be enjoyed by the many visitors to those streets; and
- reductions in daily traffic are forecast on many local streets throughout the inner west suburbs such as Eagle Terrace (-24%), Haig Road (-30%), Stuartholme Road (-22%), Rainworth Road (-43%), Sylvan Road east of Milton Road (-38%), Morley Street (-25%) and Birdwood Terrace (-38%).

Figure 5-44 clearly illustrates the significant reduction not only on the arterial routes such as Coronation Drive and Milton Road but throughout the Inner West Transport Study Area. This is particularly pertinent when compared to the local streets identified in **Figure 5-20** that are used by extraneous through traffic. The implementation of Northern Link has the potential to help alleviate some of these routes.

Examples of daily traffic reductions that could lead to noticeable traffic relief on local streets through residential areas between Toowong and Milton include: Heussler Terrace (-27%), Birdwood Terrace (-38%), Morley Street (-25%), Park Road (-22%), Rainworth Road (-43%), Stuartholme Road (-22%), and Lang Parade (-21%).

To identify the changes to the categories of vehicles using the surface road system with the Project, **Table 5-38** provides a comparison of forecast overall traffic levels as well as the number of commercial vehicles on surface streets within the inner west suburbs when compared to a situation without the Project. Forecasts for the Toowong screenline in 2026 (location shown in **Figure 5-3**) shows reductions of 24% of total daily traffic and 30% of commercial vehicles would be removed from roads from Mt Coot-tha Road across to Coronation Drive. The Milton screenline (location shown in **Figure 5-3**) also shows significant forecast reductions with 19% of total daily vehicle traffic and 24% of commercial vehicle traffic being removed from the surface network routes from Coronation Drive through Milton to Musgrave Road in 2026.

The Project is forecast to result in some increase in traffic flow through the western section of the study area (the Indooroopilly screenline) although it is noted some double counting occurs in the tabulation as traffic from within the study area in the vicinity of Indooroopilly uses Moggill Road and the Western Freeway to reach Northern Link. This can be seen in **Figure 5-39**. Overall traffic increases and commercial vehicle traffic are

confined to the higher order roads such as the Western Freeway-Centenary Highway which are designated freight routes. There would be reduction in general and freight traffic on Moggill Road ,and negligible impact on the Walter Taylor Bridge.

Table 5-37 Volumes on Surface Roads within the Inner West Transport Study Area - Comparison without and with the Project

Hierarchy Reporting Point		Road	Location	2007	Average Weekday Traffic											
					2014			2016			2021			2026		
					Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
Regional Radial																
	B	Moggill Road	East of Russell Terrace, Indooroopilly	40,700	42,200	40,400	-4%	43,000	41,500	-3%	44,300	43,000	-3%	47,000	44,800	-5%
	D	Moggill Road	East of Brisbane Boys College Entrance, Toowong	38,500	47,000	40,000	-15%	46,800	40,000	-15%	48,600	42,000	-16%	50,100	43,400	-13%
	F	High Street	West of Benson Street, Toowong	32,400	35,000	26,100	-25%	35,300	26,500	-25%	36,100	27,300	-32%	37,300	27,400	-27%
	X	Milton Road	West of Croydon Street, Toowong	54,900	61,400	58,300	-5%	61,400	58,300	-5%	63,000	60,600	-4%	63,000	60,600	-4%
	J	Milton Road	East of Croydon Street, Toowong	52,900	64,500	58,100	-10%	65,000	60,200	-7%	66,300	62,700	-6%	68,200	63,500	-7%
	O	Milton Road	East of Castlemaine Street, Milton	51,500	68,200	61,100	-10%	67,800	60,900	-10%	70,600	63,900	-10%	72,500	65,900	-9%
	K	Coronation Drive	West of Land Street, Auchenflower	62,600	70,300	56,000	-20%	71,400	56,500	-21%	72,900	58,200	-25%	74,000	57,900	-22%
	P	Coronation Drive	East of Cribb Street, Milton	90,100	92,100	80,900	-12%	94,100	82,000	-13%	97,000	83,900	-16%	96,400	83,800	-13%
Regional Ring																
	C	Walter Taylor Bridge	Indooroopilly	32,500	33,800	33,800	0%	33,400	33,400	0%	34,000	34,100	0%	33,800	33,900	0%
	E	Miskin Street	North of Ascog Terrace, Toowong	10,500	10,200	8,400	-18%	9,700	8,700	-10%	10,500	9,300	-13%	10,800	9,500	-12%
	I	Frederick Street	South of Victoria Crescent, Toowong	33,500	33,900	32,900	-3%	36,700	33,500	-9%	37,200	34,200	-9%	37,400	33,200	-11%
	19	Hale Street	South of Caxton Street	76,900	84,100	81,600	-3%	80,700	81,600	1%	80,400	86,200	7%	83,500	86,800	4%
	30	Jubilee Terrace	North of Coopers Camp Road	27,700	29,900	25,900	-13%	30,400	26,700	-12%	31,500	27,000	-17%	32,600	27,900	-14%
	31	Sherwood Road	West of Jephson Street	5,400	6,000	4,200	-30%	6,600	5,100	-23%	7,300	5,800	-26%	7,900	6,000	-24%

Continued over

Hierarchy Reporting Point		Road	Location	2007	Average Weekday Traffic											
					2014			2016			2021			2026		
					Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
City Distributor																
	G	Brisbane Street	North of Josling Street, Toowong	37,100	43,100	42,200	-2%	43,900	42,900	-2%	44,700	43,600	-3%	45,900	45,000	-2%
	W	Sylvan Road	South of Croydon Street, Toowong	10,900	13,500	12,500	-7%	14,500	12,000	-17%	15,000	12,000	-20%	15,500	12,000	-23%
	Q	Caxton Street	West of Hale Street, Paddington	22,900	33,700	29,200	-13%	39,600	31,300	-21%	38,500	32,900	-17%	38,900	31,600	-19%
	32	Latrobe Terrace	West of Enoggera Terrace	14,200	18,200	16,700	-8%	19,600	17,000	-13%	20,500	17,600	-16%	21,400	18,200	-15%
Local Streets																
	L	Eagle Terrace	West of Roy Street, Auchenflower	4,100	6,600	6,000	-9%	7,200	6,100	-15%	7,100	6,400	-11%	9,100	6,900	-24%
	M	Haig Road	West of Barona Road, Milton	6,500	12,600	9,400	-25%	16,900	10,900	-36%	16,200	9,700	-67%	14,500	10,200	-30%
	N	Park Road Mid-block	North of Gordon Street, Milton	12,100	15,000	13,400	-11%	16,200	13,400	-17%	16,300	14,100	-16%	19,000	14,800	-22%
	33	Sir Samuel Griffith Drive	North of Birdwood Terrace	5,300	9,900	4,900	-51%	11,500	5,500	-52%	11,900	5,700	-109%	13,900	6,500	-53%
	34	Stuartholme Road	North of Birdwood Terrace	3,600	5,100	3,100	-39%	5,400	3,000	-44%	4,500	3,900	-15%	5,100	4,000	-22%
	35	Enoggera Terrace	North of Latrobe Terrace	5,100	7,700	5,800	-25%	8,700	6,100	-30%	9,500	6,800	-40%	10,400	7,300	-30%
	28	Rainworth Road	East of Rouen Road	4,300	7,000	4,200	-40%	9,500	4,600	-52%	8,400	5,400	-56%	10,000	5,700	-43%
	36	Morley Street	North of Milton Road	3,900	6,300	4,600	-27%	6,600	4,700	-29%	6,400	4,600	-39%	6,700	5,000	-25%
	37	Lang Parade	North of Coronation Drive	6,800	11,300	9,000	-20%	12,000	9,400	-22%	11,600	9,600	-21%	12,600	10,000	-21%
	29	Birdwood Tce	East of Gregory Street	1,600	3,900	3,000	-23%	4,500	3,000	-33%	4,700	3,000	-57%	4,500	2,800	-38%
	38	Heussler Terrace	West of Castlemaine Street	8,000	13,500	11,200	-17%	16,800	11,200	-33%	16,700	11,200	-49%	14,800	11,200	-24%
	H	Sylvan Road	East of Milton Road, Toowong	8,400	5,500	4,500	-18%	6,000	4,400	-27%	6,100	4,600	-33%	6,300	3,900	-38%

Table Note: Source: Northern Link Traffic Model

Table 5-38 Surface Traffic Changes within the Inner West Transport Study Area - Comparison without and with the Project

Screenline[1]	2007	Average Weekday Traffic											
		2014			2016			2021			2026		
		Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
1 – Indooroopilly	162,400	178,400	201,400	11%	187,400	208,400	10%	191,600	220,600	13%	198,900	229,600	13%
2- St Lucia and University	73,800	81,600	81,300	-0.4%	83,500	82,300	-1%	85,100	84,700	-0.5%	88,100	87,700	-0.5%
3 – Toowong	174,200	210,400	174,700	-20%	219,400	174,100	-26%	224,400	185,200	-21%	230,900	186,900	-24%
4 - Milton	205,500	244,900	210,600	-16%	255,200	208,100	-23%	263,000	222,400	-18%	269,700	226,300	-19%
Screenline[1]	2007	Commercial Vehicle Weekday Traffic											
		2014			2016			2021			2026		
		Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change	Without NL	With NL	% Change
1 – Indooroopilly	6,300	6,200	6,900	10%	6,500	7,200	10%	7,000	8,100	14%	7,600	9,000	16%
2- St Lucia and University	2,600	3,200	3,100	-3%	3,300	3,300	0%	3,600	3,600	0%	4,000	3,900	-3%
3 – Toowong	10,200	11,100	9,400	-18%	11,400	9,200	-24%	12,200	10,000	-22%	12,900	9,900	-30%
4 – Milton	11,100	12,300	10,600	-16%	12,900	10,700	-21%	14,000	11,700	-20%	14,800	11,900	-24%

Table Notes:

Source: Northern Link Traffic Model

1. A screenline is a notional boundary across roads within the inner west suburbs in the vicinity of the project across which traffic demands can be compared. Screenline locations are shown on Figure 5-3.

Traffic Effects in Toowong North of Milton Road

The effect of the Project on traffic volumes within the residential precinct north of Milton Road in the vicinity of the Toowong connection has also been modelled. This assessment has taken into account the potential for use of the Gregory Street - Morley Street route for traffic seeking to access the Northern Link ramp connection. Key findings from this assessment are as follows:

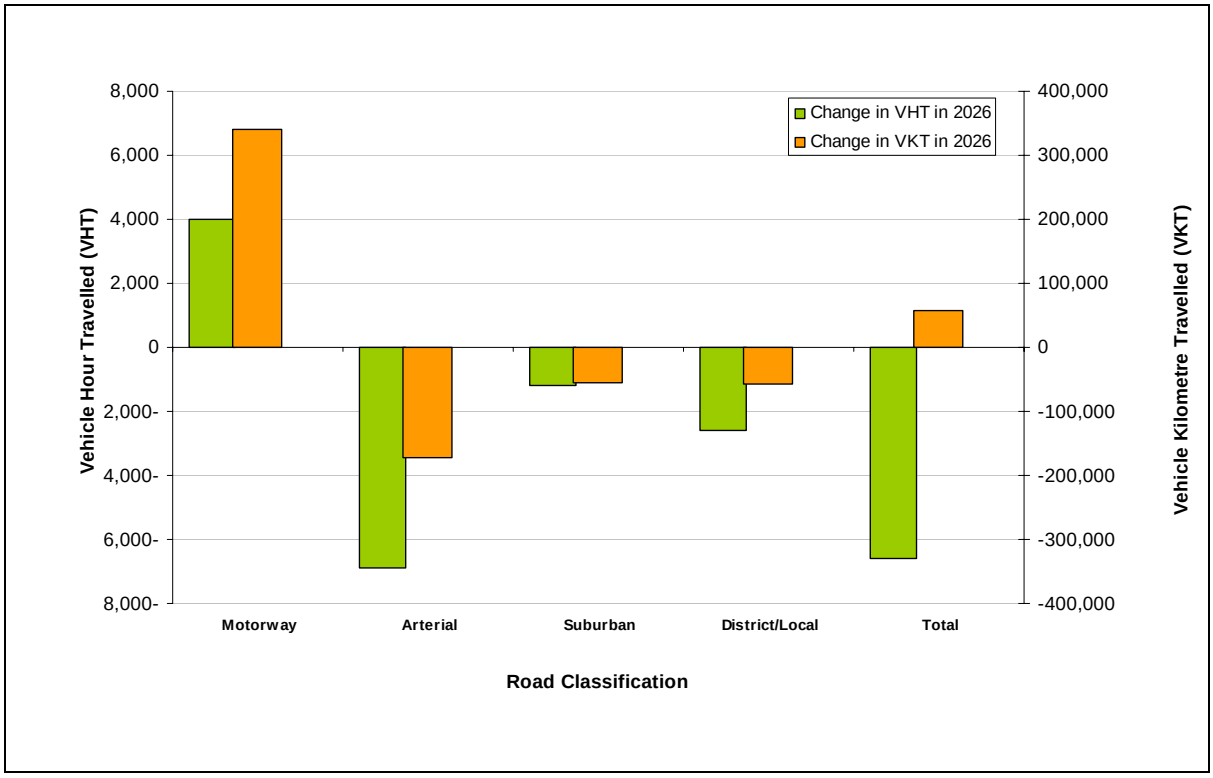
- modelling shows that only traffic from the immediate local area (forecast as 360vpd) would find it beneficial to use Morley Street to access the Northern Link entry ramp via a right turn movement from Morley Street. Approximately 140vpd are forecast to ultimately use Morley Street as an exit route, with this traffic exiting to Croydon Street (as Northern Link exit traffic must turn into Croydon Street) and then travelling via an indirect route to access Morley Street. These travel patterns have been illustrated in **Figure 5-40** and connection use forecasts are tabulated in **Table 5-33;**
- **Figure 5-44** illustrates that traffic reductions, compared to the without Project scenario are forecast for the Gregory Street - Morley Street route. This occurs due to congestion relief effects that Northern Link provides within the wider network;
- resultant traffic volumes forecast on Morley Street by 2026 (as shown in **Table 5-35**) of 5,000 vehicles per average weekday would be greater than existing levels (less than 4,000 vpd) due to the general pressure of increase travel demand in the inner west associated with growth in population and economic activity; and
- without the Project, and in the absence of improvements to the adjacent arterial road links such as Frederick Street and Milton Road, traffic demands of up to 6.700 vpd are forecast within this precinct, significantly above the typical level generally regarded as tolerable within a residential area (4,000 vpd). The traffic relief provided by Northern Link on the arterial links and at the Milton Road/Frederick Street roundabout and the upgrading of the Milton Road/Croydon Street intersection would clearly assist in reducing the pressure for through traffic intrusion (rat-running) into the precinct. As indicated in **Table 5-35,** a 25% reduction with Northern Link is forecast for 2026 however this would not solve the on-going issues forecast for this precinct.

As this precinct will remain challenged over time by through traffic pressures, an expansion of the currently planned local area traffic management (LATM) measures would be prudent to further protect the amenity of this residential area. Due to the proximity of the Project to this on-going problem, it would be beneficial to investigate further LATM measures as part of the Operational Traffic Management Plan recommended for the Northern Link Project as part of the Environmental Management Plan (EMP). It is recommended that potential supplementary initiatives be considered for the precinct extending from Milton Road in the south to Birdwood Terrace in the north and from Frederick Street in the west to Wienholt Street in the east. The expanded LATM scheme would need to be established in consultation with the local community. The scheme objectives would be to include minimising the potential use of the local streets in this precinct by extraneous though traffic generally, whilst still allowing access to local residents and businesses.

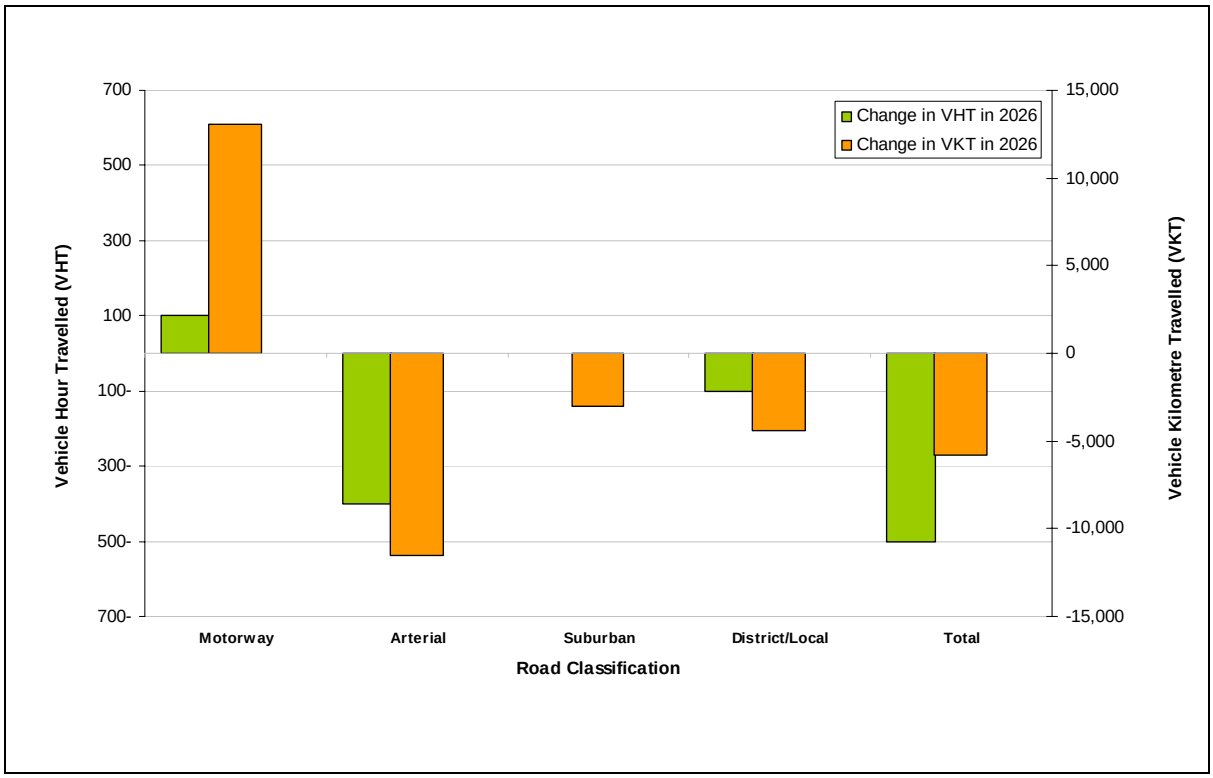
5.6.6 Metropolitan Area Network Performance

The forecast impact of the Northern Link Project on the overall Metropolitan Area network performance is summarised in **Table 5-39** and for commercial vehicles in **Table 5-40**. These forecast effects are shown graphically in **Figure 5-45** and **Figure 5-46.**

- **Figure 5-45 Changes in Overall Vehicle Kilometres and Vehicle Hours of Travel With Northern Link**



- **Figure 5-46 Changes in Commercial Vehicle Kilometres and Commercial Vehicle Hours of Travel With Northern Link**



The lower order roads would gain a positive effect from the implementation of Northern Link with an overall decrease in VKT or amount of travel on these roads. The increase in VKT on Motorways shows the redistribution of traffic from these lower order roads to Northern Link. There would be a very slight increase in overall vehicle kilometres travelled on the network of less then 0.15% in 2026.

This will provide important benefits to industry by reducing operating cost through increased travel speeds on the network and would improve amenity within residential areas by reducing the vehicle hours travelled by commercial vehicles on suburban, district and local roads.

The overall forecast reduction of less then 1% of vehicle hours travelled (VHT) along with the general increase in average network speed indicates a general lowering of congestion on the road network.

Table 5-39 Network Performance by Road Type without and With Northern Link

Road Type	Without Northern Link			With Northern Link			Difference		% Difference	
	VHT(1)	VKT(2)(4)	Speed km/h	VHT(1)	VKT(2)(4)	Speed Km/h	VHT(1)	VKT(2)(4)	VHT(1)	VKT(2)(4)
2014										
Motorway	297,100	24,677,400		301,100(3)	24,956,700(3)		4,000	279,300	1.3%	1.1%
Arterial	444,900	20,442,200		438,000	20,306,900		-6,900	-135,300	-1.6%	-0.7%
Suburban	167,600	8,147,700		166,400	8,121,500		-1,200	-26,200	-0.7%	-0.3%
District	106,300	3,505,100		102,400	3,465,100		-3,900	-40,000	-3.7%	-1.1%
Local	52,100	1,315,500		53,400	1,305,700		1,300	-9,800	2.5%	-0.7%
Total	**1,068,000**	**58,087,900**	**54.4**	**1,061,400**	**58,156,000**	**54.8**	**-6,600**	**68,100**	**-0.6%**	**0.1%**
2021										
Motorway	361,100	29,431,800		365,000(3)	29,747,000(3)		3,900	315,200	1.1%	1.1%
Arterial	484,200	22,559,000		476,800	22,397,800		-7,400	-161,200	-1.5%	-0.7%
Suburban	185,500	9,059,800		184,400	9,016,500		-1,100	-43,300	-0.6%	-0.5%
District	120,300	3,833,500		119,900	3,791,200		-400	-42,300	-0.3%	-1.1%
Local	66,200	1,399,700		62,400	1,372,100		-3,800	-27,600	-5.7%	-2.0%
Total	**1,217,300**	**66,283,800**	**54.5**	**1,208,500**	**66,324,600**	**54.9**	**-8,800**	**40,800**	**-0.7%**	**0.1%**
2026										
Motorway	412,800	32,754,100		415,400(3)	33,094,000(3)		2,600	339,900	0.6%	1.0%
Arterial	514,700	23,578,300		504,600	23,406,800		-10,100	-171,500	-2.0%	-0.7%
Suburban	200,900	9,624,600		199,100	9,570,000		-1,800	-54,600	-0.9%	-0.6%
District	136,400	4,057,600		133,500	4,013,600		-2,900	-44,000	-2.1%	-1.1%
Local	73,900	1,465,200		73,900	1,451,700		0	-13,500	0.0%	-0.9%
Total	**1,338,700**	**71,479,800**	**53.4**	**1,326,500**	**71,536,200**	**53.9**	**-12,200**	**56,400**	**-0.9%**	**0.1%**

Table Notes:

(1) VHT - Vehicle Hours Travelled on Average Weekday
(2) VKT - Vehicle Kilometres Travelled on Average Weekday
(3) Includes NL Tunnel VHT and VKT
(4) Excludes travel on traffic zone centroid connectors within traffic model.

- **Table 5-40 Commercial Vehicles Network Performance by Road Type without and With Northern Link**

Road Type	Without Northern Link			With Northern Link			Difference		% Difference	
	VHT[1]	VKT[2][4]	Speed Km/h	VHT	VKT[2][4]	Speed Km/h	VHT	VKT[2][4]	VHT	VKT[2][4]
2014										
Motorway	21,400	1,853,000		21,500[3]	1,859,600[3]		100	6,600	0.5%	0.4%
Arterial	29,300	1,379,400		28,900	1,372,700		-400	-6,700	-1.4%	-0.5%
Suburban	9,000	436,600		9,000	435,300		0	-1,300	0.0%	-0.3%
District	5,100	190,400		5,000	189,500		-100	-900	-2.0%	-0.5%
Local	3,000	72,400		3,000	72,000		0	-400	0.0%	-0.6%
Total	**67,800**	**3,931,800**	**58.0**	**67,300**	**3,929,100**	**58.4**	**-500**	**-2,700**	**-0.7%**	**-0.1%**
2021										
Motorway	25,300	2,128,500		25,400[3]	2,137,400[3]		100	8,900	0.4%	0.4%
Arterial	32,000	1,521,400		31,600	1,511,400		-400	-10,000	-1.3%	-0.7%
Suburban	10,300	500,000		10,300	499,200		0	-800	0.0%	-0.2%
District	6,000	214,500		5,900	213,200		-100	-1,300	-1.7%	-0.6%
Local	4,100	82,700		4,100	82,000		0	-700	0.0%	-0.8%
Total	**77,800**	**4,447,100**	**57.2**	**77,300**	**4,443,100**	**57.5**	**-500**	**-4,000**	**-0.6%**	**-0.1%**
2026										
Motorway	27,900	2,291,500		28,000[3]	2,304,600[3]		100	13,100	0.4%	0.6%
Arterial	34,100	1,602,300		33,500	1,590,800		-600	-11,500	-1.8%	-0.7%
Suburban	11,300	540,800		11,200	537,800		-100	-3,000	-0.9%	-0.6%
District	7,000	235,200		6,900	232,300		-100	-2,900	-1.4%	-1.2%
Local	4,800	89,100		4,800	87,600		0	-1,500	0.0%	-1.7%
Total	**85,100**	**4,758,800**	**55.9**	**84,200**	**4,753,000**	**56.4**	**-900**	**-5,800**	**-1.1%**	**-0.1%**

Table Notes:
(1) VHT - Vehicle Hours Travelled on Average Weekday; (2) VKT - Vehicle Kilometres Travelled on Average Weekday
(3) Includes NL Tunnel VHT and VKT; (4) Excludes travel on traffic zone centroid connectors within traffic model

5.6.7 Intersection Performance

The effect of the Project on the performance of intersections within the network has been assessed. Locations have been selected to cover key signalised intersections on feeder routes to the facility, as well as intersections along the surface road network that would benefit due to diversion of traffic due to Northern Link. Intersections examined include:

- key intersections in the Coronation Drive and Milton Road corridors;
- intersections along Kelvin Grove Road corridor, including the Normanby Five-Ways intersection;
- locations along Musgrave Road including off ramps from Hale Street;
- key intersections along the Moggill Road corridor, including the Western Freeway on and off ramps;
- locations around the Toowong shopping precinct in particular, High Street, Jephson Street and intersecting local streets; and
- Sir Fred Schonell Drive and Gailey Road.

Intersection assessment has been carried out using modelled volumes for the two hour peak period in the morning, without taking into account peak spreading, and is therefore considered to be conservative. The intersection analysis provides an assessment of the relative forecast effects of the Project compared to the without Project scenario using this conservative assumption in both cases.

The intersection Degree of Saturation (DoS) and Level of Service (LOS) is provided in **Table 5-41** for both year of opening 2014 and the future year of 2026 (10+ years from opening). This is the standard practice for traffic impact assessments for intersection effects. Key effects on intersection performance and LOS are listed below.

- Significant benefits to the operation of the Mt Coot-tha Roundabout are indicated. In the future scenarios without Northern Link this roundabout, located where the Western Freeway intersects with Mt Coot-tha Road, is forecast to operate significantly above practical capacity. With Northern Link operational, significant traffic relief would occur and improved operations (LOS B or better) during both the morning and evening peak periods is forecast.
- A sound improvement in the operation of the Toowong Roundabout would occur, particularly during the evening peak period.
- An overall improvement in operating conditions on Coronation Drive is indicated with the Project. Intersections such as Cribb Street and Lang Parade would particularly benefit from traffic reductions. It should be noted that intersection operation assessment with the Project has incorporated the re-introduction of tidal flow bus lane on Coronation Drive (as a maximum impact on general traffic performance), and slightly better overall performance would be likely at most locations with a permanent inbound T3 arrangement.
- Milton Road would show significant improvement with the Project in 2026 with most intersections benefiting from the improved operating conditions associated with traffic relief during peak periods.
- Jephson Street would experience some decrease in LOS associated with increased traffic due to the Project. Intersections that would be most heavily challenged by traffic increases are those with Sherwood Road and Lissner Street, although there is a re-distribution of movements forecast. The Lissner Street intersection with the Project would still operate satisfactorily in the morning peak period and would operate under a DOS of 1.00 during evening peak period in 2026. The Sherwood Road/Jephson Street intersection, both with and without the Project has a forecast LOS F by 2026, and improvements would be desirable. Council has been actively pursuing set-backs along the Jephson Street corridor to facilitate future capacity improvements.
- The Project incorporates a significant upgrade to the intersection of Jephson Street with Croydon Street and improved traffic operations are forecast.
- In the Toowong area there would be a strong congestion relief at the busy High Street/Benson Street/Brisbane Street intersection near the Toowong railway station.
- Along Moggill Road the DOS and the LOS would at most locations improve for signalised intersections, due to decreased traffic volumes during both the morning and evening peak periods as evidenced by the results for the sample of intersections assessed in detail.
- At the intersection at the on ramp to the Western Freeway from Moggill Road, the LOS declines with the Project, however remains satisfactory, at LOS D or better until 2026. At the intersection of the off ramp from the Western Freeway with Moggill Road, the LOS improves with the Project due to traffic re-distribution effects.
- Although catering for access traffic to the Kelvin Grove south-facing ramps, there would be little change at the intersections on Musgrave Road, Countess Street and in the College Road corridor compared to the

without Project scenarios. This occurs because some existing cross-city traffic between Milton Road and Coronation Drive/Milton Road and would transfer to use Northern Link instead of this part of the CBD network.

The design of the Project has been shaped so that traffic entering or exiting the Project tunnels at the following connections would not be affected by signalised intersections:

- exiting from the Western Connection to the Western Freeway;
- exiting from the Eastern Connection to Inner City Bypass;
- Kelvin Grove Road North Facing on ramp; and
- Kelvin Grove South Facing on ramp from Kelvin Grove Road and Musgrave Road loop.

For other locations, where traffic exiting the tunnel would encounter a potential stop point, the assessment has found that:

- the Kelvin Grove off ramp to the southbound direction of Kelvin Grove Road would operate in 2026 with a LOS of D and a maximum queue length of 185m, demonstrating that the queue would not affect traffic on the off ramp that would go northbound on Kelvin Grove Road;
- the Musgrave Road loop to Kelvin Grove Road and Hale Street off ramp connection to Kelvin Grove Road/Musk Avenue intersection would operate with a LOS D and a maximum queue of 159m in 2026 meaning that the queue would not extend to the diverge of the Musgrave Road loop to the ICB; and
- The east facing off ramp to Milton Road/Croydon Street would operate with a maximum queue of 456m by 2026. This is within the 480m space available from the tunnel portal.

If excessive queuing were to develop, the operational measure to be implemented to manage queues associated with traffic flows into and out of the tunnel system would be identified within the Operational Traffic Management Plan for the facility.

- **Table 5-41 Intersection Performance without and with Northern Link – 2014 and 2026**

Intersection	Peak	2007 LOS	2014				2026			
			Without NL		With NL		Without NL		With NL	
			Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS
Coronation Drive										
Coronation Drive/Cribb Street	AM	C	0.92	C	1.00	D	1.04	F	1.00	D
	PM	F	1.21	F	1.17	F	1.24	F	1.20	F
Coronation Drive/Park Road	AM	B	0.89	C	1.02	E	0.88	C	1.02	E
	PM	B	0.81	B	0.74	B	0.83	B	0.75	B
Coronation Drive/Land Street	AM	B	0.71	B	0.75	B	0.75	B	0.77	C
	PM	C	0.94	D	1.00	D	1.00	D	1.05	E
Coronation Drive/Boomerang (Hale Street)/Hale Street Link	AM	B	1.30	F	0.95	D	1.51	F	1.21	F
	PM	D	1.38	F	0.16	F	1.52	F	1.32	F
Coronation Drive/Sylvan Road	AM	B	0.66	B	1.00	E	0.63	A	0.95	D
	PM	B	0.67	B	0.83	B	0.72	B	0.84	B
Coronation Drive/Lang Parade	AM	C	1.06	F	1.03	F	1.14	F	1.06	F
	PM	C	1.07	F	0.92	C	1.10	F	0.92	C

Intersection	Peak	2007 LOS	2014				2026			
			Without NL		With NL		Without NL		With NL	
			Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS
Milton Road										
Milton Road/Cribb Street	AM	D	1.06	F	1.04	E	1.09	F	1.05	E
	PM	F	1.11	F	1.09	F	1.11	F	1.14	F
Milton Road/Park Road/Baroona Street	AM	F	1.07	F	1.05	F	1.07	F	1.08	F
	PM	D	0.99	D	0.89	C	1.01	E	0.94	D
Milton Road/Croydon Street	AM	C	0.94	D	0.88	D	1.02	E	0.92	D
	PM	D	1.00	E	0.96	E	0.99	E	1.07	F
Milton Road/Sylvan Road (Priority)	AM	n/a	0.52	n/a	0.57	n/a	0.52	n/a	0.56	n/a
	PM	n/a	0.97	n/a	0.81	n/a	1.02	n/a	0.84	n/a
Milton Road /Eagle Terrace	AM	C	0.95	D	0.84	C	0.99	E	0.90	C
	PM	D	0.95	D	0.92	C	1.02	E	1.03	C
Milton Road/Grimes Street	AM	A	0.82	B	0.73	B	0.82	B	0.74	A
	PM	C	0.96	D	0.99	E	0.99	D	0.99	D
Milton Road/Park Avenue	AM	A	0.90	B	0.82	A	0.91	B	0.84	A
	PM	A	0.85	A	0.77	A	0.85	A	0.78	A
Moggill Road										
Moggill Road/Western Freeway on Ramp	AM	A	0.58	A	0.61	A	0.61	A	0.76	B
	PM	C	0.77	C	1.00	D	0.80	C	1.00	D
Moggill Road/Western Freeway off Ramp	AM	C	0.73	C	0.65	C	1.04	D	0.63	C
	PM	C	0.89	C	0.88	C	1.19	F	1.00	C
Moggill Road/Russell Terrace	AM	C	0.73	C	0.59	B	0.73	C	0.57	B
	PM	B	1.00	A	1.00	A	1.00	A	1.00	A
Moggill Road/High Street/Jephson Street	AM	C	1.01	F	1.00	D	1.06	F	1.00	D
	PM	C	1.00	D	1.00	E	1.00	D	1.00	E
Moggill Road/Station Road	AM	B	0.83	B	0.64	A	0.84	B	0.61	A
	PM	C	0.95	D	0.93	D	0.98	E	0.97	D
High Street										
High Street/Benson Street (Coronation Drive)	AM	C	0.88	C	0.76	C	0.93	C	0.77	C
	PM	D	0.89	D	0.83	C	0.91	D	0.83	C
Mt Coot-tha Roundabout										
Western Freeway/Mt Coot-tha Road	AM	A	1.21	E	0.78	B	2.52	F	0.80	A
	PM	B	1.21	E	0.73	A	2.02	F	0.76	B
Toowong Roundabout										
Frederick Street/Milton Road/Miskin Street	AM	F	0.78	E	0.86[1]	B	0.79	C	0.86[1]	B
	PM	E	1.14	D	0.87	B	1.09	D	0.91	B
Sylvan Road										
Sylvan Road/Bennett Street (Priority)	AM	n/a	1.31	n/a	1.32	n/a	1.57	n/a	1.30	n/a
	PM	n/a	2.69	n/a	1.28	n/a	4.27	n/a	1.52	n/a
Sylvan Road/Land Street	AM	C	0.78	C	0.44	C	1.00	C	0.54	C
	PM	C	0.52	C	0.36	C	0.51	C	0.41	C
Jephson Street										

Intersection	Peak	2007 LOS	2014				2026			
			Without NL		With NL		Without NL		With NL	
			Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS
Jephson Street/Sherwood Street	AM	C	0.95	E	0.98	E	1.03	F	1.08	F
	PM	D	0.97	E	1.14	F	1.19	F	1.39	F
Jephson Street/Lissner Street	AM	B	0.59	B	0.64	B	0.63	B	0.69	C
	PM	C	0.74	C	0.92	D	0.72	C	0.98	E
Jephson Street/Croydon Street	AM	D	3.27	F	0.80	C	3.56	F	0.83	C
	PM	D	1.19	F	0.95	C	1.41	F	0.95	D
Kelvin Grove Road										
Kelvin Grove Road/Herston Road	AM	B	0.66	B	0.68	B	0.65	B	0.68	B
	PM	C	0.82	C	0.84	C	0.81	C	0.83	C
Kelvin Grove Road/Lorimer Terrace	AM	B	0.77	C	0.77	C	0.89	C	0.85	C
	PM	D	0.87	D	0.87	D	0.91	D	0.99	F
Kelvin Grove Road/Prospect Terrace	AM	B	0.81	C	0.79	C	0.80	C	0.84	C
	PM	C	1.00	E	1.13	F	1.03	F	1.04	F
Kelvin Grove Road/Blamey Street [2]	AM	B	1.00	E	0.85	C	1.00	E	0.89	C
	PM	A	0.68	B	0.76	C	0.68	B	0.82	C
Kelvin Grove Road/Musk Avenue/Northern Link (with Project) [2]	AM	B	0.53	B	0.72	C	0.63	B	0.74	D
	PM	B	0.68	B	0.61	C	0.69	B	0.64	C
Kelvin Grove Road/Ithaca Street	AM	C	0.87	D	0.85	C	0.99	E	0.92	D
	PM	C	0.73	C	0.70	B	0.74	C	0.69	B
Normanby 5 Ways	AM	D	1.14	F	0.83	D	1.16	F	0.85	D
	PM	D	1.01	F	1.00	F	0.99	E	0.94	E
Sir Fred Schonell Drive										
Sir Fred Schonell Drive/Gailey Road	AM	B	0.89	C	0.90	C	0.96	C	0.99	C
	PM	D	1.05	D	1.07	E	1.09	F	1.11	E
Musgrave Road										
Musgrave Road/Hale Street Off Ramp	AM	B	0.57	B	0.73	B	0.58	B	0.72	B
	PM	C	0.63	C	0.64	B	0.62	C	0.74	B
Musgrave Road/Hale Street On Ramp	AM	A	0.97	C	1.00	D	1.00	C	1.02	D
	PM	A	1.16	F	1.07	E	1.13	F	1.11	F
Musgrave Road/Windsor Road	AM	C	1.03	F	0.94	D	1.04	F	0.98	E
	PM	F	1.01	E	1.00	E	1.00	E	1.00	E
Countess Street										
Countess Street/Secombe Street	AM	C	0.86	C	0.84	C	0.87	C	0.83	C
	PM	B	0.49	B	0.50	B	0.52	B	0.52	B
Countess Street/Upper Roma Street	AM	C	1.00	C	1.00	D	1.00	D	1.07	F
	PM	F	1.31	F	1.28	F	1.21	F	1.13	F
Spring Hill										

Intersection	Peak	2007 LOS	2014				2026			
			Without NL		With NL		Without NL		With NL	
			Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS	Max DOS (X)	LOS
College Road/Gregory Terrace	AM	B	0.69	B	0.65	B	0.77	C	0.83	C
	PM	C	0.67	C	0.70	C	0.66	C	0.71	C
Wickham Terrace/ Leichhardt Street	AM	B	1.00	B	1.00	C	1.00	B	1.00	B
	PM	B	0.47	B	0.48	B	0.71	C	0.53	B
Leichhardt Street/Upper Edward Street	AM	D	0.87	D	0.81	D	0.88	D	0.89	D
	PM	B	1.00	B	1.00	B	1.00	B	1.00	B

Table Notes:
Level of Service (LoS),
Degree of Saturation (DOS X)
(1) – Does not include morning peak period traffic light on Miskin Street approach.
(2) – It is noted that strategic traffic modelling was undertaken for an initial concept displayed in the EIS consultation that truncated Victoria Park Road. Supplementary modelling was undertaken for the final EIS concept design that mains the existing left in and left out access at Victoria Park Road. Intersection volumes for this supplementary model runs have been used for SIDRA analysis.

The Milton Road/Croydon Street/Morley Street intersection (with upgrading to cater for increased Project traffic) would have a marginally improved LOS for all years with the Project, except the PM peak period in 2026 with the Project, where a decline is forecast. This intersection would however be accommodating a more direct, safer right turn from the western approach on Milton Road into Croydon Street for general traffic, replacing the current problematic routing of this traffic via Sylvan Road that occurs immediately upon exit from the roundabout.

In the Kelvin Grove Road corridor intersection performance is similar to the without Project scenario with the exception of the intersections with Blamey Street and Musk Avenue/Northern Link. These two intersections are both upgraded as part of the Project and the degree of saturation in 2026 during the peak periods does not exceed 0.90. It is noted that the Normanby Five-Ways intersection is forecast to experience an improvement in its operation due to the re-routing of cross-city traffic away from this part of the CBD access network to use Northern Link for travel between the Kelvin Grove Road corridor and western suburbs.

Many of the intersections in **Table 5-41** are forecast to be congested in the future without the Project, and in peak periods to have a high proportion of use associated with commuter traffic. As Brisbane grows, peak spreading will become more of an influence in the management of intersection throughput on these commuter routes.

5.6.8 Travel Time Benefits

An assessment of the effect of the Project on travel times has been undertaken by comparing estimates of peak period travel times without the Project to travel times, both on surface road routes and via Northern Link itself, once the Project is operational. Improvements in travel time forecast in the strategic model generally result from lower congestion levels, and reflect a more stable road network in terms of journey time variability. Associated with any forecast reductions in travel times there would also be reliability improvements in travel time provided by the Project.

Estimated travel times for key routes during peak periods without and with Northern Link have been extracted from the strategic model. **Table 5-42** provides a summary of forecast travel times for regional and cross city routes. **Table 5-43** summaries forecast travel times for central city and inner west trips. The travel time routes are displayed in **Figure 5-47**. These routes have been selected to show key travel movements within the study area and the greater metropolitan area such as:

- cross-city travel (Route C: Toowong to Newmarket, Route E: Indooroopilly to Chermside);
- regional cross-city trips to the ATC/Airport from the Western Corridor (Route D) and Toowong (Route F); and
- central city travel (Route B: Chapel Hill to Spring Hill).

Cross City routes such as Centenary Bridge to the ICB Land Bridge (Route A) and Toowong to Newmarket (Route C) have been analysed and show trip savings of greater then 50% in the morning peak when using Northern Link and average of 48% saving in the evening peak. The is equivalent to trip savings of greater then 10 minutes in the morning and 8 minutes in the evening peak. Similar trips using the surface network of Coronation Drive and Milton Road also gain benefits from the project to a lesser degree.

The forecast travel time benefit for regional and ATC/Airport related travel using Northern Link (Routes D, E and F) is significant with Indooroopilly to Chermside (Route E) routes showing 53% savings in the morning peak and 54% in the evening peak. This is a forecast saving of 22 minutes and 24 minutes respectively. Large benefits are also seen for airports trips from both the western corridor (Route D) and trips originating in the study area (Route F). For Route D savings of 23% in the morning or 16 minutes in 2026 would be expected with a 25% or 18 minute saving in the evening. Toowong to the Airport (Route F) in 2026 would be on average 50% quicker with savings in the morning peak of around 13-14 minutes compared to either Coronation Drive or Milton Road. Regional trips choosing to use the surface network with the project in place would also receive benefits to travel time, though to a lesser extent.

When viewing these results it should be noted that the routes from Toowong to the Airport via Northern Link (Route F) use the Airport Link facility. The surface routes that have been analysed for both the with and without project scenarios are completely toll free routes and access the Airport via Kingsford Smith Drive and do not use Airport Link.

Central City trips travelling on Northern Link to reach the city (Route B) would receive morning peak savings of around 61% compared to a surface route with the project, using Milton Road, of 36% and 16% on Coronation Drive. Evening peak travel times via the project would be reduced by 46% compared to the surface network. With the project in place time savings of 19% on Coronation Drive and 6% on Milton Road are also forecast to be experienced by trips that do not use the Northern Link.

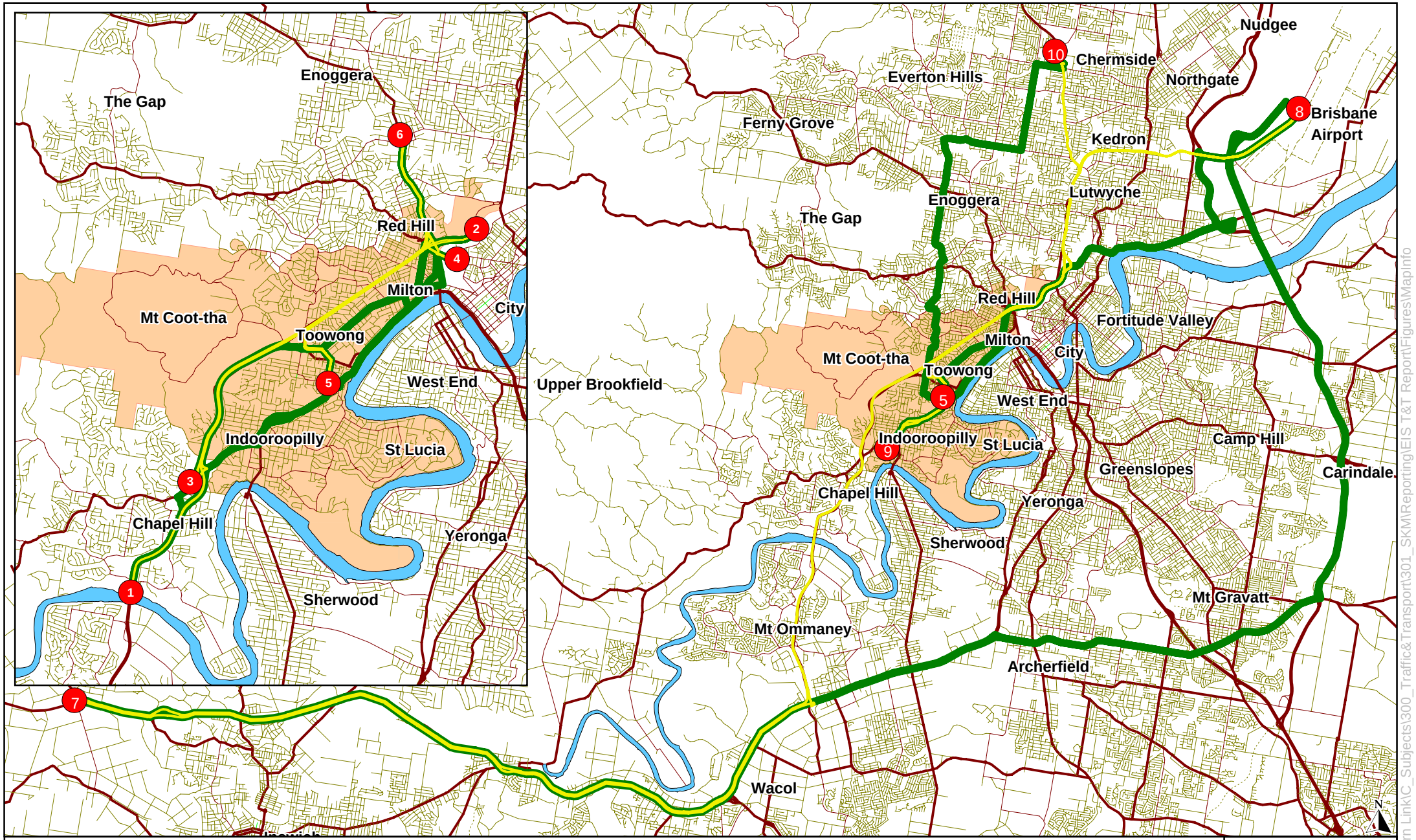
Figure 5-48 illustrates the forecast change in morning peak period travel times that would be experienced in 2026 for Northern Link users compared to the scenario without the project from Indooroopilly. This figure clearly illustrates the travel time benefits provided by the Northern Link for cross-city trips extend over a wide reach, and clearly improve the convenience of travel between the major growth area of the Western Corridor and western suburbs of Brisbane, and the regional road network to the north of Brisbane and the major growth area of the Australia Trade Coast.

- **Table 5-42 Effects of Airport Link on Travel Times and Speeds for Key Routes – Regional and ATC/Airport Travel**

Route (refer to Figure 5-47 for travel time routes)	Direction	Without NL		With NL				NL Time Benefits			
				On Surface		Via NL		On Surface		Via NL	
		(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(%)	(min)	(%)
AM Peak Hour											
2007											
D - Western Corridor to Airport	E/B – N/B	69	59	-	-	-	-	-	-	-	-
E - Indooroopilly to Chermside	E/B – N/B	34	35	-	-	-	-	-	-	-	-
F - Toowong to Airport - Milton Road	E/B – N/B	29	42	-	-	-	-	-	-	-	-
F - Toowong to Airport - Coronation Drive	E/B – N/B	30	40	-	-	-	-	-	-	-	-
2014											
D - Western Corridor to Airport	E/B – N/B	58	67	58	68	46	75	-0.4	-1%	-12	-20%
E - Indooroopilly to Chermside	E/B – N/B	35	33	33	35	20	53	-1.9	-5%	-15	-43%
F - Toowong to Airport - Milton Road	E/B – N/B	28	41	25	45	14	80	-2.4	-9%	-13	-49%
F - Toowong to Airport - Coronation Drive	E/B – N/B	29	40	27	42	14	80	-1.3	-5%	-14	-50%
2026											
D - Western Corridor to Airport	E/B – N/B	70	55	69	56	55	64	-1.3	-2%	-16	-23%
E - Indooroopilly to Chermside	E/B – N/B	42	28	34	35	20	52	-9	-20%	-22	-53%
F - Toowong to Airport - Milton Road	E/B – N/B	40	28	33	34	19	59	-6.9	-17%	-21	-52%
F - Toowong to Airport - Coronation Drive	E/B – N/B	38	30	35	32	19	59	-2.8	-7%	-19	-49%
PM Peak Hour											
2007											
D - Western Corridor to Airport	W/B – S/B	71	57	-	-	-	-	-	-	-	-
E - Indooroopilly to Chermside	W/B – S/B	34	34	-	-	-	-	-	-	-	-
F - Toowong to Airport - Milton Road	W/B – S/B	29	44	-	-	-	-	-	-	-	-
F - Toowong to Airport - Coronation Drive	W/B – S/B	30	43	-	-	-	-	-	-	-	-
2014											
D - Western Corridor to Airport	W/B – S/B	59	66	58	67	47	75	-0.4	-1%	-12	-20%
E - Indooroopilly to Chermside	W/B – S/B	37	32	35	33	20	51	-1.3	-4%	-17	-45%
F - Toowong to Airport - Milton Road	W/B – S/B	32	38	31	39	14	81	-1	-3%	-18	-56%
F - Toowong to Airport - Coronation Drive	W/B – S/B	34	35	34	35	14	81	0.1	0%	-20	-59%
2026											
D - Western Corridor to Airport	W/B – S/B	70	55	67	58	53	67	-3.8	-5%	-18	-25%
E - Indooroopilly to Chermside	W/B – S/B	44	26	36	32	21	51	-8	-18%	-24	-54%
F - Toowong to Airport - Milton Road	W/B – S/B	34	36	34	36	14	81	0	0%	-20	-58%
F - Toowong to Airport - Coronation Drive	W/B – S/B	39	31	37	33	14	81	-2.2	-6%	-25	-64%

Table 5-43 Effects of Airport Link on Travel Times and Speeds for Key Routes – Central City and Inner West Travel

Route (refer to Figure 5-47 for travel time routes)	Direction	Without NL				With NL						NL time Benefit					
		via Coronation Drive		via Milton Road		Coronation Drive		Milton Road		via Northern Link		via Coronation Drive		via Milton Road		via Northern Link	
		(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(km/h)	(min)	(%)	(min)	(%)	(min)	(%)
AM Peak Hour																	
2007																	
A - Centenary Br. to Land Br.	E/B – N/B	21	34	20	38												
B - Chapel Hill to Spring Hill	E/B – N/B	19	27	18	30												
C - Toowong to Newmarket	E/B – N/B	14	28	14	30												
2014																	
A - Centenary Br. to Land Br.	E/B – N/B	24	30	23	33	23	32	19	39	12	62	-1	-5%	-4	-17%	-12	-50%
B - Chapel Hill to Spring Hill	E/B – N/B	21	24	20	26	19	27	16	34	10	54	-2	-10%	-5	-24%	-11	-51%
C - Toowong to Newmarket	E/B – N/B	16	25	16	26	15	27	13	32	9	50	-1	-9%	-3	-17%	-7	-43%
2026																	
A - Centenary Br. to Land Br.	E/B – N/B	26	27	28	27	22	32	19	41	9	79	-4	-16%	-9	-33%	-17	-66%
B - Chapel Hill to Spring Hill	E/B – N/B	24	21	26	20	20	25	16	32	9	57	-4	-16%	-9	-36%	-15	-61%
C - Toowong to Newmarket	E/B – N/B	18	22	21	20	16	25	14	29	9	50	-3	-14%	-7	-32%	-10	-52%
PM Peak Hour																	
2007																	
A - Centenary Br. to Land Br.	W/B – S/B	20	36	18	42												
B - Chapel Hill to Spring Hill	W/B – S/B	19	27	17	31												
C - Toowong to Newmarket	W/B – S/B	16	27	15	28												
2014																	
A - Centenary Br. to Land Br.	W/B – S/B	24	31	20	37	24	31	20	38	11	63	0.1	0.4%	-0.5	-3%	-9	-43%
B - Chapel Hill to Spring Hill	W/B – S/B	22	23	20	28	22	23	19	29	11	48	-0.2	-0.9%	-0.6	-3%	-8	-42%
C - Toowong to Newmarket	W/B – S/B	19	23	16	26	19	23	15	28	9	50	-0.2	-1.1%	-1.3	-8%	-8	-47%
2026																	
A - Centenary Br. to Land Br.	W/B – S/B	28	26	20	38	23	31	19	39	10	70	-5	-16%	-0.4	-2%	-9	-48%
B - Chapel Hill to Spring Hill	W/B – S/B	28	18	21	26	23	22	20	28	11	49	-5	-19%	-1.2	-6%	-10	-46%
C - Toowong to Newmarket	W/B – S/B	23	19	17	25	19	22	16	27	9	48	-3	-14%	-0.9	-5%	-8	-46%



LEGEND

- Inner West Transport Study Area
- Travel Time Route via Northern Link
- Travel Time Route via Surface Route
- State Strategic and Regional Roads
- Other Roads

- 1 2 Route A: Centenary Highway to Inner City Bypass Landbridge
- 3 4 Route B: Chapel Hill to Sping Hill
- 5 6 Route C: Toowong to Newmarket
- 7 8 Route D: Western Corridor to ATC/Airport
- 9 10 Route E: Indooroopilly to Chermside
- 5 8 Route F: Toowong to Airport/ATC

Northern Link
Environmental Impact Statement

Figure 5-47

Travel Time Comparison Routes

Northern Link

SKM Connell Wagner JOINT VENTURE

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Indicative Travel Time from Indooroopilly without Northern Link (2026 AM Peak)

Indicative Travel Time from Indooroopilly with Northern Link (2026 AM Peak)

LEGEND

- Travel Time (mins) < 10
- 10 < Travel Time (mins) < 20
- 20 < Travel Time (mins) < 30
- 30 < Travel Time (mins) < 40
- 40 < Travel Time (mins) < 50
- 50 < Travel Time (mins)

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 5-48

Change in 2026 Morning Peak Travel Time From Indooroopilly with Northern Link

Northern Link

SKM Connell Wagner JOINT VENTURE

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5.6.9 Local Access Effects

The key local access effects have been considered in the following areas:

- Western connections:
  - Western Freeway precinct (the area west of Frederick Street and including the Mt Coot-tha Botanic Gardens, Anzac Park and the Toowong Cemetery);
  - Toowong north precinct (the area in Toowong north Milton Road and east of Frederick Street); and
  - Toowong south precinct (the area in Toowong south of Milton Road and east of Miskin Street.
- Eastern connection:
  - Inner City Bypass precinct;
  - Kelvin Grove precinct (west of Kelvin Grove Road); and
  - Kelvin Grove Urban Village (east of Kelvin Grove Road).

Western Freeway precinct

The Project would have an overall beneficial effect on local traffic access to the Western Freeway precinct. The existing arrangements from the eastern end of the Western Freeway at the Mt Coot-tha Roundabout to the Toowong Roundabout are proposed to remain. The existing access to the Mt Coot-tha Botanic Gardens, Anzac Park and the Toowong Cemetery through connections with Mt Coot-tha Road, Dean Street, Miskin Street and Frederick Street would not alter with the Project.

In addition the effects of reduced traffic volumes east of the Western Freeway ramps and on Mt Coot-tha Road would benefit local traffic operations and access in this precinct.

Toowong north precinct

The existing operation and local access from Frederick Street is proposed to remain unchanged with the exception of the left-in and left-out access from Valentine Street that would be closed. Gregory Street would also no longer have direct access with Milton Road. Convenient access to both Valentine Street and Gregory Street would be available via Morley Street.

The Project design would allow for local access from Morley Street to the eastbound Northern Link on ramp, which would be located on Milton Road, via a right turn movement at the signalised intersection of Morley Street and Milton Road.

Demand for use of Northern Link via Morley Street is forecast to be minimal and would be confined to only local precinct traffic. The demand for Northern Link use from the suburbs north of Milton Road (Auchenflower, Paddington, Bardon, Ashgrove) would also be minimal. Forecast traffic reductions on Latrobe Terrace and Given Terrace would provide for improved travel conditions via the surface network from these suburbs to destinations in the east such as the Central City, ICB, the Airport, and the regional road network to the north.

The properties on the northern kerb of Milton Road between Gregory Street and Morley Street and further eastwards on Milton Road through to Penrose Street would continue to be accessed through existing access points through left in and left out movements.

In summary, there are minimal effects of the Project on local traffic access in the Toowong precinct north of Milton Road. Where current access arrangements would be altered, suitable alternative arrangements have been incorporated into the Project design so that both Valentine Street and Gregory Terrace can be accessed from Milton Road via Morley Street. To mitigate against extraneous through traffic it is recommended that a LATM measure be implemented within the Toowong north precinct.

Toowong south precinct

Access to Miskin Street from the Toowong roundabout would not be altered with the Project.

Local access to the residential precinct to the south of Milton Road and east of Miskin Street, which includes the Toowong State School, would alter with the Project. The structures associated with the Toowong connecting ramps would require the removal of the existing priority right turn from Milton Road to Sylvan Road and the closure of the current access to Quinn Street from Milton Road. A right turn movement at the signalised intersection of Milton Road and Croydon Road would provide access to Sylvan Road. Access to Sylvan Road, west of Croydon Street, and Quinn Street would be completed through the right turn from Croydon Street to Sylvan Road. Alternatively, Sylvan Road and Quinn Street would be accessible from Ascog Terrace via Miskin Street. The removal of through traffic on Sylvan Road in the eastbound direction and the revised access arrangements would provide for safer traffic operations on this local road section of Sylvan Road for residential access, pedestrians and cyclists.

The proposed surface works on Croydon Street include a central median and the removal of the existing properties on the western kerb between Milton Road and Jephson Street. The central median would include a break at Cadell Street to facilitate right turn movements from Croydon Street. The right turn out of Cadell Street to Croydon Street would be prevented on safety grounds. Access to properties on the eastern kerb of Croydon Street and to Bayliss Street would be left in and left out only. Convenient access would remain to Bayliss Street via Park Avenue for trips from the north and south and from Cadell Street for trips from the west. As the right turn from Bayliss Street and Cadell Street would be banned trips to Milton Road and Frederick Street could be via Park Avenue or Sylvan Road. Trips to the Toowong north precinct, accessed at Morley Street, would be via Sylvan Road, St Osyth Road and Croydon Street.

The proposed surface works maintain the existing unnamed laneway between Croydon Street and St. Osyth Street for vehicular access to the rear of properties on Sylvan Road.

With the Project, significant changes are proposed to the signalised intersection of Croydon Street, Jephson Street and Sylvan Road. This would include the removal of the right turn from Jephson Street to Sylvan Road. Appropriate local access would be available for this movement via Lissner Street and Bennett Street. The removal of this right turn, traffic reduction and redistribution of trips due to the Project would result in trips originating from West Toowong using the regional road network (Miskin Street, Sherwood Road, Moggill Road and High Street) for trips to the east rather than local streets.

During peak traffic periods, on-street parking would not be possible on both sides of Croydon Street between Jephson Street and Milton Road. The proposed surface works on Croydon Street would result in the removal of all existing properties on the western side of Croydon Street and future re-development would need to ensure that suitable off-street parking provision was incorporated.

Although Croydon Street would experience significantly increased traffic flow with the Project the proposed surface works and intersection improvements would result in improved intersection operations (as reported in Section 5.6.7).

In summary, there would be moderate effects of the Project on local traffic access in the Toowong south precinct. However, suitable alternative access arrangements have been incorporated into the Project design to minimise adverse impacts.

ICB

The proposed connection of the Northern Link with the ICB would be located to the east of Kelvin Grove Road and maintains the existing connectivity of the ICB with Hale Street, Ithaca Street and Kelvin Grove Road.

Similarly, the existing connectivity of Hale Street with Musgrave Road and Kelvin Grove would remain unaltered.

The proposed connection of the Northern Link with the ICB would be located to the east of Kelvin Grove Road and would maintain the existing connectivity of the ICB with Hale Street, Ithaca Street, Victoria Park Road and Kelvin Grove Road. Similarly, the existing connectivity of Hale Street with Musgrave Road and Kelvin Grove would remain unaltered. The effect of the Project on local access would be minimal.

Kelvin Grove precinct

On the western side of Kelvin Grove Road between the ICB and Victoria Street the proposed local access changes that would be required to facilitate the Northern Link connection with Kelvin Grove Road are summarised in **Table 5-44** along with an assessment of the effect of the proposed change.

Table 5-44 Proposed local access changes in the Kelvin Grove precinct

Street	Current access	Proposed access	Alternative Route	Effect
Lower Clifton Terrace	One way north bound - left in from Musgrave Road and left out to Kelvin Grove Road	Two way street and closed at Kelvin Grove Road. Left in and left out with Musgrave Road	Trips to Kelvin Grove Road via left out to Musgrave Road and left turn at signalised intersection from Musgrave Road to Kelvin Grove Road.	Marginally increased travel time for low number of people for trips to Kelvin Grove Road Reduced traffic volume.
Upper Clifton Terrace	All movements with Musgrave Road. No access to Kelvin Grove Road	No change	No change	No change
Westbury Street	Left in from Kelvin Grove Road and left and right to Victoria Street for access to Kelvin Grove Road (left out) and Windsor Road and Musgrave Road	Access with Kelvin Grove Road closed	Access to Kelvin Grove Road via Victoria Street and Windsor Road or Prospect Terrace.	Marginally increased travel time for low number of people for trips to Kelvin Grove Road
Victoria Street	Left in and left out with Kelvin Grove Road and all movements with Windsor Road and other local streets in the network for access to Musgrave Road and Prospect Terrace.	Access with Kelvin Grove Road closed	Access to Kelvin Grove Road via Victoria Street and Windsor Road or Prospect Terrace.	Marginally increased travel time for low number of people for trips to Kelvin Grove Road. Reduced traffic volume.
Prospect Terrace	All movements at Kelvin Grove Road (signalised intersection)	Currently it is not possible to access Musgrave Road from the ICB (westbound). The route of ICB – Ithaca Street, Kelvin Grove Road, Victoria Street is currently used as an alternative.	Musgrave Road accessed from ICB (westbound) via Ithaca Street, Kelvin Grove Road, Prospect Terrace.	Increased travel time. Increased traffic volume.

The proposed Northern Link connection with Kelvin Grove Road provides for additional road capacity at the signalised intersections of Kelvin Grove Road with Musk Avenue and Blamey Street. This would result in

marginally increased journey times of just over 10% (approximately 30 seconds) in 2026 (compared to the without Project scenario) from the Ithaca Street off ramp of the ICB to the intersection of Windsor Road and Prospect Terrace during the morning peak period and just over 15% (over 30 seconds) during the evening peak period.

The proposals would also result in reduced traffic volumes on the local streets within this precinct, for example on Lower Clifton Terrace and Victoria Street.

In summary, the proposed changes to the local road network adjacent to Kelvin Grove Road that have been presented above would result in marginally increased journey times and reduced traffic volumes on the local streets within the precinct to the west of Kelvin Grove Road.

Hospitals

Hospitals within or close to the study area include the Wesley Hospital in Auchenflower, Toowong Private Hospital and the Royal Brisbane Hospital in Herston.

The Project would not affect access arrangements to the Wesley Hospital in Auchenflower or the Toowong Private Hospital, which is located on the southern kerb of Milton Road between Park Avenue and Croydon Street. The Toowong Private Hospital would continue to be accessed from both Milton Road and Cadell Street. Reduction in traffic volumes are forecast on Milton Road, Coronation Drive and local streets within the vicinity of these hospitals would however improve travel times for both routine and emergency access. Overall regional accessibility to these facilities would be improved, with significant travel time benefits for travel to these hospitals via Northern Link from suburbs to the east and north.

Similarly, the Project would not affect access to the Royal Brisbane Hospital in Herston. Northern Link tunnel would provide significant travel time savings for trips from the west to the Royal Brisbane Hospital for ambulance and emergency trips.

Emergency Services Vehicles

The Project would not alter existing access to Police Stations, Queensland Fire and Rescue Service stations or ambulance stations that are located within or close to the Inner West Transport Study Area. Forecast traffic reductions within the study area on regional roads and local streets would reduce response times, and emergency vehicles would also experience the travel time benefits from direct use of the Project.

5.6.10 Rail Services and Infrastructure

The Project would not have an effect on rail services or access to QR infrastructure.

5.6.11 Bus Travel Effects

Effects on bus travel due to the Project would include:

- changes in travel time and travel time reliability due to changed traffic conditions or traffic volumes on the road network;
- potential for bus services to utilise Northern Link when operational; and
- changes to the location of bus stops.

Corridor Effects

An assessment of peak hour travel times along major bus routes on the surface road system with the Project has been undertaken. The major bus corridors are Milton Road, Coronation Drive, Moggill Road, Kelvin Grove Road and Musgrave Road. These travel time comparison routes are shown in **Figure 5-49**. The estimated

change in overall traffic volumes, the change in travel speed in the peak direction, and the forecast bus use for key routes during peak periods have been extracted from the strategic model and are summarised in **Table 5-45**.

Key findings from the assessment are listed below.

- Coronation Drive is the highest utilised corridor for bus services in the Inner West Transport Study Area. The Project is forecast to yield travel time savings of over 3 minutes in the morning peak period and 2.5 minutes in the evening peak period for commuter trip to the CBD along Coronation Drive compared to the scenario without the Northern Link. An overall speed improvement of around 25% in the peak periods is forecast for Coronation Drive in 2026 compared to the scenario without Northern Link, and this would improve travel time reliability for bus passengers.
- For the counter commuter peak direction on Coronation Drive (for example outbound in the morning peak) the forecast traffic reductions would lead to travel time reductions for bus passengers travelling to the University of Queensland.
- Milton Road would also experience reductions in traffic volumes that would lead to increased travel speeds for all vehicles including buses. Improvement in bus travel speeds of over 30% in the morning peak direction and 20% in the evening peak direction are forecast for 2026 compared to the scenario without the Project.
- Traffic on the Western Freeway approach to the Project is forecast to increase. Bus services that use the Western Freeway are predominantly rocket services that also use Milton Road to access the CBD. **Table 5-45** shows that the effect of the traffic reductions on Milton Road would provide an overall benefit for CBD destined bus services, while still taking into account the effects of increased traffic on the Western Freeway.
- Marginal travel time savings are forecast for bus services that use Moggill Road corridor between the Western Freeway and Benson Street in Toowong.
- At the eastern connection of the Project on Kelvin Grove Road increases in traffic volume are forecast with the effect on peak period bus services limited to a 15% increase in travel time for the peak direction between Newmarket Road and Ithaca Street. Marginal travel improvements are forecast for the component of a CBD based bus trip between Ithaca Street and Roma Street that would reduce the impact of the travel time increases.
- Northern Link would not affect the access route for buses to and from the Inner Northern Busway at Normanby.
- On Musgrave Road minimal changes in traffic volume and travel time are forecast so the forecast effect of Northern Link on bus services that use Musgrave Road is minimal.
- The Project includes retention of the existing left in and left out access of Victoria Park Road with the ICB. Consequently, there would be no changes to the route of the QUT Kelvin Grove Campus – Gardens Point Campus shuttle bus.

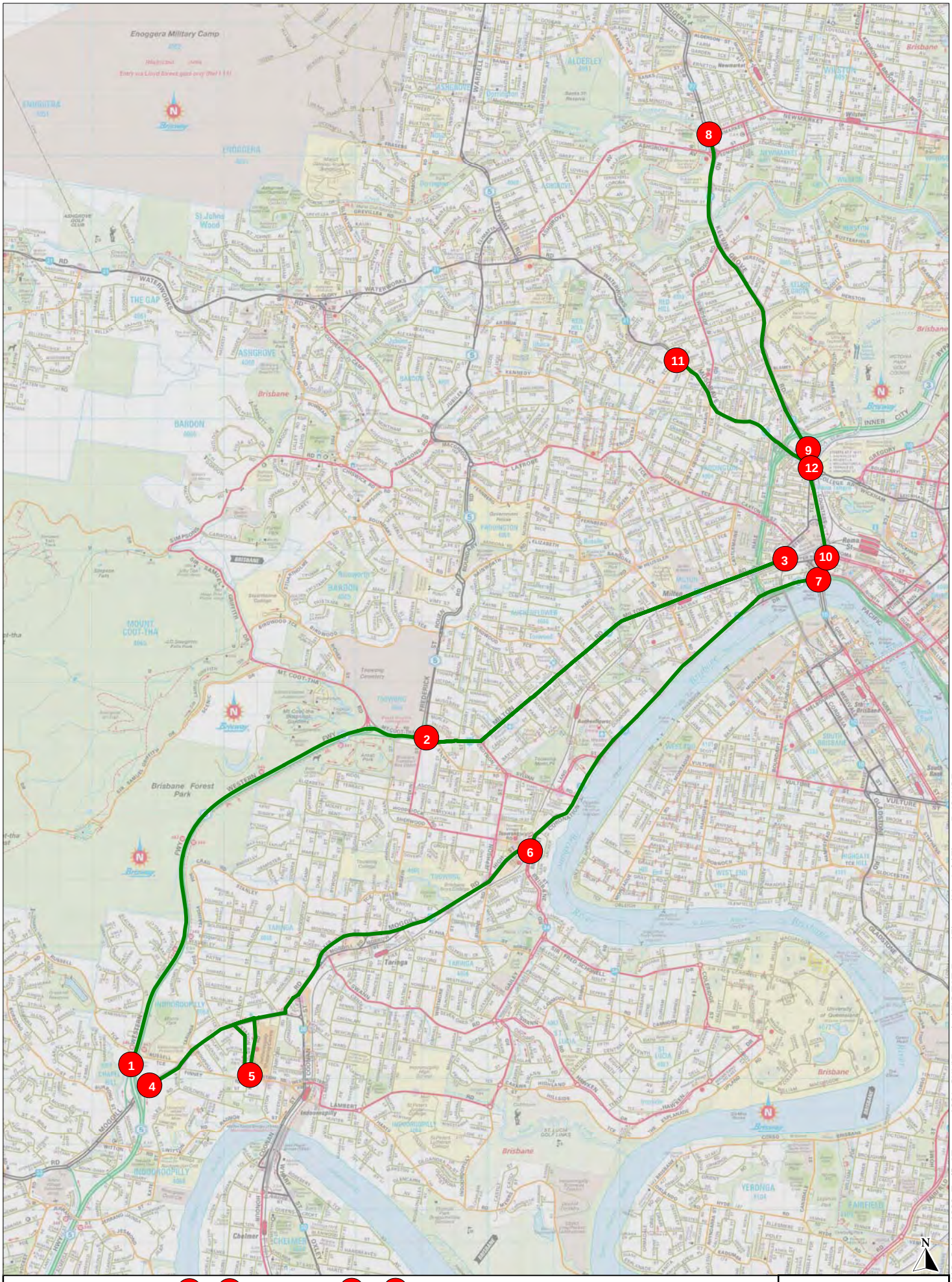
Table 5-45 Effect of Northern Link on Bus Routes in 2026

Travel Time Route	Route	Start of Route	End of route	AM Peak Hour Inbound				PM Peak Hour Outbound			
				Bus Volume (veh)	% Change Total Traffic	Improvement in Bus Route Travel Speed[1]		Bus Volume (veh)	% Change Total Traffic	Improvement in Bus Route Travel Speed[1]	
						km/h	%			km/h	%
A	Western Freeway and Milton Road	Western Freeway at Moggill Road Ramps	Milton Road at Petrie Terrace	84	-5%	9	28%	104	-2%	3	9%
K	Milton Road	Frederick Street	Petrie Terrace	84	-5%	10	33%		-2%	5	21%
D	Moggill Road	Western Freeway Ramps	Indooroopilly Westfield	131	-24%	1	4%	135	5%	0	0%
E	Moggill Road	Indooroopilly Westfield	Benson Street	142	-24%	2	7%	117	5%	-1	-2%
F	Coronation Drive	High Street	William Jolly Bridge	208	-26%	6	27%	200	-25%	5	23%
H	Kelvin Grove Road	Newmarket Road	Ithaca Street	141	52%	-4	-15%	116	14%	-4	-15%
I	Countess Street	Ithaca Street	Roma Street	186	-4%	2	9%	177	-1%	1	9%
J	Musgrave Road	Enoggera Terrace	Normanby 5 Ways	94	4%	1	5%	111	5%	0	-1%
Routes to UQ in Counter Peak Direction											
F	Coronation Drive	William Jolly Bridge	High Street	200	-15%	6	18%	208	-15%	8	31%
G	Sir Fred Schonell Drive	Benson Street/High Street	Coldridge Road Roundabout	86	2%	0	0%	91	2%	1	3%

Table Notes:

Source –Northern Link Traffic Model

(1) Improvement is compared to the without Project scenario.



LEGEND

- 9–10 Route I
- 11–12 Route J
- Travel Time Route
- 1–2 Route A
- 2–3 Route K
- 4–5 Route D
- 5–6 Route E
- 6–7 Route F
- 8–9 Route H

NORTHERN LINK
ENVIRONMENTAL IMPACT STATEMENT

Figure 5-49

Bus Travel Time Routes

Northern Link

SKM Connell Wagner JOINT VENTURE

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Bus Use of Northern Link

The Project creates the opportunity for Rocket bus services from the western suburbs to use Northern Link as an express route from the Western Freeway to access the Inner Northern Busway via Kelvin Grove Road and Ithaca Street to access the Busway Stations in the CBD. Queensland Transport provided advice to the project team regarding the likely bus services that could be diverted to Northern Link and this is shown in **Table 5-46**. Queensland Transport advised that they would not be likely to divert bus services that accessed Indooroopilly and Toowong to Northern Link, as the route to the CBD would be indirect and result in additional bus kilometres.

Table 5-46 Possible Bus Service Diversion to Northern Link

Service	Description	Service Type	Weekday Peak Direction Bus Trips	
			2016	2026
426	Chapel Hill - CBD via Western Freeway, Northern Link and INB	Rocket	11	17
431	Kenmore South - CBD via Western Freeway, Northern Link and INB	Rocket	10	14
436	Brookfield - CBD via Western Freeway, Northern Link and INB	Rocket	2	2
446	Figtree Pocket - CBD via Western Freeway, Northern Link and INB	Rocket	6	9
455	River Hills - CBD via Western Freeway, Northern Link and INB	Rocket	24	24
456	Mt Ommaney - CBD via Western Freeway, Northern Link and INB	Rocket	6	9
461	Forest Lake - CBD via Western Freeway, Northern Link and INB	Rocket	11	17
	Total		**64**	**92**

Table Notes:

(1) Source – Queensland Transport
(2) Stopping pattern for all services - all existing suburban bus stops, then non-stop between Western Freeway and Normanby busway station. Stops at Roma St busway station and QSBS (platform B)
(3) All services connect with the Northern Link at the Western Freeway and at Kelvin Grove Road.
(4) All services connect with the Inner Northern Busway at Normanby via Ithaca Street and Kelvin Grove Road

Key findings from the BSTM mode choice model assessment of diverting these bus services to Northern Link for 2026 are listed below:

- Queensland Transport has identified that approximately 64 planned peak period Rocket bus services each morning and evening could be re-routed travel via Northern Link in 2014 increasing to 92 services by 2026;
- commuters using these buses travelling via Northern Link would benefit from daily savings in 2026 of 11 to 12 minutes each way (ie: 23 minutes per day);

- patronage modelling indicates approximately 6,600 patrons would use these services daily by 2026. Many of these trips (5,500) would transfer from other bus services (principally using Milton Road and Coronation Drive) with some diversion of passengers from rail services to the bus services using Northern Link;
- there would be a small increase on public transport trips overall, and a minor reduction in forecast private vehicle trips using Northern Link (<1%); and
- A small increase (600 public transport trips per day) in the Brisbane Metropolitan area would occur due to modal shift from private vehicle to public transport.

Bus Infrastructure

A total of seven bus stops would be affected by the Project when it is operational. Bus stops affected by the Project are shown in **Figure 5-50**.

Western Connection

On Milton Road, between Frederick Street and Croydon Street, three bus stops would be affected. On the northern kerb (inbound direction) of Milton Road to the west of Gregory Street the existing bus stop would be relocated to a site approximately 50 m to the west so that is would be opposite Sylvan Road. Due to the availability of acquired land at this location, a replacement indented bus bay would be provided.

On the southern kerb (outbound direction) of Milton Road the existing bus stop to the immediate east of Sylvan Road would be relocated to the entrance of Sylvan Road. This location allows for an indented bus bay, an enlarged pedestrian waiting area with good pedestrian connectivity with Sylvan Road. The existing bus stop that is located to the west of Croydon Street would be permanently removed in order to allow the construction of the Northern Link on ramp from Milton Road and Croydon Street. A replacement is not planned due to the proximity and convenience offered via the new bus stop at Sylvan Road.

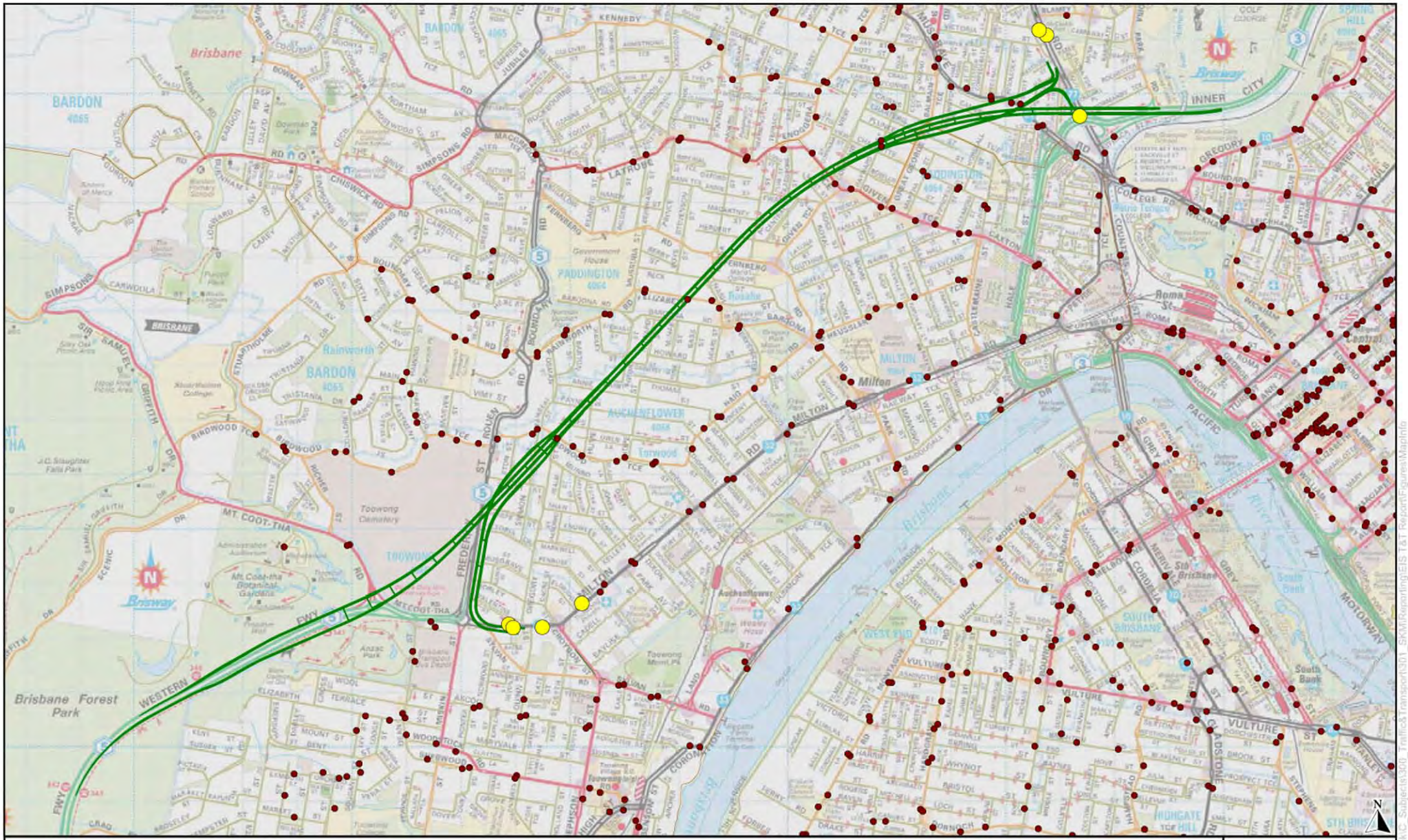
These changes would affect services 426, 431, 436, 446, 455, 456, 461 and 470 at these bus stops.

Eastern Connection

On Kelvin Grove Road, in the southbound direction, the existing indented bus bay to the immediate south of Blamey Street would be relocated marginally west into McCaskie Park due to proposed widening of Kelvin Grove Road at this location. The bus bay would continue to be indented. The bus stop that serves the northbound direction that is located south of Blamey Street would be relocated approximately 50m south so that it is closer to Victoria Street. It would have an indented bus bay.

In the northbound direction on Kelvin Grove Road the existing indented bus stop that is located under the ICB overbridge would be relocated approximately 50m south so that it would be closer to the Normanby Five-Ways intersection. It would continue to have an indented bus bay and could be served by bus services that access Kelvin Grove Road from both Ithaca Street and the Normanby Five-Ways intersection.

These changes would affect services 325, 344, 345, 351, 356, 357, 359, 360, 361, 364, 372 and 390 at these bus stops.



LEGEND

- Impacted Bus Infrastructure
- Existing Bus Infrastructure
- Inner West Transport Study Area
- Northern Link Alignment

Northern Link
Environmental Impact Statement

Figure 5-50

Project Impacts on Bus Infrastructure

Northern Link

SKM Connell Wagner
JOINT VENTURE

5.6.12 Active Transport

The potential effects of the Project on infrastructure for pedestrian and cycle movements are discussed below. Northern Link does not permit usage by pedestrians and cyclists. The main changes to the pedestrian and cycle network would occur around the tunnel portals and the connections of the tunnel ramps to the surface road network. The Project's design has ensured that connectivity would be maintained in those areas for pedestrians and cyclists. A description of the relevant changes to the local pedestrian and cycle accessibility that have been included in the Project design are detailed in the following sections.

Opportunities where the pedestrian and cycling connectivity of the existing or planned networks could be enhanced, within the inner west transport study area due to improvements in the amenity of such routes, have been identified and are described below.

Western Connection

The ramps that would connect the Western Freeway with the proposed Northern Link are in the vicinity of the Western Freeway bikeway and the Western Freeway Roundabout Cycle and Pedestrian Bridge that is currently being constructed by DMR. The works associated with Northern Link would result in re-alignment of the Western Freeway bikeway and the approaches to the Cycle and Pedestrian Bridge. The existing connectivity and function of the Western Freeway bikeway would be maintained as would the connectivity and functionality planned by DMR for the Cycle and Pedestrian Bridge.

The ability for pedestrians to cross at the signalised intersection of Milton Road/Croydon Street/Morley Street would be maintained through the provision of pedestrian crossings on three of the four approaches. A pedestrian crossing would not be provided on the Milton Road western approach. Due to the width of Milton Road, a staged crossing of the eastern approach with a wide median island would be provided. The number of pedestrians using the existing pedestrian facility on the western approach is low (see section 5.2.7 and **Figure 5-19**) with a far greater number of pedestrian using the crossing on the eastern approach (which connects to the local shopping centre).

Pedestrian crossings of all approaches would be maintained at the Croydon Street/Jephson Street/Sylvan Road signalised intersection. Full pedestrian footpaths would be kept on both Croydon Street and Milton Road.

The on-road bike paths on Sylvan Road and its connectivity with the Western Freeway and the Bicentennial bikeway would be maintained. The on-road bike paths would be kept on the Sylvan Road approaches to the Croydon Street/Jephson Street/Sylvan Road signalised intersection. Improved amenity of these on-road bike paths would be experienced due to the traffic volume reductions that are forecast on both approaches of Sylvan Road to this intersection. (Refer to **Table 5-37** for forecast traffic volume reductions.)

Eastern Connection

The surface works associated with connecting the Northern Link to the ICB would not impact on the off-road bikeway adjacent to the southern side of the ICB or on the bikeway and pedestrian paths on the ICB landbridge. The off-road bikeway on the northern side of the ICB between Kelvin Grove Road and the ICB landbridge would be re-aligned. The existing connectivity and functionality would be maintained.

The connection of the Northern Link with Kelvin Grove Road has been designed such that all pedestrian connections would be maintained with appropriate accessibility for mobility impaired users. The pedestrian facilities would maintain the linkages between the Kelvin Grove Urban Village and the community and bus stops to the west of Kelvin Grove Road. Key features of the pedestrian facilities are listed below.

- The existing pedestrian footpaths on both sides of Kelvin Grove Road between College Road and Musk Avenue would be maintained. The footpath on the eastern side of Kelvin Grove Road between Musk Avenue and the on ramp to the ICB would be widened. The footpath on the western side between the

connecting loop from Hale Street and Musgrave Road would be re-aligned to suit proposed road surface works.

- The existing pedestrian underpass of the connecting loop from Hale Street and Musgrave Road to Kelvin Grove Road would be maintained and lengthened to suit the additional traffic lanes that would access the Northern Link. This would connect with the pedestrian footpath on the western side of Kelvin Grove Road, with the existing Kelvin Grove Road pedestrian overbridge that provides connectivity with the eastern and western sides of Kelvin Grove Road and with Lower Clifton Terrace via steps.
- New pedestrian footpaths would be provided on both sides of Lower Clifton Terrace so creating a good quality pedestrian connection between Kelvin Grove Road and Musgrave Road.
- Existing pedestrian crossing facilities of the signalised intersection of Kelvin Grove Road/Musk Avenue and Northern Link would be maintained. A pedestrian crossing would also be provided across the Northern Link approach to this intersection. Access from this intersection to Upper Clifton Terrace and the continuation of the footpath northwards on Kelvin Grove Road would be via steps or a switchback ramp that provide access to a pedestrian route over the tunnel portal. A pedestrian crossing would not be provided across the Northern Link north facing off-ramp to Kelvin Grove Road.
- Pedestrian footpaths would continue to be provided on both sides of Kelvin Grove Road between Musk Avenue and Blamey Street.
- At the signalised intersection of Kelvin Grove Road and Blamey Street pedestrian crossings would be provided on Blamey Street and the southern approach of Kelvin Grove Road. The existing crossing of Kelvin Grove Road is currently on the northern approach and it is proposed to relocate this crossing to the southern approach. This proposal would locate the pedestrian crossing closer to the bus stops that are located on both sides of Kelvin Grove Road to the south of Blamey Street.

Effect on Active Transport within the Inner West Transport Study Area

The Project would reduce traffic congestion on some regional radial roads in the study corridor, such as Milton Road and Coronation Drive; city distributors such as Caxton Street, Given Terrace and Latrobe Terrace and many local streets in Toowong, Milton, Red Hill and Rosalie. This would enable improved access within the study corridor, through improved movement of traffic, including for pedestrians and cyclists.

Roads that are either existing or planned principal cycle routes or are part of the BCC bikeway/Greenway network include Milton Road, Coronation Drive, High Street, Moggill Road, Frederick Street, Musgrave Road, Sylvan Road, Coonan Street and Sir Samuel Griffith Drive. **Section 5.2.7** of this EIS detailed the existing daily number of pedestrians that cross roads at key locations in Toowong, Milton and Kelvin Grove. Through significant traffic volume reductions that are generally forecast on these roads in the future with Northern Link compared with the scenario without Northern Link (refer **Table 5-37**) improvements to pedestrian and cycle facilities could be provided. Options to improve pedestrian and cycle connectivity could include:

- Provision of additional pedestrian crossing opportunities at existing signalised intersections by amending the intersection phasing.
- Increasing the available pedestrian crossing time at signalised traffic intersections.
- Widened pedestrian and cycle paths.
- Additional on-road cycle routes.

5.6.13 Road Safety Effects

Crash rates calculated for existing conditions have been used to determine the future number of accidents for 2014 and 2026, without and with the Project, based on estimates of vehicle kilometres of travel (VKT). No future major works are expected on any other route within the Inner West Transport Study Area so it is reasonable to adopt existing crash rates for assessment.

A crash rate of 0.18 crashes per 100 million VKT has been applied for the Northern Link ramps and main tunnel, similar to that applied in the assessment of similar recent tunnel projects in Brisbane, and based on historical data for the Sydney Harbour Tunnel.

Estimated crashes for 2014 and 2026 without and with the Project are shown for the key arterial routes within the Inner West Transport Study area and for the Northern Link in **Table 5-47**. Average annual accidents from the crash history have been included for comparative purposes.

Table 5-47 Estimated Crashes on Key Routes Without and With Northern Link

Arterial	Section	2007	2014				2026			
		Average Annual Crashes	Without Project	With Project	Difference	% Change	Without Project	With Project	Difference	% Change
Northern Link	All	-	-	11	11	-	-	15	15	-
Coronation Drive	All	51	58	52	-7	-11.2%	62	51	-11	-17.9%
Milton Road	All	38	46	41	-5	-10.3%	48	45	-3	-6.5%
Moggill Road	Western Freeway ramps to Toowong	25	28	23	-5	-16.8%	30	26	-4	-12.3%
Frederick Street	All	5	5	5	-0.2	-3.7%	5	5	-0.61	-11.3%
Rouen Road	All	5	5	5	-0.15	-2.8%	6	5	-1	-12.3%
Boundary Road	All	7	7	7	0.17	2.5%	7	7	-0.37	-5.3%
Sir Fred Schonell Drive	All	9	10	10	-0.16	-1.6%	10	11	0.25	2.4%
Coonan	Walter Taylor Bridge to Moggill Road	19	20	20	-0.37	-1.9%	20	20	0.08	0.4%
Western Freeway (1)	Moggill Road Ramps east for 2.75km	5	6	5	-1.0	-16.9%	7	6	-1.5	-20.8%
Western Freeway (1)	Mt Coot-tha Road roundabout west for 0.75km	4	4	6	2	27.1%	5	7	2	31.0%
Total		**178**	**190**	**183**	**-6**	**-3.4%**	**201**	**197**	**-4**	**-2.0%**

Table Note: Source: BCC 2006 (crash data), Northern Link Traffic Model (VKT, Distance)
(1) Crash rates analysed for individual sections of Western Freeway.

The table shows that with Northern Link operational:

- an overall reduction of forecast crashes on major routes in the inner west in 2014 and 2026 with Northern Link of 3.4% and 2.0% respectively;
- an overall reduction in forecast crashes on Coronation Drive (18%) and Milton Road (6.5%) in 2026;
- part of the MetRoad 5 north of the Toowong Roundabout up to and including Rouen Road experiences road safety benefits on average of 11%;
- the Western Freeway has been analysed in two sections, one located to the east of the Northern Link Western Freeway ramp connections, stretching 0.75km to the Mt Coot-tha Road Roundabout and the other for the 2.75km west to the Moggill Road off ramp. The majority of crashes on the Western Freeway have occurred in the eastern section. With the forecast decrease in traffic with the Project in place an overall reduction in crashes would be expected (21%) in the eastern section. To the west of the Northern Link ramps an increase in crashes (31%) in 2026 is forecast due to the increase in traffic volumes along this section of the Western Freeway, however the overall increase in the number of crashes would be small when the two segments are considered in combination; and
- it is noted that with Northern Link traffic relief forecast on a range of other regional routes south of the Brisbane River (such as Ipswich Road and Fairfield Road) that are heavily used by freight, and these locations would also benefit from crash reductions.

5.7 Construction Impacts

5.7.1 Introduction

Traffic and transport in the area of the Project may be affected by additional construction traffic generated by the Project, physical changes to transport networks, and disturbance of normal traffic flows resulting from construction traffic management measures. Such measures may include diversions, lane closures, temporary realignment of traffic lanes and temporary access arrangements to local streets and properties.

5.7.2 Construction Site Traffic Generation and Access

Work sites and Working Hours

The construction of the Reference Project would be organised around the surface connections and associated construction worksites identified in Chapter 4, Project Description, of the EIS.

Working hours for surface works would typically be between 6.30 am and 6.30 pm Monday to Saturday with no works expected to be carried out on Sundays and public holidays. In some cases, works on major roads may have to be carried out at other times, if the impacts of daytime works are considered unacceptable by the relevant approval agencies (relevant sections of Council, Main Roads and the Police). Such works should be identified in the detailed Construction Traffic Management Plans (CTMP). Underground works would continue 24 hours a day. Spoil haulage is proposed at any time of the day or night from 6.30am Monday until 6.30 pm Saturday, with no haulage on Saturday night or Sunday, and subject to approval conditions and any time limitations required to manage impacts on traffic, such as peak periods, or residential amenity.

Construction site access

Potential access arrangements during construction for each of the worksites have been identified on the indicative worksite layouts identified in Chapter 4, Project Description. These are further described below.

Western Freeway Access

Access to the Western Freeway worksite, adjacent to the northern or inbound tunnel, would be via a left in and left out diverge and merge lane with the Western Freeway. Suitable diverge and merge tapers would be

provided for safe access to and from the Western Freeway. The length of these tapers would be designed to suit deceleration and acceleration of loaded vehicles. Queuing capacity would be provided within the worksite to prevent vehicle queues from backing on to the Western Freeway.

A cross passage tunnel would be constructed between the worksite and the southern or outbound tunnel construction area to provide access for loaded vehicles to travel west from the worksite in order to avoid using the Mt Coot-tha Roundabout or the Toowong Roundabout.

Toowong Connection Access

The Toowong worksite access would be via a left in only entrance on the northern side of Milton Road heading east, and immediately east of the Toowong Roundabout. This entrance would include a left in taper in order to minimise disruption to other traffic on Milton Road. The exit from the worksite would be via a left out only movement to Frederick Street near the existing intersection of Valentine Street. A separate exit for site office vehicles only would be provided directly on to Milton Road opposite the Sylvan Road intersection. These access arrangements would avoid the need for spoil trucks and all other construction related traffic from using the local streets.

Kelvin Grove Connection Access

Access to the Kelvin Grove Road work site would be provided at the southern end of the worksite next to the one lane connection from Hale Street to Kelvin Grove Road. A truck stop bay with an appropriate length deceleration taper would be provided on Kelvin Grove Road in order to access this entry from Kelvin Grove Road heading north. Vehicle actuated traffic signals would be installed to provide a truck jump to allow trucks to enter the worksite across the Hale Street and Musgrave Road merge to Kelvin Grove Road.

The main exit out from the Kelvin Grove Road worksite would be a right turn onto Kelvin Grove Road through modification of the signalised intersection at Musk Avenue.

An auxiliary exit would be provided at the north of the worksite. This exit would not be used by spoil trucks or other large vehicles. This exit would allow entry to the service road feeding Victoria Street with access either onto Victoria Street or Kelvin Grove Road.

A new service road would be provided adjacent to the worksite to provide access to properties at the northern end of Upper Clifton Terrace and Westbury Street from the Victoria Street service road.

Traffic Generation

Workforce Transportation

It is anticipated that the workforce would consist of around 450 people working on-site over a 45 month construction period. An estimate of the division of the workforce during the daytime shift over the three work sites is shown in **Table 5-48**. The evening shift would be likely to involve a smaller workforce for tunnelling operations only.

Table 5-48 Construction Workforce

Site Location	Tunnel/Portals(1)	Surface(1)
Western Freeway	24	30
Toowong	24	30
Kelvin Grove	24	30
Project Management (various)	40	60

Table Note: (1) Based on FTEs from cost estimate

The major traffic flows would occur during shift changes, with low volumes of deliveries, visitors and maintenance workers throughout the day.

Spoil Haulage Traffic Generation

The haulage of excavated material has been described in Chapter 4, Project Description.

Impacts of spoil haulage on regional traffic flows are described below under that heading.

5.7.3 Local Traffic Impacts

The impact on traffic flow, journey times and public transport due to worksite activities would be minimal as the following strategies have been incorporated:

- Construction staging has been developed following the strategy that the current number of traffic lanes and connectivity with other roads should not be reduced during the construction phase.
- Access to the worksites would be via diverge and merge tapers of length to suit the deceleration and acceleration of loaded vehicles.
- Queuing capacity would be provided within the worksites so that vehicles would not queue on the road network.
- The number of haulage vehicles that would be generated during the construction phase would be minimal (as illustrated in **section 5.7.4**).

The CTMPs would be designed to provide sufficient capacity on the major traffic routes at all times, reducing the desire for drivers to seek alternative routes. The road network surrounding the work sites would generally not provide convenient alternative routes via local streets for both cross-city and radial trips.

Traffic Operations

Western Freeway Connection Local Traffic Arrangements

Construction of the west facing Northern Link entry and exit ramps on either side of the Western Freeway works would not generally require closure, re-alignment or diversion of the Western Freeway traffic lanes. Any lanes closures that maybe required would be carried out during off-peak periods such as night time.

At the Mt Coot-tha Roundabout construction of cut and cover tunnels would require the temporary re-alignment of traffic lanes during the staged construction process. It is proposed that the construction of the cut and cover tunnels would start in August 2010 and be completed by November 2011 and would be carried out in four stages. The existing number of traffic lanes and connectivity would be maintained with the exception of the free flow slip through the Mt Coot-tha Roundabout from the north to the east. This would be closed for a period of time during stage 1 construction. A short left turn pocket on the approach to the roundabout would be provided which is not expected to have an impact on the capacity of the Western Freeway.

Access to and from the worksite would be via diverge and merge tapers of suitable length and queuing of construction vehicles would not occur on the Western Freeway.

These measures would result in a minimal impact during the construction phase on traffic flow and journey times on the Western Freeway and Mt. Coot-tha Road.

Western connection works would not affect access to the Mt Coot-tha Botanic Gardens or any other property and they would not affect the operation of the Toowong Roundabout at Frederick Street.

Toowong Connection Local Traffic Arrangements

The preliminary construction staging would involve activity at the Toowong worksite from July 2010 until March 2012. Works would be contained within the work site and would be predominantly associated with tunnelling activities and would not require re-alignment or diversion of traffic lanes on Frederick Street and

Milton Road. The establishment of the work site would require the closure of Valentine Street at Frederick Street. This closure would be permanent and alternative and convenient access would be possible via Gregory Street.

From March 2012 work associated with transition structures, elevated structures and road widening would take place on Milton Road. Construction works would be staged such that the existing capacity of Milton Road, Frederick Street, Croydon Street and the Toowong Roundabout would not be compromised. The existing number of traffic lanes would be maintained on these roads and the operation of the Toowong Roundabout would not be altered. The following turning movements would be altered.

- The right turn from Milton Road to Sylvan Road would be permanently closed during the early stages of these works and relocated to the signalised intersection of Milton Road and Croydon Street. The left out movement from Sylvan Road to Milton Road would be maintained.
- The left turn in and out movements of Gregory Street with Milton Road would be permanently closed during the early stages of these works with the alternative provided via Morley Street.
- The access to Quinn Street would be permanently closed during the early stages of works on Milton Road.

Surface works on Milton Road would be carried out after the cut and cover tunnels have been completed at the Mt Coot-tha Roundabout. This would limit construction activities to specific locations at the western connections of the project to separate times.

Access to and from the worksite would be via diverge and merge tapers of suitable length and queuing of delivery and haulage vehicles would occur within the Toowong connection worksite.

These measures would result in a minimal impact during the construction phase on traffic flow and journey times on the roads local to the Toowong connection worksite such as Milton Road, Frederick Street, Croydon Street and Morley Street.

Property access on Milton Road between Gregory Street and Morley Street would be maintained. Property access on the southern side of Milton Road would be maintained until such times as these properties, which would be acquired for the widening of Milton Road, are demolished.

Kelvin Grove Connection Traffic Arrangements

Construction activity at the Kelvin Grove Connection work site associated with tunnelling activities is proposed from August 2010 to October 2012. The connection of Lower Clifton Terrace with Kelvin Grove Road would be closed as part of the establishment of the work site in late 2009. This would create a cul-du-sac of an existing one-way road and would so require Lower Clifton Terrace to be converted to a two-way road with a left-out movement added to the intersection with Musgrave Road. This would result in a marginally increased travel time for a low number of people for trips to Kelvin Grove Road and the traffic flow on Lower Clifton Terrace would be reduced. This arrangement would be permanent when Northern Link is operational.

Establishment of the work site would also require Upper Clifton Terrace to be severed approximately 60m west from Kelvin Grove Road. This would require the three properties closest to Kelvin Grove Road to be accessed via a temporary road that would connect with Westbury Street. All other properties on Upper Clifton Terrace would continue to be accessed from Musgrave Road.

The intersection of Westbury Street, Kelvin Grove Road and the temporary access road to Upper Clifton Terrace would be realigned. Left-in and left-out access with Victoria Street and Kelvin Grove Road would be maintained. The impact of this local traffic arrangements during the construction phase would be minimal.

Surface works that would require realignment of traffic lanes would be carried out between October 2012 and October 2013. These works would be carried out in several stages so that the existing number of traffic lanes

and connectivity with the ICB, Hale Street, Musgrave Road, Ithaca Street (including the access to the INB), Musk Avenue and Blamey Street would be maintained. As the existing number of traffic lanes on these roads would not be reduced during the construction of Northern Link the capacity of these roads would not be compromised.

Access to and from the worksite would be via diverge and merge tapers of suitable length and queuing of delivery and haulage vehicles would occur within the Kelvin Grove connection worksite.

These measures would result in a minimal impact during the construction phase on traffic flow and journey times on the roads local to the Kelvin Grove connection worksite such as the ICB, Hale Street, Musgrave Road, Ithaca Street, Musk Avenue and Blamey Street.

ICB Connection Local Traffic Arrangements

The works at the ICB work area would be carried out in four stages so that the impact on the existing capacity and connectivity would be minimised. In the eastbound direction of the ICB three traffic lanes would be maintained between Kelvin Grove Road and Victoria Park Road. The left-in and left-out access to Victoria Park Road would be maintained throughout the construction of Northern Link. The ICB would reduce to two lane at Victoria Park Road and widen to three lanes to the east of the Inner Northern Busway overbridge.

In the westbound directions three traffic lanes would be maintained and as with the existing layout the outside lane would diverge and widen to two lanes as Ithaca Street. The capacity of Ithaca Street would not be affected by the preliminary construction design.

The ICB connection worksite would generally be serviced from the Kelvin Grove worksite such that delivery and haulage activities at the ICB connection worksite would be minimal.

These measures would result in a minimal impact during the construction phase on traffic flow and journey times on the ICB.

Trucks Queuing

Trucks entering the work sites should not create a queue that impacts on traffic flow on the road network. The critical time for truck queue space requirements would be at the start of a shift, when several trucks arrive early and queue to wait for their first load.

Each of the work sites would provide a significant length of access road within the site which would provide space for trucks to queue. All of the worksites have over 150 m of queuing space within the work site.

Construction Workforce Parking

The identified workforce is expected to generate a parking demand of approximately 350 vehicles. Shift changeovers for underground workers are expected to occur outside working hours for surface workers, providing ample parking for the short term double demand of the shift workers' vehicles. The majority of workforce car parking would not be provided at the worksite but at convenient sites close by from where the workforce would be taken to the work site by a shuttle bus.

At the western end of the Project suitable options for an off site car park have identified on Mt Coot-tha Road and Sir Samuel Griffith Drive. From the selected location the workforce would be taken to the Toowong and Western Freeway work site by shuttle bus. To access the work site the shuttle bus would enter the Western connection work site from the eastbound carriageway of the Western Freeway.

The eastern end of the Project would have a workforce car park located on Brisbane City Council parkland that is located between the ICB and Gilchrist Avenue. This car park would be accessed from Gilchrist Avenue. Shuttle buses would transport the workforce to both the Kelvin Grove Road work site and the ICB work area.

Each work site would also provide a small number of parking spaces for visitors and deliveries.

The off-site car parks would have sufficient capacity for the workforce to avoid parking on the local streets. The management of this would be the responsibility of the contractor and specified within their CTMP. On street car parking conditions should be monitored on the streets surrounding all work sites. If necessary, and following consultation with the community and Brisbane City Council, enforcement could be achieved by local area traffic plans or extending the Brisbane City Traffic Area around the Kelvin Grove worksite.

Workforce parking and associated management for surrounding residential or commercial areas, addressing issues such as safety, access and amenity, will need to be fully addressed in the CTMPs prepared by the construction contractor.

5.7.4 Regional Traffic Flow Impacts

Spoil Haulage

Although it is intended that a significant quantity of spoil would be transported to the Mt Coot-tha Quarry by a conveyor there would be a haulage operation that would require suitable routes and management. The likely traffic impacts would vary depending on the time of the day and the chosen route.

Preliminary investigation has identified potential haulage routes to designated spoil sites to the west and to the east of the Project (Chapter 4, Project Description). Many of the major roads on the haulage routes experience peak period congestion. Truck haulage mixed with peak hour traffic would create inefficiency for the trucks and may have unacceptable impacts on general traffic. Intersection operations along these routes would need to be analysed and consideration given to limiting haulage to off-peak periods. The relatively small number of trucks movements that would be generated is such that limiting haulage to off-peak periods would be feasible.

Western Freeway and Toowong Connection Spoil Haulage Routes

The haul routes associated with the Western and Toowong worksites would be likely to follow the Western Freeway, Centenary Highway, Ipswich Motorway and Swanbank Road to the potential spoil site at Swanbank, south of the Swanbank Power Station. This haulage route would be completely on regional roads that are currently utilised by heavy vehicles. Further, these roads do not have any active frontages. The haul route for the majority of spoil from the Toowong worksite would be to the Western Freeway worksite for transportation to the Mt Coot-tha Quarry by conveyor. Spoil trucks from the Toowong worksite would access directly onto Frederick Street and travel via the Western Freeway to the Moggill Road intersection and return along the Western Freeway to the Western connection work site via the eastbound carriageway. An indicative scenario has been based on an average of an approximate total of 6 trucks per hour from the Western and Toowong worksites. This scenario would generate a two-way total of over 100 haulage vehicles per day. This total would be a maximum total that would vary over time. Early in the construction sequence an average of 2-3 trucks per hour (a two way total of 90 haulage vehicles per day) would be generated for three months from July 2010. This would increase to the maximum (two-way total of 100 haulage vehicles per day) for 11 months and then substantially decrease to no more than one truck per hour (two-way total of six haulage vehicles per day), for a further 8 months when haulage is no longer required from the Western Connection worksite but continues at the Frederick Street worksite.

These totals are small and the maximum number of trucks generated would represent an increase in traffic of less than 1% along the haulage route and account for an increase in commercial vehicles of 5% or less. Consequently, the haulage traffic is not expected to adversely affect the performance of any of the roads on the haul route.

The effect of trucks on the Western Freeway could be reduced further through the possibility of using a cross passage tunnel to enable trucks to access the westbound direction of the Western Freeway directly from the worksite rather than using the Mt Coot-tha Roundabout as a turning location.

Additional haulage trucks from the Toowong worksite would take spoil to the Western Connection worksite. Spoil activity would commence in July 2010 and last for 19 months and would be equivalent to four trucks per hour (two-way total of just over 80 trucks a day). The additional volume would be small and consists of 0.2% of the total traffic on the Western Freeway. The proposed haulage route would be:

- Mt Coot-tha Road, Western Freeway, turn at Moggill Road interchange, Western Freeway to access the Western Connection worksite from the eastbound direction of the Western Freeway.

These measures are not expected to adversely impact on traffic flow and journey times on the Western Freeway and Toowong spoil haulage routes.

Kelvin Grove Spoil Haulage Routes

Spoil from the Kelvin Grove connection worksite would be taken to a soil placement site at Fisherman Islands at the Port of Brisbane. The route identified utilise regional roads that are already used by heavy vehicles (refer Chapter 4). This route would consist of Kelvin Grove Road to access the ICB and then Kingsford Smith Drive, the Gateway Motorway, the Port of Brisbane Motorway and Lytton Road to access the spoil placement sites at the Port of Brisbane.

The volume of haulage trucks expected is relatively low with a forecast of 3 trucks per hour each way, a daily two-way total of 108 truck trips.

The effects of this additional traffic on the haulage routes may include:

- the haulage vehicle volumes represent only a small increase (8%) in the background heavy vehicle traffic volume on Kelvin Grove Road, south of Musk Avenue, and an increase of less than 0.5% in total traffic; and
- the increase in total traffic on the ICB, Kingsford Smith Drive, Gateway Motorway, the Port of Brisbane Motorway and Lytton Road that would be due to haulage traffic is less than 0.5%. It is not expected that the haulage traffic would affect the performance of any of the roads on the haul routes.

These measures are not expected to adversely impact on traffic flow and journey times on the Kelvin Grove spoil haulage routes.

Material Deliveries

The delivery routes for materials would vary with the sources of materials and equipment, which are not known at this stage of the planning process. In general, truck numbers required for deliveries are expected to be lower than those required for spoil haulage. Therefore the effect of the deliveries would be expected to be relatively small, except at intersections which are already close to capacity and significantly congested. At these locations, deliveries in peak periods may have to be avoided. This issue would be investigated in detail during the preparation of the CTMPs.

Some deliveries would need to be made using oversize vehicles. These deliveries would need to follow the guidelines set out by Queensland Transport, including loading, safety measures, and time of transport. The number of such deliveries and the routes required are not yet known. Planning for these deliveries would need to be examined in detail during the preparation of the CTMPs.

In general delivery times would be restricted to daytime hours Monday to Saturday.

5.7.5 Impacts on Bus Routes and Operations

Acceptable traffic flow and journey times would be maintained past the worksites on all major roads throughout construction, using the management measures to be detailed in the CTMPs. Bus routings would therefore not be affected. Also, the road sections affected by construction zone speed restrictions are likely to be too short to require schedule changes. Bus stops at the Toowong and Kelvin Grove work sites would be affected by construction works and they may require temporary relocation during construction of the Northern Link to locations as close as possible to the existing bus stops.

Construction of the Northern Link would not affect bus operations on the Inner Northern Busway.

5.7.6 Emergency Service Vehicle Movements

Emergency service vehicle routes would not be affected by the construction of the Project. This includes access to the Wesley Hospital in Auchenflower and the Royal Children's Hospital and the Royal Brisbane and Women's Hospital in Herston.

5.7.7 Construction Impacts on Pedestrian and Cycle Movements

Pedestrian and cyclist routes would be provided through all work areas and access to all properties would be maintained. Temporary diversions may be required. All pedestrian crossings would be maintained throughout construction. Specific impacts in each area are discussed in the following sections.

Western Freeway Connection

The Western Freeway bikeway and the Western Freeway Roundabout Cycle and Pedestrian Bridge, which is currently being constructed, would generally not be closed during the Northern Link construction phase as there are not satisfactory alternative routes for cyclist and pedestrians. The occasional closure to the Western Freeway Roundabout Cycle and Pedestrian Bridge may be required. To mitigate the impact of such closures they should be carried out during the night time when usage of the bridge by cyclists and pedestrians would be minimal. Sufficient notification of any closure would be given. Modifications to this facility that could be required are identified in Chapter 4, Project Description.

Toowong Connection

Pedestrian access would be maintained along both sides of Milton Road and Croydon Street and on Frederick Street throughout construction. Pedestrian crossing facilities at the signalised intersections of Milton Road/ Croydon Street/Morley Street and Croydon Street/Jephson Street/Sylvan Road would also be maintained. The existing bikeway on Milton Road that provides a connection from the Sylvan Road to the Western Freeway bikeway would also remain operational.

The CTMPs would need to address potential safety hazards and associated management for pedestrians and cyclists interacting with construction traffic leaving and entering the work site on Frederick Street and Milton Road.

Kelvin Grove Connection

On Kelvin Grove Road the existing pedestrian footpaths would be maintained on its eastern and western sides through the work area. The existing pedestrian footpath on the western side of Kelvin Grove Road that connects the pedestrian underpass of the Musgrave Road and Hale Street connection to Kelvin Grove Road would be realigned to suit the work site boundary.

The work site would result in the closure of pedestrian access between Kelvin Grove Road and Lower Clifton Terrace and Upper Clifton Terrace. Suitable alternative pedestrian access would be provided by installing a temporary footpath around the southern border of the work site between Kelvin Grove Road and Lower Clifton Terrace. For pedestrians travelling between Upper Clifton Terrace and Kelvin Grove Road suitable alternative

pedestrian access would be provided by a footpath on the western side of the work site between Upper Clifton Terrace and Westbury Street. A pedestrian crossing of the work site vehicular access at Westbury Street would be provided for pedestrians to walk to Kelvin Grove Road.

The current pedestrian crossing points at the signalised intersections of Kelvin Grove Road with both Blamey Street and Musk Avenue would also be maintained. Pedestrian safety hazards at the work site access points would be mitigated.

ICB Connection

The bikeways on both the northern and southern side of the ICB would remain operational. Realignment of the bikeway on the southern side would be required. The bikeway on the northern side, in the vicinity of Victoria Park Road may need some temporary re-alignment and the occasional night time or weekend closure.

5.7.8 Construction Impacts on Rail Infrastructure and Operations

The construction of Northern Link would not impact on rail infrastructure and operations, including access to QR property. Minor work at the QR access on the ICB in the vicinity of the Landbridge would be required. These works would not affect access to QR property.

5.7.9 Recommended Construction Mitigation Measures

Mitigation measures that have been adopted on similar projects such as the CLEM7 and the ICB and those that are proposed for the Airport Link tunnel to reduce construction effects on traffic and other road users during the construction phase have been reviewed and include:

- measures to reduce the impact of site access, haulage and deliveries;
- measures to reduce the impact on traffic adjacent to the worksites;
- traffic management through the construction area;
- traffic management to minimise potential impact on the local community;
- measures to reduce the impact on cyclists and pedestrians;
- measures to reduce the impact on public transport; and
- community awareness.

All of the reviewed measures are suitable for implementation on the proposed Northern Link.

The construction contractor would be required to prepare a detailed construction traffic management plan or CTMP for all elements of the works, in order to minimise adverse effects. The preparation of this plan would have to include performance analysis for lane closures and other disruptions that could be required. The safety and convenience of all road users would need to be addressed by the plan.

Measures to Mitigate the Impact of Site Access, Haulage and Deliveries

Spoil haulage would have to be managed appropriately to minimise any adverse impact on the road network. The haulage operations would need to be detailed in the contractors CTMP, and would need to be based on detailed analysis that looks at any potential impact that the operation may have on the road users and the community.

The main issues for transporting materials from the sites would include:

- minimising truck traffic in local streets, by providing direct access to major roads and specifying haulage routes on the major road network;

- minimising the effect on residential communities, by using routes through residential areas only where there is no practical alternative and preferably not operating after hours on these routes;
- minimising congestion effects, by avoiding congested roads if a suitable alternative exists, or operating off peak only on these roads if possible, and also by analysing the capacity of intersections along the route to identify and mitigate against any operational impacts;
- minimising the effect on businesses and conflicts with pedestrians, by avoiding busy commercial areas if a suitable alternative exists, or operating after work hours only on these routes if possible;
- minimising the perceived impact of additional trucks, by using routes already used by heavy vehicles; and
- avoiding conflicts with major events and peak holiday period traffic.

These principles would need to be followed in developing the contractors TMP for construction of the Project. There a number of measures that can be used to mitigate the amount of deliveries to the proposed work site and the amount spoil that is removed. These measures should be employed so to reduce the number and impact of heavy vehicles that would access the work sites. Measures include:

- reduce the amount of haulage through the use of spoil conveyor systems to a local spoil site. This would significantly reduce the number of spoil trucks that would be required to access the work sites;
- the use of on-site water treatment plants and/or storm water runoff harvesting to provide appropriate water supply for construction use, shotcrete and concrete batching plants. This would reduce the number of delivery vehicles that would be required;
- the use of drop holes from the surface down to the tunnel (external to the actual worksite locations) to transfer concrete/shotcrete from the surface down to the tunnel and reduce the number of trucks entering and leaving the worksites;
- spoil haul routes via the regional road network and not through residential areas to reduce the impact on residential communities;
- access to worksites via the regional road network and not via local streets and residential areas;
- appropriate worksite access points such that truck/car queues would not occur on the road network and suitable deceleration/acceleration lanes provided for entry and exit locations;
- satellite navigation of spoil haulage trucks to assist with minimising truck queues at worksites;
- provision of construction staff parking areas with bus transport to work sites to eliminate the need for construction staff car parking in residential areas and therefore reduce the number of construction vehicles entering and exiting the worksites on a daily basis; and
- local area traffic scheme (such as permit parking or the zone extension of the inner city parking time limits) could be used to prevent the workforce from parking on streets in the vicinity of the worksites if such parking occurred.

Measures to Reduce the Impact on Traffic Adjacent to the Worksites

Traffic management measures that could be put in please to reduce the impact of construction activities on traffic using the roads adjacent to the work sites are listed below.

- Maintain the existing road capacity and connectivity by staging the construction sequence such that it would be possible to maintain the existing number of traffic lanes and connections to the local road network within the future road reserve.
- If it would not be possible to maintain the existing number of traffic lanes at all times then limit reductions in road capacity to outside peak periods such as at night and at weekends.

- Work site deliveries and spoil haulage could occur outside the peak traffic periods.
- Take into account public holidays and events when planning construction activities so to avoid peak traffic periods that occur outside of the typical commuter peak periods.

Traffic management through the construction area

A detailed CTMP that would outline the mitigation measures that would limit the impact on local traffic would be produced for each of the work sites and areas by the contractor. The TMPs would consider the convenience and safety of all road users, including public transport, pedestrians and cyclists. Access to properties would need to be maintained at all times wherever possible.

The CTMPs would include, but not be limited to, a detailed description and plans for:

- staging and timing of works on roads;
- signage and delineation past the work site, including any diversion routes; and
- other measures to help ensure safety and manage the change in traffic flows, for example: traffic controllers; traffic signal operational changes using Council's BLISS system; dynamic advance warning using variable message signage (VMS); and real time monitoring of traffic conditions using closed circuit television (CCTV); and public awareness campaigns that would inform the travelling public of such works.

Although the preliminary Project construction staging does not propose a reduction in through traffic lanes or any significant diversions it is recommended that, when preparing the CTMPs, it would be necessary to predict the likely traffic redistribution as a result of the proposed temporary traffic arrangements.

Conditions surrounding the work sites and areas would need to be monitored throughout the construction period, and the CTMPs reviewed as appropriate to address any negative impacts that could develop. This would include regular monitoring of traffic flows against the modelled traffic volumes.

Suitable mitigation measures also include the management of traffic through the construction area. These measures are aimed at minimising the number of traffic incidents that could occur in the construction area and the rapid removal of any vehicle or debris that would restrict traffic flow as a consequence of an incident.

- The installations of CCTV equipment so that traffic can be observed and incidents acted on at all times.
- Facilitate the rapid removal of vehicles in the event of traffic incidents and vehicle breakdowns by having recovery vehicles permanently located at strategic locations in the vicinity of the work areas. Such recovery vehicles would be alerted to incidents through the use of CCTV.
- The provision of barrier screens around the construction sites to reduce driver distraction.
- The reduction of speed limits in the vicinity of the construction worksites in order to reduce the occurrence and severity of incidents without creating a significant net loss of existing road capacity.
- The provision of street lighting through the work areas to improve driver visibility and awareness during hours of darkness.
- Satellite navigation of spoil haulage trucks would assist in minimising queues at work sites and so reduce the impact on traffic flow.

Traffic Management to Minimise Potential Impact on the Local Community

Mitigation measures should be provided that would reduce the impact of construction activities on the local community. Such measures are listed below.

- To continue to provide existing connectivity to local streets, or provide reasonable alternatives if existing connections are closed, during the construction period.
- Provide an assessment of the likelihood for traffic to divert to local roads and, if necessary, mitigate such diversions by implementing local area traffic management schemes (such as permit parking or the zone extension of the inner city parking time limits).

Measure to Minimise Potential Impact on Cyclists and Pedestrians

The establishment of worksites and construction activities could result in the removal of cycle and pedestrian facilities such as paths and crossings unless measures are put in place to minimise the impact. Such measures include:

- Replace existing footpaths and cycleways with convenient, direct and safe alternatives. Temporary diversions should not require pedestrians and cyclists to complete multiple road crossings to bypass a worksite.
- Existing pedestrian and cycle crossings of roads should be maintained.
- Measures to provide safe pedestrian crossings of work site vehicular access points.

Measure to Minimise Potential Impact on Public Transport

The previously mentioned measures to reduce the impact on traffic and to provide traffic management through the construction area should minimise the impact on public transport. Maintaining existing road network connectivity and capacity would remove the need to divert bus services and maintain satisfactory bus journey times.

Bus stops should generally not be relocated due to construction activities and pedestrian access them should be maintained. In the event that a bus stop is relocated then a close alternative should be provided.

Northern Link construction activities would not impact on rail and ferry services.

Community Awareness

The local community and the travelling public should be kept informed of construction related traffic management measures through the advertising of changes to traffic conditions sufficiently prior to their implementation. If necessary the community could be encouraged to use alternative routes or to alter their time of travel to minimise the impact of traffic management schemes.