# Airport Link

## Phase 2 – Detailed Feasibility Study

EIS CHAPTER 5

TRAFFIC AND TRANSPORT

- October 2006

# Contents

# 5. Traffic and Transport

*This chapter addresses the issues raised in Section 4 of the Terms of Reference and provides an overview of the traffic and transport studies undertaken for the project. The studies were undertaken by Sinclair Knight Merz (SKM) 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 network for the base year of 2005 and its performance in terms of the regional and local road systems, public transport services, emergency services flows 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 described for future years – 2012, 2016, 2022 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, 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 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.*

*Pedestrian and bicycle movements are discussed, impacts identified and opportunities for walking and cycling network improvements described. The traffic and transport analysis includes scenarios where the planned North-South Bypass Tunnel (NSBT) is implemented and operational as well as addressing functional relationships with the proposed Northern Busway Project. The potential cumulative effects of the project with and without the proposed Northern Busway have also been considered in this study.*

## 5.1 Approach and Methodology

### 5.1.1 Study Corridor

A study corridor was defined for the project and a range of areas of interest has also been established to enable an examination of the breadth of traffic and transport effects.

The following areas are considered in this report as shown on **Figure 5-1** and **Figure 5-2**:

- *Central Brisbane* - The zone of extensive 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 Statistical Local Areas (SLAs). This area includes the Central Business District (CBD).
- *Inner North Study Area* - An area defined initially for the purposes of examination of the localised effects on traffic and transport of corridor options for the project. It encompasses areas to the north of the CBD where local effects of the project require consideration and includes the suburbs of Wooloowin, Clayfield, Kedron, Gordon Park, Lutwyche, Albion, Windsor and Bowen Hills. 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 25.6km$^2$.
- The *Brisbane Metropolitan Area* or Brisbane Statistical Division (BSD) - The City of Brisbane and the surrounding area extending to Caboolture in the north, Beenleigh in the south, Ipswich to the west and Redland Shire 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 and Brisbane Airport. It covers an area of 4,670 $km^2$.

The Central Brisbane area, as defined here, represents a grouping of key activity areas including the CBD, which enable the effects of the project, particularly at its Southern Connection, to be identified.

The Inner North area, as defined for this study, 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.

The Brisbane Metropolitan area represents a standard defined geographic area used for examination of traffic and transport issues in the Brisbane context.

### 5.1.2 Modelling and Forecasting

A traffic and transport model was used to forecast the effects of the project in the following ways:

- To describe and assess the existing traffic flows and transport system performance, supplementing traffic counts and other observed data to generate estimates of existing conditions via modelled data; and
- To forecast traffic conditions and network performance at specific years in the future, without and with the project.

The model used a range of inputs to predict transport and traffic demand including:

- Land use descriptors in the form of demographic projections of population, employment and education enrolments within small geographic areas termed traffic zones;
- Travel characteristics, such as trip making rates and vehicle occupancy for different trip purposes, from a survey undertaken in 2003/04 in Brisbane of the travel behaviour of a sample of Brisbane households;
- Data from a survey of over 800 residents of the Brisbane Metropolitan area, which was designed to obtain specific behaviour characteristics for potential toll road users. The information was used to model the trade-off between the payment of a monetary toll and the benefit of a travel time saving and greater journey time reliability on Airport Link;
- Descriptions of existing and planned or likely future road infrastructure, and road tolls, for the various forecasting years; and
- Descriptions of existing and likely future public transport services, their coverage and frequency, for the various forecasting years.

The modelling of future transport networks, both without and with the project, includes the scenario where the North-South Bypass Tunnel (NSBT), a planned major cross-river toll road, connecting Bowen Hills and Wooloongabba, with an intermediate link to the eastern suburbs, is implemented and operational.

Other major road projects included in all future transport network modelling are:

- The Gateway Upgrade Project (GUP), the planned duplication of the tolled Gateway Bridge and upgrading of the Gateway Motorway on each side of the Brisbane River.
- Brisbane Airport Northern Access, planned by the Brisbane Airport Corporation as a new access road connecting to the new northern deviation of the Gateway Motorway created with GUP, to primarily serve the domestic and international terminals at Brisbane Airport.

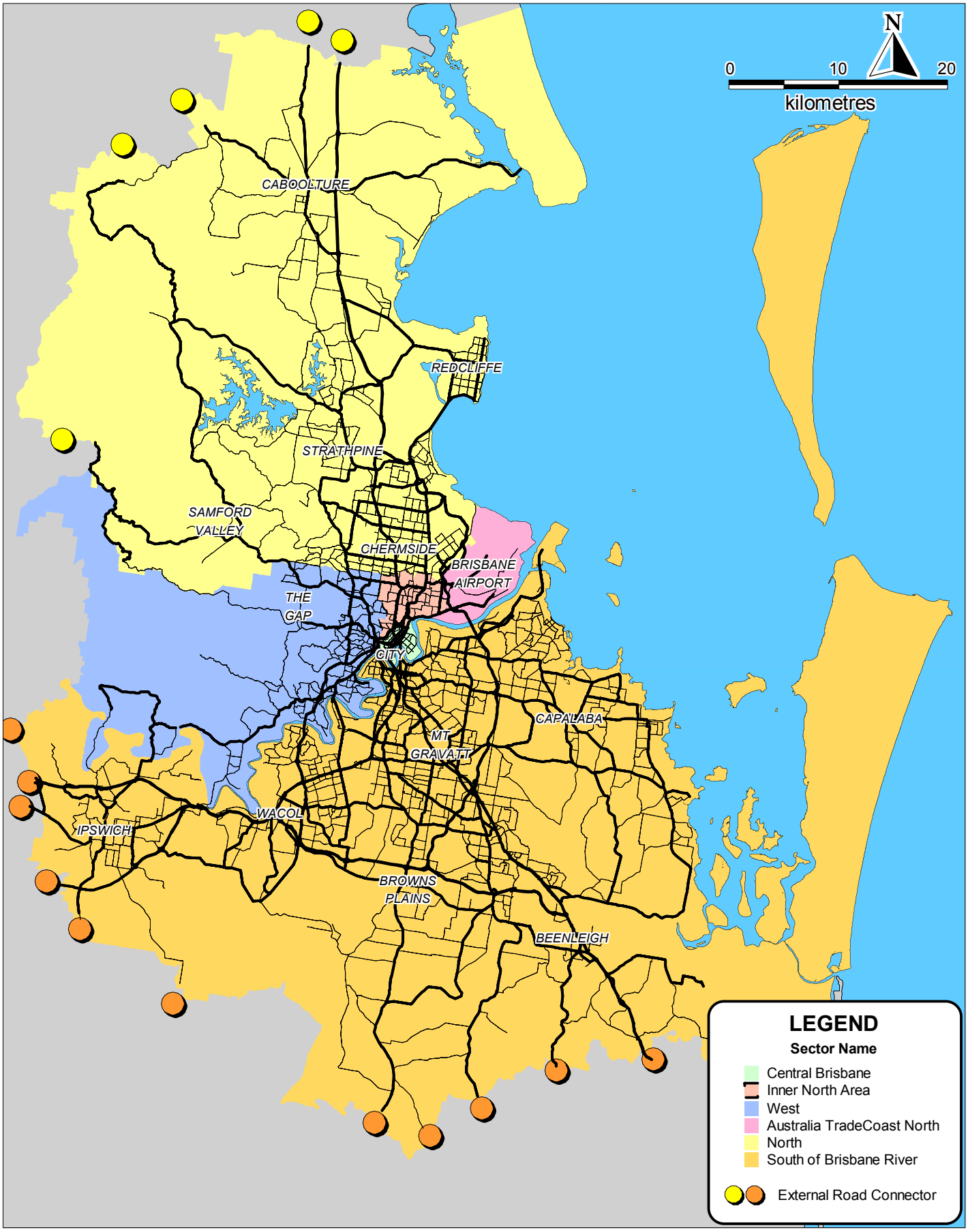
Modelling of a separate scenario which considers the cumulative effects of the proposed staged implementation of the Northern Busway, a major public transport improvement in northern Brisbane, has also been undertaken and is reported in **Chapter 21**.

Future traffic and transport conditions were modelled and assessed at two levels:

1) At a strategic level covering the Brisbane Metropolitan Area, which extends beyond Brisbane City and encompasses some nearby local authorities within the Brisbane Statistical Division (BSD). This enabled consideration of city-wide transport network implications of the project as well as interaction with areas of influence outside the EIS study corridor, such as Brisbane's CBD and the Australia TradeCoast area, which includes Brisbane Airport.
2) At a more detailed local level, covering Inner North Brisbane, to consider localised traffic and transport effects of the project within the suburbs of Wooloowin, Clayfield, Kedron, Gordon Park, Lutwyche, Albion, Windsor and Bowen Hills.

At the city-wide level the model used in the study was based on the Brisbane Strategic Transport Model (BSTM), with specific enhancements incorporated for the Airport Link study to enable more accurate forecasting. Key improvements included using more up-to-date input data, and more sophisticated representation of the delays typically experienced at intersections along a route. At the detailed level, the effects of the project on local intersection performance were examined using the aaSIDRA software with data extracted from the city-wide model.

Future traffic and transport conditions with the project, such as travel demand, travel times, travel speeds and the operating level of service of the road network and intersections, were forecast for 2012 (the year of project opening), 2016, 2022 and 2026 for scenarios without, and with, the project.




**AIRPORT LINK - Figure 5-1**
Areas of Interest & Travel Sectors

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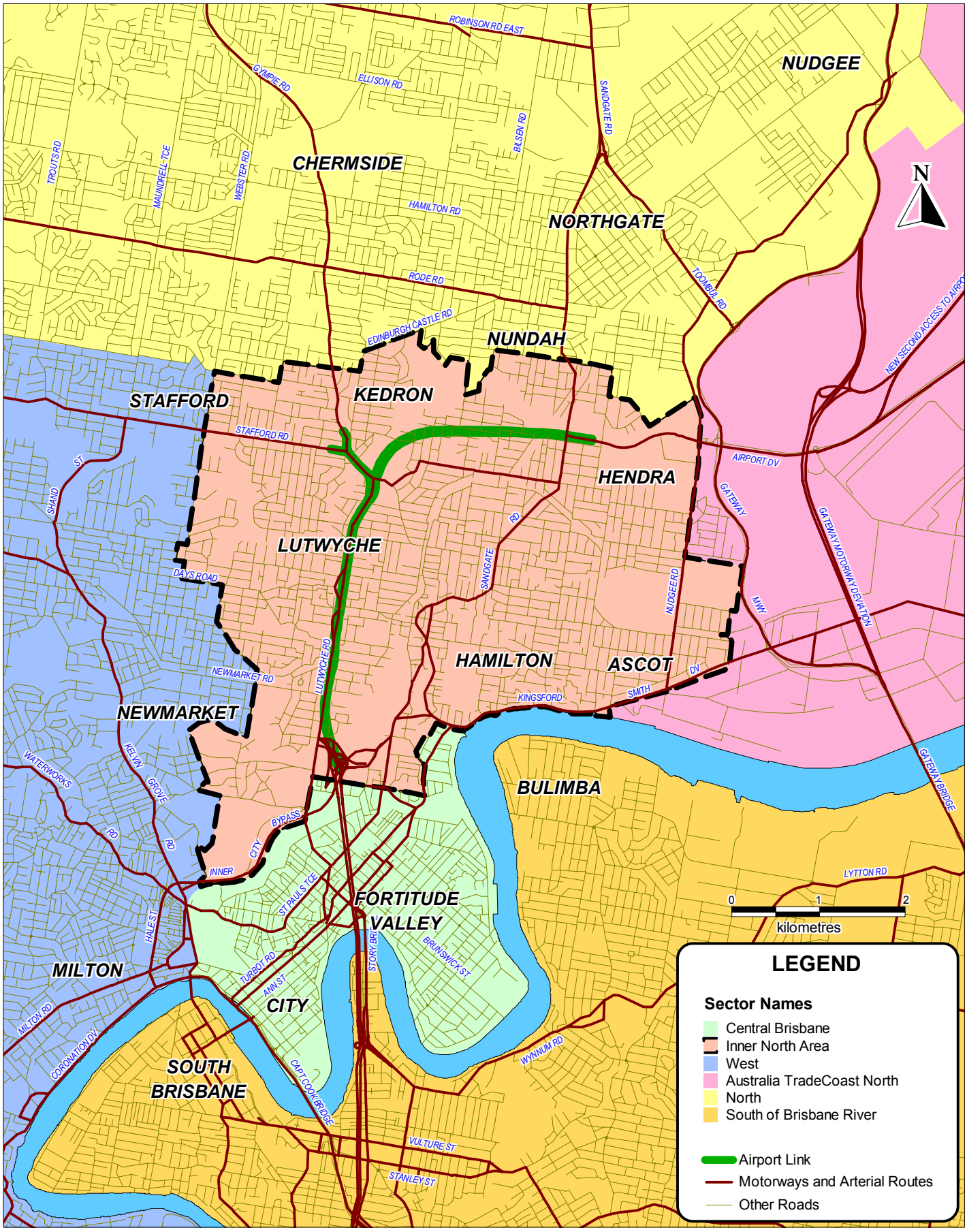


**AIRPORT LINK - Figure 5-2**

Inner North Study Area

Airport Link

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## 5.2 Description of Existing Transport Network

### 5.2.1 Travel Demand

Travel demand by mode of transport is influenced by a range of factors such as the demographic characteristics of the region and Inner North area, land-use distribution and the transport system itself.

In 2004, the Brisbane Metropolitan Area had a population of 1.77 million persons. Population growth rates in the region have been strong, averaging 2.0% pa over the last 10 years.

As shown in **Table 5-1**, an estimated 57,000 persons lived within the Inner North area in 2004, with an overall population density of 2,230 persons/km$^2$. This is much higher than the Brisbane Metropolitan area average of 380 persons/km$^2$. The average household size of 2.05 persons in the inner north is much lower than the metropolitan area average.

**Table 5-1 Existing Population and Employment**

| Parameter | Brisbane Metropolitan Area | Inner North Area |
|---|---|---|
| Total Persons | 1,773,000 | 57,100 |
| Area (km$^2$) | 4,670 | 25.64 |
| Density (persons/km$^2$) | 380 | 2,230 |
| Total Households | 695,000 | 27,800 |
| Person/Household | 2.55 | 2.05 |
| Total Employment | 805,000 | 36,400 |
| Central Brisbane Employment | 150,000 | N/a |
| ATC North Employment | 22,000 | N/a |

**Table Note**: Source: PIFU (2005)

The Inner North area only accounted for 5% of the region's employment in 2004 whereas Central Brisbane accounted for 19% of the 805 000 jobs within the Brisbane Metropolitan area. The Australia TradeCoast (ATC) region is emerging as a significant future employment node for the region, particularly the ATC North precinct which includes Brisbane Airport.

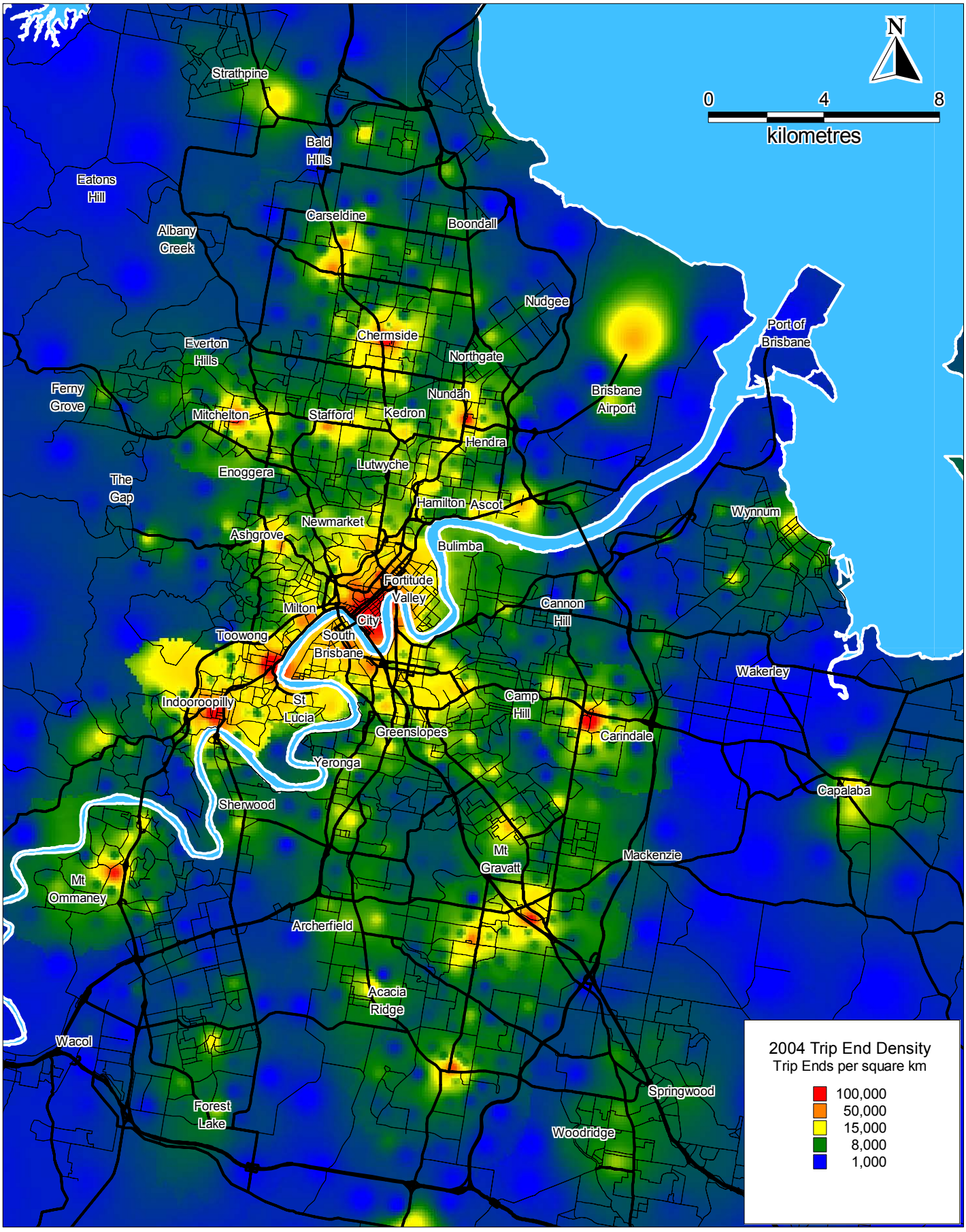
Key land uses that generate travel demand within the Inner North area are shown graphically on **Figure 5-1** and include:

- Residential land-uses. The Inner North area is predominantly residential, varying widely in density and character. Higher density residential complexes occur along arterials such as Sandgate Road, and in the vicinity of the rail line.
- Retail land-uses such as
  - Centro Lutwyche, located on Lutwyche Road, providing supermarket and speciality shops within the general Lutwyche commercial district.
  - Centro Toombul, a sub-regional shopping complex, located adjacent to the East-West Arterial on Sandgate Road and opposite Toombul rail station.
  - Windsor Homemaker Centre, a bulky goods retail centre located on Lutwyche Road in Windsor.
  - The Albion Village on Sandgate Road, recently upgraded to promote an attractive pedestrian and commercial precinct within Albion.
- Industrial land use towards the south-eastern region, with pockets of light industrial in Albion, Newstead and Bowen Hills, as well as along Nudgee Road and Kingsford Smith Drive east of Nudgee Road.

- The Royal Brisbane Hospital complex (RBH), Brisbane's largest hospital, is located on the western side of Bowen Bridge Road at Herston.
- A major Emergency Services Complex, located at the northern end of Lutwyche Road at Kedron.
- Sport and recreation complexes including Downey Park, Crosby Park in Albion, Allan Border Cricket Oval at Albion, and the Albion Park Raceway.
- Various local schools.

Key land uses that directly influence through traffic demands through the Inner North include:

- Central Brisbane, including the CBD, to the south.
- The Brisbane Airport and Australia TradeCoast region to the east.
- The Prince Charles Hospital, Queensland University of Technology (QUT) Carseldine Campus and Westfield Chermside Shopping Centre to the north.
- The RNA Exhibition grounds at Bowen Hills.
- QUT Kelvin Grove and Gardens Point campuses and the University of Queensland (UQ) St Lucia campus to the south and west.




**AIRPORT LINK - Figure 5-3**

Existing Trip Generation

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### 5.2.2 Transport Network

#### Transport Modes

The transport network in the Brisbane Metropolitan area comprises the following transport modes:

- Road network;
- Bus services, bus lanes, transit lanes and Busway;
- Rail network;
- Ferry services;
- Cycle facilities; and
- Pedestrian facilities.

The existing road hierarchy within the Inner North Area is shown in **Figure 5-4**. The wider system is characterised by a strong radial road network, with arterial roads operating radially from the CBD area to the outer Brisbane Suburbs. The radial links also connect to the CBD river crossings and thus also cater for cross-city travel. Lutwyche Road and Sandgate Road within the inner north are key radial links that cater for a mix of commuter, cross-city and local traffic.

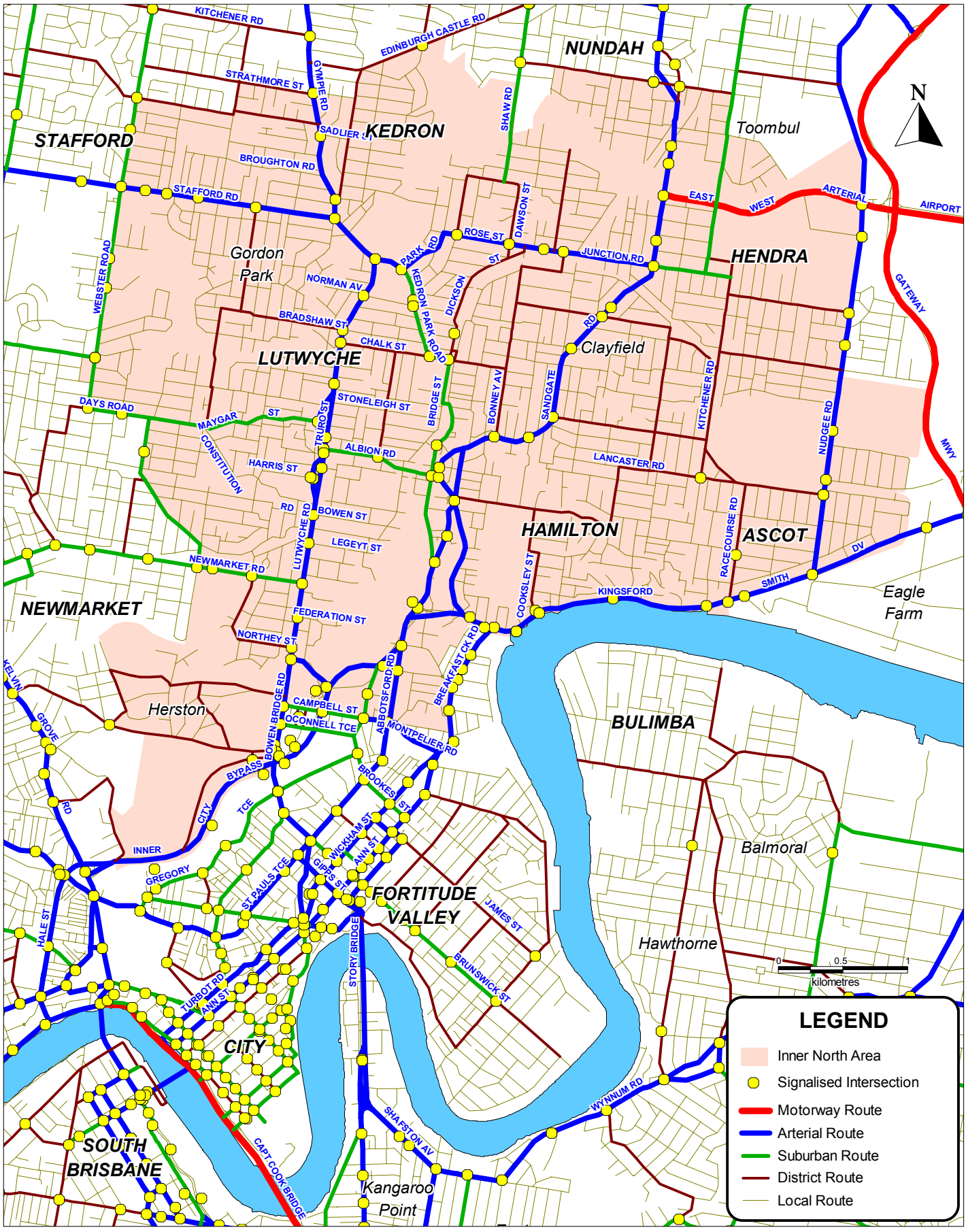
#### Road Hierarchy and Function

BCC's Transport Plan for Brisbane 2002- 2016 (BCC, 2005) adopts a six-tier road hierarchy as follows:

- *Motorways(1)* – Serve inter and intra regional connections for high volumes of people and goods and direct longer distance traffic away from heavily developed areas. There is no direct property access and connections with lower order roads are limited.
- *Arterial (2) and Suburban (3) Routes* – Provide connections for the movement of people and goods between major activity centres and residential areas of the City.
- *District Accesses (4)* – Provide a transitional function between the movement of people and goods and local access functions. They are ideal bus routes and provide pedestrian and bicycle facilities.
- *Neighbourhood (5)/Local Accesses (6)* – provide direct property access and are pedestrian and cyclist friendly.

A range of movement types occurs on roads within the Inner North area consistent with the functions served by the range of road hierarchy types represented in the area. Key examples of roads within each category are:

- Lutwyche Road and Sandgate Road are key north-south radial arterial routes. The East-West Arterial Road, a state controlled (DMR) route comprising Stafford Road, part of Kedron Park Road, Park Road, Rose Street and Junction Road, linking to Sandgate Road and the East-West Arterial, is a cross-town arterial route.
- Suburban routes provide a direct east-west connection between the radial arterial routes or act as a major connection between an arterial route and nearby residential areas. They include Albion Road, Newmarket Road, Maygar Street, Kedron Park Road and Bridge Street.
- Bradshaw Street, Chalk Street and Northey Street-Green Terrace are district access routes connecting to Lutwyche Road, whilst Crosby Road, Oriel Road, Bonney Avenue and Bayview Terrace-Wagner Road are district access routes connecting to Sandgate Road.




**AIRPORT LINK - Figure 5-4**
Inner North Road Network

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## Bowen Bridge Road-Lutwyche Road-Gympie Road

Bowen Bridge Road connects Lutwyche Road with the Brisbane CBD. The Royal Brisbane Hospital complex fronts Bowen Bridge Road at the southern end of the corridor, just north of the Inner City Bypass (ICB) and Inner Northern Busway (INB). Between Herston Road and Butterfield Street bus lanes operate northbound, and between O'Connell Terrace and Herston Road southbound, restricting general purpose traffic to two lanes in each direction, with turn lanes at intersections. The ICB (westbound) can be accessed from Lutwyche Road by southbound traffic only at the Horace Street intersection. Northbound traffic on Bowen Bridge Road can access the ICB, westbound via Campbell Street. Traffic conditions in this area will change with the planned North-South Bypass Tunnel's access intersection arrangements.

Lutwyche Road extends between Enoggera Creek and Kedron Park Road. It provides a key arterial connection between the Brisbane CBD and Brisbane's northern suburbs. Lutwyche Road is predominantly six (6) lanes of undivided road. There is an inbound transit (T3) lane operating in the southbound kerbside lane during the morning commuter peak between Stoneleigh Street and Horace Street. Lutwyche Road operates in conjunction with Roblane Street (southbound only) between the Constitution Road and Albion Road intersections to provide both arterial and local access functions. Between these locations four (4) lanes operate southbound. Between Albion Road and Stoneleigh Street intersections Lutwyche Road operates in combination with Truro Street (southbound only), and between these intersections five (5) lanes operate southbound. North of the Stoneleigh Street intersection, through the Lutwyche centre, the road narrows to two (2) lanes in each direction, a result of the restrictions on road reserve created by the existing shop frontage, as shown in **Figure 5-5**. It returns to three (3) lanes in each direction north of the Bradshaw Street intersection.

- **Figure 5-5 Photo of Lutwyche Road near Centro Lutwyche**

North of the Kedron Park Road intersection, Lutwyche Road becomes Gympie Road, continuing as three (3) lanes in each direction to connect to the Bruce Highway at the Pine River Bridge at Bald Hills.

The total length of the Bowen Bridge Road-Lutwyche Road-Gympie Road route between Herston (at Gregory Terrace) and Kedron (at Strathmore Street) is 5.8 km.

### Campbell Street and O'Connell Terrace

Campbell Street and O'Connell Terrace are both one-way suburban roads, operating as an east-west couplet between the Lutwyche Road and the Abbotsford Road-Sandgate Road corridors. O'Connell Terrace also provides access to the Royal Brisbane and Women's Hospital. The ICB (westbound) can be accessed from Campbell Street via Horace Street. Traffic conditions in this area will change with the planned NSBT access intersection arrangements.

### Sandgate Road-Abbotsford Road

The Sandgate Road arterial route connects the CBD to Brisbane's north-eastern suburbs. It also provides a link to the Brisbane International and Domestic Airports via the East-West Arterial Road which links to Sandgate Road at Toombul. Sandgate Road is predominantly a four (4) lane undivided road as shown in **Figure 5-6**. Kerbside clearways are provided during peak periods in the peak direction to allow full use of both lanes. However, its narrow road reserve restricts the ability to provide right turn pockets at a number of signalised intersections commonly resulting in queuing and delays for through traffic. Outside of peak periods, most sections of Sandgate Road allow parking in the kerbside lane. Frodsham Street provides a three (3) lane southbound bypass of the Albion Village, with the left kerbside lane operating as a bus lane during the morning commuter peak.

North of the East-West Arterial intersection, Sandgate Road is a six (6) lane divided roadway and links to a tunnel bypass of the Nundah commercial district.

- **Figure 5-6 Photo of Sandgate Road at Albion**

South of the Albion five-ways intersection (of Sandgate Road, Abbotsford Road, Frodsham Street and Crosby Road), the majority of traffic diverts to Abbotsford Road, a six (6) lane undivided arterial route which provides access to the Brisbane CBD. The southern segment of Sandgate Road provides access to a light industrial and commercial precinct in Albion and ramp access to the ICB westbound.

### Kingsford Smith Drive

Kingsford Smith Drive is an east-west arterial connection between the ICB and Brisbane CBD in the west and the Gateway Motorway, Brisbane Airport and Australia TradeCoast (ATC) in the east. Kingsford Smith Drive is predominantly a four (4) lane undivided arterial road. East of the Nudgee Road intersection, Kingsford Smith Drive is gazetted for B-Double (long articulated heavy vehicle) usage. At the western end of Kingsford Smith Drive the road connects to the ICB. At this juncture, ramps from Kingsford Smith Drive provide access to Breakfast Creek Road and the Brisbane CBD. The majority of the intersections with Kingsford Smith Drive, within the Inner North area, are T-junctions with a northern approach, which is generally a local access/neighbourhood route. The Brisbane River parallels Kingsford Smith Drive on its southern side.

### Newmarket Road

Newmarket Road is a four (4) lane undivided suburban route providing a direct east-west connection between the Lutwyche Road and Kelvin Grove Road corridors. The inner northern suburbs can be accessed from Newmarket Road via district and neighbourhood routes. A number of parks can also be accessed from Newmarket Road.

Northey Street-Green Terrace (district route) provides an alternative access to Newmarket Road to and from the CBD, bypassing two signalised intersections on Lutwyche Road. This route also provides access to sporting facilities at Downey Park.

### Albion Road

Albion Road is a four (4) lane undivided suburban route providing an east-west connection between the Lutwyche Road and Sandgate Road corridors. The Albion rail station and associated parking can be accessed from local access roads feeding onto Albion Road. Albion Road also provides access to Windsor Park and its associated recreational uses.

### East–West Arterial to Stafford Road

The East-West Arterial Road is a state controlled (DMR) route consisting of East-West Arterial, Sandgate Road, Junction Road, Rose Street, Park Road, Kedron Park Road, Gympie Road and Stafford Road.

Stafford Road is a four (4) lane undivided road, providing an east-west connection between the Gympie Road and South Pine Road corridors. The Stafford City shopping centre and commercial shopping strip, as well as schools and parks, front Stafford Road.

The Kedron Park Road, Park Road and Junction Road section is a predominantly two (2) lane undivided road connecting the Lutwyche Road and Sandgate Road corridors. A large number of residential properties are located along the route. The Eagle Junction rail station fronts Junction Road. This route also provides access to the northern suburbs around Wooloowin.

The East-West Arterial is predominantly a four (4) lane divided road connecting Sandgate Road to the Gateway Motorway and Brisbane Airport. Nudgee Road is the only intersection with the East-West Arterial between Sandgate Road and the Gateway Motorway. East of the Nudgee Road intersection, the East-West Arterial is gazetted for use by B-Double vehicles.

### Nudgee Road

Nudgee Road is an arterial route parallel to the Gateway Motorway which connects the major east-west routes of Kingsford Smith Drive, East-West Arterial and Toombul Road. Between Kingsford Smith Drive and Gadara Street, Nudgee Road is predominantly two (2) lanes undivided with on-street parking provisions and primarily residential land use. North of the Gadara Street intersection, Nudgee Road widens to four (4) lanes and land use is primarily industrial.

### Inner City Bypass

The ICB is a circumferential inner city arterial connecting a number of radial arterial routes including Coronation Drive, Milton Road, Musgrave Road, Kelvin Grove Road, Lutwyche Road and Abbotsford Road. Connecting Coronation Drive at Milton to Kingsford Smith Drive at Breakfast Creek, the ICB is a six (6) lane divided arterial with speed limits varying between 60 and 80km/hr. The ICB provides a high speed uninterrupted connection between the western and northern - eastern suburbs of Brisbane, bypassing the CBD.

## 5.2.3 Road Traffic Movement Patterns

### Daily Traffic Volumes

Daily traffic volumes for 2004/05 on key roads within the Inner North Area are shown in **Table 5-2**. Reference locations (ID) are annotated on **Figure 5-7**. Volumes have been collated from a number of sources including Brisbane City Council, Department of Main Roads 2004 Census and various surveys commissioned for this study. Data from 2004 and 2005 have been used.

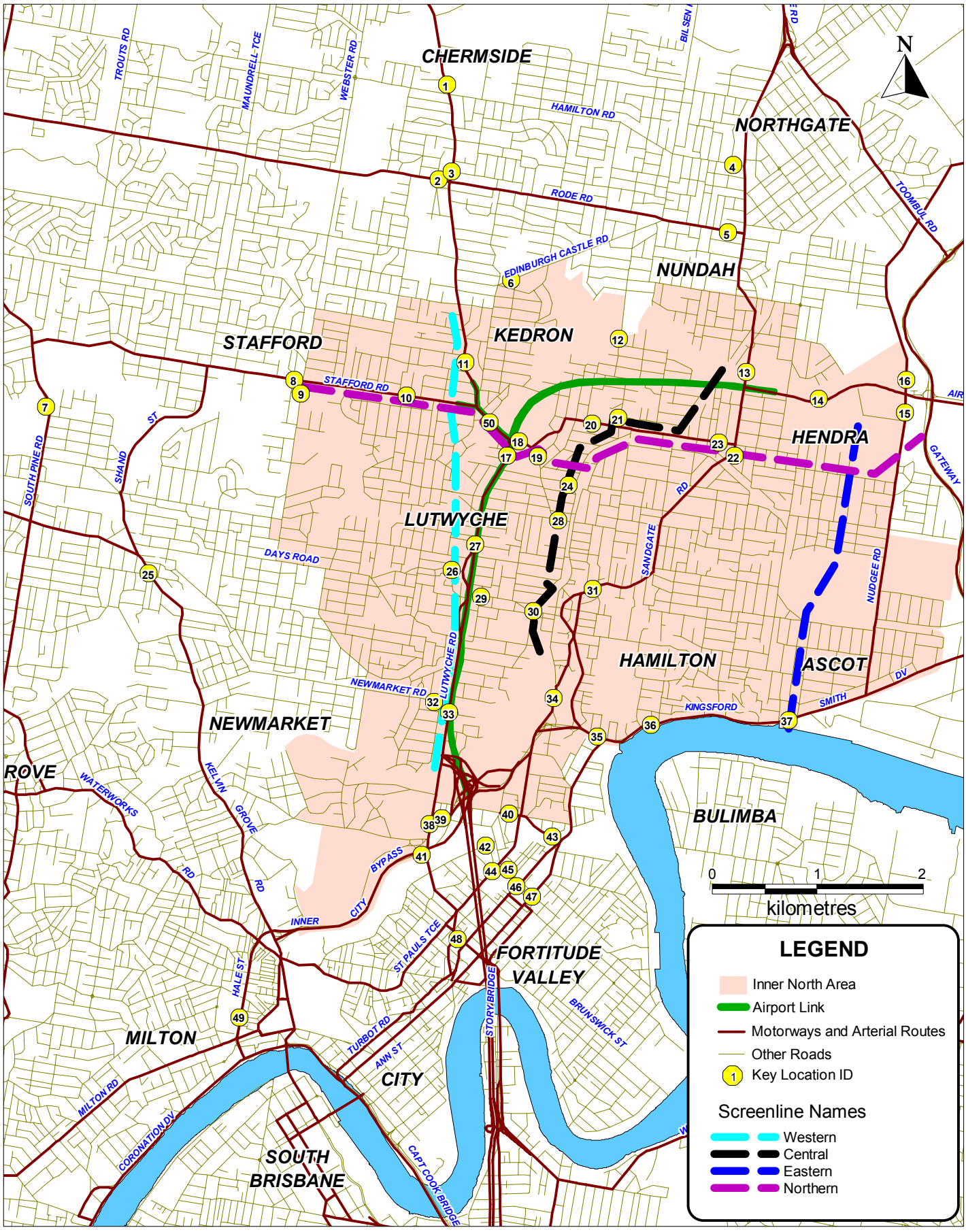
- **Table 5-2 Existing Traffic Volumes (two way totals)**

| ID | Road | Location | Average Weekday Traffic Volumes (AWDT)[1] | Average Daily Traffic Volumes (AADT)[2] |
|---|---|---|---|---|
| **Motorway** | | | | |
| 14 | East – West Arterial | East of Widdop Street, Hendra | 23,000 | 21,200 |
| **Arterial** | | | | |
| 5 | Rode Road | West of Sandgate Road, Wavell Heights | 19,300 | 17,800 |
| 10 | Stafford Road | West of Richmond Street, Kedron | 22,500 | 21,200 |
| 11 | Gympie Road | North of Broughton Road, Kedron | 59,100 | 55,900 |
| 13 | Sandgate Road | North of Schulz Canal, Toombul | 52,200 | 48,100 |
| 16 | Nudgee Road | North of East-West Arterial, Hendra | 11,300 | 10,100 |
| 18 | Kedron Park Road | East of Lutwyche Road, Kedron | 17,600 | 16,200 |
| 20 | Rose Street | Melrose Park, Wooloowin | 10,700 | 10,000 |
| 22 | Sandgate Road | South of Junction Road, Clayfield | 37,000 | 34,100 |
| 23 | Junction Road | West of Sandgate Road, Clayfield | 18,200 | 17,000 |
| 27 | Lutwyche Road | North of Stoneleigh Street, Lutwyche | 59,600 | 56,400 |
| 31 | Sandgate Road | South of Bonney Avenue, Albion | 35,900 | 32,900 |
| 33 | Lutwyche Road | South of Newmarket Road, Windsor | 60,300 | 56,900 |
| 34 | Abbotsford Road | South of Burrows Street, Bowen Hills | 54,800 | 48,900 |
| 35 | Inner City Bypass | West of Breakfast Creek Road, Hamilton | 26,800 | 23,900 |
| 36 | Kingsford Smith Drive | East of Cooksley Street, Hamilton | 65,600 | 59,200 |
| 41 | Inner City Bypass | West of Bowen Bridge Road, Herston | 65,900 | 59,800 |
| **Suburban** | | | | |
| 12 | Shaw Road | At Kedron Brook, Wooloowin | 14,100 | 12,500 |
| 26 | Maygar Street | West of Lutwyche Road, Windsor | 8,300 | 7,700 |
| 29 | Albion Road | East of Lutwyche Road, Windsor | 15,100 | 13,700 |
| 32 | Newmarket Road | West of Lutwyche Road, Windsor | 17,600 | 16,700 |
| **District Access** | | | | |
| 24 | Dickson Street | North of Wride Street, Wooloowin | 10,400 | 8,400 |

**Table Notes:** Source: BCC, DMR, 2005 Surveys

1) AWDT - Average of the five (5) working days

2) AADT - Average of the full seven (7) day week.




**AIRPORT LINK - Figure 5-7**
Inner North Study Area Reference Locations

Airport Link

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Lutwyche Road carries approximately 60,000 vehicle trips per weekday whilst Sandgate Road, south of the East-West Arterial, caters for between 35,000 and 40,000 vehicle trips each weekday.

The flow profile for Lutwyche Road during a weekday is shown in **Figure 5-8** and the variation throughout the week is shown on **Figure 5-9**. Typical commuter peaks of 2,600 vph southbound in the AM peak and northbound in the PM peak are evident, with the PM peak outbound extending over a slightly longer duration.

Hourly two-way volumes of over 3,500 vehicles are maintained on Lutwyche Road during the midday off peak. This limited peak to daily off peak variation of only 22% indicates the broad range of functions served by the route.

The weekly volume profile for Lutwyche Road indicates that weekend daily traffic levels only decline to 80% of daily traffic, indicating strong recreational traffic use on the weekends. This is because Lutwyche Road provides a key connection to routes to the Sunshine Coast.

A typical weekday traffic flow profile and daily variation for Sandgate Road are shown in **Figure 5-10** and **Figure 5-11**. Traffic patterns on Sandgate Road indicate a higher variation between the peak periods and the daytime off peak of between 33% and 43%. A larger decline in traffic volumes between weekday and the weekend is also evident. These are representative of an arterial roadway that is primarily used as a commuter route.

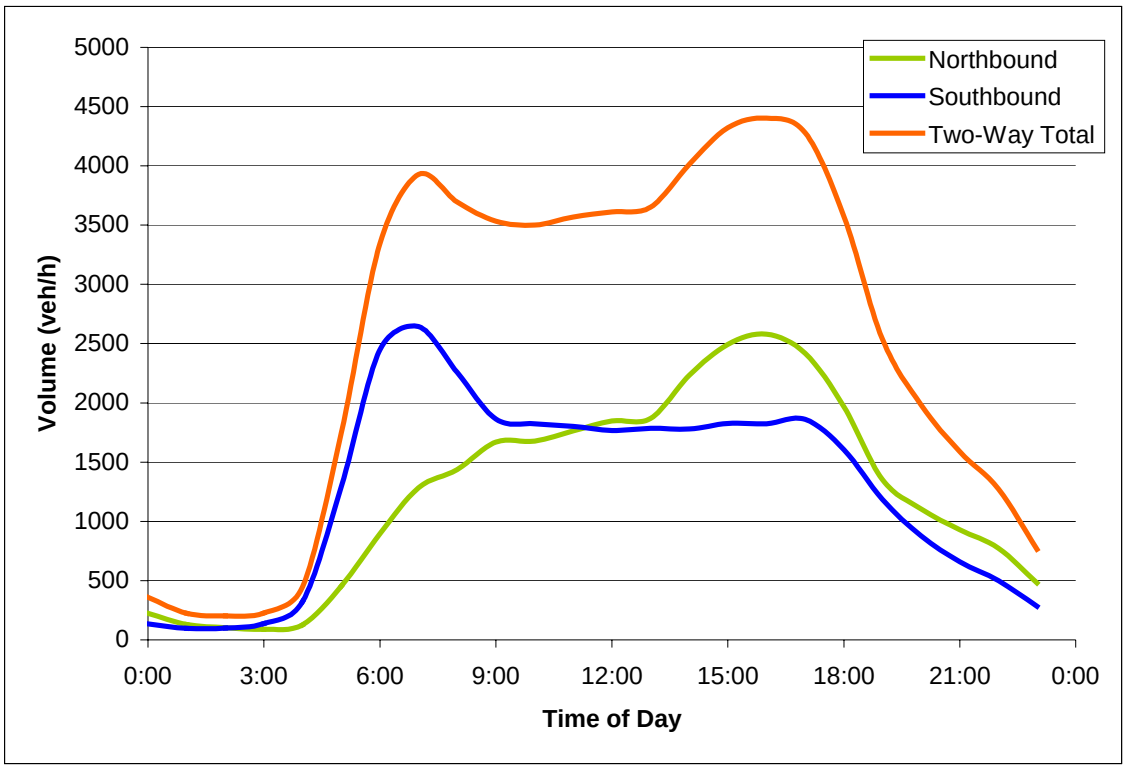
Dickson Street-Bridge Street forms part of a north-south district-suburban route though the local area. The flow profile shown in **Figure 5-12** reveals high peak hour volumes with peak to daily off peak variation of over 50% in hourly traffic volumes, indicative of a commuter route. This reinforces community views that suggest that increased traffic congestion on the Lutwyche and Sandgate Road north-south arterials in recent years has resulted in the increasing use of lower-order roads in the local area as “rat-runs” by commuters to Central Brisbane. Similarly the flow profile on the suburban east-west connector route provided by Albion Road shown in **Figure 5-13** indicates strong Central Brisbane orientated commuter use profiles.

## Traffic Composition

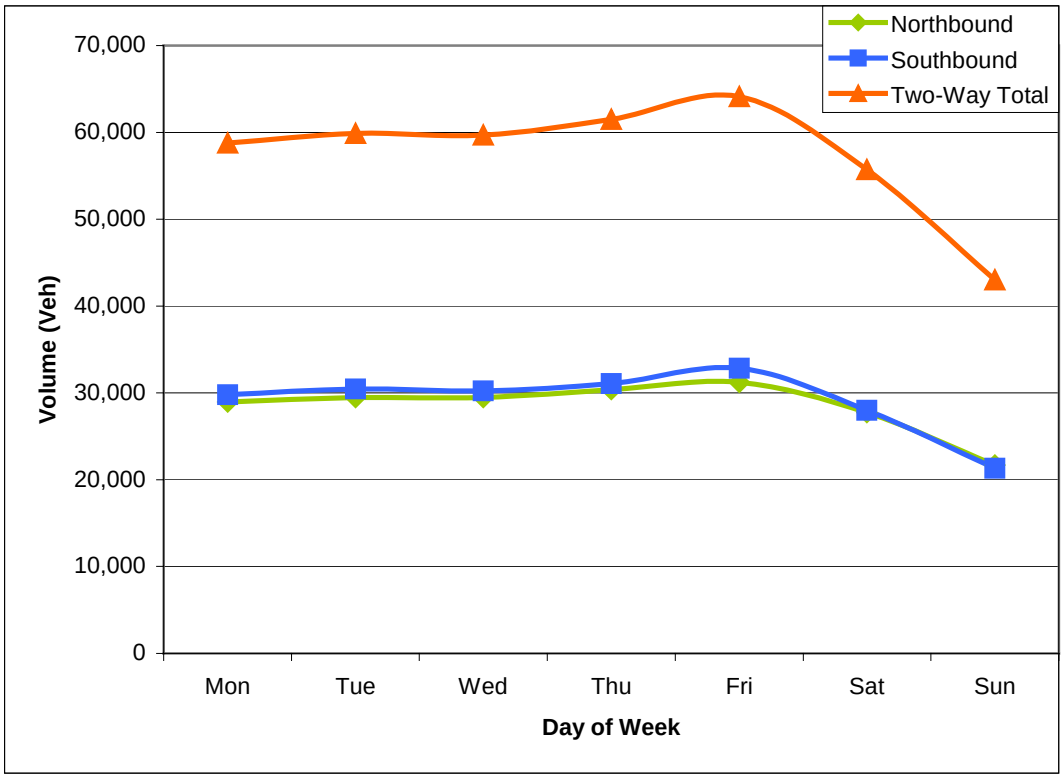
The composition of traffic or vehicle mix (cars, buses, commercial vehicles) has an effect on the performance and characteristics of the road network. Motorways and arterial routes typically carry the higher proportions of commercial and/or industrial traffic, whereas suburban and district roads cater for lower truck volumes.

Lutwyche Road (6.5% - 9.4%) and Sandgate Road (5.2%-8.0%) carry quite high proportions of commercial vehicles. Daily traffic flow by vehicle type on Lutwyche Road indicates a consistent profile of commercial vehicle use throughout the morning then declining mid-afternoon. Nudgee Road (15.9%) and Kingsford Smith Drive (11.1%) have higher commercial vehicle usage. Both these roads are, at least in part, gazetted for B-double vehicle use and directly serve industrial precincts.

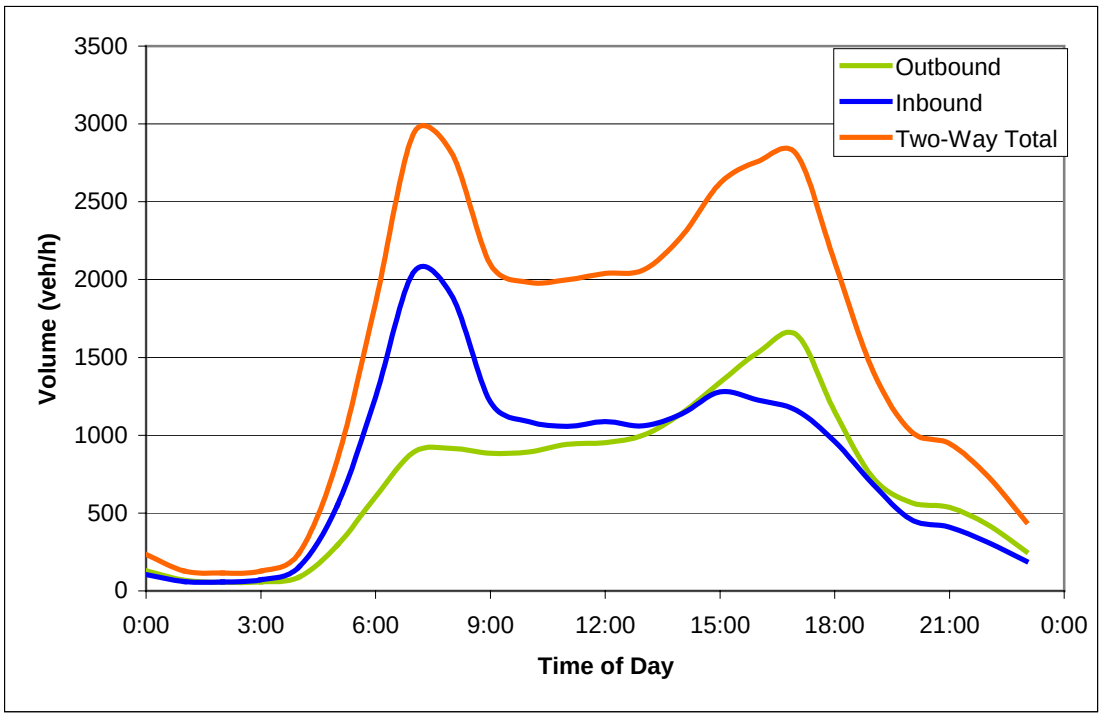
- **Figure 5-8 Lutwyche Road Weekday Temporal Traffic Profile**



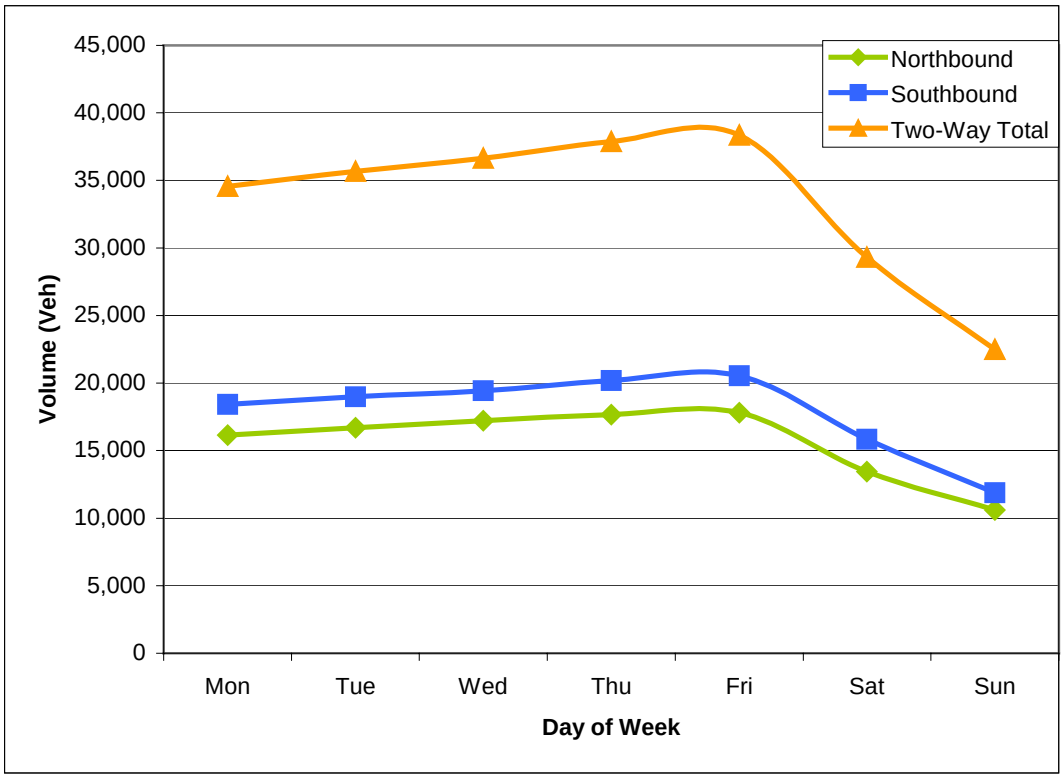

- **Figure 5-9 Lutwyche Road Weekly Traffic Flow Profile**



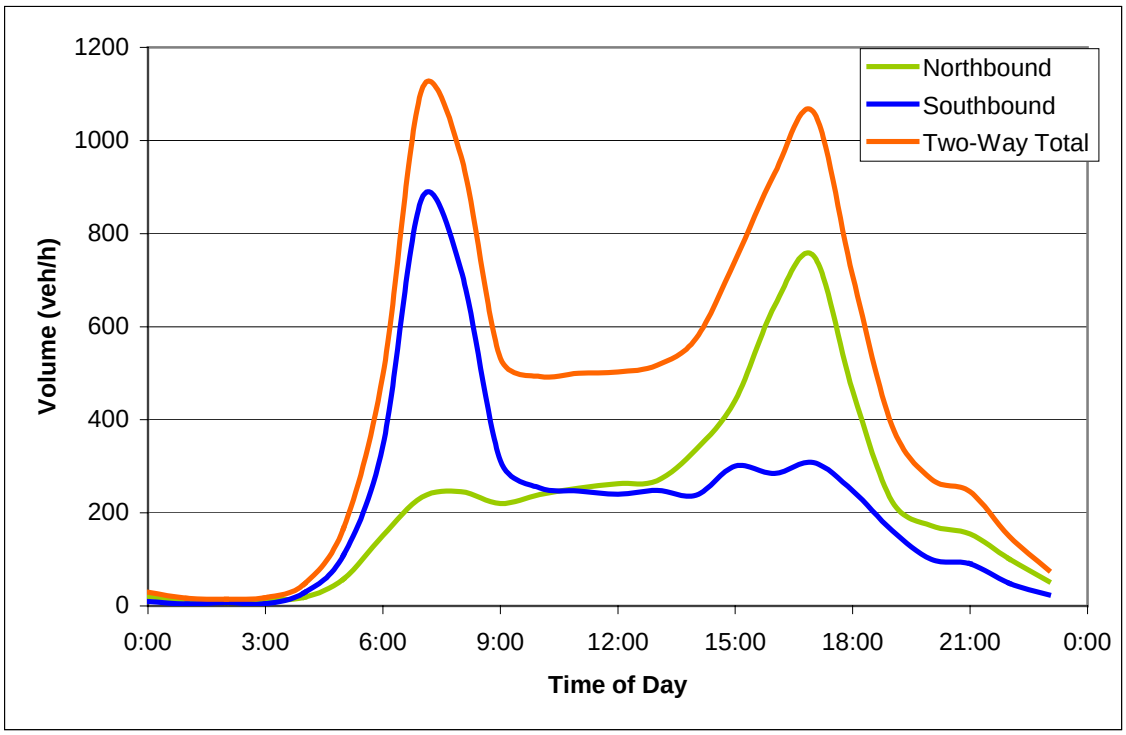
- **Figure 5-10 Sandgate Road Weekday Temporal Traffic Profile**



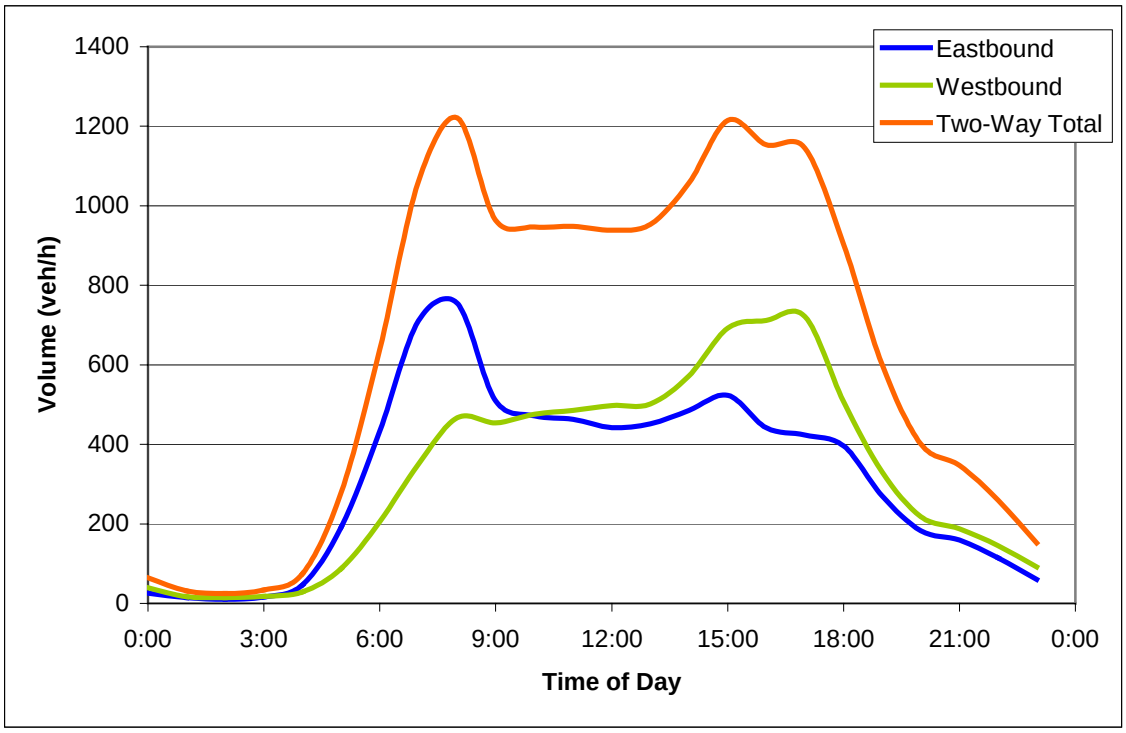

- **Figure 5-11 Sandgate Road Weekly Traffic Flow Profile**



- **Figure 5-12 Dickson Street Weekday Temporal Traffic Profile**




- **Figure 5-13 Albion Road Weekday Temporal Traffic Profile**



### Peak Hourly Traffic Volumes

Existing peak hour traffic volumes on major routes within the Inner North area are shown in **Table 5-3**. These volumes are primarily sourced from recent surveys, Department of Main Roads count database and Brisbane City Council. Typically, the morning peak is found to be of a shorter time period whilst the evening peak is more extended.

- **Table 5-3 2005 Peak Hour Two-way Traffic Volumes**

| ID | Road | Location | AM Peak Volume | PM Peak Volume |
|---|---|---|---|---|
| **Motorway** | | | | |
| 14 | East – West Arterial | East of Widdop Street, Hendra | 1,700 | 1,900 |
| **Arterial** | | | | |
| 5 | Rode Road | West of Sandgate Road, Wavell Heights | 1,400 | 1,600 |
| 10 | Stafford Road | West of Richmond Street, Kedron | 1,600 | 1,700 |
| 11 | Gympie Road | North of Broughton Road, Kedron | 4,700 | 4,300 |
| 13 | Sandgate Road | North of Schulz Canal, Toombul | 3,800 | 4,000 |
| 16 | Nudgee Road | North of East-West Arterial, Hendra | 800 | 1,000 |
| 18 | Kedron Park Road | East of Lutwyche Road, Kedron | 1,300 | 1,500 |
| 20 | Rose Street | Melrose Park, Wooloowin | 3,300 | 4,200 |
| 22 | Sandgate Road | South of Junction Road, Clayfield | 2,700 | 2,700 |
| 27 | Lutwyche Road | North of Stoneleigh Street, Lutwyche | 3,900 | 4,300 |
| 31 | Sandgate Road | South of Bonney Avenue, Albion | 2,900 | 2,700 |
| 33 | Lutwyche Road | South of Newmarket Road, Windsor | 4,100 | 4,300 |
| 34 | Abbotsford Road | South of Burrows Street, Bowen Hills | 4,900 | 4,500 |
| 35 | Inner City Bypass | West of Breakfast Creek Road, Hamilton | 2,100 | 2,000 |
| 36 | Kingsford Smith Drive | East of Cooksley Street, Hamilton | 4,500 | 4,600 |
| 41 | Inner City Bypass | West of Bowen Bridge Road, Herston | 2,100 | 2,000 |
| **Suburban** | | | | |
| 12 | Shaw Road | At Kedron Brook, Wooloowin | 1,600 | 1,300 |
| 26 | Maygar Street | West of Lutwyche Road, Windsor | 700 | 900 |
| 29 | Albion Road | East of Lutwyche Road, Windsor | 1,000 | 1,100 |
| 32 | Newmarket Road | West of Lutwyche Road, Windsor | 900 | 1,400 |
| **District Access** | | | | |
| 24 | Dickson Street | North of Wride Street, Wooloowin | 1,100 | 900 |

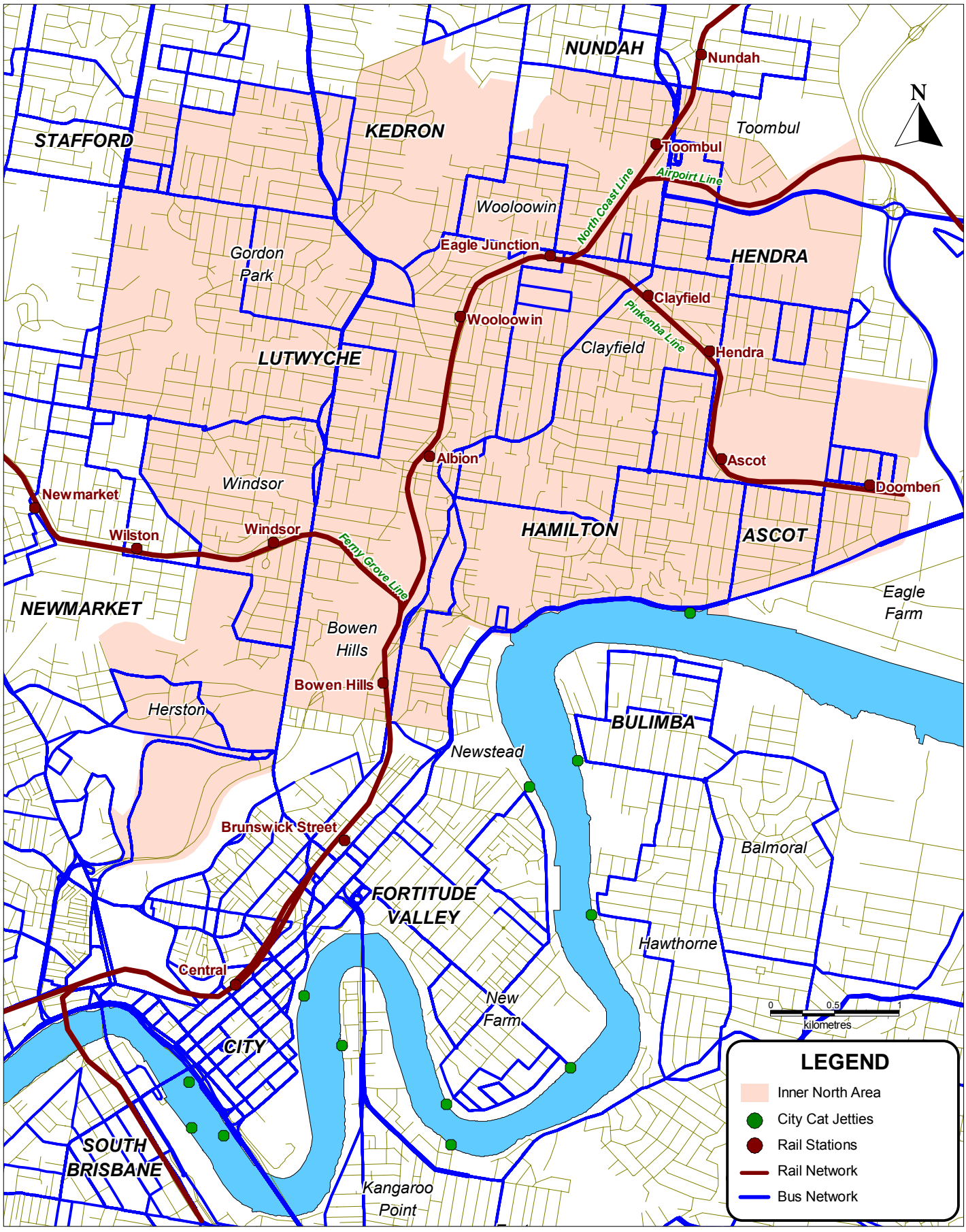
**Table Note:** Source: BCC, DMR, 2005 Surveys

### Traffic Growth

Historic medium to long term traffic growth rates experienced within the Inner North area have been examined by comparing the average daily traffic volumes (AADT) for 1995, 2000 and 2005 at key locations. This indicates sustained traffic growth in the range 1 to 2 % per annum has generally occurred over the last 10 years.

## 5.2.4 Public Transport Services and Infrastructure

The three main forms of public transport in Brisbane are bus, rail and ferry. All of these major forms of public transport within and surrounding the Inner North area are shown in **Figure 5-14**.




**AIRPORT LINK - Figure 5-14**

Existing Public Transport Network

Airport Link

SKM Connell Wagner JOINT VENTURE

## Bus Network

The Brisbane bus network is radially designed, consistent with the road network. Bus services utilise major radial arterial routes as well as the 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 two major bus corridors within the Inner North area are Lutwyche Road and Sandgate Road.

Lutwyche Road is traversed by a number of BCC bus services including Buz (high frequency all day), Rocket (very limited stops), City Express (limited stops) and City Bus (all stops) services. The majority of bus routes service the entire corridor whilst some bus routes enter and/or exit the Lutwyche Road corridor at Northey Street, Maygar Street, Albion Road, Bradshaw Street, Chalk Street, Norman Street or Kedron Park Road.

Two key generators of public transport trips located on Lutwyche Road are the Lutwyche shopping/commercial area and the Royal Brisbane Hospital complex (RBH). Total buses using Lutwyche Road range from 600 per day at Lutwyche to approximately 800 per day at RBH. The Inner Northern Busway (INB) provides a high quality connection for bus services between the Royal Children's Hospital at Herston and Roma Street. A number of bus services on Lutwyche Road use the INB for CBD access. Connectivity between Bowen Bridge Road and the INB is provided via Gilchrist Avenue and Herston Road. Construction is underway to connect the INB to the Queen Street Bus Station, Brisbane's major bus interchange.

During the two hour AM Peak period (7am to 9am), forty-nine (49) buses pass the Lutwyche Road shopping centre towards the Brisbane CBD, an average of a bus every 2.5 minutes. At RBH, sixty-five (65) bus services operate inbound in the 2 hour AM Peak period, an average of 1.85 minutes per bus. The increase in services occurs as additional services join the corridor at Northey Street and Maygar Street.

Routes 335, 339, 346, and 353 run predominantly down Webster Road servicing the local residential catchments before joining Lutwyche Road at the Northey Street intersection. Route 379, servicing Stafford City Shopping Centre and the residential catchments located adjacent to Webster Road, joins the Lutwyche Road corridor at the Maygar Street intersection.

A total of 100 buses per day use Sandgate Road. Six bus routes utilise Sandgate Road and Abbotsford Road within the Inner North area. Four of these routes, designated 306, 310, 315 and 322, traverse the entire study area length of Sandgate Road and Abbotsford Road. Route 320 deviates from Sandgate Road at the Bonney Avenue intersection, servicing the residential suburbs of Clayfield and Wooloowin between the Sandgate and Lutwyche Road corridors before terminating at Chermside Shopping Centre. The sixth route, 301, deviates from Abbotsford Road-Sandgate Road at the Albion fiveways signalised intersection onto Crosby Road. This bus route services the residential suburbs of Albion, Ascot, Hamilton, Clayfield and Hendra before terminating at Toombul Shopping Centre.

The Toombul Bus Interchange is located on the western side of the Centro Toombul Shopping Centre. The bus interchange can support up to eight buses at one time with lay over space available for approximately six additional buses. Access to the Bus Interchange is provided from the Centro Toombul Access/Sandgate Road signalised intersection. Bus egress is to Grace Street. The bus interchange is located less than 150m from the Toombul Rail Station providing a multi-modal interchange facility in Brisbane's north-east.

Of the five bus routes that operate on Sandgate Road north of the Albion Fiveways at Crosby Street, three routes use the Frodsham Street bus lane to bypass the Albion Village when bound for the CBD whilst the other two routes follow Sandgate Road through the Albion Village. All of the five routes operate along Sandgate Road in the outbound direction.

Bus priority measures are usually provided to improve travel times and/or increase reliability of travel times for bus services. Bus priority measures currently active in the Inner North area include:

- Bus lanes located on Bowen Bridge Road between Herston Road and Butterfield Street northbound, and between O'Connell Terrace and Herston Road southbound.
- A T3 transit lane southbound on Lutwyche Road between Ada Street and Horace Street in the AM peak, used by buses, taxis and vehicles with at least three occupants.
- A bus lane on Frodsham Street in the AM Peak.
- Brisbane City Council's BLISS (Brisbane Linked Intersection Signals System) and RAPID (Real Time Advanced Priority and Information Delivery) information systems, monitored by BCC and used to update bus stop variable message signs (VMS) providing patrons with up to date information on bus delays and arrival times.

### Rail Network

A predominantly radial rail network services Brisbane and its surrounding suburbs. All rail lines service the inner city stations of Roma Street, Central, Brunswick Street and Bowen Hills, which act as the four primary interchange points between services.

The Ferny Grove, Doomben, Airport and Shorncliffe lines service the northern suburbs, whilst the Caboolture line services the north coast. These services follow an alignment close to the Abbotsford Road/Sandgate Road corridor through the study area. East of the Eagle Junction station the three corridors service different regions. The Doomben line services residential suburbs in the south-east of the study area, terminating within the study area at Doomben. The Airtrain rail corridor runs elevated parallel to the East-West Arterial Road whilst the Caboolture and Shorncliffe lines service the Toombul Rail station before heading north.

Bowen Hills rail station is one of the four major interchange stations in Brisbane (along with Brunswick Street, Central and Roma Street), and services on the Sandgate, Petrie, Ferny Grove, Airport and Doomben lines, operate via this station. Bowen Hills has an average peak service headway of under 4 minutes in each direction in both the morning and afternoon peaks.

The suburbs of Wilston and Windsor are serviced by the Ferny Grove rail line, which runs east – west through the southern section of the Inner North area. Windsor station is located on the Ferny Grove rail line. This rail line services the north-western suburbs of Brisbane, and runs east-west crossing over Lutwyche Road just south of the Bowen Street signalised intersection. Windsor Station has services operating inbound at a headway of 24 minutes in the AM peak and 13 minutes outbound in the PM peak.

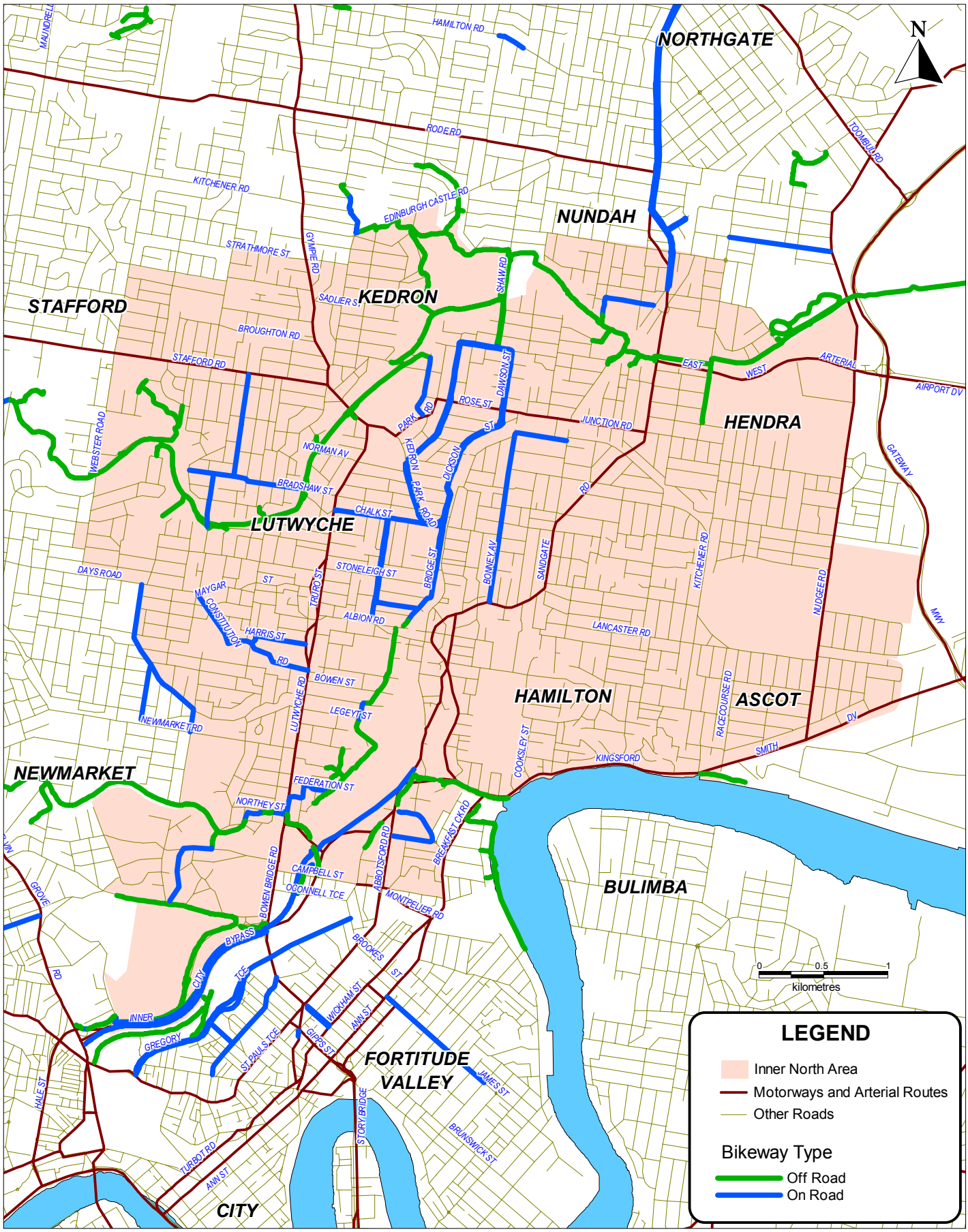
Opened in 2002 as an alternative means of to/from airport travel, Airtrain provides a 22 minute service between Central rail station and the Domestic Airport at a cost of $12 per one-way trip. Services to the Airport depart Central between 5:30am and 7pm and services from the Airport depart between 6:15am and 7:30pm on weekdays. Typical peak headways are 15 to 20 minutes, with services operating every 30 minutes during off-peak times.

### Ferry Network

The Brisbane City Cat catamaran ferry network operates between Brett's Wharf in Hamilton and the University of Queensland St Lucia campus. Key jetty locations include Southbank, University of Queensland St Lucia Campus, Brisbane City, and Toowong. The Brett's Wharf City Cat ferry terminal in Hamilton on the southern side of Kingsford Smith Drive is the only ferry servicing point in the Inner North area. City Cat ferries to the City and St Lucia depart from this terminal every 15 to 20 minutes during peak periods, and 30 minutes off-peak, 18 hours per day.

## 5.2.5 Cycle and Pedestrian Movements and Facilities

A number of on-road cycle lanes and off road shared pedestrian/cycle facilities are present within the Inner North area as shown in **Figure 5-15**.




**AIRPORT LINK - Figure 5-15**
Existing Cycle Network

Airport Link

SKM Connell Wagner
JOINT VENTURE

Major pedestrian/cycle shared use pathways connect the east and west regions of the study corridor as follows:

1) An off-road cycle path between Kelvin Grove Road and Albion Road.

   This link follows the natural curvature of Enoggera Creek on its northern bank. Three footbridge crossings have been provided across Enoggera Creek, between Kelvin Grove Road and Bowen Bridge Road, connecting the cycle path with local pedestrian and cyclist friendly roads south of Enoggera Creek. Connectivity of the pathway across Lutwyche Road is provided through a signalised pedestrian crossing at the Northey Street intersection. A southern connection from this cycle way to the shared path described in 3) is provided via a bridge over Enoggera Creek at Downey Street.

2) Kedron Brook Path.

   This link follows the natural curvature of Kedron Brook, primarily along its southern bank. For the most part, this is an off road path connecting the north-western corridor of the Inner North Area, to the north-eastern suburbs of Nudgee and Boondall. This cycle path has a total distance of approximately 25kms and services the Stafford City and Toombul Shopping Centres. The Kedron Brook shared path cycleway also forms an important element of the pedestrian network, with high levels of recreational pedestrian use.

3) A third shared use path, located south of the nearby Enoggera Creek path, follows Gilchrist Avenue through Victoria Park from Herston Road to the ICB. This predominantly commuter path, leads to a landbridge that has been constructed over the ICB to connect the cycleway to the suburb of Spring Hill and the Brisbane Grammar Schools. The Enoggera Creek pathway is connected to the Herston Road/Victoria Park path by the local road network.

Lutwyche Road and Sandgate Road are two main arterials in the study area and are both important commuter routes. There are no on-road cycle lane provisions along either of these roads in the Inner North area and conditions for on road cyclists are not conducive to shared lane travel. Lane widths are generally only 3 metres wide compared with recommended standards of 4.0 to 4.5 meters wide for cyclist use. Furthermore, the short segment of inbound transit lane on Lutwyche Road has strong bus usage, especially during peak periods.

The Lutwyche Road and Sandgate Road corridors are flanked on either side by pedestrian footpaths. Signalised intersections provide for pedestrian crossings at all intersections for both roads. However, due to heavy traffic demands and limited capacity most intersections on Lutwyche Road only provide pedestrian facilities across one of the Lutwyche Road approaches. The same applies for Sandgate Road where most of the intersections located south of Adelaide Street provide pedestrian facilities across one of the Sandgate Road approaches only.

### 5.2.6 Freight

The only routes gazetted for use by B-double vehicles within the Inner North area occur on the eastern fringe. Kingsford Smith Drive and Nudgee Road are both partially gazetted for B-Doubles. Kingsford Smith Drive is gazetted east of the Nudgee Road intersection. Nudgee Road is gazetted for B-Doubles from the Hedley Avenue intersection to north of the East-West Arterial Road. Hedley Avenue itself is also gazetted for B-doubles and serves a significant industrial precinct. The East-West Arterial Road is also gazetted for B-doubles between the Nudgee Road and Gateway Motorway intersections, allowing B-Double access to the Gateway Motorway.

Nudgee Road, between Kingsford Smith Drive and Lamington Avenue is gazetted for the smaller 23m B-Double access between 9am and 4pm on weekdays. Kingsford Smith Drive traffic recorded 660 B-Doubles on an average weekday in 2005.

Although not gazetted for B-doubles, surveys indicate that Lutwyche Road and Sandgate Road often experience use by some heavy articulated freight traffic.

Significant freight movements by rail on the Pinkenba Line, and other branches east of Doomben, travel through the Mayne Rail Depot to access other routes but the proposed road tunnels are unlikely to have any effect on this service.

### 5.2.7 Emergency Services

Police stations within the study area are located at:

- Nudgee Road (Hendra) – all movements access to Nudgee Road;
- Corner Stafford Road and Webster Road (Stafford) with left-in left-out access from Webster Road; and
- Toombul Shopping Centre (Shop Front, Toombul).

Fire services within the study area are located at:

- Nudgee Road (Hendra); and
- Truro Street (Windsor).

The Nudgee Road fire station is located south of the Hedley Avenue intersection. Its main access directly fronts Nudgee Road and the lack of a centre median allows for both north and south movements to be made. A secondary access is provided from Navigator Place.

The Windsor fire station is located between Fosbery Street and Annie Street. The fire station has a main access onto Fosbery Street, just east of the signalised intersection with Lutwyche Road, and a secondary access from Truro Street.

The central office complex for the Queensland Department of Emergency Services is located at Kedron on the north-eastern corner of the Lutwyche Road/Kedron Park Road intersection. The complex provides integrated accommodation for Queensland Fire and Rescue Service, Queensland Ambulance Service, Emergency Management Queensland and the State Disaster Coordination Centre, providing communication and co-ordination across all the services. Around 600 persons work at the Kedron complex with an expected increase to 800 once it reaches operational capacity. Primary vehicular access is left-in left-out from Lutwyche Road, with movements constrained directionally by a central raised median. Another access point is located on Park Road near the neighbouring Kedron State High School.

Ambulance services operate from the Royal Brisbane Hospital complex with the main ambulance access onto Butterfield Street and a secondary access at the signalised intersection of Bowen Bridge Road with O'Connell Terrace.

## 5.3 Existing Road Network Performance

### 5.3.1 Traffic Demands and Movement Patterns

**Figure 5-16** shows the distribution of current traffic (daily traffic flow patterns), using both Lutwyche Road (north of Stoneleigh Street) and Sandgate Road (south of Bonney Avenue) during an average weekday. **Figure 5-17** shows traffic using Junction Road during an average weekday. Daily travel patterns are summarised in **Table 5-4; Table 5-5** and **Table 5-6** based on travel sectors shown in **Figure 5-1** and **Figure 5-2**. The figure and sector travel analysis illustrate the wide catchments served by the Sandgate Road and Lutwyche Road corridors. The catchment for east-west travel demands catered for on the East-West Arterial Road at Junction Road is also identified.

Overall network daily traffic demands are shown on **Figure 5-18.**

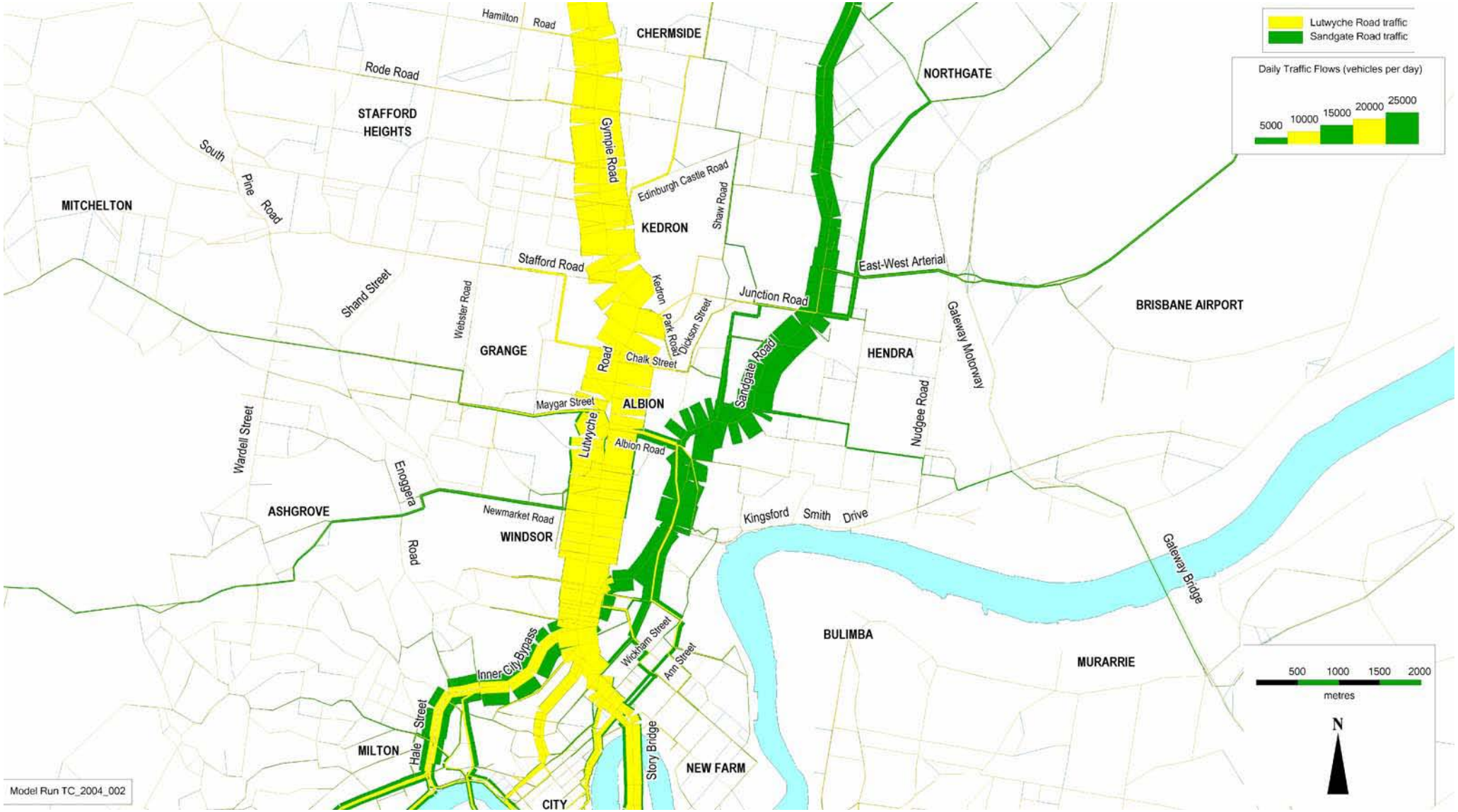



**Figure 5-16**
Existing Daily Travel Patterns
Lutwyche Road and Sandgate Road
(select links)

Airport Link

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JOINT VENTURE


Figure 4-2
Existing Daily Travel Patterns
Junction Road
(select links)

Airport Link

SKM Connell Wagner JOINT VENTURE

BRISBANE CITY

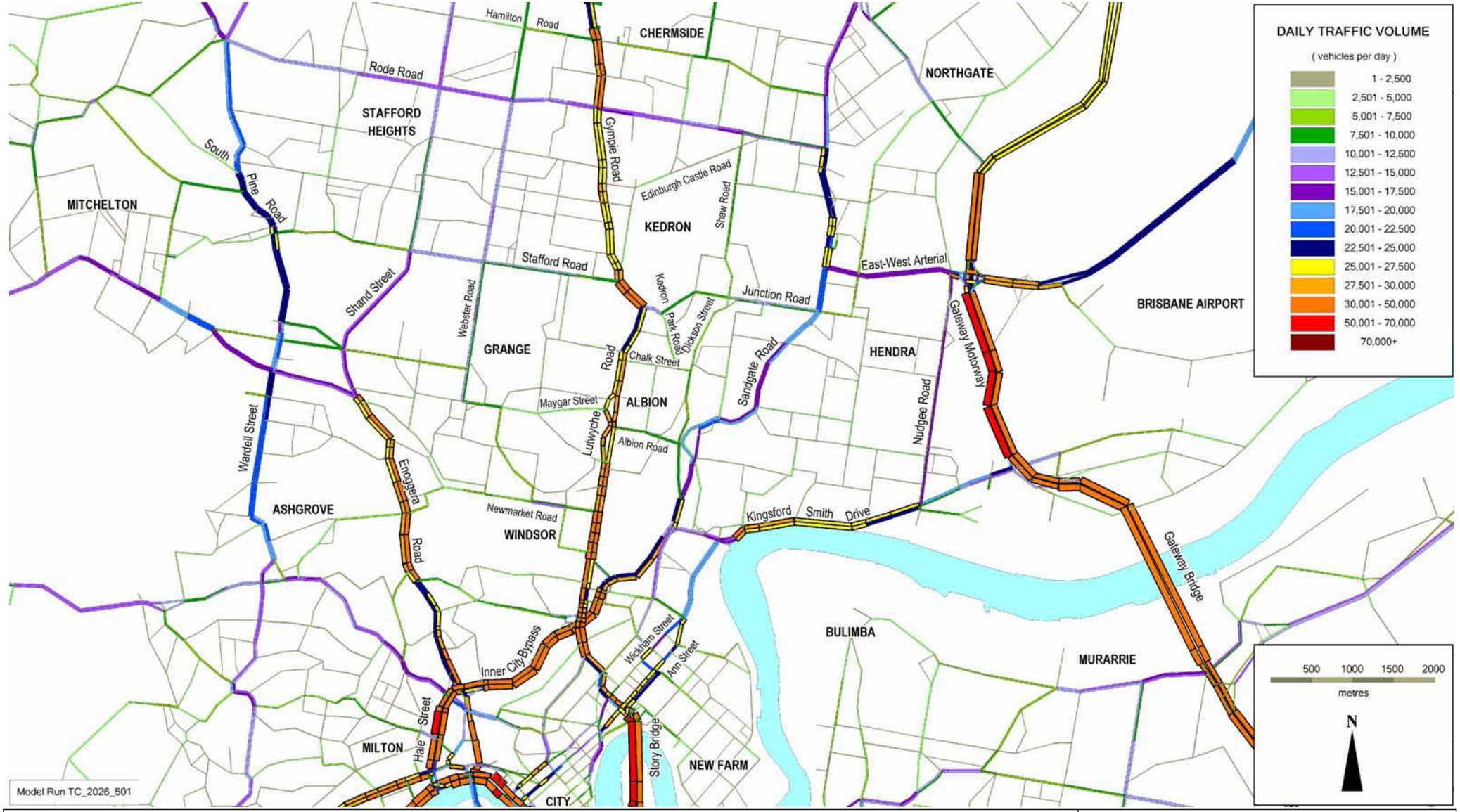


**Figure 5-17**

2004 Average Weekday Traffic Volumes

Airport Link

SKM Connell Wagner JOINT VENTURE

On an overall basis Lutwyche Road typically carries a mix of local traffic (4%), radial or CBD oriented trips (38%) and cross-city traffic (58%). The component of peak period use (<1%) related to Airport travel is relatively small as alternative routes, particularly via Kingsford Smith Drive or Sandgate Road, offer more direct connectivity.

Sandgate Road similarly caters for local traffic (9%), radial or CBD oriented trips (23%) and has similar cross-city traffic role (63%) to Lutwyche Road. About 9% of traffic use on Sandgate Road during peak periods is related to the Airport/ATC area.

Whilst daily travel demand to Central Brisbane is strong on both routes, travel patterns between the north and south sectors, across the River, are also high for both Lutwyche and Sandgate Roads. This clearly demonstrates their function as part of a network of cross-city connections between the northern and southern, and northern and western suburbs of Brisbane.

On Junction Road, which forms part of the state-controlled East West Arterial Road, there is a strong mix of local use (20%) as well as cross-city travel movements. This route clearly plays an important east-west travel function, with 36% of travel related to the western catchment. Approximately 15% of total use is specifically associated with east-west travel to/from the Airport/ATC area.

The overall network daily traffic demands shown on **Figure 5-18** illustrate that the traffic volumes of 60,000 vpd on Lutwyche Road and 40,000 vpd on Sandgate Road represent a major proportion of the traffic task within the network in Inner North Brisbane. This demonstrates their significance within the broader network of the Metropolitan area. Junction Road on the East-West Arterial route carries a lower weekday traffic volume of less than 20,000 vpd, which as described previously is due to a mix of local traffic and east-west travel movements within the northern suburbs road network

### Table 5-4 Lutwyche Road Daily Travel Patterns

| To / From | Central Brisbane | Inner North | West Brisbane | North Brisbane including Airport | Brisbane South | Total |
|---|---|---|---|---|---|---|
| Central Brisbane | - | 2% | - | 15% | - | **17%** |
| Inner North | 2% | 4% | 3% | 4% | 3% | **17%** |
| West Brisbane | - | 2% | - | 3% | - | **5%** |
| North Brisbane including Airport | 18% | 6% | 3% | - | 14% | **42%** |
| Brisbane South | - | 3% | - | 15% | - | **18%** |
| **Total** | **21%** | **17%** | **6%** | **38%** | **17%** | **100%** |

### Table 5-5 Sandgate Road Daily Travel Patterns

| To / From | Central Brisbane | Inner North | West Brisbane | North Brisbane including Airport | Brisbane South | Total |
|---|---|---|---|---|---|---|
| Central Brisbane | - | 5% | 1% | 6% | - | **11%** |
| Inner North | 5% | 9% | 7% | 4% | 6% | **30%** |
| West Brisbane | - | 6% | - | 7% | - | **13%** |
| North Brisbane including Airport | 7% | 5% | 9% | - | 9% | **30%** |
| Brisbane South | - | 6% | 1% | 9% | - | **16%** |
| **Total** | **12%** | **31%** | **18%** | **26%** | **15%** | **100%** |

- **Table 5-6 East-West Arterial Road at Junction Road Daily Travel Patterns**

| From \ To | Central Brisbane | Inner North | West Brisbane | North Brisbane including Airport | Brisbane South | Total |
|---|---|---|---|---|---|---|
| Central Brisbane | - | 0% | - | 0% | - | **0%** |
| Inner North | 0% | 20% | 5% | 12% | 4% | **41%** |
| West Brisbane | - | 5% | - | 10% | 3% | **19%** |
| North Brisbane including Airport | 0% | 16% | 9% | 5% | 2% | **32%** |
| Brisbane South | - | 4% | 2% | 1% | - | **7%** |
| **Total** | **0%** | **45%** | **17%** | **28%** | **10%** | **100%** |

### 5.3.2 Local Accessibility

#### Lutwyche Road Corridor

The road hierarchy around the Lutwyche Road corridor is shown in **Figure 5-4**. District and Suburban routes service the majority of residents in local catchments on either side of Lutwyche Road. Connecting the residential areas with Lutwyche Road at signalised intersections are Newmarket Road, Albion Road, Maygar Street, Chalk Street, Bradshaw Road, Kedron Park Road, Stafford Road and Leckie Road.

Due to the high volume of traffic on Lutwyche Road, as well as the continually changing grades, restrictions have been placed on local access at many priority (unsignalised) intersections. These restrictions are designed to optimise the performance of Lutwyche Road for commuter and through traffic. Almost all priority intersections along the Lutwyche Road corridor are restricted to left in, left out only movements, either by a raised median or unbroken central line markings.

Right turns to and from Lutwyche Road are, with a few exceptions, only permitted at signalised intersections and priority intersections with right turn bays. Due to road reserve constraints a number of signalised intersections lack right turn bays, resulting in banned right turns at signalised intersections either permanently or during peak periods. Banned right turns are found at the following signalised intersections:

- Northey Street (AM Peak inbound)
- Eildon Street/Le Geyt Street (AM and PM peaks)
- Bowen Street (outbound)
- Bradshaw Street (outbound)
- Kedron Park Road (outbound)

A recent (2005) change to the network on Gympie Road comprises a raised median converting the operation of Suez Street and Park Terrace, located just south of the Stafford Road, to left-in left-out operation. This was done on safety grounds due to a very high accident record. Similarly, a combination of safety grounds and operational reasons has lead to the recent closure of the right turn movement into Leckie Road from Gympie Road. Motorists from the south seeking to access the eastern precinct on Gympie Road at Kedron must use signals at the Gympie Road/Sadlier Street intersection some 400 metres further to the north.

West of Lutwyche Road, on Victoria Street traffic calming devices have been installed to discourage rat running by motorists bypassing the congestion surrounding the Newmarket Road intersection. Traffic calming devices have also been constructed on Fuller Street, Bowen Street and Grafton Street. The disjointed road network within the study area close to Lutwyche Road, as well as the narrow road reserves, and generally short road segments on lower order roads, help to reduce speeds and discourage the use of these routes as rat runs when Lutwyche Road is impacted by congestion.

Most shop frontages on Lutwyche Road provide direct driveway access. The spacing and number of signalised intersections allow for easy left-in left-out merging of driveway by providing gaps in the traffic flow. Sight distances on Lutwyche Road are generally of a high standard, further aiding merging traffic.

### Sandgate Road-Abbotsford Road Corridor

Priority intersections on Sandgate Road and Abbotsford Road within the Inner North area predominantly permit right turn movements to and from Sandgate Road. Priority intersections on Sandgate Road within the study area that are restricted to left-in left-out movements include Kedron Street, Reeve Street, Riverton Street, and Christian Street.

All movements at signalised intersections along Sandgate Road are generally permitted, however at the ICB off ramp intersection with Allison Street and Abbotsford Road, the right turn movement is banned from ICB to Abbotsford Road.

## 5.3.3 Travel Speeds and Travel Times

Travel time surveys were conducted in November 2005 along the Lutwyche Road and Sandgate Road corridors. The study length extended for 5.5 km on Gympie Road-Lutwyche Road- Bowen Bridge Road between the Strathmore Street/Castle Street intersection at Kedron and the Herston Road intersection at Bowen Hills, and for 6.0 km on Sandgate Road between the Nundah by-pass tunnel at Toombul and the Campbell Street intersection at Bowen Hills. Data from previous travel time surveys on the East-West Arterial route was incorporated in transport model validation.

**Table 5-7** shows the average travel speeds and times along these two corridors in the northbound (outbound from the city) and southbound (inbound to the city) directions. The travel time and speed range surveyed on these study corridors are indicated in **Table 5-8**.

On Lutwyche Road, the section between the Chalk Street and Newmarket Road intersections is problematic for delays for southbound commuter travel in the AM peak. In the PM peak period, severe northbound congestion is typically evident between the Albion Road and Chalk Street intersections through Lutwyche, and around the Stafford Road intersection at Kedron.

Along Sandgate Road, delays for southbound traffic in the morning peak, typically occur in the Albion area. The Clayfield section of the route near Junction Road is congested in the evening peak and causes delays.

- **Table 5-7 2005 Average Travel Times and Travel Speeds**

| Parameter | Morning Peak (7-9 AM) | | | | Evening Peak (4-6 PM) | | | |
|---|---|---|---|---|---|---|---|---|
| | Lutwyche Road | | Sandgate Road | | Lutwyche Road | | Sandgate Road | |
| | North-bound | South-bound | North-bound | South-bound | North-bound | South-bound | North-bound | South-bound |
| Average Time (min) | 9.26 | 11.10 | 10.97 | 11.62 | 10.69 | 9.80 | 11.52 | 12.97 |
| Average Speed (km/h) | 36 | 29 | 33 | 31 | 31 | 33 | 31 | 28 |

**Table Note:** Source: 2005 Travel Time Surveys

- **Table 5-8 2005 Travel Times and Travel Speed Variability**

| Parameter | Morning Peak (7-9 AM) | | | | Evening Peak (4-6 PM) | | | |
|---|---|---|---|---|---|---|---|---|
| | Lutwyche Road | | Sandgate Road | | Lutwyche Road | | Sandgate Road | |
| | North-bound | South-bound | North-bound | South-bound | North-bound | South-bound | North-bound | South-bound |
| Time Range (min) | 8.37-10.35 | 6.50-16.67 | 9.78-12.02 | 7.89-17.50 | 8.65-14.42 | 9.03-10.72 | 9.83-13.54 | 12.06-14.09 |
| Speed Range (km/h) | 39-32 | 50-20 | 37-30 | 45-20 | 38-23 | 36-30 | 37-27 | 30-25 |

**Table Note:** Source: 2005 Travel Time Surveys

### 5.3.4 Road Capacity and Level of Service

Level of Service (LOS) provides an assessment of the operation 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 2004. The assessment uses AustRoads criteria that use travel speed as the defining measure for urban arterial roads with interrupted flow. LOS can be measured at a mid-block point along a road or at an intersection. As travel speeds decrease from the optimum free-flow condition, the LOS to road users deteriorates. The Level of Service range is from A (very good) to F (congested), and **Table 5-9** describes the characteristics of each category.

- **Table 5-9 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 for 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

Lutwyche Road in the inbound direction during the AM peak period and outbound direction in the PM peak period has many mid-block segments that operate at Level of Service E or F. Between Newmarket Road and Northey Street, Lutwyche Road is congested in the peak direction in both peaks. This implies that unstable flow conditions, low speeds and delays are likely. A transit lane operates inbound on Lutwyche Road during the morning peak benefiting public transport and high occupancy vehicle users. This benefit is not reciprocated in the evening peak outbound.

Various sections of Sandgate Road, Abbotsford Road and Hudson Road, between the ICB and the East-West Arterial Road, operate at low Level of Service during the AM peak. The inbound section of Sandgate Road

between Bonney Avenue and Frodsham Street is also highly congested. Similarly during the PM peak Burrows Street, Hudson Road, Abbotsford Road and Sandgate Road are very congested in the Albion area.

### 5.3.5 Intersection Performance

Within an urban road network, performance is strongly influenced by the operating conditions of intersections which are generally more constrained from a capacity viewpoint than the mid-block sections of roadway. An intersection performance assessment considers the interaction of vehicle demands (turning movements), pedestrians, lane capacity, form of intersection control and traffic signal phasing and co-ordination.

Key measures of intersection operation include the Level of Service (LOS) and Degree of Saturation (DOS). The intersection Level of Service criteria are shown in **Table 5-10** and is based on average delays for all vehicles using an intersection over a given time period, typically a two hour peak period.

**Table 5-10 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: Highway Capacity Manual , 2000.

The Degree of Saturation is measured as a ratio (X value) 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%, 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.

Over-saturated, congested traffic conditions occur during peak periods at several intersections along the Gympie Road-Lutwyche Road-Bowen Bridge Road corridor. The 5.8 km section between Kedron (Strathmore Street) and Herston (Gregory Terrace) includes 23 sets of traffic signals and two signalised pedestrian crossings. Examples of intersections with a Level of Service E or F, coupled with a very high degree of saturation, include the three closely spaced intersections of Gympie Road/Leckie Road, Gympie Road/Stafford Road and Lutwyche Road/Kedron Park Road. In this area congested conditions hamper the ability to provide good progression of travel through the co-ordinated signal system and delays to the side road traffic (e.g. Kedron Park Road) can be very high. In late 2005 changes were made to the intersection of Gympie Road/Leckie Road and the right turn lane from Gympie into Leckie Road was discontinued.

In the 6.0 km section of Sandgate Road between Bowen Hills (Montpelier Road) and Toombul (Union Street), congestion occurs at several locations during peak periods. There are 18 sets of traffic signals and two signalised pedestrian crossings. In particular, intersections in the Albion area typically require vehicles to wait more than one cycle at the signals.

Stafford Road intersections generally operate well within capacity, although congestion occurs in the AM peak at the Webster Road intersection.

### 5.3.6 Public Transport Performance

**Figure 5-19** shows existing public transport demands, and illustrates the strong role of rail in servicing public transport demands in the Inner North area and the value of the South-East Busway in servicing the south of Brisbane.

## Bus System Performance

Bus travel demands, whilst not as high as rail, indicate a strong use of this mode of public transport with a 10.0% public transport mode share by Inner North area residents compared to the metropolitan average of 8.3%.

Lutwyche Road services are predominant, serving the northern suburbs and the major employment hubs of the Royal Brisbane Hospital complex and Westfield Chermside Shopping Centre. Sandgate Road bus services also service the north-eastern suburbs of Brisbane, however they compete for patronage with the parallel rail corridor.

Lutwyche Road bus occupancy surveys conducted in 2003 indicated sound levels of peak direction bus usage of 42 persons per bus in the AM peak period and 26 persons per bus in the PM peak period. These loads are within the capacity of the bus system. The 2004 estimate of weekday patronage of bus services on Lutwyche Road at Enoggera Creek is 10,000 passengers per day.

**Table 5-11** provides the average travel times and speed for bus services along the Lutwyche Road and Sandgate Road corridors. These data were retrieved from Brisbane City Council (BCC) Brisbane Linked Intersection Signals System (BLISS) and Real time Advanced Priority and Information Delivery (RAPID). The bus data were retrieved for the same day as a general travel time survey was conducted.

The bus travel time data were retrieved for all services that run along these two bus corridors in the AM and PM peak periods. The data were analysed for buses travelling in the peak direction only (southbound in the AM and northbound in the PM) as they run more frequently during these periods.

Most bus services run at longer travel time and slower speeds than general traffic, particularly on Sandgate Road. On Lutwyche Road the inbound transit lane offers benefits to bus travel times in the AM peak, especially for Rocket bus services.

### Table 5-11 Observed Average Travel Times and Travel Speeds for Bus Services

| | Morning Peak (7-9 AM) (Travelling Southbound) | | | | | Evening Peak (4-6 PM) (Travelling Northbound) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Lutwyche Road | | | Sandgate Road | | Lutwyche Road | | | Sandgate Road | |
| Services | All Stops | Limited Stops | Rocket | All Stops | Limited Stops | All Stops | Limited Stops | Rocket | All Stops | Limited Stops |
| Average Time (min) | 16.19 | 12.08 | 9.59 | 9.46 | 7.21 | 15.49 | 12.17 | 10.45 | 6.40 | 7.13 |
| Average Speed (km/h) | 20 | 27 | 34 | 23 | 31 | 21 | 27 | 31 | 35 | 31 |

**Table Note:** Source: BCC, 2005.


**Figure 5-18**
2004 Average Weekday
Public Transport Demands

Airport Link

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Several key intersections used by Brisbane City Council bus services in the Inner North area operate close to, or above, nominal capacity in either or both the morning and evening peak periods. These include:

- Gympie Road/Stafford Road;
- Lutwyche Road/Kedron Park Road;
- Lutwyche Road/Chalk Street;
- Lutwyche Road/Albion Road;
- Lutwyche Road/Newmarket Road;
- Lutwyche Road/Federation Street;
- Bowen Bridge Road/Butterfield Street; and
- Bowen Bridge Road/Gregory Terrace.

## Rail System Performance

Daily station usage for the three major rail stations is shown in **Table 5-12**. Observed 2005 daily rail patronage north of the Bowen Hills rail station is shown in **Table 5-13**. Indicative patronage of the segment between Bowen Hills and Fortitude Valley is 50,000 passengers per day. Patronage demands are within the capacity of the rail system.

### Table 5-12 Daily Rail Station Usage

| Station | Persons Boarding | Persons Alighting |
|---|---|---|
| Albion Rail Station | 1,400 | 1,100 |
| Wooloowin Rail Station | 1,350 | 1,200 |
| Windsor Rail Station | 600 | 550 |

**Table Note:** Source: Queensland Rail, 2002

### Table 5-13 Daily Rail System Demand

| Rail System Segment | Persons To City | Persons From City |
|---|---|---|
| Albion – Bowen Hills | 17,700 | 16,400 |
| Windsor – Bowen Hills | 7,000 | 6,800 |
| **Total** | **24,700** | **23,200** |

**Table Note:** Source: Queensland Transport, 2005

Average travel times between key stations and Central Rail Station are shown in **Table 5-14**. Travel times vary by on average 1 minute depending on peak period and trip direction. Occasional services to some stations can take approximately 5 minutes longer than the average travel time.

### Table 5-14 Peak Period Average Travel Time between Station and Central

| Station | Average Travel Time (mins) |
|---|---|
| Bowen Hills | 5 |
| Windsor | 8 |
| Albion | 8 |
| Wooloowin | 9 |
| Eagle Junction | 11 |
| Toombul | 14 |
| Clayfield | 12 |
| Ascot | 18 |
| Doomben | 20 |
| Brisbane Airport | 22 |

**Table Note:** Source: TransLink, 2005

## Pedestrian and Cyclist System Performance

The existing on and off-road pedestrian and cycle facilities can be seen with reference to the existing road and cycle network in **Figure 5-15**.

Pedestrian and cycle surveys were conducted in 2005 to assess the level of usage of existing facilities. The results for the ICB landbridge, the Enoggera Creek path and the Kedron Brook path are shown below, for the average weekday and average weekend day use, in **Table 5-15** and **Table 5-16** respectively. Data for two other locations within the Inner North area, Breakfast Creek Bridge on Breakfast Creek Road and Bowen Bridge Road at Gregory Terrace, are presented for an average weekday.

### Table 5-15 Pedestrian and Cyclist Activity - Average Weekday 2005

| Location | Cycle | | | Pedestrian | | | 2 way Total |
|---|---|---|---|---|---|---|---|
| | Southbound/ Eastbound | Northbound/ Westbound | Total | Southbound/ Eastbound | Northbound/ Westbound | Total | |
| ICB Landbridge | 134 | 96 | 230 | 164 | 157 | 321 | 551 |
| Enoggera Creek | 109 | 94 | 203 | 369 | 354 | 723 | 926 |
| Kedron Brook | 84 | 45 | 129 | 106 | 40 | 146 | 275 |
| Breakfast Creek Bridge | 43 | 25 | 68 | 36 | 37 | 73 | 141 |
| Bowen Bridge Road | 63 | 22 | 85 | 200 | 230 | 430 | 515 |

**Table Note:** Source: BCC surveys, 2005.

### Table 5-16 Pedestrian and Cyclist Activity - Average Weekend Day 2005

| Location | Cycle | | | Pedestrian | | | 2 way Total |
|---|---|---|---|---|---|---|---|
| | Southbound/ Eastbound | Northbound/ Westbound | Total | Southbound/ Eastbound | Northbound/ Westbound | Total | |
| ICB Landbridge | 27 | 35 | 62 | 59 | 45 | 104 | 166 |
| Enoggera Creek | 38 | 36 | 74 | 94 | 122 | 216 | 290 |
| Kedron Brook | 343 | 59 | 402 | 338 | 49 | 387 | 789 |

**Table Note:** Source: BCC surveys, 2005.

The surveys show that all connections are well used by pedestrian and cyclist commuters, whilst significant recreational usage is also found on weekends. The ICB Landbridge and the Enoggera Creek path have a higher total two-way usage on the weekday than they do on the weekend. This indicates that these paths tend to act more as a commuter route rather than as a recreational facility.

In general there are more pedestrian than cycle users on all the paths, for both the average weekday and weekend. This however, does not apply to Kedron Brook where the number of cyclists surpasses the number of pedestrians on the weekend. Furthermore Kedron Brook has both more pedestrian and more cycle users on the weekend than it does on weekdays. The result is contrary to the other two locations and reflects the predominantly recreational nature of the Kedron Brook.

Heavy traffic and a narrow road reserve on Bowen Bridge Road present an unattractive pedestrian and cyclist environment. Despite this, usage on Bowen Bridge Road is similar to the ICB Landbridge during the same

period. This can be attributed to its role in providing accessibility to the Royal Brisbane Hospital complex and Fortitude Valley.

### 5.3.7 Toll Routes

No toll routes are currently located within the Inner North 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 5-17**.

- **Table 5-17 Existing Toll Locations and Values (expressed June 2006 dollars including GST)**

| Toll Road (Location) | Cars and Light Vehicles | Commercial Vehicle (Classes 3 and above) |
|---|---|---|
| Gateway Bridge | $2.40 | $6.00 |
| Gateway (Kuraby) | $1.60 | $3.90 |
| Logan Motorway (Stapylton Road) | $1.70 | $3.90 |
| Logan Motorway (Loganlea Road) | $1.00 | $2.80 |

The planned North-South Bypass Tunnel due to open in late 2010 will have a toll (expressed in 2006 dollars including GST) of $3.64 for cars and $9.65 for commercial vehicles.

### 5.3.8 Road User Safety

A five-year crash history for the Inner North 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:

- 2,640 crashes occurred in the 5-year period in the Inner Northern area.
- A total of eleven fatal accidents occurred, of which two involved a pedestrian.
- Almost 25% of crashes occurred within the Lutwyche Road and Gympie Road corridor between Northey Street and Stafford Road. These include 383 crashes at intersections and 253 mid-block. Two fatal accidents occurred in this corridor, both at intersections.
- Intersection crashes accounted for 57% (1,512) of accidents.
- Almost 80% (2,082) of accidents within the area involved more than one vehicle.
- Within the Inner North area, 111 pedestrian related accidents have been recorded. This was only 4.2% of overall area accidents, which is quite similar to the Brisbane local government area average of 4.7%.

Crash rates (per million kilometres travelled) for each of the major corridors in the Inner North area are shown in **Table 5-18**.

The highest crash rates occur on Stafford Road, Lutwyche Road, Sandgate Road and the East-West Arterial route, between Gympie Road and Sandgate Road (formed by Kedron Park Road, Park Road, Rose Street, and Junction Road).

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

- On Lutwyche Road rear end collisions were the predominant crash type (37%), followed by right turning traffic colliding with opposing through traffic. These two accident types accounted for 65% of all accidents on Lutwyche Road. Two notable areas of accidents were near Centro Lutwyche Shopping Centre and the Lutwyche Homemaker Centre. A combination of congested traffic conditions and mix of user types (local, through movements etc) would be contributing influences.

- More than 25% of all the crash potential occurring on Gympie Road has been removed by the recent construction of a raised median at the Suez Street/Park Terrace intersection with Gympie Road.
- On Sandgate Road more than 20% of all accidents resulted from right turning traffic colliding with opposing through traffic. Similar to Lutwyche Road, rear-end collisions were also another predominant accident type (a further 36% of crashes). The narrow road reserve with limited storage for turning vehicles along this route contributes to this occurrence.
- A major factor contributing to the high crash rate on Stafford Road is accidents recorded in the vicinity of the Gympie Road intersection. One-third of all accidents and 50% of all mid block accidents on Stafford Road occurred within 300m of this location. Rear end collisions were the predominant accident type near Gympie Road. Congested conditions at this intersection are likely to be a major contributing influence.
- On the section of East-West Arterial route through Wooloowin, between Lutwyche Road and Sandgate Road, formed by Kedron Park Road-Park Road-Rose Street-Junction Road the majority of crashes occurred at the Sandgate Road intersection or mid-block approaching the intersection. The intersection of Sandgate Road and Junction Road has the worst crash history of all intersections within the Inner North area.

**Table 5-18 Crash Rates for Major Routes Within the Inner North Area 2000-2005**

| Route | Total Accidents | Distance (km) | Annual VKT | Crash Rate (Crashes per million VKT) |
|---|---|---|---|---|
| Lutwyche Road | 503 | 3.25 | 62,589,000 | 1.61 |
| Gympie Road | 173 | 1.45 | 29,192,000 | 1.19 |
| Bowen Bridge Road | 94 | 0.86 | 17,190,000 | 1.09 |
| Sandgate Road | 366 | 4.26 | 53,493,000 | 1.37 |
| Abbotsford Road | 90 | 1.85 | 19,771,000 | 0.91 |
| East West Arterial (Webster Road to Gympie Road) i.e. Stafford Road | 110 | 1.67 | 10,676,000 | 2.06 |
| East West Arterial (Lutwyche Road to Sandgate Road) i.e. Park Road-Rose Street-Junction Road | 121 | 1.59 | 18,325,000 | 1.32 |
| East West Arterial Road (Sandgate Road to Nudgee Road) | 54 | 2.33 | 15,089,000 | 0.72 |
| Nudgee Road | 26 | 2.88 | 20,334,000 | 0.26 |
| Kingsford Smith Drive | 165 | 3.41 | 52,161,000 | 0.63 |

**Table Note:** Source: BCC 2005 (accident data), BSTM (VKT, Distance)

## 5.4 Transport and Traffic Demand Forecasting

The traffic forecasting model developed and applied in the study, (the Airport Link Traffic Model) 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:

- 2012 – the Airport Link opening year
- 2016 – interim year corresponding to Council's Transport Plan horizon
- 2022 – 10 year post-opening horizon
- 2026 – the maximum forecast year for which key inputs were available

The Airport Link Traffic Model has been based on the Brisbane Strategic Transport Model (BSTM). The BSTM provides travel demand forecasts for the Brisbane Metropolitan Area up to and including the year 2026, and has been extensively used in planning for future traffic and transport infrastructure by all levels of government. The BSTM was updated during 2005 using the findings of the 2003/04 South East Queensland Travel Survey on travel characteristics.

The following developments of the BSTM were undertaken to develop the Airport Link Traffic Model in consultation with BCC, DMR and QT representatives:

- Modification of the standard BSTM to include specific intersection representation and provide improved estimation of road delays at intersections.
- Updating of existing road network database for the Airport Link study area.
- Auditing descriptions of future road infrastructure projects in consultation with BCC, DMR and QT.
- Collection of new toll choice behaviour data relating to potential Airport Link users.
- Development of a toll choice traffic assignment model using the new toll choice survey data.
- Validation of the base year model against observed 2004/2005 traffic count and journey time information.
- Upgrading the BSTM Mode Choice Model to allow future TransLink Public Transport initiatives to be modelled.
- Incorporation of processes to calculate induced demand effects of major transport infrastructure.
- Development of a module to allow testing of Brisbane Metropolitan area population scenarios.

### 5.4.1 Scope and Validity of the Models

A representation of the transport and other models used as components of the Airport Link Traffic Model is given in **Figure 5-20**. The various components are briefly discussed below with a more detailed discussion of their scope and validity 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 (e.g. 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.

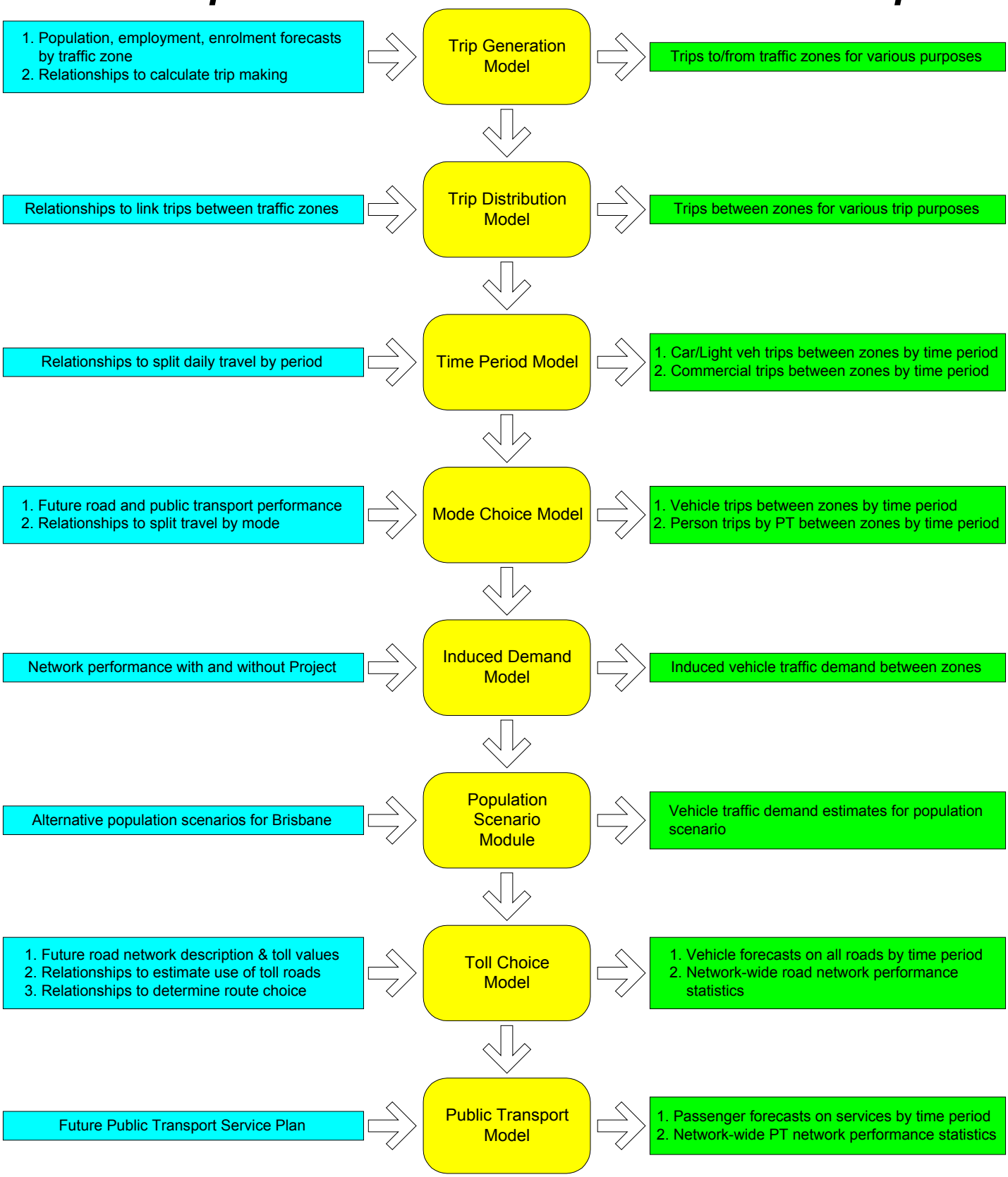


**Figure 5-19**

Airport Link Model Components

Airport Link

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### 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 (e.g. 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 based on observed data on commercial-vehicle origins and destinations (Queensland Transport, 2004) and is factored to represent future travel demands using relationships based on employment quantum and distribution.

### Time Period Model

Trip generation and distribution are used to forecast total daily travel on an average weekday (Monday to Friday). 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.

### Mode Choice Model

The mode choice model uses a current estimate of public transport travel and comparisons of road network performance and public transport service changes to estimate changes in public transport patronage. Future improvements in public transport infrastructure and services planned by TransLink (QT), including the proposed Northern Busway, have been explicitly modelled.

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

Research of techniques used in the UK and New Zealand was carried out to identify a suitable method to incorporate induced traffic effects within the Airport Link model. 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 induced demand model has been applied as a standard inclusion when applying the Airport Link model, to give a consistent upper estimate of travel expected for all forecasting years.

### Population Scenario Module

In its standard form, the BSTM uses demographic projections that most closely reflect an ABS Low Series forecast for the Metropolitan Area. A process has been developed within the Airport Link model to produce estimates of travel that align with the ABS Medium Series population. A Medium Series population outlook has been adopted for consistency with the approach used in the SEQ Regional Plan.

The methodology provides a sound basis to examine the implications of a range of population outlooks on traffic forecasts on a regionally significant road such as the Airport Link.

### 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. The approach in regard to the presence of multiple toll routes used in the Airport Link model gathers route cost information for the best tolled route and the best free alternative route, to allow a consumer choice comparison to be made. 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.

### Public Assignment Transport Model

This sub-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.

### Model Validation

The entire model process, inclusive of the components described above, has been validated against a range of data sources, including 2004/2005 observed road traffic counts, road travel times and public transport ticketing data, to verify its accuracy.

General daily flow comparison results show that the model is giving total crossing volumes approximately 1.7% lower than the observed daily flows, 0.7% lower in the AM peak and 1.2% higher in the PM peak. The majority of individual screenlines modelled are at or below 10% difference compared to observed daily volumes, a commonly accepted validation benchmark.

A series of journey time surveys were also compared with model predicted travel times. Journey time surveys were collected during 2005 for this study in and around the Airport Link study area. The model tends to slightly underestimate the travel time in the non-peak direction, however this does not appear to have a major effect on route choice in the non-peak direction. Routes in the contra-peak direction appear, on inspection, to be logical. PM peak comparisons are less favourable with respect to surveyed time ranges for the various routes although they are considered to be sufficiently accurate.

## 5.4.2 Land Use Patterns and Demographic Forecasts

**Table 5-19** gives the projections of population, employment and estimates of person trips for the Brisbane Metropolitan area for the ABS Medium Series population scenario.

As land use and growth patterns vary across the Metropolitan Area, this will result in changes to travel demands. A representation of these changed travel demands as a result of land-use growth patterns is provided in **Figure 5-21** and shows clearly the distribution of land uses that will generate the greatest density of trip ends. To show the effects of forecast changes and growth in land use and travel demand generation, **Figure 5-22** depicts the change in trip ends forecast over the period between 2012 and 2026. This clearly depicts the significant growth in travel demand forecast at key locations served by the project, such as Brisbane Airport, the ATC North precinct and Chermside.

**Table 5-19 Brisbane Metropolitan Area Population Forecasts**

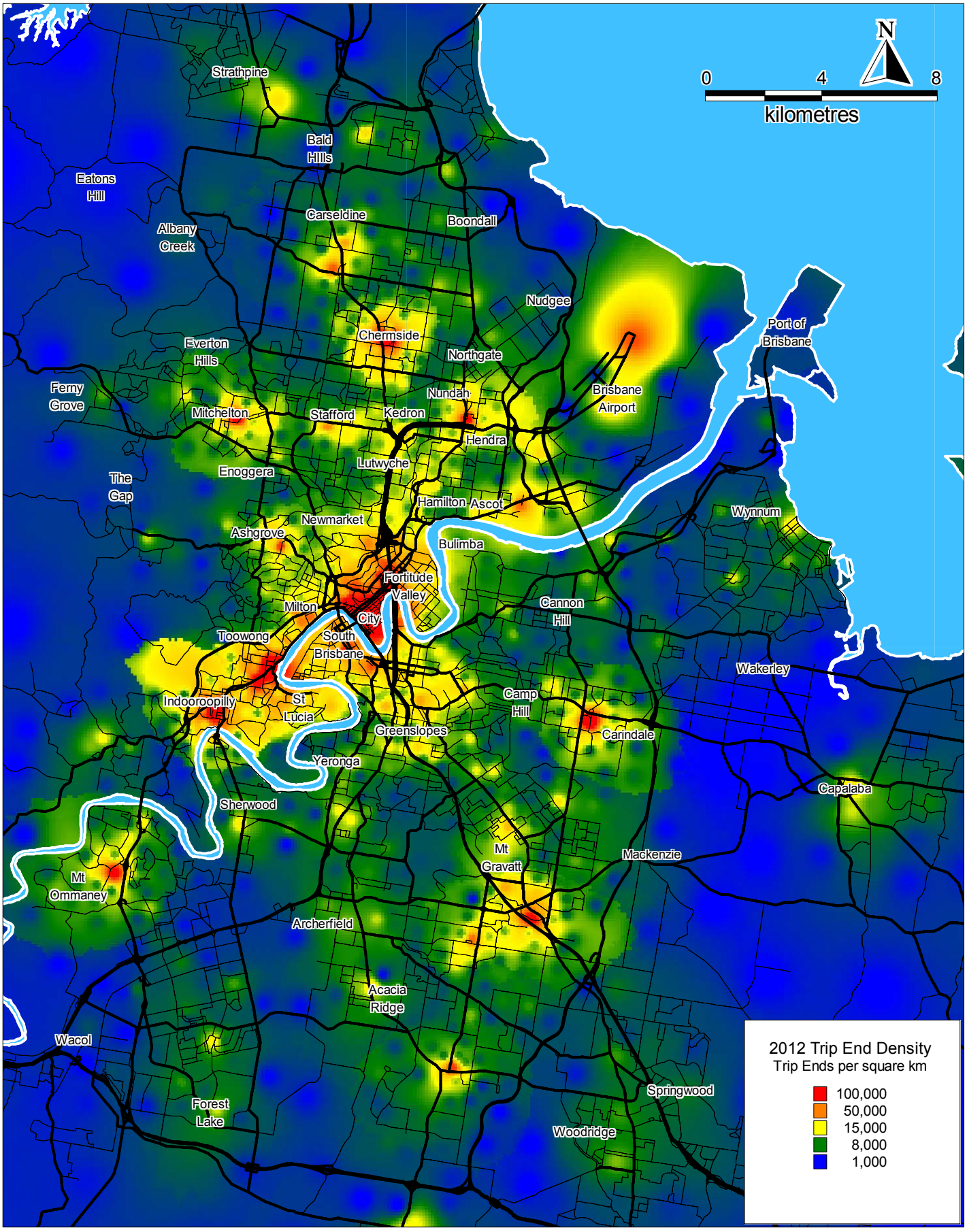
| Year | Population (1) | Employment (2) | Total Person Trips (3) |
|---|---|---|---|
| 2004 | 1,773,000 | 804,800 | 6.1 million |
| 2012 | 2,074,500 | 1,025,400 | 7.2 million |
| 2016 | 2,221,500 | 1,130,900 | 7.7 million |
| 2022 | 2,439,600 | 1,253,500 | 8.4 million |
| 2026 | 2,583,700 | 1,320,500 | 8.8 million |

**Table Notes:**

(1) Source: Australian Bureau of Statistics – Medium Series, 2005.

(2) Employment opportunities consistent with ABS Medium population projection

(3) Trips by all modes including walk/cycle.




**AIRPORT LINK - Figure 5-20**

2012 Daily Vehicle Trip End Density

Airport Link

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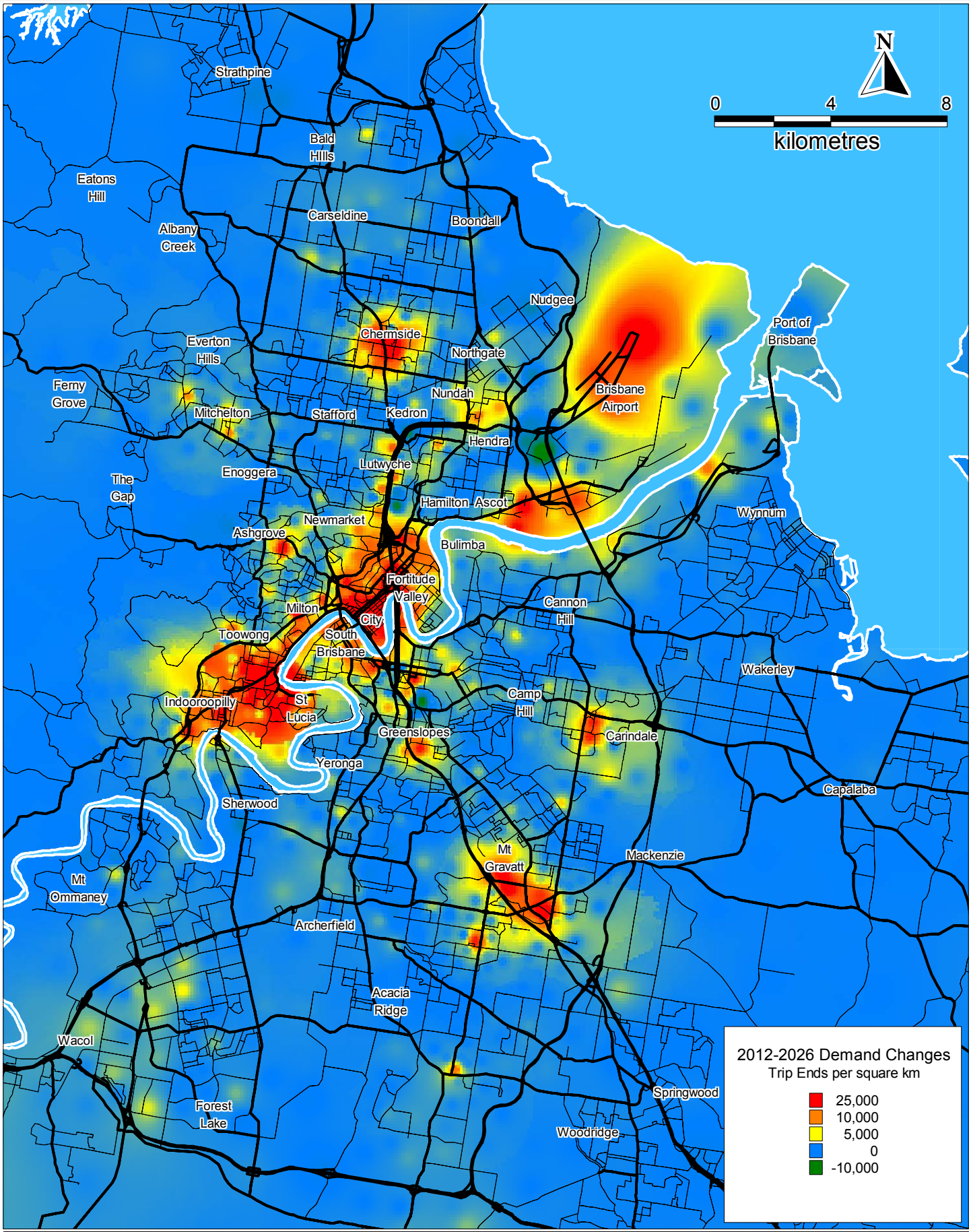


**AIRPORT LINK - Figure 5-21**

2012 to 2026 Daily Vehicle Trip End Changes

Airport Link

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### 5.4.3 Travel Behaviour

Current household travel behaviour and historic trends have been examined by a comparative analysis of trip generation and modal use characteristics in the Brisbane Statistical Division (BSD) and the Inner North area using the results of the 1992 and the 2003/04 SEQ Travel Surveys and are shown in **Table 5-20**.

- **Table 5-20 Travel Behaviour Trends from SEQ Household Travel Survey 2003/04 and 1992**

| Parameter | 1992 | | 2003/04 | |
|---|---|---|---|---|
| | Brisbane Metropolitan Area (BSD) | Inner North Area | Brisbane Metropolitan Area (BSD) | Inner North Area |
| **General** | | | | |
| Total Persons | 1.2 million | 48,000 | 1.8 million | 57,000 |
| Total Households | 0.5 million | 21,400 | 0.7 million | 27 800 |
| Person/Household | 2.7 | 2.2 | 2.6 | 2.1 |
| Trips/Person | 3.81 | 3.98 | 3.61 | 4.05 |
| Trips/Household | 10.41 | 8.89 | 9.44 | 8.46 |
| **Mode Choice** | | | | |
| Vehicle Driver | 51.1% | 51.0% | 56.2% | 56.6% |
| Vehicle Passenger | 25.9% | 22.8% | 23.8% | 19.3% |
| Walking | 13.5% | 15.1% | 10.5% | 12.4% |
| Cycling | 2.0% | 1.0% | 1.1% | 1.7% |
| Public Transport [1] | 7.5% | 10.1% | 8.3% | 10.0% |
| Vehicle Occupancy | 1.51 | 1.45 | 1.42 | 1.34 |
| **Trip Purpose** | | | | |
| Home Based Work | 15.3% | 17.1% | 18.1% | 21.6% |
| Home Based Shopping | 17.7% | 21.5% | 18.7% | 21.7% |
| Home Based Education | 13.8% | 10.4% | 15.6% | 10.0% |
| Home Based Social | 9.5% | 13.4% | 13.3% | 12.2% |
| Home Based Other | 11.1% | 7.3% | 5.3% | 4.1% |
| Work Based Other | 3.9% | 3.2% | 4.4% | 6.1% |
| Work Based Shopping | 5.0% | 5.6% | 4.1% | 5.4% |
| Work Based Work | 5.4% | 5.2% | 3.7% | 3.2% |
| Non Home Based | 18.2% | 17.4% | 16.9% | 15.8% |

**Table Note:** Source: SEQ Travel Survey – 2003/04 and 1992

(1) Does not comprehensively cover public transport travel to external locations

Key characteristics of travel behaviour and trends are:

- Existing household size in the Inner North area is lower than the overall Metropolitan Area average, and the resultant trip rate per household of 8.5 trips/day is slightly lower than the metropolitan average of 9.4 trips per day. This relativity is similar to what was evident in 1992.
- The trip generation rates per person in the Inner North area have remained quite stable over time, around 4 trips per person per day. Person trip making rates are higher than the Metropolitan area average, although household trip rates in Brisbane overall have declined with due to decreasing household size.
- The most dominant travel purposes in the Inner North area are work related travel and shopping travel, both of which are more important relative to other trip purposes than elsewhere in the metropolitan area. Education travel however in the Inner North area is of much lower significance than regionally, a relationship, which has been stable over time.

- There is relatively sound use of public transport by Inner North area residents with a 10.0% public transport mode share compared to the metropolitan average of 8.3%. Compared to 1992, public transport mode share in the Inner North has remained quite stable, with a slight increase at the Metropolitan Area level.
- Walking and cycling is also proportionally higher in the local area compared to the wider metropolitan area (14.1% compared to 11.6%), a relativity that was also evident in 1992. By comparison to 1992, walking has declined in modal significance however cycling has increased in the Inner North area from 1.0% to 1.7% of travel. In contrast, in the metropolitan area overall, both walking and cycling have declined.
- For vehicle travel, average occupancy is 1.4 persons per vehicle, which has declined between 1992 and 2004.
- On an overall Metropolitan area basis, some sustainable travel indicators have improved between 1992 and 2004. For example, public transport mode share has improved over time and person trip-making rates are stable or slightly declined (at Metropolitan Area level). However, motorised travel has increased to 80% of total modal use at the Metropolitan Area level from 77% in 1992.
- The travel behaviour of Inner North area residents has shown mixed characteristics with regard to improved sustainability over the period 1992 to 2004. Whilst public transport and cycle use trends are sound, and motorised travel (76% of total modal use) has remained lower than the Metropolitan average, trip-making rates have increased and car-occupancy rates declined.

### 5.4.4 Alternative Future Scenarios for Strategic Modelling

#### 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 the South East Queensland Infrastructure Plan and Program (SEQIPP), and an agreed list for network modelling projects for forecasting years 2012, 2016, 2022 and 2026 developed in consultation with DMR and BCC (Appendix C of Technical Paper No1 – Traffic and Transport Technical Paper).

The major road transport projects relevant to the project at the time of the study were the North-South Bypass Tunnel (NSBT), Gateway Upgrade Project and Brisbane Airport Northern Access. Key features are as follows:

##### *North-South Bypass Tunnel*

The North-South Bypass Tunnel is a planned cross-river toll road, connecting between the Inner City Bypass and Lutwyche Road at Bowen Hills and Ipswich Road and the Pacific Motorway at Wooloongabba, with an intermediate link to Shafston Avenue to service the eastern suburbs. Most of the road will be in tunnel.

From a traffic and transport standpoint, Airport Link will expand the road network which allows cross-city travel movements to bypass the Brisbane Central Business District (CBD) and inner suburbs. In doing so, Airport Link creates a high quality connection between the NSBT, and the southern catchments within the Brisbane Metropolitan region served by that facility, and the middle orbital road formed by the East-West Arterial connecting to the Brisbane Airport and ATC North region.

Airport Link, by its connection with the NSBT, provides enhanced linkage to other motorway standard connections and caters for long distance movements between locations external to South East Queensland and major economic activity areas. Connection alternatives to the Gateway Motorway for the ATC precinct from southern and western areas are provided via the Airport Link, NSBT, and the Pacific Motorway, or via the Airport Link, NSBT and the Ipswich Motorway ,.

Construction is due to commence on the NSBT in the latter half of 2006. The facility is expected to be open for traffic use by 2010. In the transport modelling for Airport Link, it has therefore been assumed that the NSBT will be operational in 2012, prior to the opening of Airport Link.

An example of the service integration that would be available between the NSBT and Airport Link, would be inter-operability of the transponders used for the electronic tolling system by users of both facilities.

### *Gateway Upgrade Project*

Two other key road projects that have been incorporated within future network scenarios are:

- The Gateway Upgrade Project (GUP) - a planned duplication of the tolled Gateway Bridge and upgrading of the Gateway Arterial Road on each side of the Brisbane River. This project will alleviate pressures on the road network to the east of the CBD and in the Gateway Corridor, providing improved access to the Port of Brisbane and Brisbane Airport.
- Brisbane Airport Northern Access - a project planned by the Brisbane Airport Corporation that provides a new access road to primarily serve the domestic and international terminals at Brisbane Airport. The new road links to a new Airport access interchange on the northern deviation of the Gateway Motorway, planned as part of GUP. It will provide a more convenient, high quality route to the terminals. The new access road will alleviate traffic pressure on the existing Airport Drive link to the Gateway Motorway, particularly on the roundabout at the Gateway Motorway interchange.

## Effects of Public Transport Services

The proposed Northern Busway, implemented in a staged form, has been considered in a cumulative impact scenario as described in Chapter 21 of the EIS. It represents a major public transport improvement in northern Brisbane proposed within SEQIPP. The Northern Busway would connect the completed Inner Northern Busway at Herston to Kedron, with ultimate extension further north to Bracken Ridge. The potential cumulative effects of the project with and without the proposed Northern Busway have been assessed in this study.

Improvements in public transport services for each of the forecasting years 2012, 2016, 2022 and 2026 have been incorporated into the Airport Link future scenarios. This was done based on advice from TransLink using their detailed forward planning being undertaken consistent with the draft TransLink Network Plan and SEQIPP initiatives.

A base future public transport scenario includes increased bus and rail service frequencies for existing routes and additional bus services on approximately 40 new bus routes, including seven (7) routes across the Green Bridge and two (2) new bus routes between Central Brisbane and the ATC North area.

For the Northern Busway cumulative impact scenario, bus routes running in the Northern Busway corridor have been transferred to an Interim Busway before 2026 and to a Full Busway in 2026. The impacts of the Northern Busway on road infrastructure have also been included.

Key features of these infrastructure projects and their timing are listed in **Table 5-21**.

- **Table 5-21 Key Network Assumptions**

| Project Title Project and Description | Network Year | | | |
|---|---|---|---|---|
| **Network Year Key: ✓ = Include in Do Minimum Network & all tests including Airport Link; A = Include in a separate Cumulative Impact Test** | **2012** | **2016** | **2021** | **2026** |
| **North-South Bypass Tunnel**<br>New tolled river crossing (4 lanes, in two separate tunnels) approximately under Story Bridge alignment, with connections to ICB (east and west), Lutwyche Road, Shaftson Avenue, Ipswich Road and Pacific Motorway.<br>Configuration fromNSBT Changed Project, including surface road connections. | ✓ | ✓ | ✓ | ✓ |
| **Gateway Upgrade Project** | | | | |
| **Gateway Motorway Bridge Duplication**<br>New 6-lane toll bridge downstream of existing bridge providing a total of 12 lanes. | ✓ | ✓ | ✓ | ✓ |
| **Gateway Northern Deviation (Nudgee Road to Gateway Bridge)**<br>New 4 lane motorway standard direct connection from Gateway Bridge to the existing Gateway Motorway south of Nudgee Road opposite Raubers Road. Includes interchange and new northern connection to Airport at Cannery Creek. | ✓ | ✓ | ✓ | ✓ |
| **Gateway Motorway South (Port Of Brisbane Motorway to Wynnum Road)**<br>Upgrading to eight lanes (from four lanes) of the Gateway Motorway from Port Motorway to Lytton Road, and new ramp from Gateway Motorway S/B to Port of Brisbane Motorway E/B. | ✓ | ✓ | ✓ | ✓ |
| **Gateway Motorway (Wynnum Road to Mt Gravatt-Capalaba Road)**<br>Upgrading from four lanes to six lanes. | ✓ | ✓ | ✓ | ✓ |
| **Brisbane Airport Northern Access Road**<br>Northern Access Road connecting Airport Drive to Northern Access Interchange on Gateway Northern Deviation, plus new internal western roads within Airport site. | ✓ | ✓ | ✓ | ✓ |
| **Airport Drive (Lomandra Drive to Domestic Terminal)**<br>Upgrading from 4 to 6 lanes. | ✓ | ✓ | ✓ | ✓ |
| **Schneider Road Extension**<br>Extension over rail line to Lomandra Drive/Qantas Drive to provide additional access to ATC North area. | ✓ | ✓ | ✓ | ✓ |
| **Northern Busway Staging Project – Interim Busway**<br>Road network design features of Northern Busway Interim works as per Concept Design at time of study include:<br>+ bus lanes on Lutwyche Road between Newmarket Road and Stoneleigh Street<br>+ two way bus and local traffic access only on Truro Street<br>+ bus and local traffic access only (southbound only) on Roblane Street.<br>+ Lutwyche Road re-configuration to provide two general traffic lanes in each direction between Stoneleigh Street and Newmarket Road. | **A** | **A** | **A** | |
| **Northern Busway Staging Project – Full Busway**<br>Road network design change as per Concept Designs at time of study include: with the Full Northern Busway involves the conversion of the interim bus lanes on Lutwyche Road to T3 lanes between Fosbery Street and Newmarket Road. | | | | **A** |

**Table Notes:** (1) Network Year Key: ✓ = Include in Do Minimum Network; A = Include in Airport Link Cumulative Impact Scenario

## Toll Value and 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 Airport Link and other toll facilities at the proposed year of opening, 2012, were modelled as:

- Airport Link tolls (2006 dollars including GST)
  - full (north-south) journey – $3.64 for light vehicles, $7.28 for commercial vehicles
  - partial (east-west) journey – $2.43 for light vehicles, $4.86 for commercial vehicles

- North-South Bypass Tunnel toll (2006 dollars including GST)
  - $3.64 for light vehicles, $9.65 for commercial vehicles
- Gateway Bridge toll (2006 dollars including GST)
  - $2.71 for light vehicles, $6.79 for heavy vehicles

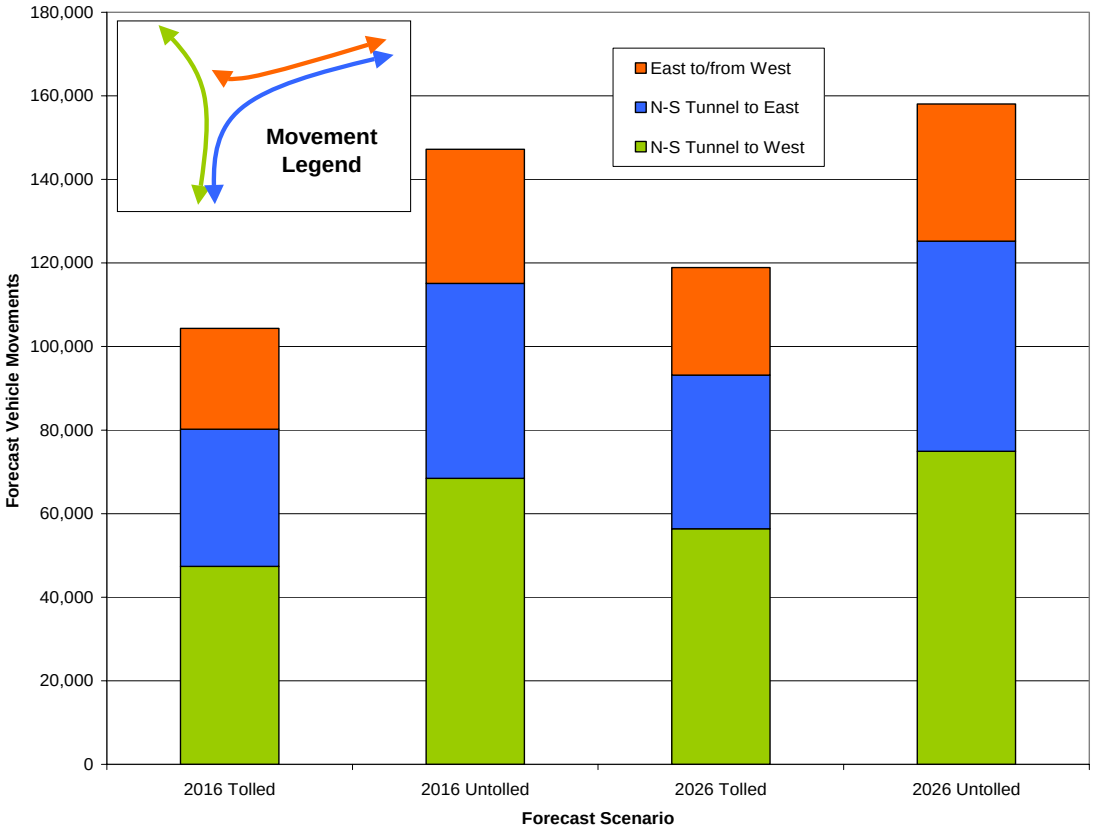
The calculated toll dollar value takes into account the assumption that tolls will rise for each year for use in the model with CPI, and increases in average wages (spending power) slightly higher than CPI.

A final decision on the tolls to be charged for use of Airport Link will be made by the State Government and Council following assessment of the Business Case for the project. For this EIS study, Airport Link traffic forecasts have been prepared assuming a toll of $3.64 (expressed in June 2006 dollars including GST) for a full (north-south) journey and a $2.43 toll for a part (east-west) journey. These toll levels are within the range under consideration within the Business Case. The full north-south journey toll on Airport Link equates to $3.30 expressed in 2002 dollars, which was the toll value used in the TransApex Prefeasiblity Study (Brisbane City Council, 2005).

The implementation of a toll on Airport Link for either a full journey or partial journey will 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 is directly related to the cost and attractiveness of alternate routes.

**Figure 5-23** illustrates the effects of a $3.64 toll for a full journey (north-south) and a $2.43 toll for a partial journey (east-west) at two future years, 2016 and 2026.

**Figure 5-23 Effect of Toll on Airport Link Traffic Compared to No Toll**



These toll amounts are expressed in 2006 dollars and include GST. Comparing the diversion (i.e. the proportion of users not prepared to pay a toll) between 2016 and 2026 indicates that this decreases over time, as users perceive greater benefits in travel time savings can be realised by using the toll road facility as the overall road network becomes more congested over time.

For both types of journeys, the effect of no toll would be to increase traffic volumes on the facility and approaches. A resultant lowering of the level of service of operation and average travel speed on the facility would occur. Increased traffic volumes on the feeder routes would also be evident compared to the tolled scenario.

### 5.4.5 Induced and Suppressed Traffic Demand

#### Induced Traffic Assessment

The opening of a major transport infrastructure facility such as Airport Link can produce several responses from the travelling public. The responses of the travelling public to improvements in network connectivity or reduction in congestion are referred to as induced traffic demand and can result in increased vehicle kilometres on the road network. Responses directly catered for within the Airport Link 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.

Other responses catered for by separate processes are:

- 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.
- Changes in the pattern of land use - land use patterns proposed by Brisbane City Council are used as fixed inputs, as these land use patterns reflect the desired vision for the City under the South East Queensland Regional Plan.

Many of these induced traffic effects are not catered for within standard strategic transport models. The induced demand model has been 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 5-22** gives estimates of the change in total daily vehicle demand.

- **Table 5-22 Daily Induced Private Vehicle Demands**

| | Original Analysis without Induced | Network with the Project |
|---|---|---|
| Year | Total Daily Demand Across Brisbane | Induced Demand Across Brisbane |
| 2012 | 4,219,200 | 20,600 (0.49%) |
| 2016 | 4,510,000 | 24,300 (0.54%) |
| 2021 | 4,848,400 | 24,900 (0.51%) |
| 2026 | 5,181,800 | 34,700 (0.67%) |

The assessment demonstrates that low levels of induced demand across Brisbane in the order of 0.5% (2012) to 0.7% (2026) are forecast in a network that includes Airport Link and NSBT.

Results from the induced demand assessment indicate that traffic increases vary across Brisbane, with a concentration where the project has the most direct effect on congestion levels. Suburbs within and neighbouring the Inner North area such as Stafford, Kedron, Lutwyche, Windsor, Clayfield, Ascot and Hamilton have 2026 daily induced vehicle demands in the order of 1.8% to 2.5%. Areas more distant from the study corridor that are forecast to produce induced demands include Nundah, Eagle Farm the Brisbane Airport, Brisbane CBD and Mt Gravatt.

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 is in the range 0.6% to 0.7% of the base demand. PM peak induced demand is in the range 1.0% to 1.3%, and the off-peak induced demand is in the range 0.3% to 0.5%.

### 5.4.6 Model Outputs and Sensitivity

Outputs from the traffic and transport modelling for use in the assessment of project effects have been prepared using the Airport Link Model for scenarios without and with 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 Level of Service 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.
- 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.

A range of sensitivity tests were undertaken to check the model's predictive stability with respect to:

- Effect of Public Transport Initiatives and Change in Mode Share. These were examined by implementing changes to the road system to reflect reallocation of some road space to public transport infrastructure (e.g. as proposed with the Interim Northern Busway). In conjunction, the effect of improved public transport services on shift in mode share to public transport was incorporated. Due to changes in surface road capacity on Lutwyche Road the model responded reliably by assigning traffic to alternative routes, including the Airport Link. The model's mode share forecasting processes estimated an increased patronage on public transport and an associated reduction in private vehicle demand in the affected corridors.
- Effect of Changes in Airport Link Tolls. These were tested rigorously within the toll choice model development and application. Changes in toll were tested for independent movements on the facility across a range of toll levels. As expected, as toll was increased Airport 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 north-south Airport Link journeys in the 2026 peak period, for example, is between 0.22 and 0.33 (i.e. increase toll by 10% results in a forecast of between 2.2% and 3.3% less traffic on Airport Link). Toll sensitivity in the off-peak periods was greater due to the reduced congestion on

competing routes. Tests were carried out to check the elasticity to toll for all major movements, and the basic vehicle classes, and these found that the model reacted reliably.

- Effect of Airport Link Capacity and Connectivity. By independent tests reducing the number of traffic lanes within the tunnel segments, and removal of various access ramps, these effects were examined. The testing showed logical response. Reduced capacity in the main line tunnel (for example, 2 lanes in each direction instead of 3 lanes in the north to south tunnels) reduced demand by a small amount (by 4% in 2026). Provision of reduced connectivity resulted in logical restrictions of movements, however it also has the effect of releasing tunnel capacity for other independent movements to increase.
- Effect of other Major Road Infrastructure. Examination of the potential effects of additional TransApex facilities (in combination with Airport Link and NSBT) was conducted. A scenario which included both Hale Street Link and Northern Link within the modelled networks showed that these facilities would complement the functionality of Airport Link. The resultant increases in demand on Airport Link ranged between 1% in early years and 6% by 2026.
- Effect of Land Use & Demographic Changes. These effects were checked by using the model to prepare forecasts with both the ABS Low Series and ABS High Series population projections, and compare these to those prepared using the adopted ABS Medium projections used for the EIS forecasting. Overall traffic demand logically increased with high series population projections and decreased with low series population projections. Traffic on Airport Link in the period 2012 to 2026 also followed this trend with between 3% and 8% increases with the ABS high series population projections, and between 3% and 7% reductions in traffic with the ABS low series population projections.
- Effect of Increased Vehicle Operating Costs. These effects were 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 (e.g. Gateway Motorway) in favour of more direct routes such as Airport Link and NSBT.

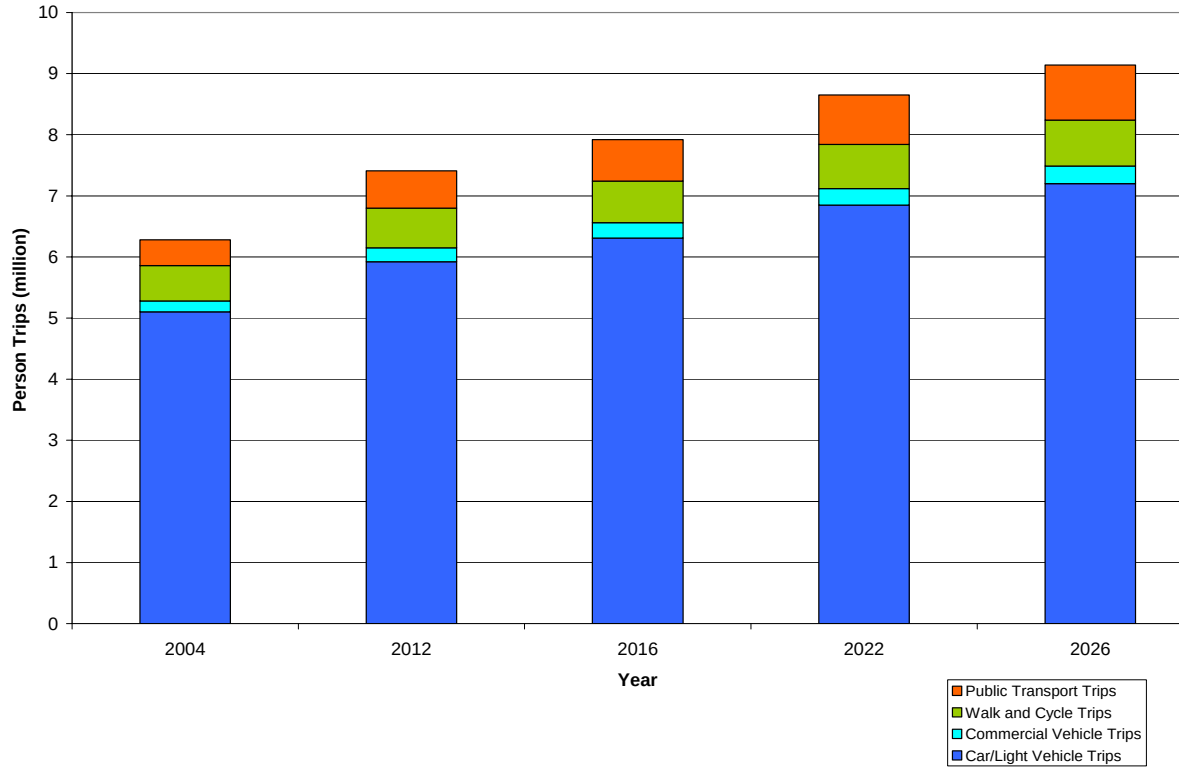
The validation checks and sensitivity tests undertaken have verified that the model described above is capable of producing traffic estimates of sufficient accuracy and sensitivity for use in this study.

## 5.5 Future Base Traffic Conditions

### 5.5.1 Future demand

The estimated growth in the travel task (in terms of person trips) is shown in summary in **Figure 5-24**. Vehicle travel demand in the network is shown in **Table 5-23**. Even with enhanced mode share for public transport, a significant increase of 45% in vehicle trips (from 3.8 million to 5.5 million vehicle trips on an average weekday) is forecast in the Brisbane Metropolitan area between 2004 and 2026.

- **Figure 5-24 Forecast Growth in Average Weekday Travel Demand Within Brisbane Metropolitan Area (Person Trips)**




- **Table 5-23 The Motorised Travel Task with Improved Public Transport within the Brisbane Metropolitan Area**

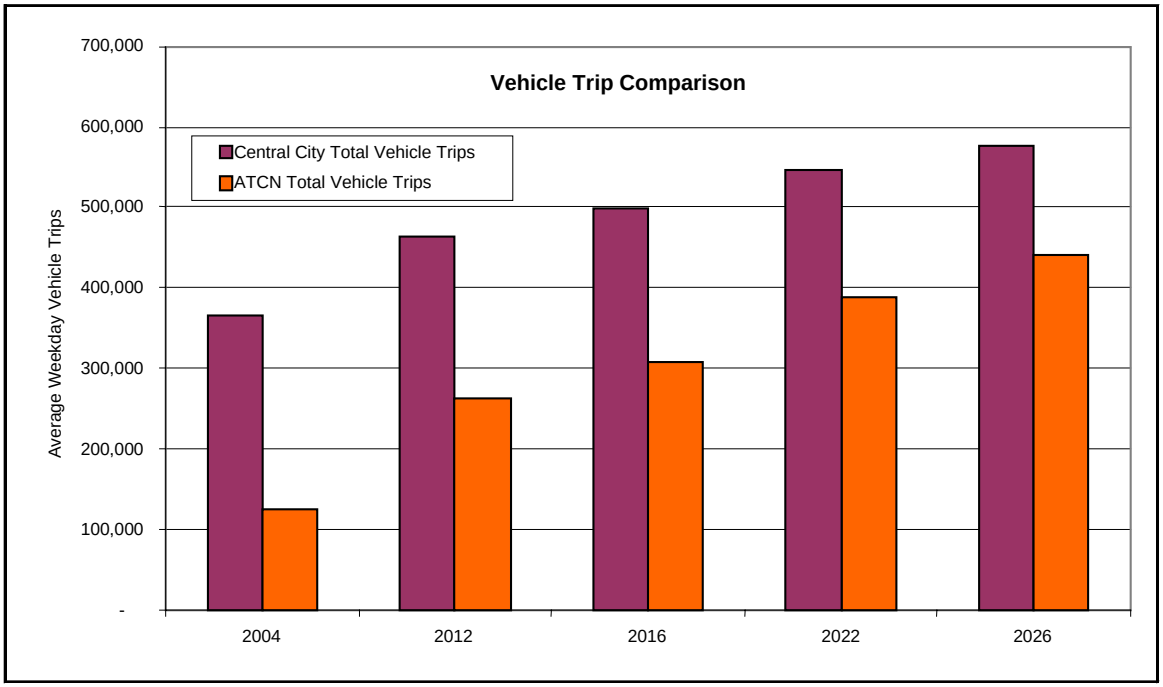
| Parameter | 2004 | 2012 | 2016 | 2022 | 2026 |
|---|---|---|---|---|---|
| Population (million) | 1.77 | 2.07 | 2.22 | 2.44 | 2.58 |
| Person Trips by Motorised Travel Modes [1] | 5,519,200 | 6,530,200 | 6,987,900 | 7,657,400 | 8,093,700 |
| Public Transport Trips | 415,400 | 607,100 | 677,000 | 807,200 | 895,600 |
| % PT Trips | 7.5% | 9.3% | 9.7% | 10.5% | 11.1% |
| Car/Light Vehicle Trips | 3,611,000 | 4,239,800 | 4,534,300 | 4,940,700 | 5,216,500 |
| Commercial Vehicle Trips | 177,600 | 231,000 | 249,700 | 272,200 | 287,600 |
| Total Vehicle Trips | 3,788,600 | 4,470,900 | 4,783,900 | 5,212,900 | 5,504,100 |
| % Growth in Vehicle Trips compared to 2004 | - | 18% | 26% | 38% | 45% |

**Table Note:** (1) Includes travel to and from locations outside the Brisbane Statistical Division

The assessment provides a perspective on the significance of the increased demand to be catered for within the overall Brisbane Metropolitan area. A specific assessment has also been carried out of the forecast growth in vehicle demand within the Central City sector and the sector to the east of the study area which incorporates the ATC North area including Brisbane Airport. Both regions will experience additional vehicle travel demand compared to 2004 levels, with the Central City forecast to increase by over 55%, and the ATC North region by over 300%.

**Figure 5-25** highlights the fact that in relative terms the vehicle travel demand associated with the ATC North area will grow from a level of under 40% of the Central City generation to almost 80% of that associated with the Central City, and in absolute terms greater than the generation of that area as shown in 2004.

- **Figure 5-25 Forecast Growth in Travel Demand Within Brisbane Metropolitan Area (Person Trips)**




### 5.5.2 Future traffic volumes and speeds

Average weekday traffic volumes have been forecast for roads in the Brisbane Metropolitan Area for the years 2012, 2016, 2022 and 2026, for a base road network without the proposed Airport Link. Estimated average weekday daily traffic volumes for 2004 have also been identified to allow comparison. The travel demand forecasts incorporate the effects of significant enhancements in public transport.

**Table 5-23** previously summarised the growth in travel demand at the metropolitan level.

**Table 5-24** summarises the forecast growth in traffic volumes at a selection of key screenlines and locations in the Inner North area network.

These forecasts show that even with significant growth in public transport mode share (to 11.1% of motorised travel in 2026), a sustained growth in vehicle travel demand is indicated both at the Brisbane Metropolitan area level and within the Inner North area. In the Metropolitan area 45% more vehicle trips are expected by 2026, even with the number of public transport trips more than doubled.

Within the immediate project area, north-south travel movements within the Inner North area are forecast to increase by 49% between 2004 and 2026, a sustained growth rate of 1.8% pa. East-west demands are forecast to grow by 55% to 65% in a similar period, a growth rate of over 2.0% pa. These growth trends are similar for commercial vehicle movement, indicating that the adverse effects of truck travel through the surface network in the Inner North areas for access to the rapidly growing ATC precinct, will become even more significant over time.

- **Table 5-24 Forecast Growth in Traffic Volumes at Screenlines**

| Average Weekday Traffic Without Airport Link | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Screenline** | **2004** | **2012** | **% Growth[1]** | **2016** | **% Growth[1]** | **2022** | **% Growth[1]** | **2026** | **% Growth[1]** |
| Western | 74,900 | 106,500 | 42% | 112,900 | 51% | 119,500 | 60% | 123,700 | 65% |
| Central | 60,500 | 81,600 | 35% | 87,300 | 44% | 91,400 | 51% | 94,200 | 56% |
| Eastern | 66,800 | 90,300 | 35% | 96,600 | 45% | 103,700 | 55% | 109,600 | 64% |
| Northern | 180,100 | 231,100 | 28% | 243,600 | 35% | 256,400 | 42% | 269,000 | 49% |
| **Commercial Vehicle Weekday Traffic Without Airport Link** | | | | | | | | | |
| **Screenline** | **2004** | **2012** | **% Growth(1)** | **2016** | **% Growth(1)** | **2022** | **% Growth(1)** | **2026** | **% Growth(1)** |
| Western | 4,300 | 5,600 | 30% | 6,100 | 42% | 6,300 | 47% | 6,500 | 51% |
| Central | 4,100 | 5,300 | 29% | 5,800 | 42% | 5,400 | 32% | 5,200 | 27% |
| Eastern | 7,500 | 9,400 | 25% | 10,100 | 35% | 10,700 | 43% | 11,000 | 47% |
| Northern | 9,500 | 11,900 | 25% | 12,800 | 35% | 13,200 | 39% | 13,900 | 46% |

**Table Note:** (1) Percentage growth compared to 2004.

The Level of Service (LOS) for the road network without Airport Link has also been examined for roads within the Brisbane Metropolitan Area for the years 2012 and 2026 for both the AM and PM peak periods. Traffic growth and network performance characteristics that are evident from these assessments include:

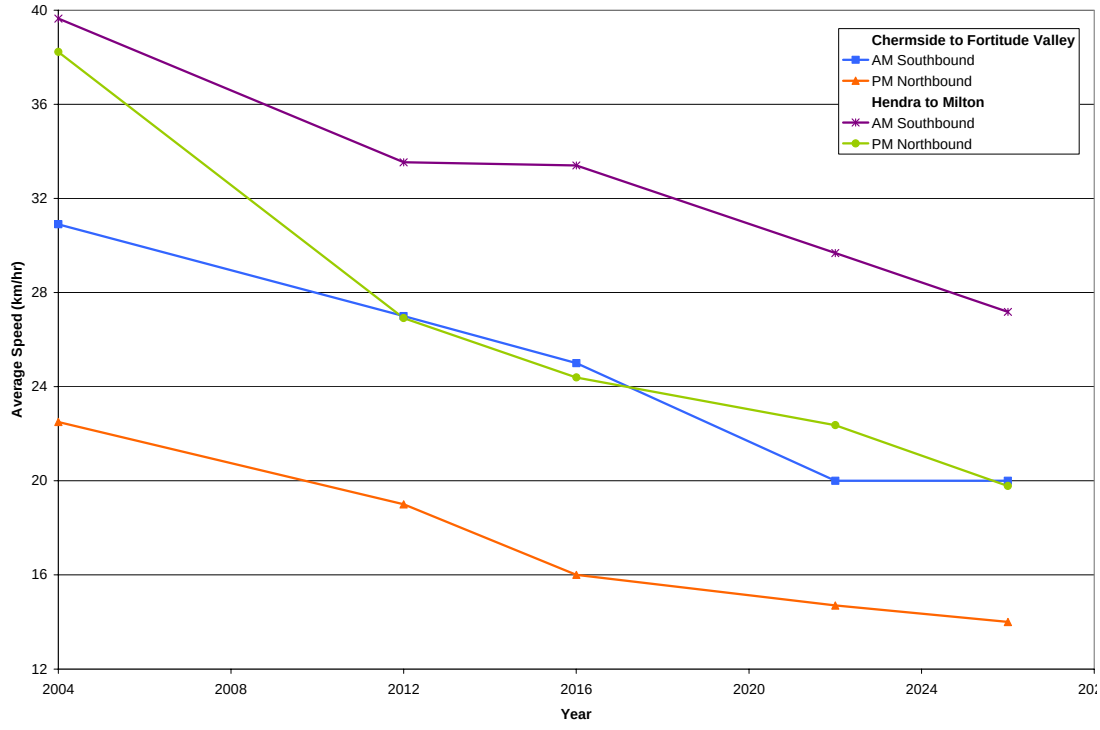
- Due to increased travel demand on the road network, there is a general decrease in LOS across the years on the road network generally, which reflects a decrease in travel speeds due to increased congestion.
- Within the Inner North area, significant sections of most arterial roads by 2012 are operating with poor LOS in both AM and PM peak periods. In these cases the LOS is typically forecast to progressively deteriorate over time indicating an increasing capacity deficiency.
- Examples where significant growth in demand is forecast on major north-south arterials north of the Central City without the project include:
  - Traffic through the Lutwyche shopping precinct would grow by over 30% from 60,000 vpd currently to 77,500 vpd by 2026. The LOS along the Lutwyche Road corridor progressively declines with over half of the 5.5 km corridor forecast to operated at LOS F (very congested) by 2026 in both AM and PM peaks.
  - Sandgate Road would experience even greater pressure from growth, due to its proximity to the ATC North precinct, a major contributing influence, and the inter-connection it provides to the Brisbane CBD, the Metropolitan area's other major economic activity area. Almost a doubling of current traffic levels is likely, with a growth in demand from 36,000 vpd through the Albion area to over 71,000 vpd by 2026. A sharp decline in LOS would be associated with this demand growth.
  - Similarly major traffic growth is forecast on Kingsford Smith Drive, another key arterial serving the ATC area and CBD, with a rise of 39% (to 76,000 vpd ) indicated by 2026 without the project.
- East-west routes to the north of the Central City are also influenced by the significance of growth in travel demand in the ATC area without the project. Key examples are:
  - Traffic on the East-West Arterial Road, east of Sandgate Road, connecting to Nudgee Road and the Gateway Motorway is forecast to grow by 69% by 2012 and then by 113% at 2026. Even without the project this will place significant pressure on the congested East-West Arterial/Nudgee Road signalised intersection. High congestion is forecast at intersections, at East-West Arterial/Sandgate Road as well as on several approaches to the Nudgee Road intersection and the Gateway Motorway roundabout.

- On Junction Road, which forms part of the DMR controlled East-West Arterial route through the Wooloowin residential area, traffic is expected to grow by 79% by 2026. A decline in the LOS along this route would occur.
- In Albion, traffic growth of over 60% is estimated on Albion Road, connecting to Sandgate Road, which itself is forecast to operate at high congestion levels in the Albion precinct. Other suburban and district roads such as Dickson Street and Shaw Road would have forecast growth in demand of over 25% and 30% respectively by 2026 compared to 2004 traffic levels.

The forecast decline in travel speed for two examples of typical journeys through the Inner North area is shown in **Figure 5-26**. By 2016 for a peak period trip from Chermside to Fortitude Valley, an average travel speed of 25 km/hr is forecast (compared to 31 km/hr currently), declining to less than 20 km/hr by 2026. A more severe deterioration is forecast for the PM peak, with forecast 2026 northbound PM peak speed of only 14 km/hr.

Similarly on Sandgate Road even greater growth would occur due to its proximity to the ATC precinct and its connecting role to the Brisbane CBD, the Metropolitan area's other major economic activity area. Almost a doubling of current traffic levels is likely by 2026, and a sharp decline in level of service would be associated with this demand growth. A morning peak period southbound trip from Hendra to Milton in 2026 would experience an average travel speed of 27 km/hr (compared to 40 km/hr currently), with the PM peak speed of only 20 km/hr for the northbound trip.

**Figure 5-26 Forecast Decline in Travel Speed on Key Routes Without Airport Link**




### 5.5.3 Traffic Network Performance

Traffic volumes on major roads within the Inner North area and surrounds, during peak periods without the project, have been forecast for 2012 and 2022 to estimate the performance of intersections.

A selection of the modelled intersections in 2012 and 2022 with Degree of Saturation (DOS) and LOS is provided in **Table 5-25**.

## Table 5-25 Intersection Performance without Airport Link – 2012 & 2022

| Intersection | Peak | 2004 LOS | 2012 | | 2022 | |
|---|---|---|---|---|---|---|
| | | | Max DOS (x) | LOS | Max DOS (x) | LOS |
| Gympie Road/Stafford Road | AM | D | 1.00 | C | 1.00 | D |
| | PM | E | 1.14 | F | 1.20 | F |
| Stafford Road/Webster Road | AM | F | 1.13 | F | 1.19 | F |
| | PM | D | 1.06 | F | 1.17 | F |
| Lutwyche Road/Kedron Park Road | AM | C | 0.99 | D | 1.12 | F |
| | PM | F | 1.12 | F | 1.09 | F |
| Kedron Park Road/Park Road | AM | C | 0.86 | C | 0.95 | D |
| | PM | C | 1.11 | F | 1.12 | F |
| Lutwyche Road/Chalk Street/ Thistle Street | AM | E | 1.13 | E | 1.13 | F |
| | PM | B | 1.01 | C | 1.00 | E |
| Lutwyche Road/Maygar Street | AM | C | 0.62 | B | 0.69 | C |
| | PM | D | 1.08 | F | 1.18 | F |
| Lutwyche Road/Albion Road | AM | B | 1.00 | D | 1.00 | D |
| | PM | B | 1.01 | F | 1.12 | F |
| Lutwyche Road/Newmarket Road | AM | D | 1.00 | E | 1.07 | F |
| | PM | C | 1.28 | F | 1.42 | F |
| Lutwyche Road/Federation Street | AM | F | 0.99 | D | 1.13 | F |
| | PM | A | 1.09 | E | 1.04 | E |
| Bowen Bridge Road/Campbell Street | AM | A | 0.67 | A | 0.74 | A |
| | PM | B | 1.08 | F | 1.16 | F |
| Bowen Bridge Road/O'Connell Terrace | AM | B | 0.84 | C | 0.94 | D |
| | PM | B | 1.10 | F | 1.20 | F |
| Sandgate Road/Toombul Station (Parkland Street)/Union Street/ Grace Street | AM | C | 0.93 | C | 1.10 | F |
| | PM | D | 1.01 | E | 1.13 | F |
| Sandgate Road/Centro Toombul | AM | B | 1.00 | D | 1.00 | D |
| | PM | B | 1.00 | D | 1.08 | F |
| Sandgate Road/East-West Arterial Road | AM | F | 1.06 | F | 1.24 | F |
| | PM | E | 1.11 | F | 1.22 | F |
| Sandgate Road/Junction Road | AM | F | 1.28 | F | 1.39 | F |
| | PM | E | 1.33 | F | 1.36 | F |
| Sandgate Road/Bonney Avenue | AM | C | 1.00 | E | 1.06 | F |
| | PM | A | 1.11 | F | 1.18 | F |
| Sandgate Road/Albion Road | AM | F | 0.99 | F | 1.52 | F |
| | PM | E | 1.86 | F | 2.16 | F |
| Sandgate Road/Frodsham Street/ Crosby Road/Abbotsford Road (Albion Fiveways) | AM | F | 1.01 | E | 1.12 | F |
| | PM | D | 1.32 | F | 1.43 | F |
| Kingsford Smith Drive/Nudgee Road/Remora Road | AM | C | 1.32 | F | 1.74 | F |
| | PM | D | 1.31 | F | 1.46 | F |

**Table Note:** (1) Cycle times as per 2004 with optimum phase times calculated within aaSIDRA.

Examples of highly congested intersections in the network include:

- The Gympie Road/Stafford Road intersection and the nearby Lutwyche Road/Kedron Park Road intersection, where a continuation of highly congested traffic operations, particularly in the PM peak is forecast. Delays at these two intersections create flow-on effects for inbound traffic on Gympie Road in the AM peak and outbound traffic on Lutwyche Road in the PM peak. To effectively manage queuing, signal settings are likely to need to be adjusted to allow priority for the major movements on Gympie Road-Lutwyche Road, causing additional delay to local traffic movements on Kedron Park Road and Stafford Road.
- The Sandgate Road/East-West Arterial intersection and the Sandgate Road/Junction Road intersection, where deteriorating traffic operations are forecast in both peak periods, as both locations cater for increasing north-south and east-west travel demands.
- Several intersections along Lutwyche Road which provide key local traffic connectivity such as Chalk Street, Maygar Street and Albion Road. Congestion at these locations often has a flow-on effect to nearby intersections between the major access points, and delays to the side-road traffic can become quite severe.
- Major local traffic access roads along Sandgate Road, serving schools and residential precincts such as Lapraik Street and Bonney Avenue.
- Intersections in the Albion shopping and commercial area including the Albion Fiveways and the Sandgate Road/Albion Road intersection, which would be the most severely congested location in the Inner North area.

A separate assessment of the performance of the East-West Arterial intersections with Gateway Motorway and Nudgee Road has been undertaken. These intersections are on a key approach route to the Australia TradeCoast precinct, which is forecast to experience a substantial growth in forecast traffic demand due to increased employment and economic activity.

The performance of the East-West Arterial/Nudgee Road intersection and the East-West Arterial/Gateway Motorway Ramps/Airport Drive roundabout have been analysed using peak period turning movements volumes extracted from the strategic transport model scenarios. The assessment without Airport Link shows:

- Both the East-West Arterial/Nudgee Road signalised intersection and the East-West Arterial/Gateway Motorway ramps/Airport Drive roundabout are highly congested and experience heavy delays and queuing during peak periods. There is currently a significant impact from the queue on the East-West Arterial at the roundabout, extending back to the Nudgee Road signals, a distance of only 170 metres. The throughput of the Nudgee Road signals is compromised by queuing from the roundabout during the peak.
- Traffic demand through both intersections following the completion of the Gateway Upgrade Project (GUP) is forecast to be equal, to or greater than, current levels, although changed traffic patterns occur due to GUP. The intersection analysis for 2012 without Airport Link indicates congested operations and significant queuing are forecast on most intersection approaches at both the East-West Arterial/Nudgee Road signalised intersection and the roundabout. The performance of the roundabout would be significantly worse than current operations.
- Without intersection improvements, conditions at both intersections would continue to degrade, worsening significantly in terms of queuing and delay.

### 5.5.4 Public Transport Network Performance

The SEQ Travel Survey in 2003/04 indicated that

- Motorised trip making accounted for 80% of all internal travel (increasing from 77% obtained from a similar survey in 1992);

- Public transport trip use accounted for a further 8% of travel (slightly higher than in 2002); and
- Around 12% of travel demand was represented by walk and cycle (decreased compared to the earlier survey).

Growth in travel demand does not have to be accommodated by vehicle travel alone. It is recognised that sustainable transport planning needs to encourage less reliance on private vehicle travel. In this regard, the effect of enhanced public transport initiatives, both planned or under consideration, has been incorporated in the estimation of future travel demand.

An enhanced mode share effect for public transport (where public transport would account for approximately 11.1% of travel demand in the Brisbane Metropolitan area) has been incorporated into the scenarios as described in **Section 5.4.4**.

By 2026 the increased public transport patronage, would represent a doubling of current levels to over 900,000 public transport trips per weekday. Even with the enhanced public transport measures described above, the reduction in vehicle trips in the network is estimated as 4%.

Bus services in the Inner North area are affected by congestion on the road system. Both Lutwyche Road and Sandgate Road are important bus corridors serving commuters from both local, and wider catchment areas in Brisbane. The deterioration in performance of the road system, as described above in Section 5.5.3, would result in similarly longer travel times and reduced travel time reliability for bus services during peak periods.

### 5.5.5 Road User Safety Performance

Increased traffic levels on the road network in the future will lead to an increase in the number of crashes on roads within the Inner North area which will affect all types of road users – motorists, pedestrians and cyclists. The forecast deterioration in road user safety without the project has been assessed by calculation of the forecast number of road crashes on key routes. These values are tabulated in **Table 5-39**. By 2012 an increase of annual crashes on key routes by 36% is forecast, and increase from 340 crashes in 2004 to 464 crashes in 2012. In 2026, the crash total would be over 50% greater than the current level.

## 5.6 Effects of the Proposal

### 5.6.1 Demand for Airport Link

The forecast Airport Link traffic volumes are significant within the regional network context and are identified in **Table 5-26**. Weekday traffic flows on the Airport Link Project north-south tunnel are forecast as 93,150 vpd in 2026, with an additional 25,750 vpd using the east-west ramps.

To examine the traffic function of the Airport Link Project an analysis of the travel patterns of forecast traffic has been undertaken. **Figure 5-27** shows the traffic routes used by vehicles using the Airport Link north-south tunnel and the east-west ramps.

**Figure 5-28** and **Figure 5-29** illustrate the geographic distribution of travellers using the facility, clearly showing the wide catchment area spread over the Metropolitan area, particularly for travel in the north-south tunnels. A significant number of locations in the western corridor including University of Queensland, Toowong and the Indooroopilly Regional Centre are identified as important destinations within the user catchment. The significance of the project for travel to the ATC precinct, including Brisbane Airport is clearly shown, with a high density of trip ends associated with users of both the north-south tunnels and east-west ramps. There are a number of other key local travel generators that also emerge as important destinations for users of the project including Centro Toombul Shopping Centre and Chermside Shopping Centre. The role of the project in catering for Central City movements is also highlighted.

## Table 5-26 Airport Link Overall Traffic Use Summary – Average Weekday Traffic Volumes [1]

| Project Element | 2012 Daily [2] | 2026 Daily | 2026 Peak Hour vph | % CV[3] |
|---|---|---|---|---|
| North-South Tunnel | 72,850<br>(51,000) | 93,150 | 4,400 AM S/B<br>5,700 PM N/B | 8.8% |
| East-West Ramps | 23,350<br>(16,400) | 25,750 | 1,000 AM E/B<br>1,200 PM W/B | 6.9% |
| Total Airport Link | 96,200<br>(67,400) | 118,900 | - | 8.3% |

**Table Notes:**

(1) Forecast based on full journey toll of $3.64 and partial journey toll of $2.43 expressed in $2006 including GST.

(2) 2012 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 ( ).

(3) CV = medium and heavy commercial vehicles as per AustRoads Class 3 & above.

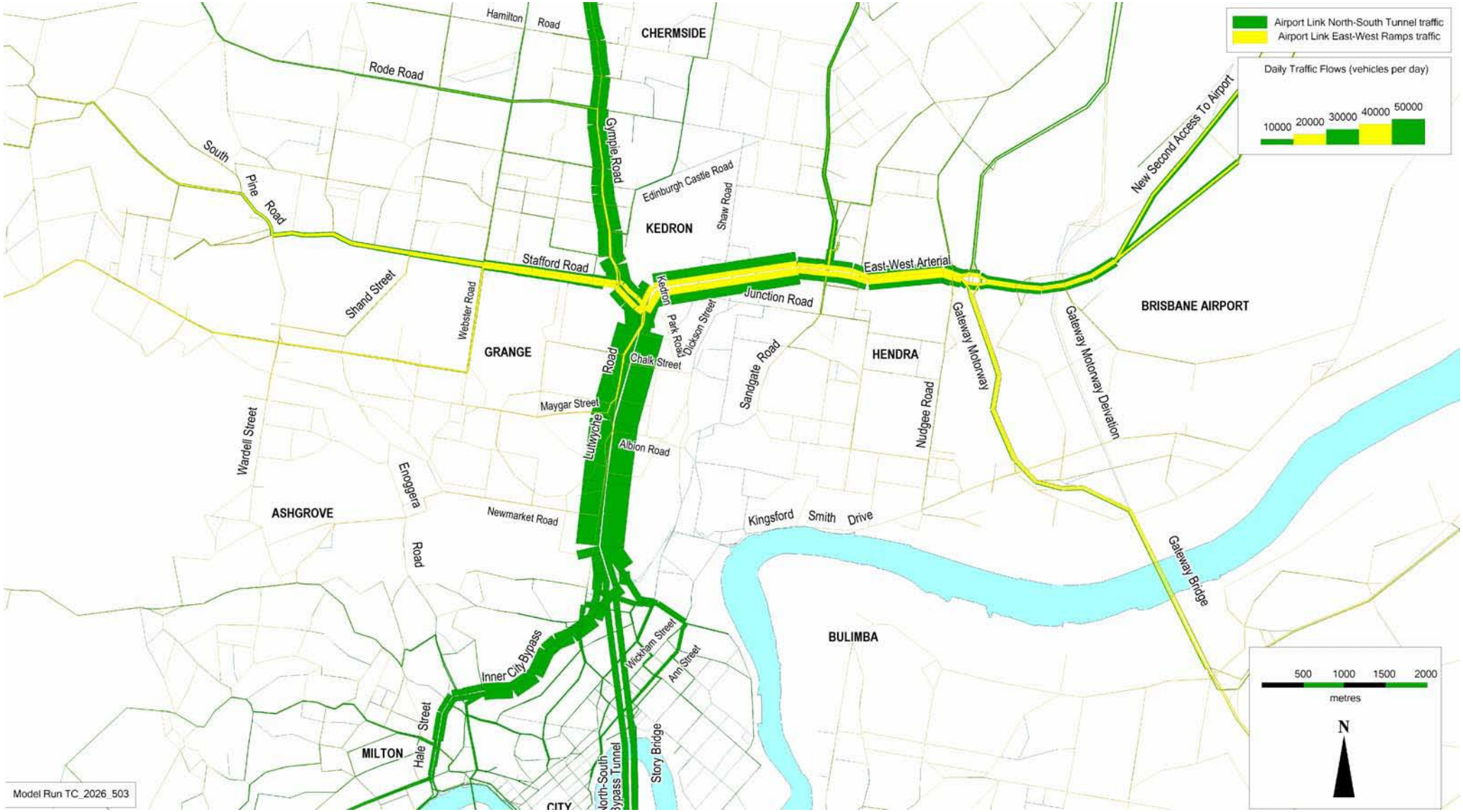
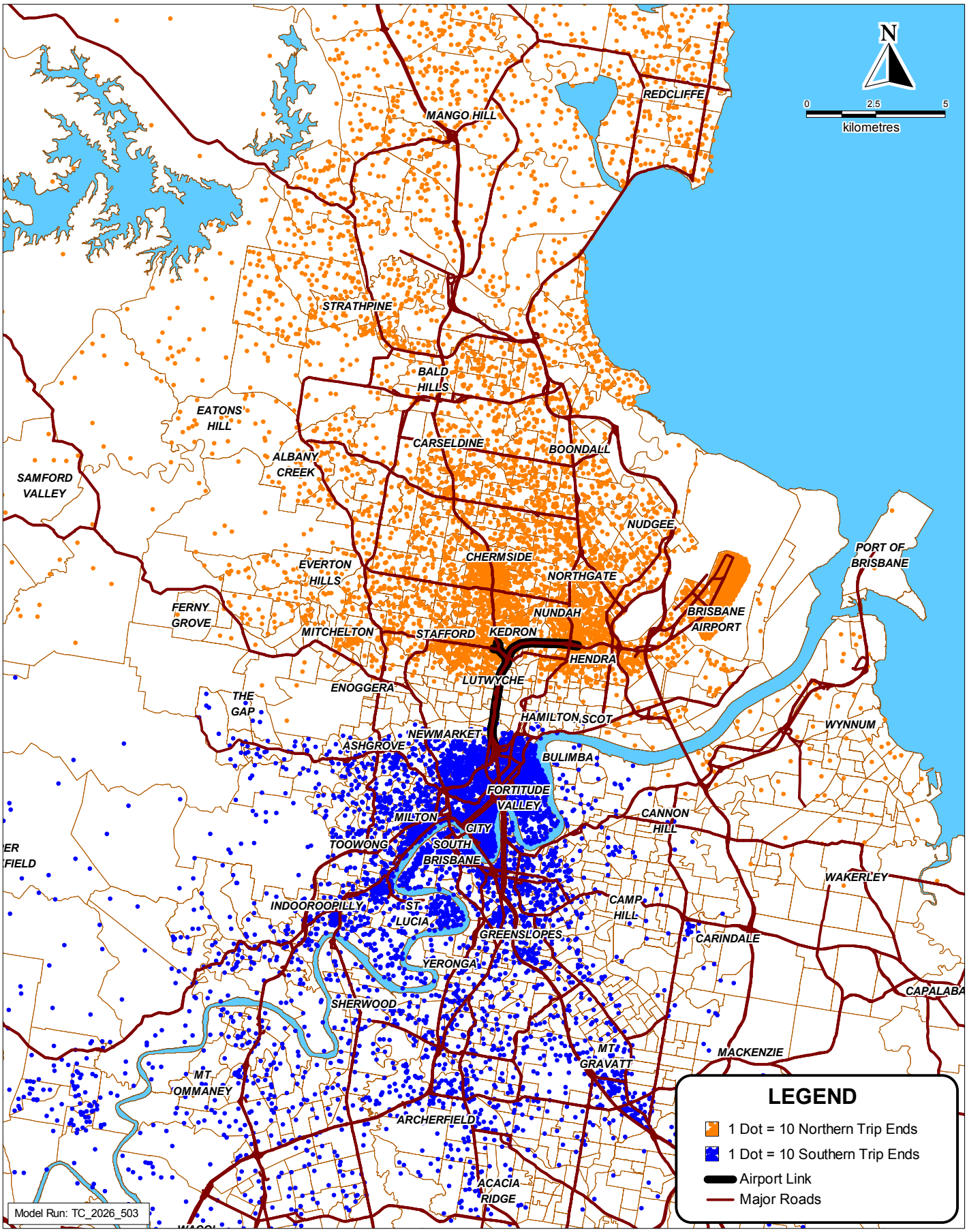



**Figure 5-26**

2026 Daily Travel Patterns
Airport Link North-South Tunnel
and Airport Link East-West Ramps
(select links)

Airport Link

SKM Connell Wagner
JOINT VENTURE

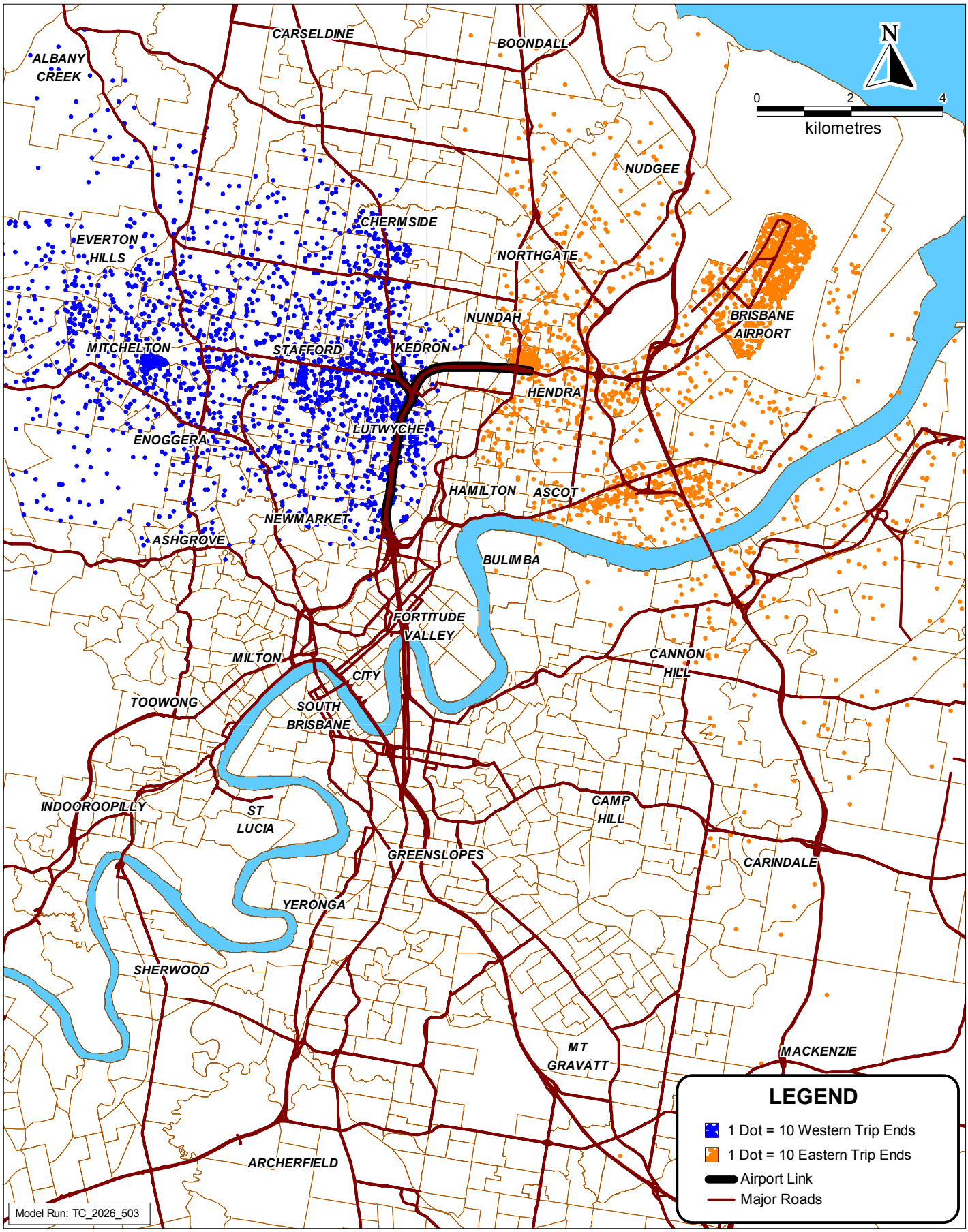



**AIRPORT LINK - Figure 5-27**

Airport Link North-South Catchment for Daily Travel (2026)

Airport Link

SKM Connell Wagner
JOINT VENTURE




**AIRPORT LINK - Figure 5-28**

Airport Link East-West Catchment for Daily Travel (2026)

Airport Link

SKM Connell Wagner JOINT VENTURE

Daily travel patterns are summarised in Table 5-27 and Table 5-28 based on travel sectors illustrated previously in Figure 5-1 and Figure 5-2. The select link and catchment area plots, in combination with the sector travel analysis presented in the tables highlight the function and major travel demands served by the project.

The north-south tunnel carries predominantly cross-city traffic (50%), and also has significant proportions of radial or CBD oriented trips (33%), Airport/ATC North precinct traffic (15%) and a small amount of local traffic (2%). This breakdown demonstrates that Airport Link fulfils an important function as part of a network of cross-city connections between the northern and southern, and northern and western suburbs of Brisbane. It also provides an important link between two major economic activity centres in the region, namely the ATC North precinct and the Brisbane CBD.

The east-west ramps cater primarily for traffic use related to the ATC North precinct including Brisbane Airport (52%) and cross-city travel (43%), with a small amount of local traffic (5%). The overall proportion of daily project use related to the Airport/ATC North area is 24%, with the majority (20%) related to land-uses within the Brisbane Airport Corporation Master Plan area.

### Table 5-27 Daily Travel Patterns for Airport Link North-South Tunnel Traffic (2026)

| From \ To | Central Brisbane | Inner North | West Brisbane | Airport/ATC North/Eagle Farm | North Brisbane | South of Brisbane River | Total |
|---|---|---|---|---|---|---|---|
| Central Brisbane | - | 2% | - | 1% | 13% | - | **16%** |
| Inner North | 2% | 2% | 1% | <1% | 3% | 2% | **10%** |
| West Brisbane | - | 1% | - | 4% | 5% | 1% | **13%** |
| Airport/ATC North/Eagle Farm | 1% | <1% | 4% | - | - | 4% | **8%** |
| North Brisbane | 14% | 1% | 6% | - | - | 12% | **34%** |
| South of Brisbane River | - | 2% | 1% | 4% | 12% | - | **19%** |
| **Total** | **17%** | **9%** | **13%** | **8%** | **34%** | **19%** | **100%** |

**Table Key for 5-26 and 5-27:**

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

### Table 5-28 Daily Travel Patterns for Airport Link East-West Ramps Traffic (2026)

| From \ To | Central Brisbane | Inner North | West Brisbane | Airport/ATC North/Eagle Farm | North Brisbane | South of Brisbane River | Total |
|---|---|---|---|---|---|---|---|
| Central Brisbane | - | - | - | - | - | - | - |
| Inner North | - | 5% | 3% | 4% | 5% | 2% | 19% |
| West Brisbane | - | 3% | - | 10% | 2% | 4% | 20% |
| Airport/ATC North/Eagle Farm | - | 5% | 11% | - | 11% | - | 27% |
| North Brisbane | - | 5% | 3% | 10% | 1% | 3% | 22% |
| South of Brisbane River | - | 3% | 5% | - | 4% | - | 12% |
| **Total** | **-** | **21%** | **22%** | **25%** | **23%** | **9%** | **100%** |

**Table 5-29** summarises the use of the Airport Link Project connections.

Of the daily traffic in the north-south tunnel, the NSBT is forecast to contribute 27%, with the remainder split evenly between the ICB west connection (36%) and the ramps at O'Connell Terrace and Campbell Street (37%).

At the northern end, approximately 60% of traffic from the north-south tunnel distributes to the Gympie Road/Stafford Road connection, with Gympie Road the major movement. The balance of north-south mainline tunnel traffic (just under 40%) proceeds to Sandgate Road/East-West Arterial.

- **Table 5-29 Airport Link Connections Traffic Summary – 2026 Average Weekday**

| Project Element | Daily Traffic 2026 | % | AM Peak S/B vph | PM Peak N/B vph |
|---|---|---|---|---|
| **Northern Connections** | | | | |
| Gympie Road | 46,100 | 56% | 1,800 | 2,100 |
| Stafford Road | 10,300 | 13% | 800 | 1,200 |
| **Total from North-South Tunnel** | **56,400** | **-** | **2,600** | **3,200** |
| East – West Ramps | 25,800 | 31% | 900 | 900 |
| **Total North-Western Connection Traffic** | **82,200** | **100%** | **3,500** | **4,100** |
| Sandgate Road | 21,100 | 34% | 900 | 1,600 |
| East-West Arterial | 41,400 | 66% | 1,500 | 1,600 |
| **Total North-Eastern Connection Traffic** | **62,500** | **100%** | **2,400** | **3,200** |
| **Southern Connection** | | | | |
| NSBT | 24,700 | 27% | 1,100 | 1,300 |
| ICB West | 33,900 | 36% | 1,300 | 1,800 |
| Campbell/O'Connell Ramps | 34,600 | 37% | 1,900 | 2,400 |
| **Total Southern Connection Traffic** | **93,200** | **100%** | **4,300** | **5,600** |

**Table Note:**

(1) Forecast based on full journey toll of $3.64 and partial journey toll of $2.43 expressed in $2006 including GST.

### 5.6.2 Traffic Volume Effects of Airport Link

A detailed assessment of the effects of the project on traffic changes on the corridor, approaches and local network is summarised in **Table 5-30** and **Table 5-31**.

Regional changes in weekday traffic volumes on the wider road network in 2026 are illustrated in **Figure 5-30**.

This supports the travel pattern assessment and again illustrates that a component of the traffic function of Airport Link is associated with intra-regional travel. Traffic volume effects are forecast beyond the corridor due to regional traffic re-distributing to alternative routes to access the facility, however these are minor in the context of total traffic use of regional routes. For example, forecast changes in weekday traffic volume in 2026 with the project compared to without the project are :

- Gateway Bridge – reduction of 2.5%;
- Pacific Motorway (M3) south of NSBT– increase of 1.1%;
- Ipswich Road, north of Beaudesert Road – increase of 0.9%; and
- Centenary Bridge – reduction of 2.1 %.

The traffic volume effects at a corridor level are illustrated in Figure 5-31 and Figure 5-32 for 2012 and 2026 respectively.

## Table 5-30 Volumes on Key Connecting Roads to the Project - Comparison without and with the Project

| Reference | Road | Location | 2004 | Average Weekday Traffic | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2012 | | | 2016 | | | 2022 | | | 2026 | | |
| | | | | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change |
| **Southern Connections** | | | | | | | | | | | | | | | |
| - | NBST | Brisbane River | - | 70,800 | 73,700 | 4% | 75,600 | 79500 | 5% | 82,300 | 93,100 | 13% | 89,800 | 96,600 | 8% |
| 41 | ICB | West of Bowen Bridge Road | 75,000 | 100,500 | 104,600 | 4% | 106,300 | 107,400 | 1% | 106,500 | 112,000 | 5% | 111,200 | 113,800 | 2% |
| 49 | Hale Street | North of Milton Road | 78,000 | 84,200 | 84,200 | 0% | 86,900 | 86,600 | 0% | 82,700 | 82,900 | 0% | 81,700 | 81,100 | -1% |
| 38 | Bowen Bridge Road | South of O'Connell Terrace | 57,000 | 51,200 | 54,700 | 7% | 53,600 | 58,000 | 8% | 55,200 | 60,800 | 10% | 56,700 | 64,200 | 13% |
| 40 | Campbell Street | East of Mayne Road | 12,000 | 21,700 | 26,000 | 20% | 23,500 | 28,200 | 20% | 26,300 | 32,200 | 22% | 28,600 | 34,200 | 20% |
| 39 | O'Connell Terrace | East of Bowen Bridge Road | 6,000 | 15,200 | 13,000 | -14% | 16,500 | 14,400 | -13% | 17,800 | 15,700 | -12% | 18,700 | 16,800 | -10% |
| 45 | Brookes Street | South of St Pauls Terrace | 18,000 | 20,500 | 22,800 | 11% | 22400 | 24,100 | 8% | 23300 | 24900 | 7% | 24,100 | 25,700 | 7% |
| 44 | St Pauls Terrace | South of Brookes Street | 9,000 | 13,200 | 14,200 | 8% | 15000 | 16,300 | 9% | 17000 | 18100 | 6% | 19,900 | 20,200 | 2% |
| 42 | Gregory Terrace | West of Brookes Street | 5,000 | 12,100 | 11,200 | -7% | 12,800 | 11,500 | -10% | 14,200 | 12,700 | -11% | 15,300 | 13,500 | -12% |
| 46 | Wickham Street | West of Brookes Street | 26,000 | 30,300 | 31,700 | 5% | 32,100 | 33,000 | 3% | 33,600 | 35,100 | 4% | 36,500 | 37,100 | 2% |
| 47 | Ann Street | West of Brookes Street | 25,000 | 30,900 | 34,100 | 10% | 32,300 | 36,300 | 12% | 36,800 | 40,600 | 10% | 39,300 | 42,500 | 8% |
| 43 | Montpelier Road | West of Breakfast Creek Road | 15,000 | 28,600 | 31,400 | 10% | 31,000 | 33,900 | 9% | 33,900 | 37,400 | 10% | 36,900 | 39,000 | 6% |
| 48 | Gipps Street | North of Wickham Street | 53,000 | 42,200 | 40,400 | -4% | 44,100 | 42,800 | -3% | 45,900 | 44,800 | -2% | 46,900 | 46,100 | -2% |
| **Northern Connections** | | | | | | | | | | | | | | | |
| 10 | Stafford Road | West of Richmond Street | 23,000 | 26,700 | 40,300 | 51% | 27,100 | 42,000 | 55% | 29,200 | 44,100 | 51% | 29,100 | 45,500 | 56% |
| 8 | Stafford Road | West of Webster Road | 22,000 | 24,600 | 30,700 | 25% | 24,400 | 31,000 | 27% | 25,300 | 33,700 | 33% | 25,000 | 34,200 | 37% |
| 11 | Gympie Road | North of Broughton Road | 59,000 | 76,800 | 97,200 | 27% | 80,400 | 100,400 | 25% | 81,700 | 104,600 | 28% | 83,500 | 106,900 | 28% |
| 3 | Gympie Road | North of Rode Road | 60,000 | 79,000 | 86,000 | 9% | 81,700 | 87,400 | 7% | 84,700 | 92,200 | 9% | 86,600 | 96,100 | 11% |
| 1 | Gympie Road | North of Hamilton Road | 70,000 | 82,700 | 88,600 | 7% | 85,400 | 90,800 | 6% | 88,500 | 94,600 | 7% | 90,200 | 98,100 | 9% |
| 2 | Rode Road | West of Gympie Road | 19,500 | 29,800 | 30,900 | 4% | 31,000 | 31,200 | 1% | 32,300 | 32,200 | 0% | 33,200 | 32,400 | -2% |
| 13 | Sandgate Road | North of Schultz Canal | 52,000 | 66,800 | 60,800 | -9% | 67,600 | 61,400 | -9% | 71,600 | 63,800 | -11% | 72,700 | 66,000 | -9% |
| 14 | East West Arterial | East of Widdop Street | 35,000 | 59,100 | 74,900 | 27% | 63,500 | 78,900 | 24% | 72,000 | 83,600 | 16% | 74,500 | 84,800 | 14% |

## Table 5-31 2022 Peak Period Volumes on Key Connecting Roads to the Project - Comparison without and with the Project

| Reference | Road | Location | 2 hour average weekday peak period volumes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AM Peak | | | | | | PM Peak | | | | | |
| | | | Northbound/Eastbound | | | Southbound/Westbound | | | Northbound/Eastbound | | | Southbound/Westbound | | |
| | | | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change |
| **Southern Connections** | | | | | | | | | | | | | | |
| - | NBST | Brisbane River | 8,750 | 8,800 | 1% | 5,650 | 7,050 | 25% | 6,300 | 8,250 | 31% | 9,200 | 9,200 | 0% |
| 41 | ICB | West of Bowen Bridge Road | 6,350 | 6,200 | -2% | 9,100 | 9,400 | 3% | 8,650 | 9,150 | 6% | 7,650 | 7,300 | -5% |
| 49 | Hale Street | North of Milton Road | 5,100 | 5,100 | 0% | 5,400 | 5,350 | -1% | 6,100 | 6,000 | -2% | 4,650 | 4,550 | -2% |
| 38 | Bowen Bridge Road | South of O'Connell Terrace | 2,750 | 3,000 | 9% | 5,500 | 6,150 | 12% | 3,600 | 5,800 | 61% | 3,200 | 3,800 | 19% |
| 40 | Campbell Street | East of Mayne Road | 2,200 | 2,700 | 23% | 2,200 | 2,300 | 5% | 2,350 | 2,250 | -4% | 2,250 | 3,300 | 47% |
| 39 | O'Connell Terrace | East of Bowen Bridge Road | N/A | 550 | | 2,450 | 1,800 | -27% | N/A | 550 | | 4,100 | 1,650 | -60% |
| 45 | Brookes Street | South of St Pauls Terrace | 2,850 | 2,900 | 2% | 850 | 1,450 | 71% | 3,250 | 3,300 | 2% | 850 | 1,450 | 71% |
| 44 | St Pauls Terrace | South of Brookes Street | 450 | 550 | 22% | 2350 | 3100 | 32% | 3400 | 3450 | 1% | 300 | 450 | 50% |
| 42 | Gregory Terrace | West of Brookes Street | 1,350 | 1,050 | -22% | 650 | 750 | 15% | 1,600 | 1,500 | -6% | 550 | 500 | -9% |
| 46 | Wickham Street | West of Brookes Street | 4,750 | 5,100 | 7% | - | - | - | 7,650 | 8,400 | 10% | - | - | - |
| 47 | Ann Street | West of Brookes Street | - | - | - | 6,400 | 6,700 | 5% | - | - | - | 4,750 | 5,350 | 13% |
| 43 | Montpelier Road | West of Breakfast Creek Road | 1,900 | 1,200 | -37% | 3,950 | 4,450 | 13% | 2,300 | 3,650 | 59% | 3,500 | 3,450 | -1% |
| 48 | Gipps Street | North of Wickham Street | 3,150 | 3,300 | 5% | 3,550 | 3,800 | 7% | 2,350 | 2,600 | 11% | 4,100 | 3,850 | -6% |
| **Northern Connections** | | | | | | | | | | | | | | |
| 10 | Stafford Road | West of Richmond Street | 2,450 | 4,200 | 71% | 2,050 | 2,500 | 22% | 2,100 | 2,550 | 21% | 3,050 | 4,900 | 61% |
| 8 | Stafford Road | West of Webster Road | 2,050 | 2,950 | 44% | 1,250 | 1,600 | 28% | 1,700 | 1,950 | 15% | 2,750 | 3,900 | 42% |
| 11 | Gympie Road | North of Broughton Road | 4,200 | 5,600 | 33% | 6,600 | 7,600 | 15% | 7,200 | 8,250 | 15% | 4,500 | 6,150 | 37% |
| 3 | Gympie Road | North of Rode Road | 3,750 | 4,300 | 15% | 6,750 | 6,850 | 1% | 7,200 | 7,300 | 1% | 5,000 | 5,400 | 8% |
| 1 | Gympie Road | North of Hamilton Road | 3,800 | 4,300 | 13% | 6,800 | 6,950 | 2% | 7,500 | 7,500 | 0% | 5,400 | 5,750 | 6% |
| 2 | Rode Road | West of Gympie Road | 2,150 | 2,100 | -2% | 2,000 | 1,900 | -5% | 2,150 | 2,100 | -2% | 2,300 | 2,250 | -2% |
| 13 | Sandgate Road | North of Schultz Canal | 4,200 | 3,250 | -23% | 6,700 | 6,350 | -5% | 6,100 | 6,200 | 2% | 4,600 | 2,900 | -37% |
| 14 | East West Arterial | East of Widdop Street | 5,400 | 5,450 | 1% | 4,100 | 5,200 | 27% | 5,200 | 5,600 | 8% | 5,200 | 5,600 | 8% |


**AIRPORT LINK - Figure 5-29**

2026 Regional Traffic Volume Changes with Airport Link

Airport Link

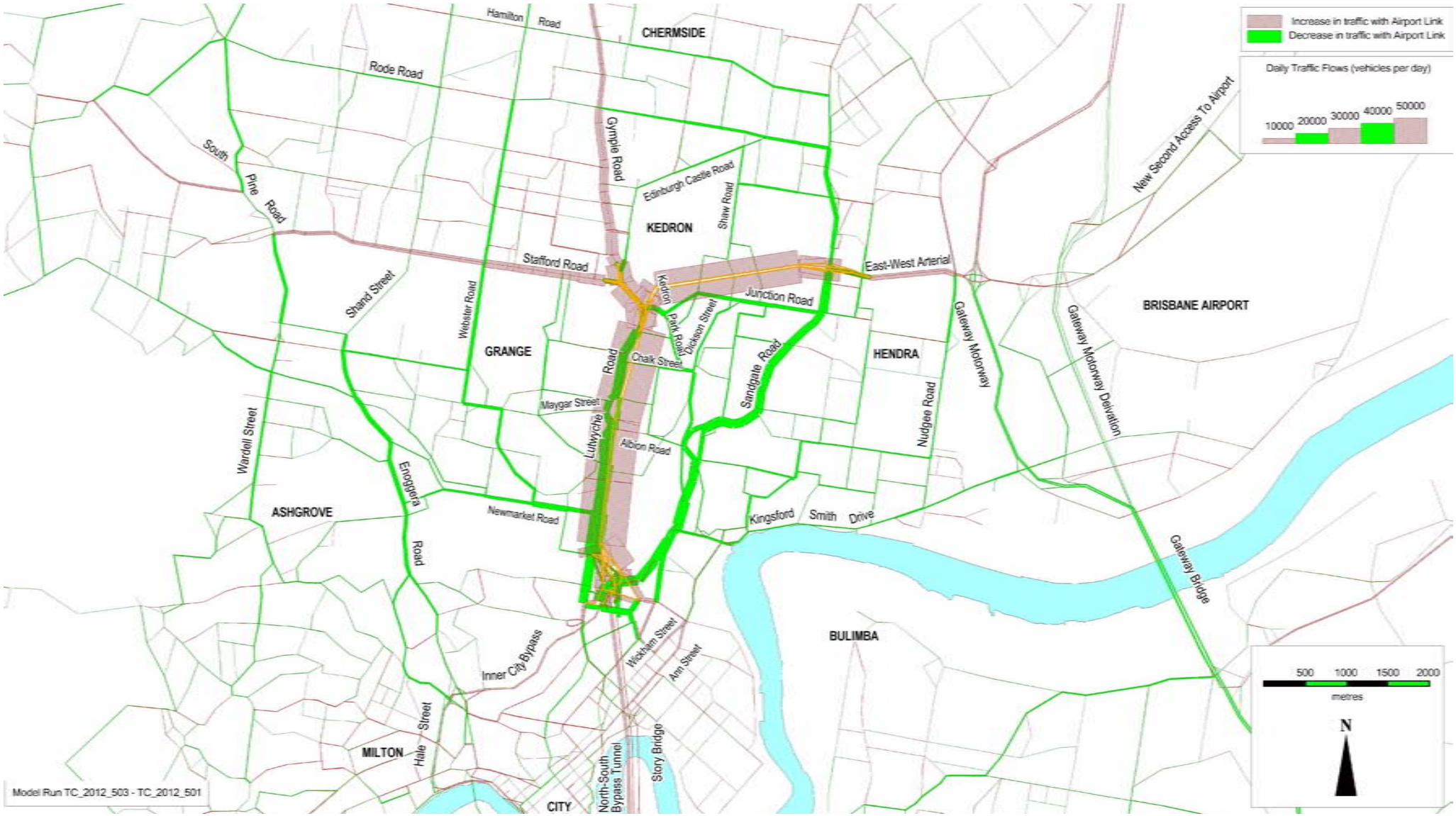
SKM Connell Wagner JOINT VENTURE


**AIRPORT LINK - Figure 5-30**

2012 Corridor Traffic Volume Changes with Airport Link

Airport Link

SKM Connell Wagner JOINT VENTURE




**AIRPORT LINK - Figure 5-31**

2026 Corridor Traffic Volume Changes with Airport Link

Airport Link

SKM Connell Wagner JOINT VENTURE

## Regional Traffic Volume Effects

Key findings from this assessment are:

- At the southern end of the project a number of roads will experience increased traffic demands. Increases are generally modest on individual roads (< 15%) and well within the network capacity with resultant acceptable levels of service. On the busiest links, where capacity issues are most critical, much smaller changes are forecast such as minor increases of 2-3% on the Inner City Bypass and 5-6% on Bowen Bridge Road.
- With the project the planned NSBT is forecast to be effectively operating at capacity in the peaks, particularly northbound in the AM peak and southbound in the PM peak.
- At the northern end of the project the most significant effect occurs on Stafford Road where over 50% increase in demand is forecast. This is due to the combined role of this link catering for travel demand for both east-west and north-south movements. The resultant traffic volumes of 45,000 vpd in 2026 are within the mid-block traffic lane capacities of a well-managed four (4) lane arterial route. Satisfactory levels of service could be achieved with the implementation of traffic management measures along the route.
- From Stafford (west of Webster Road) to Appleby Road, significant upgrading of Stafford Road has already been undertaken in conjunction with abutting commercial/retail development access provisions. The effects of the project diminish in this region and no specific mitigation is warranted. Further west the traffic increases on Stafford Road do not result in a congested Level of Service.
- Impacts on Gympie Road diminish quite rapidly north of the project and at Chermside represent only a 6-7% increase, with no significant impact on Level of Service. North of the project Gympie Road has a robust, wide cross-section , incorporating six (6) general traffic lanes, a wide median and parking lanes. Satisfactory performance could be achieved with operational traffic management such as signal coordination.
- Traffic volumes on Sandgate Road north reduce by 9-10% with the project, due to the re-distribution of travel movements from northern areas to the east-west toll road to access the East-West Arterial Road. This effect will reduce traffic congestion at the access to Centro Toombul Shopping Centre.

## Local Traffic Volume Effects

Improved amenity on many roads in the inner north suburbs is likely, due to forecast traffic reductions with the project. Forecast effects are shown in **Table 5-32** and **Table 5-33** and graphically on **Figure 5-31** and **Figure 5-32**.

Examples of local traffic volume effects in 2026 include:

- Reduction in daily traffic of 25% on Lutwyche Road through the Lutwyche shopping area, and 28% on Sandgate Road at Albion.
- Reduced traffic levels on suburban and district roads, such as Shaw Road (-16%), Dawson Street (-8%) and Dickson Street (-28%), which currently experience strong peak travel demands from north-south commuter traffic seeking to avoid congestion on the arterials.
- Strong reductions (23-28%) in east-west traffic on the Junction Road-Rose Street route through residential areas.
- Traffic relief on key east-west links between Gympie and Sandgate Roads north of the project, such as Rode Road (-24%) and Hamilton Road (-16%).

- **Table 5-32 Volumes on Surface Roads within the Inner North Area - Comparison without and with the Project**

| Reference | Road | Location | 2004 | Average Weekday Traffic | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2012 | | | 2016 | | | 2022 | | | 2026 | | |
| | | | | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change |
| **Arterial Roads** | | | | | | | | | | | | | | | |
| 17 | Lutwyche Road | South of Kedron Park Road, Kedron | 54,600 | 68,200 | 53,400 | -22% | 70,200 | 53,700 | -24% | 70,800 | 53,300 | -25% | 71,500 | 54,200 | -24% |
| 27 | Lutwyche Road | North of Stoneleigh Street, Lutwyche | 59,600 | 74,200 | 56,900 | -23% | 76,200 | 57,200 | -25% | 77,000 | 56,800 | -26% | 77,500 | 57,800 | -25% |
| 33 | Lutwyche Road | South of Newmarket Road, Windsor | 60,300 | 105,100 | 77,400 | -26% | 110,800 | 79,000 | -29% | 113,400 | 79,900 | -30% | 116,300 | 82,100 | -29% |
| 22 | Sandgate Road | South of Junction Road, Clayfield | 37,000 | 51,100 | 38,100 | -25% | 55,800 | 39,300 | -30% | 59,300 | 41,800 | -30% | 60,700 | 45,100 | -26% |
| 31 | Sandgate Road | South of Bonney Avenue, Albion | 35,900 | 57,300 | 42,500 | -26% | 62,700 | 44,800 | -29% | 67,400 | 46,900 | -30% | 71,000 | 51,400 | -28% |
| 18 | Kedron Park Road | East of Lutwyche Road, Kedron | 17,600 | 35,000 | 26,600 | -24% | 37,000 | 27,600 | -25% | 38,700 | 28,300 | -27% | 39,900 | 29,300 | -27% |
| 20 | Rose Street | Melrose Park, Wooloowin | 10,700 | 24,600 | 16,700 | -32% | 25,500 | 17,700 | -31% | 26,700 | 18,600 | -30% | 26,700 | 19,100 | -28% |
| 23 | Junction Road | West of Sandgate Road, Clayfield | 18,200 | 29,800 | 21,800 | -27% | 30,700 | 22,900 | -25% | 32,000 | 24,200 | -24% | 32,600 | 25,200 | -23% |
| 5 | Rode Road | West of Sandgate Road, Wavell Heights | 19,300 | 24,700 | 19,100 | -23% | 25,600 | 19,100 | -25% | 27,500 | 20,700 | -25% | 28,100 | 21,400 | -24% |
| 15 | Nudgee Road | North of E-W Arterial, Hendra | 5,400 | 8,600 | 10,300 | 20% | 10,200 | 12,700 | 25% | 11,500 | 14,300 | 24% | 12,800 | 15,300 | 20% |
| 16 | Nudgee Road | South of E-W Arterial, Hendra | 24,600 | 21,800 | 17,800 | -18% | 22,200 | 19,200 | -14% | 23,900 | 20,900 | -13% | 25,600 | 20,700 | -19% |
| 36 | Kingsford Smith Drive | East of Cooksley Street | 65,600 | 73,500 | 66,900 | -9% | 76,500 | 71,000 | -7% | 77,200 | 74,100 | -4% | 78,000 | 75,900 | -3% |
| 37 | Kingsford Smith Drive | East of Racecourse Road, Hamilton | 54,900 | 71,000 | 64,700 | -9% | 74,300 | 69,100 | -7% | 75,300 | 72,600 | -4% | 76,400 | 74,600 | -2% |
| 7 | South Pine Road | Kedron Brook, Everton Park | 33,800 | 49,300 | 42,200 | -14% | 50,400 | 43,900 | -13% | 58,100 | 51,600 | -11% | 59,100 | 52,300 | -12% |
| 25 | Enoggera | South of South Pine Road, | 50,400 | 57,900 | 51,000 | -12% | 58,000 | 51,400 | -11% | 71,800 | 62,800 | -13% | 73,900 | 64,500 | -13% |

| Reference | Road | Location | 2004 | Average Weekday Traffic | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2012 | | | 2016 | | | 2022 | | | 2026 | | |
| | | | | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change |
| | Road | Alderley | | | | | | | | | | | | | |
| **Suburban Roads** | | | | | | | | | | | | | | | |
| 32 | Newmarket Road | West of Lutwyche Road, Windsor | 17,600 | 33,900 | 26,000 | -23% | 36,900 | 28,100 | -24% | 39,400 | 31,000 | -21% | 41,900 | 33,300 | -21% |
| 4 | Hamilton Road | West of Sandgate Road, Wavell Heights | 15,200 | 21,500 | 18,300 | -15% | 20,700 | 18,300 | -12% | 22,800 | 19,500 | -14% | 24,100 | 20,200 | -16% |
| 19 | Kedron Park Road | South of Park Road, Wooloowin | 7,300 | 11,800 | 9,600 | -19% | 13,400 | 10,100 | -25% | 13,700 | 9,900 | -28% | 14,800 | 10,200 | -31% |
| 29 | Albion Road | East of Lutwyche Road, Windsor | 15,100 | 19,900 | 19,600 | -2% | 21,800 | 21,900 | 0% | 23,100 | 22,700 | -2% | 23,700 | 24,200 | 2% |
| 30 | Albion Road | At overpass, Albion | 17,000 | 22,500 | 20,500 | -9% | 24,100 | 23,200 | -4% | 26,000 | 24,200 | -7% | 27,500 | 25,700 | -7% |
| 12 | Shaw Road | Kedron Brook, Wooloowin | 14,100 | 15,800 | 14,000 | -11% | 16,500 | 14,300 | -13% | 17,200 | 15,000 | -13% | 18,500 | 15,500 | -16% |
| 28 | Chalk Street | West of Bridge Street, Wooloowin | 10,700 | 14,400 | 10,800 | -25% | 16,600 | 11,700 | -30% | 17,700 | 12,000 | -32% | 19,000 | 12,600 | -34% |
| 26 | Maygar Street | West of Lutwyche Road, Windsor | 8,300 | 8,100 | 7,600 | -6% | 9,100 | 8,300 | -9% | 9,900 | 9,300 | -6% | 10,600 | 9,900 | -7% |
| 9 | Webster Road | South of Stafford Road | 25,100 | 26,600 | 24,000 | -10% | 27,400 | 24,800 | -9% | 30,000 | 25,200 | -16% | 32,700 | 26,200 | -20% |
| **District Roads** | | | | | | | | | | | | | | | |
| 6 | Edinburgh Castle Road | North of Leckie Road, Kedron | 10,600 | 7,500 | 6,200 | -17% | 7,800 | 6,500 | -17% | 8,400 | 6,900 | -18% | 9,200 | 7,100 | -23% |
| 21 | Dawson Street | North of Rose Street, Wooloowin | 10,400 | 10,000 | 9,000 | -10% | 10,300 | 9,000 | -13% | 10,500 | 9,400 | -10% | 10,600 | 9,800 | -8% |
| 24 | Dickson Street | North of Wride Street, Wooloowin | 13,000 | 11,700 | 9,200 | -21% | 11,800 | 9,200 | -22% | 12,400 | 9,100 | -27% | 13,000 | 9,300 | -28% |

- **Table 5-33 Surface Traffic Changes within the Inner North Area - Comparison without and with the Project**

| Screenline | 2004 | Average Weekday Traffic | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2012 | | | 2016 | | | 2022 | | | 2026 | | |
| | | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change |
| Western | 74,900 | 106,500 | 109,800 | 3% | 112,900 | 116,700 | 3% | 119,500 | 124,700 | 4% | 123,700 | 129,100 | 4% |
| Central | 60,500 | 81,600 | 66,200 | -19% | 87,300 | 71,400 | -18% | 91,400 | 73,100 | -20% | 94,200 | 75,800 | -20% |
| Eastern | 66,800 | 90,300 | 81,900 | -9% | 96,600 | 89,300 | -8% | 103,700 | 98,100 | -5% | 109,600 | 104,000 | -5% |
| Northern | 180,100 | 231,100 | 187,400 | -19% | 243,600 | 193,500 | -21% | 256,400 | 201,100 | -22% | 269,000 | 208,600 | -22% |
| Screenline | 2004 | Commercial Vehicle Weekday Traffic | | | | | | | | | | | |
| | | 2012 | | | 2016 | | | 2022 | | | 2026 | | |
| | | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change | Without AL | With AL | % Change |
| Western | 4,300 | 5,600 | 5,500 | -2% | 6,100 | 6,200 | 2% | 6,300 | 6,300 | 0% | 6,500 | 6,400 | -2% |
| Central | 4,100 | 5,300 | 4,200 | -21% | 5,800 | 4,500 | -22% | 5,400 | 3,600 | -33% | 5,200 | 3,400 | -35% |
| Eastern | 7,500 | 9,400 | 9,200 | -2% | 10,100 | 9,800 | -3% | 10,700 | 10,300 | -4% | 11,000 | 10,400 | -5% |
| Northern | 9,500 | 11,900 | 9,600 | -19% | 12,800 | 8,300 | -35% | 13,200 | 7,400 | -44% | 13,900 | 7,100 | -49% |

As the project has a wider effect on route choice within the network, a range of heavily trafficked north-south arterial roads in the broader northern network are forecast to experience traffic reductions and improved operations. Examples at 2026 include Kingsford Smith Drive (-3%), Nudgee Road (-19%), Enoggera Road (-13%) and South Pine Road (-12%).

The project has the effect of significantly reducing both overall traffic levels and commercial vehicles (medium and heavy trucks) on surface streets through the Inner North suburbs, in the vicinity of the project as demonstrated in **Table 5-32** compared to the situation without the project. Based on the reductions forecast on the Northern Screenline (location as shown in **Table 5-33**), 22% of total traffic and 49% of truck traffic will be removed from north-south surface routes from Webster Road across to Nudgee Road, by 2026. Similarly on the Central Screenline (location as shown on **Table 5-33**), which captures the reduction in east-west traffic movements on the local surface road network between Lutwyche Road and Sandgate Road, an overall reduction of 20% in total traffic and 35% in commercial vehicle traffic is estimated in 2026.

A local area where some likelihood for additional traffic increases associated with northbound traffic from the project is indicated is the north-west precinct at the Stafford Road/Gympie Road intersection.

### 5.6.3 Network Performance Effects

#### Metropolitan Network Performance Effects

The impact of the Airport Link Project on overall Metropolitan Area network performance is summarised in **Table 5-34**. This shows that the project reduces the amount of travel on lower order roads in the network (local district and suburban routes) and redistributes travel to Motorway routes. The Arterial road network is also benefited by travel distance and time reductions. A very small (<0.2%) increase in overall vehicle kilometres of travel in the network is forecast.

These effects are shown graphically in **Figure 5-33**. An overall 1 to 2% reduction in the vehicle hours of travel within the overall Metropolitan Area is indicated, together with an increase in overall average network speed reflecting a general lowering of congestion.

## Table 5-34 Network Performance by Road Type without and With Airport Link

| Road Type | Without Airport Link | | | With Airport Link | | | Difference | | % Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | VHT[1] | VKT[2] | Speed km/h | VHT | VKT | Speed Km/h | VHT | VKT | VHT | VKT |
| **2012** | | | | | | | | | | |
| Motorway | 272,900 | 22,103,000 | | 277,100[3] | 22,290,000[4] | | 4,200 | 187,000 | 1.5% | 0.8% |
| Motorway (AL Tunnel) | - | - | | - | 331,000 | | - | 331,000 | - | - |
| Arterial | 464,300 | 20,819,000 | | 452,600 | 20,550,000 | | -11,700 | -269,000 | -2.5% | -1.3% |
| Suburban | 170,100 | 8,186,000 | | 165,700 | 8,075,000 | | -4,400 | -111,000 | -2.6% | -1.4% |
| District | 98,900 | 3,329,000 | | 97,200 | 3,291,000 | | -1,700 | -38,000 | -1.7% | -1.1% |
| Local | 53,800 | 1,317,000 | | 53,000 | 1,295,000 | | -800 | -22,000 | -1.5% | -1.7% |
| Total | 1,059,900 | 55,754,000 | 52.6 | 1,045,600 | 55,833,000 | 53.4 | -14,300 | 79,000 | -1.3% | 0.1% |
| **2022** | | | | | | | | | | |
| Motorway | 358,000 | 27,777,000 | | 362,600[3] | 27,977,000[4] | | 4,600 | 200,000 | 1.3% | 0.7% |
| Motorway (AL Tunnel) | - | - | | - | 397,000 | | - | 397,000 | - | - |
| Arterial | 556,800 | 24,004,000 | | 538,000 | 23,715,000 | | -18,800 | -289,000 | -3.4% | -1.2% |
| Suburban | 204,700 | 9,581,000 | | 198,200 | 9,429,000 | | -6,500 | -152,000 | -3.2% | -1.6% |
| District | 120,600 | 3,873,000 | | 116,000 | 3,803,000 | | -4,600 | -70,000 | -3.8% | -1.8% |
| Local | 77,600 | 1,508,000 | | 75,300 | 1,472,000 | | -2,300 | -36,000 | -3.0% | -2.4% |
| Total | 1,317,600 | 66,742,000 | 50.7 | 1,290,200 | 66,793,000 | 51.8 | -27,400 | 51,000 | -2.1% | 0.1% |
| **2026** | | | | | | | | | | |
| Motorway | 408,800 | 30,070,000 | | 411,400[3] | 30,255,000[4] | | 2,600 | 185,000 | 0.6% | 0.6% |
| Motorway (AL Tunnel) | - | - | | - | 410,000 | | - | 410,000 | - | - |
| Arterial | 608,000 | 25,238,000 | | 588,000 | 24,932,000 | | -20,000 | -306,000 | -3.3% | -1.2% |
| Suburban | 225,400 | 10,224,000 | | 218,500 | 10,077,000 | | -6,900 | -147,000 | -3.1% | -1.4% |
| District | 132,800 | 4,129,000 | | 129,300 | 4,065,000 | | -3,500 | -64,000 | -2.6% | -1.6% |
| Local | 93,100 | 1,608,000 | | 91,400 | 1,577,000 | | -1,700 | -31,000 | -1.8% | -1.9% |
| Total | 1,468,200 | 71,269,000 | 48.5 | 1,438,500 | 71,317,000 | 49.6 | -29,700 | 48,000 | -2.0% | 0.1% |

**Table Notes:**

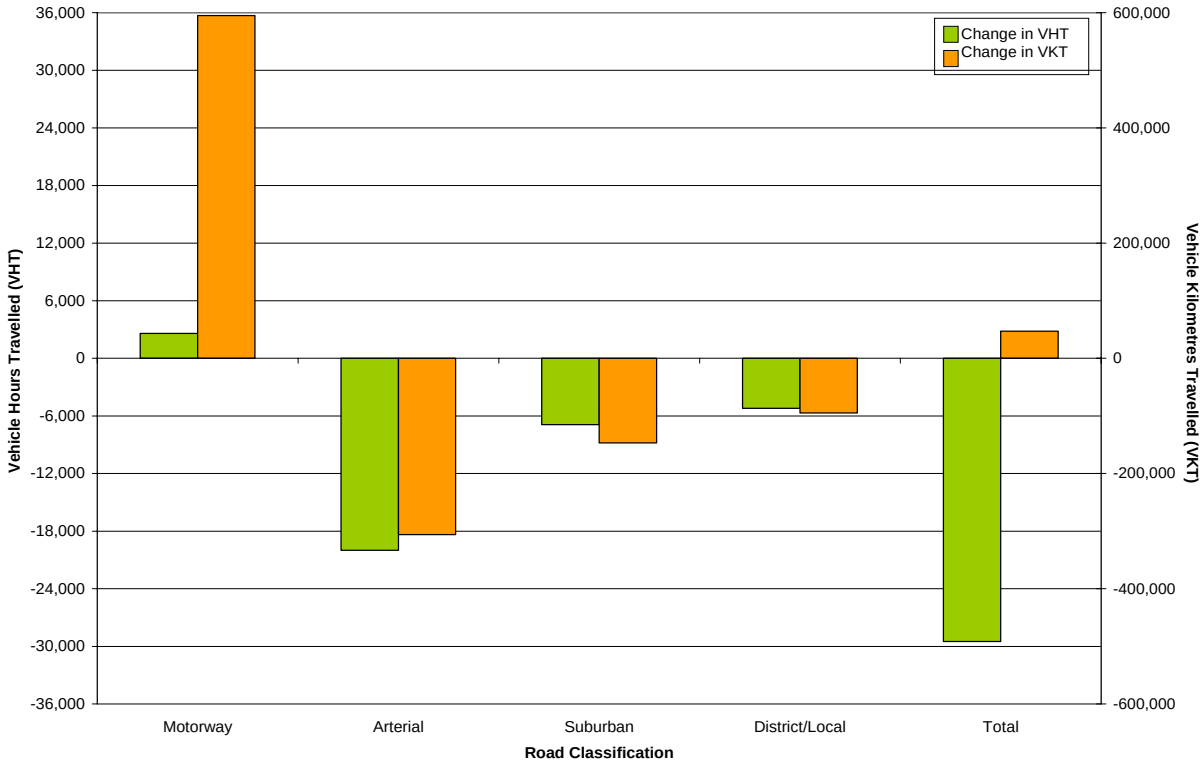
(1) VHT - Vehicle Hours Travelled on Average Weekday

(2) VKT - Vehicle Kilometres Travelled on Average Weekday

(3) Includes AL Tunnel VHT

(4) Excludes AL Tunnel VKT

- **Figure 5-33 Changes in 2026 from Without and With Airport Link in Overall Vehicle Kilometres Travelled and Vehicle Hours of Travel.**




The effects on network performance for commercial vehicle travel are provided in **Table 5-35** and shown graphically on **Figure 5-34**. Overall reductions in truck use of local, district and suburban roads, at the Metropolitan area level, of over 2% are indicated in later years. A reduction in total vehicle hours of travel and vehicle kilometres of travel is estimated for commercial vehicles with the project, providing important benefits to industry through reduced operating costs and improved travel time reliability.

- **Table 5-35 Commercial Vehicles Network Performance by Road Type without and With Airport Link**

| Road Type | Without Airport Link | | | With Airport Link | | | Difference | | % Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | VHT[1] | VKT[2] | Speed Km/h | VHT | VKT | Speed Km/h | VHT | VKT | VHT | VKT |
| **2012** | | | | | | | | | | |
| Motorway | 19,100 | 1,651,000 | | 19,300[3] | 1,655,000[3] | | 200 | 4,000 | 1.0% | 0.2% |
| Motorway (AL Tunnel) | - | - | | - | 13,000 | | - | 13,000 | - | - |
| Arterial | 29,200 | 1,324,000 | | 28,700 | 1,309,000 | | -500 | -15,000 | -1.7% | -1.1% |
| Suburban | 8,800 | 418,000 | | 8,600 | 413,000 | | -200 | -5,000 | -2.3% | -1.2% |
| District | 4,700 | 173,000 | | 4,600 | 171,000 | | -100 | -2,000 | -2.1% | -1.2% |
| Local | 2,900 | 71,000 | | 2,900 | 70,000 | | 0 | -1,000 | 0.0% | -1.4% |
| Total | 64,700 | 3,636,000 | 56.2 | 64,100 | 3,631,000 | 56.6 | -600 | -5,000 | -0.9% | -0.1% |
| **2022** | | | | | | | | | | |
| Motorway | 23,700 | 1,959,000 | | 24,100[3] | 1,966,000[3] | | 400 | 7,000 | 1.7% | 0.4% |
| Motorway (AL Tunnel) | - | - | | - | 30,000 | | - | 30,000 | - | - |
| Arterial | 34,200 | 1,494,000 | | 33,100 | 1,465,000 | | -1,100 | -29,000 | -3.2% | -1.9% |
| Suburban | 10,800 | 495,000 | | 10,500 | 484,000 | | -300 | -11,000 | -2.8% | -2.2% |
| District | 6,100 | 204,000 | | 5,800 | 199,000 | | -300 | -5,000 | -4.9% | -2.5% |
| Local | 4,700 | 83,000 | | 4,600 | 81,000 | | -100 | -2,000 | -2.1% | -2.4% |
| Total | 79,600 | 4,234,000 | 53.2 | 78,100 | 4,225,000 | 54.1 | -1,500 | -9,000 | -1.9% | -0.2% |
| **2026** | | | | | | | | | | |
| Motorway | 26,200 | 2,063,000 | | 26,500[3] | 2,067,000[3] | | 300 | 4,000 | 1.1% | 0.2% |
| Motorway (AL Tunnel) | - | - | | - | 34,000 | | - | 34,000 | - | - |
| Arterial | 38,400 | 1,561,000 | | 37,300 | 1,534,000 | | -1,100 | -27,000 | -2.9% | -1.7% |
| Suburban | 12,000 | 527,000 | | 11,600 | 514,000 | | -400 | -13,000 | -3.3% | -2.5% |
| District | 7,000 | 215,000 | | 6,900 | 211,000 | | -100 | -4,000 | -1.4% | -1.9% |
| Local | 5,900 | 90,000 | | 5,800 | 88,000 | | -100 | -2,000 | -1.7% | -2.2% |
| Total | 89,500 | 4,455,000 | 49.8 | 88,100 | 4,448,000 | 50.5 | -1,400 | -7,000 | -1.6% | -0.2% |

**Table Notes:**

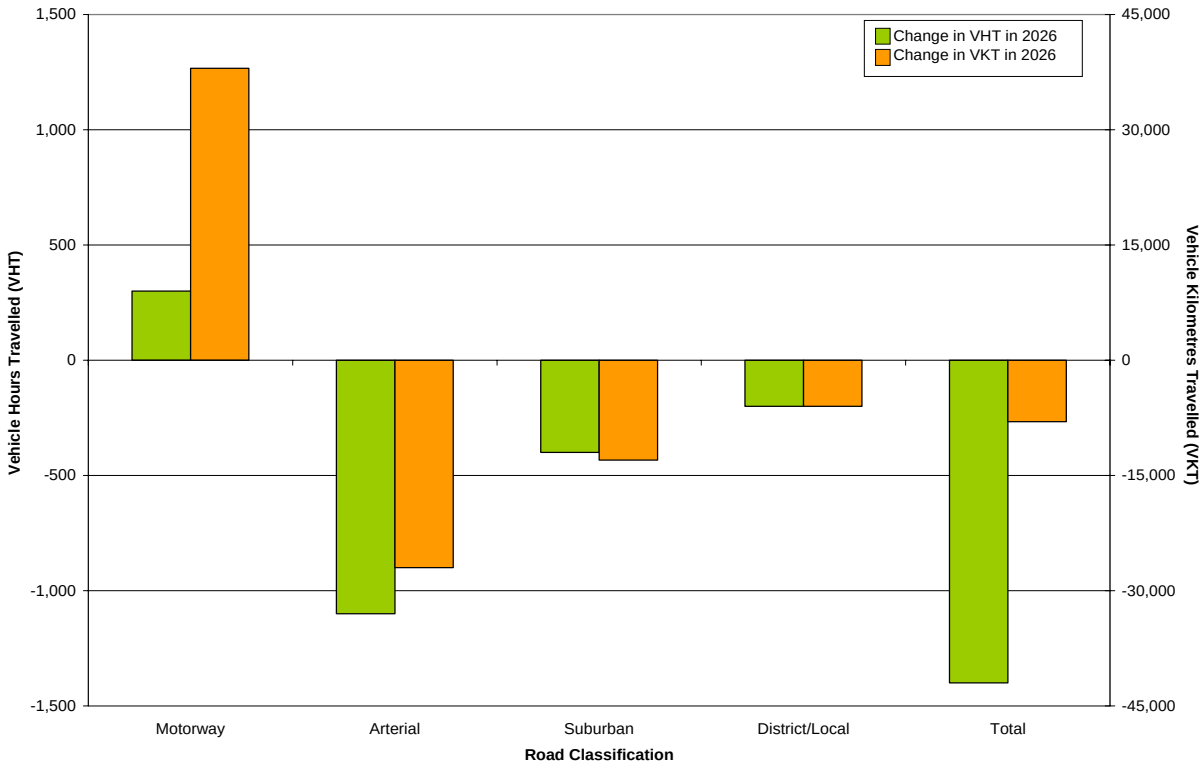
(1) VHT - Vehicle Hours Travelled on Average Weekday

(2) VKT - Vehicle Kilometres Travelled on Average Weekday

(3) Includes AL Tunnel VHT

(4) Excludes AL Tunnel VKT

- **Figure 5-34 Changes in 2026 from Without and With Airport Link in Commercial Vehicle Kilometres Travelled and Vehicle Hours of Travel**




## 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 will benefit due to diversion of traffic to Airport Link.

The intersections examined include:

- Key intersections in the Gympie Road-Lutwyche Road corridor;
- Intersections along the Stafford Road corridor;
- Locations along the Sandgate Road-Abbotsford Road corridor;
- Key intersections on the feeder roads in the Bowen Hills and Fortitude Valley area at the southern end of the project corridor;
- Selected intersections along Kingsford Smith Drive; and
- Intersections within the local road network between Lutwyche Road and Sandgate Road.

Intersection assessment has been carried out using modelled volumes for the two hour peak period in the morning, and assuming that half of these volumes occur in a one-hour time period within the peak. In practice, however, as travel demand builds-up over the entire network in Brisbane, peak spreading will occur. This means that the peak period in the morning will begin to spread over a longer period than two hours, for example between 6.45am and 9.15am, or 3.30 pm and 6.00pm, consistent with an urban area with a larger population base. As transport demands increase with population growth, some commuters who choose to travel to work by

private vehicle, will adjust their time of trip-making within the peak period so as to avoid heavy congestion. Assuming all peak traffic occurs in the modelled two hour period is therefore conservative.

The intersection analysis provides an assessment of the relative effects of the project compared to the without project scenario using this conservative assumption in both cases. The intersection Level of Service is provided in **Table 5-36** for both year of opening (2012) and a 10 year beyond opening horizon (2022), the standard practice for traffic impact assessment for intersection effects.

- **Table 5-36 Intersection Performance LOS without and with Airport Link – 2012 & 2022**

| Intersection | Peak | 2004 | 2012 | | 2022 | |
|---|---|---|---|---|---|---|
| | | | Without AL | With AL | Without AL | With AL |
| **Gympie Road Intersections** | | | | | | |
| Gympie Road/Sadlier Street | AM | - (1) | B | B | B | C |
| | PM | - (1) | B | B | A | C |
| Gympie Road/Stafford Road | AM | D | C | F | D | F |
| | PM | E | F | F | F | F |
| **Stafford Road Intersections** | | | | | | |
| Stafford Road/Webster Road | AM | F | F | F | F | F |
| | PM | D | F | F | F | F |
| Stafford Road/Clifford Street | AM | A | A | A | B | B |
| | PM | A | A | A | A | B |
| Stafford Road/Lennon Street | AM | A | A | A | A | A |
| | PM | A | A | A | A | C |
| Stafford Road/Richmond Street | AM | A | C | C | C | D |
| | PM | B | C | D | C | E |
| **Lutwyche Road Intersections** | | | | | | |
| Lutwyche Road/Kedron Park Road | AM | C | D | F | F | F |
| | PM | F | F | F | F | F |
| Lutwyche Road/Norman Avenue/Norman Street | AM | A | A | A | C | D |
| | PM | A | B | B | C | D |
| Lutwyche Road/Bradshaw Street | AM | D | C | C | C | C |
| | PM | B | C | B | F | B |
| Lutwyche Road/Chalk Street/Thistle Street | AM | E | E | B | F | B |
| | PM | B | C | B | E | C |
| Lutwyche Road/Maygar Street | AM | C | B | C | C | C |
| | PM | D | F | B | F | F |
| Lutwyche Road/Fosbery Street | AM | C | A | B | B | B |
| | PM | B | A | A | A | B |
| Lutwyche Road/Albion Road | AM | B | D | D | D | D |
| | PM | B | F | D | F | E |
| Lutwyche Road/Bowen Street | AM | A | A | A | A | A |
| | PM | A | A | A | C | A |
| Lutwyche Road/Eildon Street/Le Geyt Street | AM | A | A | A | A | A |
| | PM | A | A | A | C | A |
| Lutwyche Road/Grantson Street | AM | A | A | A | B | A |

| Intersection | Peak | 2004 | 2012 | | 2022 | |
|---|---|---|---|---|---|---|
| | | | Without AL | With AL | Without AL | With AL |
| | PM | A | C | A | F | A |
| Lutwyche Road/Newmarket Road | AM | D | E | D | F | D |
| | PM | C | F | F | F | F |
| Lutwyche Road/Federation Street | AM | F | D | B | F | B |
| | PM | A | E | B | E | B |
| Lutwyche Road/Northey Street | AM | D | E | D | F | D |
| | PM | D | F | F | F | F |
| **Bowen Hills and Fortitude Valley Intersections** | | | | | | |
| Bowen Bridge Road/Butterfield Street | AM | E | D | C | E | C |
| | PM | D | F | F | F | F |
| Bowen Bridge Road/Campbell Street | AM | A | A | B | A | B |
| | PM | B | F | B | F | B |
| Bowen Bridge Road/O'Connell Terrace | AM | B | C | D | D | D |
| | PM | B | F | C | F | C |
| Bowen Bridge Road/Herston Road | AM | C | D | E | D | E |
| | PM | C | D | F | D | F |
| Bowen Bridge Road/Gregory Terrace/Brunswick Street | AM | F | D | D | D | D |
| | PM | D | E | E | E | E |
| Brookes Street/Markwell Street/St Pauls Terrace | AM | C | D | F | E | F |
| | PM | C | E | E | E | E |
| Brookes Street/Gregory Terrace | AM | C | C | C | C | C |
| | PM | B | C | C | C | C |
| Brookes Street/Wickham Street | AM | B | C | C | E | F |
| | PM | B | E | F | E | F |
| Campbell Street/Mayne Road/Hamilton Place | AM | D | D | D | D | F |
| | PM | D | D | D | D | E |
| Brookes Street/Ann Street | AM | B | A | B | A | B |
| | PM | B | B | B | B | B |
| Breakfast Creek Road/Montpelier Road | AM | E | F | F | F | F |
| | PM | E | F | F | F | F |
| Bridge Street/Chalk Street | AM | B | B | B | B | B |
| | PM | B | B | B | B | B |
| **Sandgate Road Intersections** | | | | | | |
| Sandgate Road/Toombul Station (Parkland Street)/Union Street/Grace Street | AM | C | C | C | F | D |
| | PM | D | E | D | F | F |
| Sandgate Road/Centro Toombul | AM | B | D | D | D | D |
| | PM | B | D | B | F | B |
| Sandgate Road/East-West Arterial Road | AM | F | F | F | F | F |
| | PM | E | F | E | F | F |
| Sandgate Road/Junction Road | AM | F | F | F | F | F |
| | PM | E | F | F | F | F |

| Intersection | Peak | 2004 | 2012 | | 2022 | |
|---|---|---|---|---|---|---|
| | | | Without AL | With AL | Without AL | With AL |
| Sandgate Road/Oriel Road | AM | B | B | A | B | A |
| | PM | A | B | B | B | B |
| Sandgate Road/Lapraik Street | AM | A | B | A | E | A |
| | PM | A | C | A | E | A |
| Sandgate Road/Bonney Avenue | AM | C | E | C | F | C |
| | PM | A | F | F | F | F |
| Sandgate Road/Albion Road | AM | F | F | C | F | D |
| | PM | E | F | F | F | F |
| Sandgate Road/Frodsham Street/Crosby Road/Abbotsford Road | AM | F | E | B | F | C |
| | PM | D | F | F | F | F |
| **Abbotsford Road Intersections** | | | | | | |
| Abbotsford Road/Burrows Street | AM | C | C | B | C | B |
| | PM | D | B | B | C | B |
| Abbotsford Road/Edmondstone Road/Mayne Road | AM | C | B | B | B | A |
| | PM | F | F | F | F | F |
| Abbotsford Road/Folkestone Street | AM | A | A | A | A | A |
| | PM | A | B | A | E | A |
| Abbotsford Road/Montpelier Road/Markwell Street/Campbell Street | AM | C | F | F | F | F |
| | PM | C | F | F | F | F |
| **Kingsford Smith Drive Intersections** | | | | | | |
| Kingsford Smith Drive/Amy Street/Breakfast Creek Road | AM | B | D | C | F | C |
| | PM | B | F | D | D | E |
| Kingsford Smith Drive/Cooksley Street | AM | F | B | B | C | B |
| | PM | F | F | D | F | E |
| **Local Area Intersections** | | | | | | |
| Albion Road/McLennan Street | AM | C | C | B | D | B |
| | PM | B | A | A | A | A |
| Albion Road/Hudson Road | AM | F | D | D | F | D |
| | PM | F | F | E | F | E |
| Junction Road/Morrison Road | AM | C | D | C | F | C |
| | PM | E | D | C | D | D |
| Dawson Street/Rose Street | AM | C | B | B | B | C |
| | PM | C | C | C | D | C |
| Kedron Park Road/Park Road | AM | C | C | B | D | C |
| | PM | C | F | C | F | D |

**Table Note:** (1) This intersection was not signalised until 2005.

Key effects on intersection performance and LOS are:

- An overall improvement in operating conditions along the Sandgate Road corridor is indicated with the project. This will enhance the operation of intersections both north of the project, such as the Sandgate Road/Centro Toombul Shopping Centre Access, and south of the project, such as the congested intersections in the Albion area, where both vehicular and pedestrian movements will benefit from reduced delays.

- In the Lutwyche Road corridor south of the Kedron Park intersection, the project will result in a lessening of the degree of saturation and improvements in the level of service compared to the situation without the project. This creates opportunities for the use of some road capacity for pedestrian improvements and/or public transport priority.
- Intersections on roads through the local area, such as Albion Road and Junction Road-Rose Street-Park Road, will experience less congested operations during peak periods with the project, in many cases with an improved Level of Service compared to current conditions.
- Along Stafford Road the level of service of operation at intersections will decline with the project due to the increase in traffic volumes. At most locations however, Level of Service will remain within acceptable levels. At the Stafford Road/Webster Road intersection congested operations are forecast without the project and further deterioration in performance is indicated. Traffic volumes on Webster Road through the intersection will decline, although movements on Stafford Road increase. Forecast peak volumes may be accommodated by an increase in the duration of the peak period due to peak spreading effects. Alternatively, in the absence of provision of additional lanes, turn bans during peak periods for some movements may be necessary to achieve greater traffic capacity and reduce delays.

Where possible, grade separation has been incorporated within the project to ensure that traffic accessing or egressing the project tunnels can connect in an unimpeded manner to the connecting road network and not encounter a signalised intersection for a considerable distance. For exit traffic, this means that the potential for traffic exiting the tunnel to queue back from the first potential stop point upon egress is minimised. Key examples of where the design has been shaped to ensure this occurs are for the following major movements:

- Exiting from the northbound tunnel onto Gympie Road;
- Exiting from the northbound tunnel onto Stafford Road; and
- Exiting from the eastbound tunnel onto the East-West Arterial.

For other locations, where traffic exiting the tunnel will encounter a potential stop point, an analysis of the level of service and queuing at the exit was undertaken. Measures used in the analysis included:

- Degree of Saturation: the ratio of the flow to the capacity of the movement; and
- Queue: the maximum queue length relative to the stop line, below which a nominated % of all queue lengths fall. The desirable standard is 95%, with 90% an absolute minimum.

Key Airport Link movements checked and found to be satisfactory were:

- The westbound off-ramp to the Lutwyche Road/Kedron Park Road signalised intersection;
- The eastbound off-ramp to the Sandgate Road/East-West Arterial signalised intersection;
- The southbound off-ramp to the Campbell Street/Mayne Road/Hamilton Place signalised intersection; and
- The southbound off-ramp to the O'Connell Terrace signalised intersection.

If excessive queuing were to develop on some occasions, the operational measures to be implemented to manage queues associated with traffic flows into and out of the tunnel system will be identified within the Traffic Management Plan (Operations) for the facility.

A complex range of traffic movements will continue to need to be catered for at the surface road intersections in the vicinity of the access points to the project at the north-western and north-eastern connections. As a result the level of service at these intersections will remain very congested with the project. At the Sandgate Road/East-West Arterial intersection, where AM peak conditions are forecast to improve compared to the situation without

the project, with PM peak conditions similar. At the Gympie Road/Stafford Road intersection, AM peak conditions worsen, although they improve in the PM peak compared to the without project situation. At the Gympie Road/Kedron Park Road intersection, the opposite effect is likely to occur. These effects are principally related to the increased concentration of east-west traffic movement though the two intersections.

To manage these impacts, traffic signal co-ordination can be implemented though the Traffic Management Plan (Operations) for the facility to ensure that key movement streams using the surface road routes are not unduly delayed. It is noted that traffic using these Northern Connection intersections to proceed to the alternative un-tolled surface road routes, will find that intersections further along Lutwyche Road and Sandgate Road will be less congested so the overall effect on travel time on the surface route will be improved.

At the southern connection, changes to the traffic performance of intersections in the Bowen Hills and Fortitude Valley area affected by project traffic varies between peaks, and generally does not materially change the LOS on key commuter routes compared to intersection performance without the project. Along Abbotsford Road south of the Campbell Street ramps, increased use of intersections by users of the project with origins and destinations in the Central City area will increase the level of saturation of some intersections. These intersections are forecast to be congested without the project, and in peak periods have a high proportion of use associated with commuter travel. As Brisbane grows peak spreading influences will emerge as the mechanism by which travel on these commuter routes closest to the CBD are most appropriately managed.

### East-West Arterial and Nudgee Road

As discussed in **Section 5.5.3** (without the project), a separate assessment of the effect of the project on the East-West Arterial intersections with Gateway Motorway and Nudgee Road has been undertaken using peak period turning movement volumes.

The assessment shows:

- In 2012 Airport Link adds 12% in the AM peak and 3% in the PM peak to total volumes at the Nudgee Road intersection, and 6% in the AM peak to 5% in the PM peak to total volumes at the Airport roundabout.
- Traffic distribution changes through these intersections with Airport Link. Lower demands on the Nudgee Road south approach and reduction of some of the key demands through the roundabout occur (for example, a reduction in demand for movements between the East-West Arterial and the Gateway Motorway south). East-west through demands, however, are increased.
- At the East-West Arterial/Nudgee Road intersection, with the Airport Link in 2012, overall intersection performance is forecast to improve slightly in the AM peak, and reduce slightly in the PM peak, with some queuing pressures reduced. However, in terms of the critical queue for the Airport Link tunnel, (i.e. the queue extending west from Nudgee Road where a distance of 1.6km is available to the tunnel portal), queuing into the tunnel would occur unless some level of improvements were undertaken at the intersection. In conjunction with this it would be necessary to ensure that improvements at the nearby roundabout were also undertaken. This is to ensure that the queuing extending west from the roundabout to Nudgee Road (where only 170 metres is available) did not in turn affect the operation of the East-West Arterial/Nudgee Road signals (as is the current situation).
- Notional upgrading was assessed at the East-West Arterial/Nudgee Road intersection involving:
  - An additional eastbound stand-up lane on the East-West Arterial;
  - Capacity improvements on the Nudgee Road north approach to achieve additional stand-up lane capacity; and
  - Removal of the pedestrian crossing on the eastern side of the East-West Arterial.

- Notional upgrading of the East West Arterial/Gateway intersection roundabout, identified for 2011 in the Gateway Upgrade Project Traffic Modelling and Forecasting Report (MWT, 2004) was also assessed. It involved replacement of the roundabout with a signalised single point interchange. The indicative form analysed comprised three stand-up through lanes and double right turn lanes on both Airport Drive and the East-West Arterial, and additional flaring on the motorway off-ramps to provide three right turn lanes on the northbound off-ramp and two right-turn lanes on the southbound off-ramp. This notional arrangement for the Airport roundabout has been proposed as an interim measure pending the outcome of a major Australia Trade Coast Transport Study.
- The analysis indicated that with both these indicative upgrades to the intersections being operational by 2012 a satisfactory situation with regard to queuing between the Nudgee Road and the Airport Link tunnel could be achieved in 2012. A 95th percentile queue of 900 metres (compared to the available 1.6km) is indicated. Queuing between the Gateway Motorway Ramps signalised single point interchange and the East-West Arterial/Nudgee Road signals could be satisfactorily managed by signal co-ordination.
- Whilst the Airport Link Project itself is not a primary driver for these intersection improvements, without such intersection improvements, conditions at both intersections would continue to degrade, worsening significantly either with or without Airport Link in terms of queuing and delay.

The findings are summarised in **Table 5-37**.

**Table 5-37 East West Arterial Intersection Performance Without and With Airport Link in 2012**

| Scenario | AM Peak | | | PM Peak | | |
|---|---|---|---|---|---|---|
| | Total vph | Degree of Saturation (X) | LOS | Total vph | Degree of Saturation (X) | LOS |
| **East-West Arterial/Nudgee Road Signalised Intersection** | | | | | | |
| Existing (2005)[1] | 4,500 | 1.39 | F | 3,900 | 0.94 | D |
| 2012 without Airport Link | 6,000 | 1.29 | F | 7,200 | 1.43 | F |
| 2012 with Airport Link | 6,700 | 1.25 | F | 7,400 | 1.47 | F |
| 2012 with Airport Link & indicative upgrade of existing signalised intersection | 6,700 | 1.09 | F | 7,400 | 1.08 | F |
| **East-West Arterial/Gateway Ramps/Airport Drive Roundabout** | | | | | | |
| Existing (2004) | 6,900 | 1.78 | F | 7,000 | 1.96 | F |
| 2012 without Airport Link | 6,900 | 2.12 | F | 8,000 | 2.60 | F |
| 2012 with Airport Link | 7,300 | 1.80 | F | 8,400 | 2.46 | F |
| 2012 with Airport Link & indicative replacement of roundabout with single point signalised interchange | 7,300 | 0.86 | D | 8,400 | 0.96 | D |

**Table Note:** (1) From DMR Census 2005.

### 5.6.4 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 the Airport Link itself, once the project is operational.

Estimated travel times for key routes during peak periods without and with Airport Link are summarised in **Table 5-38**. These have been extracted from the strategic model. The routes and timing points referred to in **Table 5-38** are shown in **Figure 5-35**.

It should be noted that 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 will be reliability improvements in travel time provided by the project.

The travel time benefits offered by Airport Link on the cross-city routes (routes D, E and F) are significant, averaging approximately 30% in the morning peak hour and 40% in the evening peak. The time savings for these routes range from 4 minutes to 14 minutes, with the greatest benefits on the east-west routes to the ATC/Brisbane Airport precinct (E and F) in the evening peak in 2022. The average travel time benefit on these routes is approximately 8 minutes. On the northern east-west route between Hendra and Stafford (E), travel times via Airport Link are similar in both peaks.

Airport Link also provides significant travel time benefits on radial routes, averaging over 40% in both AM and PM peak hours. This represents time savings from 6 minutes on the Nundah to Fortitude Valley (B) route and the Hendra to Fortitude Valley (C) route and 7 minutes from Chermside to Fortitude Valley (A) in the morning peak in 2012, to 8 to 9 minutes savings by 2022. Evening peak savings of 10 to 12 minutes are estimated by 2022.

Traffic choosing to use the un-tolled surface links instead of Airport Link would also benefit from the project, though to a lesser degree. Average benefits of approximately 10% to 15% on cross-town routes and approximately 20% to 30% on radial routes are forecast for this traffic. This represents average time savings of approximately 3 minutes for cross-town routes and 6 minutes for radial routes. The most substantial surface route benefits are encountered on the Chermside to Fortitude Valley route (A) in 2022, while the cross-river route (D) gains the least advantage.

## Table 5-38 Effects of Airport Link on Travel Times and Speeds for Key Routes

| Route | | Direction | Without AL | | With AL | | | | AL Time Benefits | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Via AL | | On Surface | | Via AL | | On Surface | |
| | | | (min) | (km/h) | (min) | (km/h) | (min) | (km/h) | (min) | (%) | (min) | (%) |
| **AM Peak Hour** | | | | | | | | | | | | |
| **2004** | | | | | | | | | | | | |
| A | Chermside to Fortitude Valley | Southbound | 14 | 31 | - | - | - | - | - | - | - | - |
| B | Nundah to Fortitude Valley | Southbound | 14 | 33 | - | - | - | - | - | - | - | - |
| C | Hendra to Fortitude Valley | Southbound | 14 | 34 | - | - | - | - | - | - | - | - |
| D | East Brisbane to Chermside | Northbound | 20 | 32 | - | - | - | - | - | - | - | - |
| E | Stafford to Hendra | Eastbound | 11 | 41 | - | - | - | - | - | - | - | - |
| F | Hendra to Milton | Southbound | 17 | 40 | - | - | - | - | - | - | - | - |
| **2012** | | | | | | | | | | | | |
| A | Chermside to Fortitude Valley | Southbound | 17 | 27 | 9 | 50 | 14 | 32 | 7 | 44% | 3 | 17% |
| B | Nundah to Fortitude Valley | Southbound | 16 | 29 | 10 | 57 | 13 | 35 | 6 | 39% | 2 | 16% |
| C | Hendra to Fortitude Valley | Southbound | 15 | 31 | 9 | 59 | 14 | 35 | 6 | 39% | 2 | 11% |
| D | East Brisbane to Chermside | Northbound | 19 | 33 | 13 | 48 | 17 | 36 | 6 | 32% | 1 | 8% |
| E | Stafford to Hendra | Eastbound | 13 | 35 | 9 | 50 | 12 | 39 | 4 | 33% | 1 | 9% |
| F | Hendra to Milton | Southbound | 20 | 34 | 14 | 51 | 19 | 35 | 6 | 29% | 1 | 5% |
| **2022** | | | | | | | | | | | | |
| A | Chermside to Fortitude Valley | Southbound | 22 | 20 | 11 | 42 | 16 | 28 | 11 | 49% | 6 | 29% |
| B | Nundah to Fortitude Valley | Southbound | 19 | 24 | 10 | 53 | 14 | 33 | 9 | 46% | 5 | 27% |
| C | Hendra to Fortitude Valley | Southbound | 18 | 27 | 11 | 52 | 15 | 32 | 7 | 40% | 3 | 17% |
| D | East Brisbane to Chermside | Northbound | 23 | 26 | 17 | 35 | 22 | 28 | 6 | 26% | 1 | 6% |
| E | Stafford to Hendra | Eastbound | 19 | 24 | 11 | 38 | 15 | 31 | 7 | 39% | 4 | 23% |
| F | Hendra to Milton | Southbound | 22 | 30 | 15 | 46 | 20 | 32 | 7 | 31% | 2 | 9% |

| Route | | Direction | Without AL | | With AL | | | | AL Time Benefits | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Via AL | | On Surface | | Via AL | | On Surface | |
| | | | (min) | (km/h) | (min) | (km/h) | (min) | (km/h) | (min) | (%) | (min) | (%) |
| **PM Peak Hour** | | | | | | | | | | | | |
| **2004** | | | | | | | | | | | | |
| A | Fortitude Valley to Chermside | Northbound | 20 | 23 | - | - | - | - | - | - | - | - |
| B | Fortitude Valley to Nundah | Northbound | 15 | 30 | - | - | - | - | - | - | - | - |
| C | Fortitude Valley to Hendra | Northbound | 16 | 30 | - | - | - | - | - | - | - | - |
| D | Chermside to East Brisbane | Southbound | 21 | 30 | - | - | - | - | - | - | - | - |
| E | Hendra to Stafford | Westbound | 12 | 37 | - | - | - | - | - | - | - | - |
| F | Milton to Hendra | Northbound | 18 | 38 | - | - | - | - | - | - | - | - |
| **2012** | | | | | | | | | | | | |
| A | Fortitude Valley to Chermside | Northbound | 23 | 19 | 14 | 33 | 17 | 26 | 9 | 41% | 6 | 26% |
| B | Fortitude Valley to Nundah | Northbound | 22 | 21 | 14 | 39 | 17 | 27 | 8 | 37% | 5 | 22% |
| C | Fortitude Valley to Hendra | Northbound | 21 | 23 | 14 | 40 | 18 | 28 | 8 | 36% | 4 | 18% |
| D | Chermside to East Brisbane | Southbound | 23 | 27 | 13 | 46 | 17 | 36 | 9 | 41% | 5 | 23% |
| E | Hendra to Stafford | Westbound | 15 | 31 | 10 | 44 | 13 | 36 | 5 | 33% | 2 | 14% |
| F | Milton to Hendra | Northbound | 25 | 27 | 14 | 49 | 23 | 30 | 11 | 43% | 2 | 9% |
| **2022** | | | | | | | | | | | | |
| A | Fortitude Valley to Chermside | Northbound | 30 | 15 | 18 | 25 | 21 | 21 | 12 | 41% | 9 | 29% |
| B | Fortitude Valley to Nundah | Northbound | 27 | 18 | 15 | 35 | 19 | 25 | 12 | 43% | 8 | 29% |
| C | Fortitude Valley to Hendra | Northbound | 25 | 19 | 15 | 36 | 19 | 25 | 10 | 40% | 6 | 24% |
| D | Chermside to East Brisbane | Southbound | 22 | 29 | 17 | 36 | 21 | 29 | 4 | 21% | 0 | 1% |
| E | Hendra to Stafford | Westbound | 24 | 19 | 10 | 43 | 16 | 28 | 14 | 58% | 8 | 32% |
| F | Milton to Hendra | Northbound | 30 | 22 | 16 | 45 | 25 | 27 | 14 | 48% | 5 | 17% |

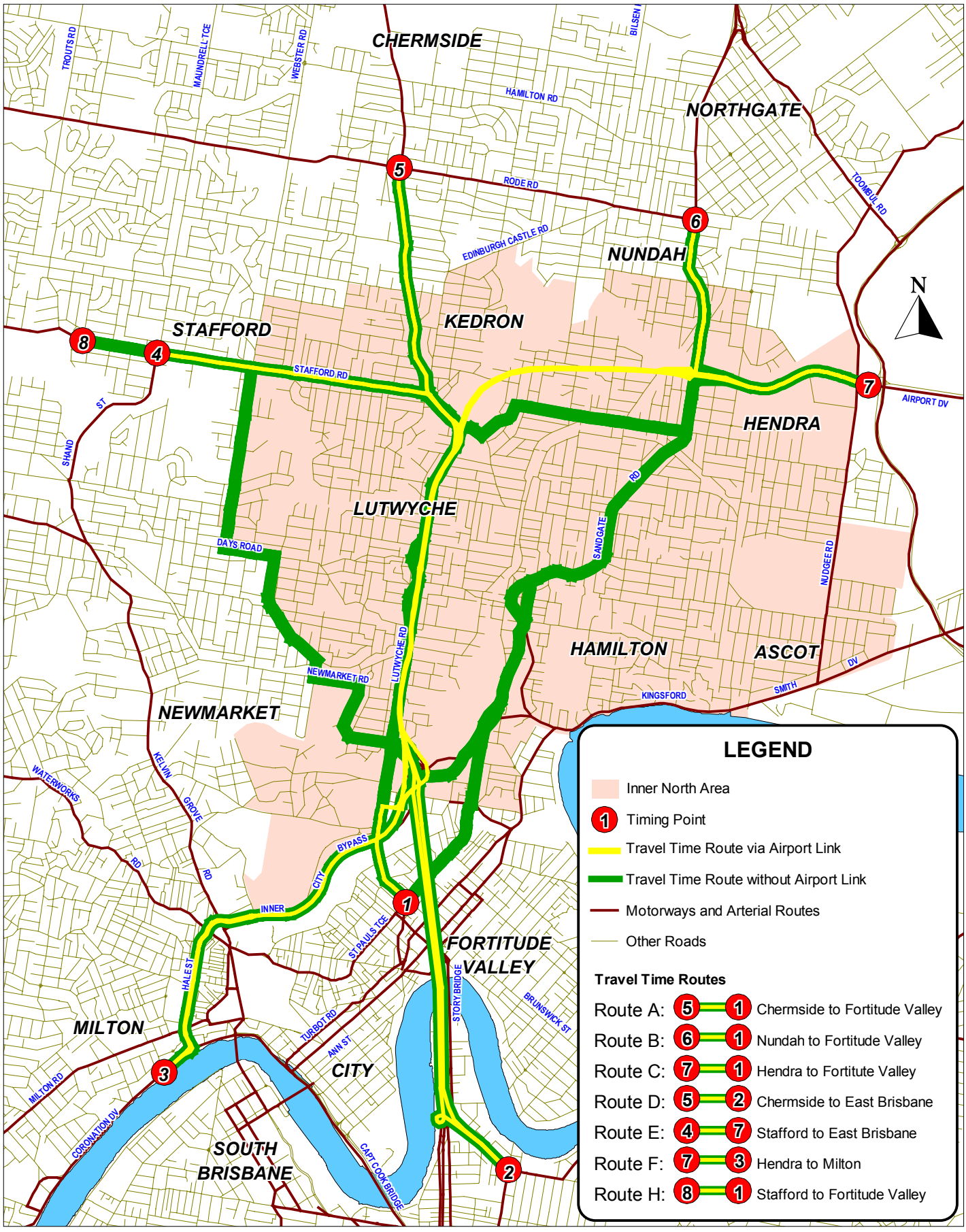



**Figure 5-34**
Travel Time Comparison Routes

Airport Link

SKM Connell Wagner
JOINT VENTURE

### 5.6.5 Local Access Effects

The main traffic impacts caused by the implementation of Airport Link would generally be confined to the tunnel portal areas and immediate approaches. Other effects would however extend for the entire route due to changes in traffic flows as a result of the project and these have been discussed previously in this Chapter.

#### Kedron East Precinct

Left-in left-out access has been maintained at local street connections to Gympie Road southbound with the exception of Lassetter Street, where direct access to Gympie Road will no longer be provided due to its proximity to the signalised intersection between Gympie Road and Stafford Road. Alternative access remains available at Park Terrace and Arnott Street so the effect on local accessibility is considered to be minor.

The priority control of movements at the Arnott Street/Leckie Road intersection has been changed such that Leckie Road southbound traffic will be controlled by stop signs to eliminate the potential conflict with left turn traffic from Gympie Road into Arnott Street. The only impact this change will have on local access is that the right turn from Arnott Street into Leckie Road will be removed. Local traffic exiting from Arnott Street and Leckie Road will be able to proceed onto Gympie Road southbound in a dedicated lane to the Stafford Road signals, providing for convenient egress from the local area. Traffic exiting Arnott Street or Leckie Road cannot proceed directly to the right turn slot into Stafford Road due to the safety problems that would be associated with weaving over a short distance, this is consistent with the existing situation. Local traffic will be able to use the signalised intersection at Gympie Road/Sadlier Street and then proceed southbound on Gympie Road to turn into Stafford Road.

The overall effect of the project on local traffic access to the Kedron east precinct is considered to be small and well managed within the project reference design.

#### Gordon Park Precinct

The Airport Link off-ramp for westbound traffic will enter Stafford Road in the median. Adjacent to this ramp, a restricted area will exist where one single through lane will now be provided from Gympie Road, instead of the current two through lane situation. Property access to residences along this section and kerbside parking will be impacted, as residents would need to enter/exit their properties from this single lane. Currently residents have access from a second kerb side lane allowing through traffic to pass when decelerating to turn left-in to property occurs. As turn movements into Stafford Road are controlled at the signals residents turning left-out of their properties will be able to do so during gaps in the traffic stream created by the signal phasing. Provision for U-turns has been incorporated at the signals to enable access to local properties for traffic approaching from the west on Stafford Road.

The Airport Link Project will retain a left-in left-out access to Suez Street at Gympie Road. With this in place, it is proposed to cul-de-sac Swan Street at its northern end so that access to Stafford Road would be prevented as this will improve conditions for pedestrian safety in this area. Right turn entry to Swan Street from the west (via the U-Turn slot on Stafford Road) could be provided to enhance accessibility for residents if required. It should be noted that these arrangements for Swan Street and Suez Street need to be modified with the implementation of the Northern Busway in this area.

In summary, there are moderate effects of the project on local traffic access to the Gordon Park North precinct, however they have been suitably managed within the project design to minimise adverse impacts.

#### Kedron West Precinct

The residential precinct located to the north-west of the Stafford Road/Gympie Road intersection will continue to be serviced as existing by left-in left-out accesses to Gympie Road at Brookfield Road, Homebush Road, Broughton Road and Somerset Road. Existing arrangements to the precinct for Stafford Road access via Clarence Road are proposed to remain.

The overall effect of the project on local traffic access to the Kedron west precinct is considered to be small although mitigation measures are recommended to address the potential pressure of increased traffic on Gympie Road and Stafford Road on traffic movements within the precinct.

### Emergency Services Complex

The primary access to the complex is via left-in left- out movements onto Gympie Road, as well as secondary access onto Park Road via an oval owned by Emergency Services but used by Kedron State High School. The project would close the Gympie Road access and relocate some of the Emergency Services Complex. The oval has been identified as an alternative location for the site with a primary vehicle access onto Park Road. Traffic volumes on Park Road are forecast to be reduced with the project and these revised access arrangements would provide sound accessibility to the site, with flexibility for entry and exit turns from both east and west.

In summary, the project affects access arrangements for the Emergency Services Complex, however a suitable alternative arrangement can be realised with the project reference design.

### Lutwyche Precinct (West of Lutwyche Road)

The priority intersections on Lutwyche Road providing residential precinct access at Colton Avenue and Windsor Avenue allow for all turn movements. With the project both Colton Avenue and Windsor Avenue will no longer have direct access to Lutwyche Road. A service road is proposed to be constructed that will link these streets from Norman Avenue in the south to Perry Street in the north. Perry Street would maintain its left-out access to Gympie Road. The Norman Avenue signalised intersection with Lutwyche Road accommodates all movements and this revised access arrangement will provide residents with a safe and convenient arrangement. Perry Street residents would also benefit from the new service road due to the improved southbound connectivity that it provides.

In summary, there are moderate effects of the project on local traffic access to the Gordon Park south precinct, however they have been suitably managed within the project reference design to minimise adverse impacts.

### Toombul Precinct

Local accessibility to the Toombul Shopping Centre and suburbs north of Shulz Canal will improve with the project. A more direct route will be available by the east-west toll tunnel, and traffic reductions on the Junction Road-Rose Street-Park Road route are also forecast. Both factors will improve travel times and connectivity to this precinct. An additional northbound lane on Sandgate Road north of Schulz Canal between the East-West Arterial Road and the Toombul Shopping Centre access is incorporated in the design. This will improve capacity in this area. In addition the effects of reduced traffic volumes on Sandgate Road north due to changed traffic patterns with the east-west toll route will benefit traffic operations in this road segment.

South of the East-West Arterial the project has no effect on the local street connections serving residential precincts on either side of Sandgate Road such as Kedron Street, Noble Street and Eliza Street. Forecast traffic reductions on Sandgate Road will allow for easier access compared to the situation without the project.

In summary, the project has an overall beneficial effect on local traffic access to the Toombul precinct.

### Southern Connection

Significant changes to this area compared to the existing situation are to be carried out as part of the NSBT project and only the additional effects due to the connection of Airport Link are discussed.

With NSBT an additional traffic lane will be provided along Lutwyche Road in each direction between Northey Street and Newmarket Road and an access intersection will be created in the vicinity of Northey Street. Movements between Northey Street and the NSBT will not be provided for. The NSBT project also make changes to access to the precinct east of Lutwyche Road with the signalised intersection at Federation Street and Lutwyche Road retained as the major external network connection. These revised arrangements will continue

with Airport Link although modifications to the Lutwyche Road/Northey Street/NSBT access intersection will occur.

NSBT provides for revised access arrangements to the Boral Concrete Plant (in Horace Street) via the Lutwyche Road/Northey Street/NSBT access intersection and access to this site is maintained with the Airport Link design features.

O'Connell Terrace with the proposed Airport Link reference design is modified to two-way operation between Bowen Bridge Road and the Airport Link access ramp. As a result only left-out movements, are proposed at O'Connell Terrace/Bowen Bridge Road signalised intersection. To allow for local movements the Campbell Street/Bowen Bridge Road intersection will be modified to provide for right turn movements onto Bowen Bridge Road northbound. A protected right turn bay will be constructed on Bowen Bridge Road to allow for signalised turn movements into O'Connell Terrace and the access ramps to the Airport Link. Wren Street will become a cul-de-sac with access provided from Campbell Street. O'Connell Terrace will remain one-way between the signalised Airport Link off ramp intersection and Sneyd Street, and further east will remain two-way as per the planned NSBT arrangements.

The Mayne Road/Hamilton Road/Campbell Street intersection will be upgraded with the project, as Airport Link on and off ramps will be located at this position. It is noted that Campbell Street will already be discontinuous with the NSBT and local access is provided for within the design via a one-way westbound service road alongside the Airport Link on ramp to join the intersection with Tufton Street, east of Hamilton Place. Tufton Street can then provide access to Bowen Bridge Road and Hamilton Place through O'Connell Terrace.

In summary, there are moderate effects of the project on local traffic access in the Southern Connection region. however, suitable alternative access arrangements have been incorporated into the project design to minimise adverse impacts.

#### Royal Brisbane Hospital Complex

Access arrangements to the RBH, which are primarily off Butterfield Street, would not be affected by the Airport Link reference project. The existing entry opposite O'Connell Terrace is also maintained. Traffic volumes on Butterfield Street are forecast to experience a small reduction with the reference project.

The reference project would also improve travel times on both surface routes and via the proposed Airport Link tunnel itself for routine and emergency access to the hospital. The proposed Airport Link route would be available for ambulance trips to the RBH, Princess Alexandra (via NSBT) and Prince Charles Hospital at Chermside, which would be a significant benefit in an emergency situation at the Airport.

In summary, the project has an overall beneficial effect on traffic access for the RBH.

### 5.6.6 Bus Travel Effects

#### Corridor Effects

Traffic reductions are forecast on a number of road corridors in the Inner North that cater for bus routes. Reduced traffic will improve travel times and travel time reliability, compared to the scenario without the project. In some instances on feeder routes, such as Gympie Road, Stafford Road, and on the East-West Arterial Road, increases in traffic volumes are forecast. These will have some adverse impact on bus travel times in these areas.

An assessment of peak hour travel times along major bus routes on the surface road system, once the project is operational, has been undertaken. 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. The travel time comparison routes are shown in **Figure 5-34**. These routes correspond to the key bus routes associated with the bus services that pass through each location.

Key findings from the assessment are:

- During peak hours Lutwyche Road and Sandgate Road will have significant traffic reductions and increased travel speeds on the surface road bus routes. These are the highest utilised corridors for bus services in the Inner North area, so the project will yield travel time savings and improved travel time reliability for bus passengers. An overall average travel time improvement of 37 to 40% in the peak hours in 2022 is forecast for a CBD trip, compared to the scenario without the project.
- Traffic on both the Stafford Road and Gympie Road approaches to north-west connection of the project increases. The Gympie Road-Lutwyche Road-Bowen Bridge Road corridor is the most prominent north south bus corridor in the Inner North area. The overall effect of the traffic reductions on Lutwyche Road provides an overall benefit for CBD destined bus services, even taking into account the effects of increased traffic north of the connection.
- Stafford Road is commonly used by bus services that run north-south on either the Webster Road - Kedron Brook Road corridor or connecting to the Lutwyche Road corridor to the CBD. Although traffic volumes will increase on Stafford Road, benefits on other segments of the route mean that Stafford Road bus services will experience either similar or slightly improved overall speed on a CBD trip, compared to the scenario without the project.

### Bus Use of Airport Link

The project creates the opportunity for a new bus route between the City and the growing employment and activity areas within ATC North precinct to utilise the east- west tunnel of the Airport Link and travel express to Nudgee Road. Services could gain access from Lutwyche Road at the north-west connection. This new route is under consideration in TransLink's forward planning.

Another option exists for express services in the Gympie Road corridor to use the north-south tunnel between Kedron and Bowen Hills. This option is not preferred however because it would limit services at key intermediate destinations such as Lutwyche. It may represent an option for some services, should alternative bus priority initiatives such as the Northern Busway not proceed within the corridor, in the short-term post-Airport Link opening.

### Bus Infrastructure

A total of four (4) bus stops would be affected by the project when operational. Construction affects a further three (3) bus stops during construction.

No operational bus stops are located on Campbell Street or O'Connell Terrace. There will be no additional effects on bus stops on Bowen Bridge Road and Lutwyche Road beyond those associated with the North-South Bypass Tunnel.

Permanent relocation of the bus stop just north of the Gympie Road/Leckie Road intersection is necessary due to corridor widening to accommodate Airport Link and Gympie Road. The land acquisition in this location is a full acquisition, allowing opportunity for the construction of an indented bus bay on the balance of the claimed land. Due to construction staging, the upgraded bus stop can be constructed prior to closure of the current bus stop. The current 370 service would be affected by the relocation of this bus stop.

The two bus stops on the western side of Gympie Road between Kedron Park Road and Stafford Road will be permanently relocated east of their current location. This is to provide for a future Northern Busway corridor along the existing kerb of Gympie Road between Kedron Park Road and Stafford Road. The reserved corridor provides opportunity for construction of indented bus bays on the reserved land. These changes would affect services 358 and 370 at both stops, whilst the southern stop would also affect routes 333, 334 and 338.

Corridor widening and intersection modifications to accommodate both Airport Link and Gympie Road affect the southbound bus stop located on Gympie Road south of Kedron Brook. Difficulties in pedestrian access following construction of the east-west connection would make this an unattractive bus stop location. A potential alternative location for the bus stop is between Lasseter Street and Park Terrace. Services 333, 334, 358 and 370 would be affected.

Northbound there are no bus stops affected by project works in this area. Southbound one bus stop located between the signalised Toombul Shopping Centre access and the rail over-bridge may require permanent relocation due to its closer proximity to the relocated Sandgate Road/Airport Link/East West Arterial Road intersection, affecting services 310 and 315. These services could instead utilise the Toombul Bus Interchange located 200m to the north of the bus stop outside Centro Toombul.

### 5.6.7 Pedestrian and Cyclist Effects

The potential effects of the Airport Link Project on infrastructure for pedestrian and cycle movements are discussed below. The main changes to the pedestrian and cycle network will occur around the tunnel portals and their connections to the surface road network. The project's reference design has ensured that connectivity will be maintained in those regions. A description of relevant changes and the opportunities to improve local pedestrian and cyclist accessibility that have been included in the design are detailed in the following sections.

#### Southern Connection

The southern portal of Airport Link is located in the vicinity of the major pedestrian and cycle pathway connecting between Newmarket and Albion, mostly along Enoggera Creek. This path is relocated by the planned NSBT works, with full existing connectivity maintained. A further enhancement will occur with the NSBT works, providing a pedestrian/cycle crossing of Enoggera Creek to Campbell Street. The Airport Link does not affect the ability to provide these planned path relocations or new connection.

Pedestrian crossings of Lutwyche Road are maintained at the signalised intersections at Federation Street, Northey Street, Butterfield Street, Campbell Street and O'Connell Terrace, providing a good range of opportunities for pedestrians to safely and efficiently cross the major arterial road. Pedestrian movement across Campbell Street, Mayne Road and Hamilton Place is also suitably accommodated within the signalised intersection concept design.

#### North-West Connection

The Kedron Brook pedestrian and cycle path that follows the southern creek bank, is a major feature of the network in the vicinity of this part of the project. The route includes an underpass beneath the Gympie Road, bridge along the southern bank of Kedron Brook.

The Kedron Brook pathway is a highly used, predominantly recreational route. It will be maintained with the project reference design. The existing pedestrian/cycle access bridge, which connects the northern and southern banks of Kedron Brook in the vicinity of Fifth Avenue will also be maintained. Immediately east of this bridge, a new path will be provided across the cut and cover structure of the project, linking the existing Kedron Brook pathway with the Kedron State High School oval. This ensures that the good pedestrian and cyclist accessibility is preserved for local residents, school students, commuters and recreational users.

Along the eastern side of the Gympie Road bridge across Kedron Brook a pedestrian path will be provided connecting to the footpath along the eastern side of Gympie Road. This will provide for convenient pedestrian and cycle access between the residential precinct north-east of Kedron Brook and the Kedron Brook pathway system.

At the Gympie Road and Stafford Road signalised intersection, pedestrian crossings of both Gympie Road (on the northern side) and Stafford Road will be provided with appropriate signal phasing. Due to the width of the intersection approach roads, staged pedestrian crossings are proposed. This will allow pedestrians to cross one

traffic stream under a green pedestrian signal and then wait in safety on a wide median island before proceeding to cross the other traffic stream via a second green pedestrian signal.

At the Lutwyche Road/Kedron Park Road signalised intersection, pedestrian crossings will be provided on the southern leg of Lutwyche Road and across Kedron Park Road. Similar to the arrangements proposed for the Gympie Road/Stafford Road intersection, the Lutwyche Road pedestrian crossing will have a staged signal phasing. This will facilitate the safe movement of pedestrians across these roads to locations such as the Emergency Services Complex, the Kedron Park Hotel and the nearby schools.

### North-East Connection

The Kedron Brook pedestrian and cycle path continues along Schulz Canal, with links and bridges provided along the way to connect it to the local road network and footpaths. The project will require modifications and re-alignment of some sections of the pathway. The section of pathway that runs between Jackson Street and Melton Road along the southern bank of the Schulz Canal and the northern side of East-West Arterial will be affected by the project alignment. The section of the path along the southern bank of Schulz Canal, will be relocated to the northern bank. This path will connect up with the existing pathway on the other side of Melton Road which continues to the north-eastern suburbs of Nudgee and Boondall.

Connectivity between the Toombul precinct and residential areas south of Schulz Canal will be maintained by a new pedestrian/cycle path linking Parkland Street, on the north of the canal, to Stuckey Road, south of the tunnel. This pathway will be across a cut and cover section of the project, which after revegetation will provide a pleasant recreational and commuter route. From Parkland Street another path will be constructed that will traverse below the Airtrain structure and link to the new path that will be established along the northern bank of Schulz Canal. The path at Stuckey Road will provide for better connectivity to Toombul Rail Station.

Pedestrian crossings will be provided via the signals at the intersection of Sandgate Road/East-West Arterial and the Airport Link ramps to cater for safe and efficient movement of pedestrians across Sandgate Road and for north-south pedestrian movement along Sandgate Road. There will be a crossing of Sandgate Road, on the southern leg of the intersection, and the East-West Arterial, on the eastern leg of the intersection. Both will connect to the pedestrian footpath along the eastern side of Sandgate Road. There will be no effect on existing arrangements for pedestrians at the traffic signals at the nearby Toombul Shopping Centre access on Sandgate Road.

## 5.6.8 Road Safety Effects

The crash history of major routes in the Inner North area affected by the Airport Link Project was analysed in **Section 5.3.8**. This assessment indicated that the highest crash rates had occurred on Lutwyche Road, Sandgate Road and parts of the East-West Arterial route.

Crash rates calculated for existing conditions in **Section 5.3.8**, with the exception of Gympie Road, have been used to determine the future number of accidents for 2012 and 2022, without and with the project, based on estimates of vehicle kilometres of travel (VKT). The crash rate applied for Gympie Road has been adjusted to take account of the disproportionate influence of the high crash history at the Park Terrace/Suez Street intersection, which has been recently addressed by mitigative works. No future major works are expected on any other route so it is reasonable to adopt existing crash rates for assessment.

A crash rate of 18 crashes per 100 million VKT has been applied for the Airport Link ramps and main tunnel, similar to that applied in the assessment of NSBT and based on historical data for the Sydney Harbour Tunnel. Minimal weaving and merging is required for the north-eastern and north-western connections, with long approaches for the major movement streams such as Gympie Road traffic, at the north-eastern connection, and East-West Arterial traffic at the north-eastern connection. At the southern connection the design provides for clear separation of movement streams entering and exiting the Airport Link.

Estimated crashes for 2012 and 2022 without and with the project are shown for the key arterial routes within the Inner North area and for the Airport Link in **Table 5-39**. Average annual accidents from the crash history have been included for comparative purposes. The table shows that with Airport Link operational:

- An overall reduction on the key routes (including the Airport Link) of 33 crashes in 2012 and 44 crashes in 2022 is forecast, representing a 7 to 9 % crash reduction.
- An overall reduction in road crashes on the Bowen Bridge Road/Lutwyche Road/Gympie Road corridor of 36 accidents (18%) in 2012 and 44 accidents (21%) in 2022 is estimated with the project.
- Similar levels of crash reductions are also estimated for the Sandgate Road/Abbotsford Road corridor of 29 (22%) in 2022 and 40 (27%) in 2022.
- Road safety benefits on the Kedron Park Road-Park Road-Rose Street- Junction Road section of the East West Arterial route of the order of 28% in 2022 are forecast associated with crash reduction.
- A small increase in crashes on the East-West Arterial east of Sandgate Road (6% in 2022) is forecast.
- Stafford Road is the only route with a significant increase (>50%) in the number of expected accidents with Airport Link. The increase is attributed to increased traffic associated with its function as a feeder route for Airport Link, particularly for east-west travel. Whilst Stafford Road has a high historic crash rate (which has been applied in this assessment) it is noted that one third of all accidents on Stafford Road have occurred at or close to the Stafford Road/Gympie Road signalised intersection. This location will undergo a significant redesign as part of the north-western connection for Airport Link and the safety benefits of this are not directly incorporated in the analysis. It is thus likely that the calculated increase in crashes for Stafford Road is conservatively high.
- The Sandgate Road/Junction Road signalised intersection would have improved operating conditions with Airport Link due to reductions on both Sandgate Road and Junction Road. This is expected to reduce the potential number of crashes at this intersection compared to the situation without the project.

## Table 5-39 Estimated Crashes on Key Routes Without and With Airport Link

| Arterial | Section | 2004 | 2012 | | | | 2022 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Average Annual Crashes | Without Project | With Project | Difference | % Change | Without Project | With Project | Difference | % Change |
| Airport Link | All | - | - | 26 | 25.9 | - | - | 31 | 31.2 | - |
| Lutwyche Road | All | 101 | 142 | 107 | -35.0 | -25% | 151 | 109 | -42.3 | -28% |
| Gympie Road | Kedron Park Road to Castle Street | 35 | 37 | 39 | 2.0 | 5% | 39 | 41 | 1.4 | 3% |
| Bowen Bridge Road | ICB Bridge to Lutwyche Road | 19 | 20 | 17 | -3.0 | -15% | 22 | 18 | -3.4 | -16% |
| Sandgate Road | Crosby Road to Nundah Tunnel | 73 | 103 | 79 | -23.7 | -23% | 118 | 86 | -31.8 | -27% |
| Abbotsford Road | Campbell Street to Crosby Road | 18 | 27 | 22 | -5.2 | -19% | 31 | 24 | -7.8 | -25% |
| East West Arterial | Webster Road to Gympie Road i.e. Stafford Road | 22 | 31 | 47 | 15.5 | 49% | 34 | 52 | 18 | 53% |
| East West Arterial | Lutwyche Road to Sandgate Road i.e. Park Road-Rose Street- Junction Road | 24 | 29 | 21 | -8.1 | -28% | 32 | 23 | -8.4 | -26% |
| East West Arterial | Sandgate Road to Nudgee Road | 11 | 23 | 26 | 3.7 | 16% | 28 | 29 | 1.8 | 6% |
| Nudgee Road | Kingsford Smith Drive to East West Arterial | 5 | 6 | 5 | -0.9 | -16% | 6 | 6 | -0.6 | -9% |
| Kingsford Smith Drive | ICB to Allison Street | 33 | 46 | 42 | -3.8 | -8% | 52 | 50 | -1.9 | -4% |
| **Total** | | **340** | **464** | **432** | **-33** | **-7%** | **513** | **469** | **-44** | **-9%** |

### 5.6.9 Mitigation Measures for Identified Operational Effects

The TMP (Operations) should identify operational actions to be implemented to manage queues into and out of the tunnel system if excessive queuing was to develop on infrequent occasions. Checks indicate that the reference design satisfactorily accommodates queuing within accepted design standards.

A number of identified operational effects of the proposed Airport Link reference design are considered to require specific mitigation measures. These are:

#### Stafford Road

More than 50% increase in demand is forecast. While the resultant traffic volumes of 45,000 vpd in 2026 are within the mid-block traffic lane capacities of a well-managed four (4) lane arterial route traffic management measures along the route between Gympie Road and Webster Road are recommended to safely and efficiently cater for the forecast increase.

Arterial traffic measures that should be investigated for implementation along this section of Stafford Road in conjunction with the Airport Link Project should include:

- Parking management/restrictions at intersection approaches (potentially for longer periods of the day than are currently applied);
- Formalisation of turn lane pockets at side streets where signalised intersections are not provided;
- Construction of a raised median along Stafford Road in segments where turn movements are currently prevented by a double centre-line, however where side-street traffic typically does not observe the restriction;
- Potential implementation of additional signalised intersections at side-streets, a particular example being Clarence Road/Rose Lane;
- Facilities for pedestrians and cyclists; and
- Facilities for public transport (e.g. indented bus stops).

Not all measures may be required and the best package of initiatives to manage the traffic flows on Stafford Road between Gympie Road and Webster Road would require scoping within the development of an arterial corridor management plan within the Traffic Management Plan (Operations).

#### Gympie Road

Impacts on Gympie Road diminish quite rapidly north of the project. The Traffic Management Plan (Operations) should address management measures such as signal co-ordination to accommodate increased traffic on the approaches of this arterial corridor connecting to the project.

#### North-western and north-eastern Connections

In the vicinity of the two northern connections, traffic signal co-ordination should also be implemented though the Traffic Management Plan (Operations) for the facility to ensure that key movement streams using the surface road routes are not unduly delayed.

#### North West Precinct of Gympie Road/Stafford Road Intersection

Increased traffic levels on Gympie Road immediately north of the Airport Link northbound exit ramp may create pressure for traffic to use local streets such as Broughton Road. To mitigate this potential effect, it is recommended that local area traffic management measures should be implemented in conjunction with the Airport Link Project in this precinct. This would aim to minimise the potential for use of the local roads in this precinct by extraneous through traffic, sometimes referred to as “rat-running” traffic.

The implementation of local area traffic management treatments, including entry thresholds, should be carried out to mitigate the impact of potential through-traffic use of these local roads by northbound exit traffic. Existing arrangements to the precinct for Stafford Road access via Clarence Road are proposed to remain, although the implementation of signals at this intersection should be considered as part of a management strategy for Stafford Road to cater for the increased traffic levels associated with the project.

### East West Arterial/Nudgee Road Intersection and the Airport Roundabout

A detailed investigation of the most suitable form of upgrading this area of the East West Arterial to achieve a long-term solution for network operations is proposed through the Australia Trade Coast Transport Study.

This ATC Transport Study should build upon the notional upgrades assessed for the purposes of this EIS and provide a more comprehensive investigation. Such an investigation should explore the merits of grade-separated treatments and the relationship between other potential accesses to the precinct, as identified in the ATC North Road Network Study (Arup, 2005), as well as land-use distribution/sequencing within ATC North in the development of the most appropriate long-term strategy.

## 5.7 Construction Impacts

The construction of a major infrastructure project such as the Airport Link may affect transport and traffic in the area, as a result of traffic generated by the project, physical changes to transport networks, and disturbance of traffic flows due to lane closures or distractions.

### 5.7.1 Construction Site Traffic Generation and Access

#### Work Sites and Working Hours

The construction of the project would be organised around the three connections and associated construction areas identified in Chapter 4 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 approval agencies (relevant sections of BCC, Main Roads and the Police) consider the traffic impacts of daytime works unacceptable. Such works should be identified in the TMP (construction). Underground works would continue 24 hours a day. Spoil haulage is also proposed to continue 24 hours a day for the five working days and 12 hours on Saturday to 6.30pm subject to approval conditions and any time limitations required to manage impacts on congestion 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. These are further described below.

##### *Southern Connection*

Access to the Southern Connection worksite would be via Federation Street near Earle Street. Federation Street provides signalised access to Lutwyche Road with all turns permitted.

##### *North-Western Connection*

Access to the north-western connection worksite west of Lutwyche Road would be via the new service road that would be built to link Norman Avenue with Perry Street. Initially the site access road would continue along the northern perimeter of the site before turning west to provide an exit to Gympie Road opposite Kedron Park Road. From Phase 2, when the northbound lanes of Lutwyche Road are proposed to be diverted to the western side of the worksite, the site exit would be relocated to Lutwyche Road south of Colton Avenue.

Access to the worksite within the Emergency Services Complex site would likely be directly to and from Gympie Road. This entry would provide access to both the main site offices within the Emergency Services Complex and the cut and cover construction area parallel to Kedron Brook.

An additional exit point would be needed for vehicles exiting from the Kedron Brook cut and cover area, potentially located at the connection of Gympie and Kedron Park Roads and providing direct access to Lutwyche Road southbound. This is the identified likely exit point that would be used by spoil haulage trucks and this exit would likely serve the main site offices as well as the tunnelling operations.

Access to the Gympie Road surface works site south of Broughton Road would be directly to and from Gympie Road.

#### *North-Eastern Connection*

Two separate access points will be provided to the north-eastern connection construction site in Toombul. Entry to the eastern part of the site, which includes the parking areas and site offices, would likely be from Widdop Street near the existing East-West Arterial off-ramp. An exit would be likely onto the East-West Arterial. Construction workers would be able to move freely between the two parts of the site by passing under Sandgate Road adjacent to Shulz Canal, but clearance is insufficient for heavy vehicles. A second access would therefore be required for the part of the site west of Sandgate Road. This would be provided to and from the East-West Arterial by modifying the signal phasing at its intersection with Sandgate Road. Left in access would also be available from the southern Sandgate Road approach, although this route would not be used for spoil haulage.

### Traffic Generation

#### *Workforce Transportation*

The workforce is considered to be around 465 people working on-site over a 47 month construction period. An estimate of the division of the workforce during the daytime shift over the three work sites is shown in **Table 5-40** below. The evening shift would likely involve a smaller workforce for tunnelling operations only.

- **Table 5-40 Construction workforce**

| Site Location | Tunnel/Portals(1) | Surface(1) |
|---|---|---|
| Southern | 80 | 80 |
| North-Western | 80 | 80 |
| North-Eastern | - | 80 |
| Project Management (various) | - | 65 |

**Table Note:** (1) Based on full time equivalents (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.

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

## 5.7.2 Local Traffic Flow Impacts

Temporary construction works that may affect traffic flow in the area surrounding the work sites during the construction period would include the following:

- Temporary traffic diversions;
- Realignment of traffic lanes;

- Partial road closures, for works staged to minimise any disruptions to traffic flow or property access; and
- Intersection operational changes.

## Traffic Diversions

There would be traffic diversions at all three connection areas, as described below.

### *Southern Connection*

The proposed Airport Link connection from O'Connell Terrace to Lutwyche Road at Northey Street involves the construction of an elevated structure over Campbell Street. Appropriate staging and diversions would be required to maintain local access to properties in this area. Intersection works on O'Connell Terrace would then be phased to minimise impact.

Traffic diversions would also be required for the new bridge across Enoggera Creek to near Earle Street proposed as part of NSBT. Traffic flows on this connection would be affected by the construction of the proposed second level bridge above, for Airport Link.

Realignment of traffic at the Lutwyche Road/Northey Street intersection would be required during the relocation of the NSBT connection.

### *North-Western Connection*

A service road is proposed between Norman Avenue and Perry Street to provide access to properties in this area. Windsor Avenue, Colton Avenue and Perry Street would then be closed at Lutwyche Road to allow the development of the Lutwyche Road worksite. These changes would be permanent.

Some short-term closures of Norman Street would be required during construction. During these periods, local traffic would be diverted to Lamington Street.

The northbound lanes of Lutwyche Road between Isedale Street and Kedron Brook would be diverted to the western side of the Lutwyche Road worksite, to allow the tunnel construction to take place. This diversion would remain in place for most of the construction period.

The southbound lanes of Lutwyche Road would also be diverted to the east between Norman Street and Isedale Street during construction of the southern section of cut and cover tunnel in this area. The southbound lanes would then return to their existing alignment.

Temporary closures of Park Terrace, Lasseter Street, Arnott Street and Leckie Road would be required during construction of the new southbound carriageway of Gympie Road. During this period local traffic would be diverted to Sadlier Street.

After completion of the permanent realigned southbound lanes of Gympie Road between Leckie Road and Kedron Brook, Gympie Road traffic would be switched to this alignment. Northbound traffic would be diverted to a similar alignment between Suez Street and Leckie Road to allow for road widening and viaduct construction.

Short-term lane closures would be required on Stafford Road to allow intersection works and ramp connections. These would be scheduled to minimise their impact on traffic flows.

### *North-Eastern Connection*

Modification of the Sandgate Road/East-West Arterial intersection would be required to provide access to the worksite.

Initial construction would include the northern elevated structure to provide ramp access to the East-West Arterial, east of Sandgate Road. Traffic from the East-West Arterial would be realigned onto this structure. The Sandgate Road/East-West Arterial intersection will be temporarily modified to suit the new alignment.

Realignment of traffic through the Sandgate Road/East-West Arterial intersection would be required during intersection works. Short-term lane closures are also likely to be required. These would be scheduled to minimise their impact on traffic flows.

Construction of the tunnel to achieve the required crossingbelow the existing North Coast Railway lines will cause some unavoidable disruption to rail operations.

### Traffic Operations

The Traffic Management Plans (TMPs) for each area would identify temporary traffic arrangements to be put in place where diversions were required in order to maintain capacity through the work area. Partial road closures would be scheduled so that the remaining capacity would be sufficient for the traffic demand, in consultation with the relevant road authorities.

As a result, local traffic impacts are expected to be small. However, a reduction in mid-block capacity may be expected due to drivers being distracted by the construction works. There is also a risk of traffic incidents due to unfamiliar geometry, which would be less easily managed due to the reduced capacity. In order to address these issues, close attention must be given to geometry, signage and delineation to guide drivers through the work area, and screening of works to avoid distractions, in the TMPs.

The slow speed of trucks turning into and out of the worksites would also affect passing traffic. This factor would be most significant in the north-western connection area, since access to the major roads from the South Connection site and the western section of the north-eastern connection site would be signal controlled. The access to the East-West Arterial from the north-eastern connection site will be via a stand up lane onto the East West Arterial.

Reducing traffic speed past the worksite would minimise the disturbance the trucks would cause to the traffic flow, as well as increasing safety in the affected area. Temporary speed restrictions could be reinforced by construction warning signage. Worksite delineation and protection such as crash barriers would also help to lower the perceived speed environment.

### Traffic Intrusion into Local Streets

The TMPs would be designed to provide sufficient capacity on the major traffic routes at all times, reducing the desire of drivers to seek alternative routes. The road network surrounding the work sites generally does not provide convenient alternative routes via local streets. Thus, the effect on local streets is expected to be small.

On middle order roads, there is some potential for drivers to divert around the north-western connection sites via Richmond Street and Bradshaw Street, and around the north-eastern connection via Melton Road. Use of these routes should be able to be managed by control of the traffic signal timings at each end. Traffic volumes on these routes should be monitored during construction and counter measures adopted if necessary.

### Trucks Queuing

Trucks queuing to enter the site are not expected to be a problem during the day when loading operations are proceeding. 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 worksites should provide a significant length of access road within the site to provide space for trucks to queue. This distance within the reference design ranges from approximately 50m at the Lutwyche Road site during Phase 3 to over 200 m at the north-eastern connection site.

The most haulage traffic would be generated by the two north-western connection sites at Lutwyche Road and the Emergency Services Complex, which would together generate approximately 6 trucks per hour during the

more intense tunnel excavation phase. It is therefore unlikely that queuing issues will arise, even at the Lutwyche Road site during Phase 3.

If more than 4 trucks arrive at the Lutwyche Road site at the start of the day during Phase 3, management measures would be required to ensure the queuing vehicles did not affect Lutwyche Road's northbound through lanes. Allocating the first round of trips the day before or arranging staggered starts could both be possible ways of managing this issue.

The south and north-eastern sites as proposed in the reference design would involve fewer trucks (approximately 2 per hour for spoil disposal), which should be able to be accommodated on site. Thus queuing is not expected to be a problem in these areas.

At all sites, the scheduling of both spoil disposal and delivery trucks will need to be monitored during construction, and modified if necessary to avoid excessive queuing.

#### Construction Workforce Parking

The identified workforce is expected to generate a parking demand of approximately 345 vehicles. The indicative worksite layouts include sufficient space for this parking demand. In particular, the north-eastern connection worksite has sufficient space for a large number of car parks. Early in the project the public car park south of Schulz Canal, directly across from the Toombul shopping centre, would become part of the worksite, and would provide considerable extra parking. When this is affected by construction, parking would be available along the northern side of the site, clear of the future East-West Arterial on ramp.

The main site office at Kedron Brook should also be able to accommodate approximately 50 additional parking spaces. It should therefore be possible for all construction related parking demand to be accommodated within the construction sites eliminating any need for on street parking.

Space for parking is more limited at the southern work site however opportunities for extending workforce parking are available in Byrne Street (then no longer used for residential access) and also parking within the RNA area in association with shuttle services to site.

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 TMPs prepared by the construction contractor.

### 5.7.3 Regional Traffic Flow Impacts

Impacts on regional traffic flow would be concentrated along the haulage and delivery routes. These are discussed below.

#### Haul Routes

*Southern Connection*

Haul routes from this area would likely follow Bowen Bridge Road, Gregory Terrace, Montpelier Road, Breakfast Creek Road, Kingsford Smith Drive, the Gateway Arterial and the Port of Brisbane Motorway to the potential spoil sites at the Port of Brisbane.

An indicative scenario has been assessed based on an average of approximately 2 trucks per hour from the southern connection. This scenario also includes approximately 5 truck loads per hour from the north-western connection. Thus, in this scenario, an average of approximately 7 trucks per hour would use this route as far as Kingsford Smith Drive in each direction, giving a two way total of 320 haulage vehicle trips per day generated by Airport Link construction. This would vary over time: early in the construction sequence an average of 4 trucks per hour (a two way total of 200 truck trips per day) would use this route, rising to an average of 8 trucks per hour (a two way total of approximately 380 truck trips per day) near the end of 2009. Approximately 80% of

these trips (averaging 5 trucks per hour) could be expected to cross the Gateway Bridge en route to the Port of Brisbane sites, with the remainder destined for the northern ATC area.

This additional traffic volume is small, particularly compared to existing traffic volumes on these roads, but may impact on performance in areas which are already heavily congested.

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

- Bowen Bridge Road past the Royal Brisbane and Women's Hospital is operating at close to capacity during peak hours. The performance impact of the additional traffic volume would need to be analysed during preparation of the TMPs, and haulage operations managed accordingly (e.g. being restricted to outside peak hours if necessary).
- Following the construction of the Airport Link Campbell Street ramps, haulage trucks would be able to use a more direct route via Campbell Street that would avoid eight signalised intersections. This would greatly reduce impacts on Bowen Bridge Road and be more efficient for the haulage trucks.
- There are several intersections along Kingsford Smith Drive operating at close to nominal capacity during peak periods. The haulage traffic would represent a small increase (averaging 5%) in the 2009 background heavy vehicle daily volumes, and an average increase of less than approximately 10.5% in total daily traffic volume. However, the impact on performance of key intersections during peak periods would need to be examined during preparation of the TMPs, since several are significant capacity constraints on the route and are already congested.
- The analysis required for the TMPs would need to examine the performance of key intersections with and without the Airport Link haulage traffic, and would include the haulage traffic anticipated from the NSBT in both cases. Until the third quarter of 2009, background traffic flow on Kingsford Smith Drive will include trucks hauling spoil from the NSBT northern construction site. The number of haulage truck loads expected from the NSBT northern construction site during the expected Airport Link construction period ranges from approximately 110 to 270 trucks per day. This would overlap with early works on the Airport Link, but not with the anticipated main tunnel excavation, which is likely to begin late in the fourth quarter of 2009. The expected combined haulage traffic from AL and NSBT on Kingsford Smith Drive would reach approximately 350 trucks per day – just over 14 trucks per hour – in each direction during the highest combined month, in early 2009. This would include approximately 10 trucks per hour from the NBST and just over 4 per hour from Airport Link. The combined peak two way total of approximately 700 truck trips per day would represent just under 10% of 2009 background truck traffic and approximately 1% of total traffic.
- The haulage traffic is not expected to have significant safety or amenity impacts on this route, since the route is already carrying a high volume of traffic including a large number of heavy vehicles. The incremental impact of the haulage traffic is expected to be small.
- The haulage traffic is not expected to adversely affect the performance of the Gateway Motorway or Port of Brisbane Motorway.

### *North-Western Connection*

Haul routes from this area would likely follow Lutwyche Road south to Bowen Bridge Road before joining the likely southern connection haul route to Kingsford Smith Drive.

The volume of haulage trucks expected is relatively low with a conservative scenario based on 5 trucks per hour each way, a daily two way total of 230 truck trips.

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

- The haulage vehicle volumes represent only a small increase (approximately 6%) in the 2009 background heavy vehicle volume on Lutwyche Road north of Stoneleigh Street, and an increase of less than 0.5% in total traffic. However, some intersections on this road currently experience congestion in peak periods, so the incremental effect of these trips may be significant.
- The Schneider Road extension across the Pinkenba rail line into the Australia TradeCoast site, anticipated to be constructed by 2008 as part of the TradeCoast development, would provide the most direct route to the spoil disposal site from Kingsford Smith Drive. This would avoid potential capacity issues due to extra turning traffic at either Kingsford Smith Drive/Nudgee Road or East-West Arterial/Gateway Motorway roundabout, both of which are currently congested at peak times.

#### *North-Eastern Connection*

Haul routes from this area would most likely follow the East-West Arterial, Airport Drive and Lomandra Drive to the TradeCoast Central site.

This connection area would generate the smallest number of haulage trips, since the spoil would just be from the cut and cover works. An average haulage rate of 2 trucks per hour in each direction, or a two way total of 80 trips per day, is expected.

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

- The East-West Arterial and Airport Drive are high standard divided roads with ample mid block capacity to absorb the haulage traffic. Lomandra Drive would also have sufficient capacity for the haulage flow.
- However, several intersections on the East-West Arterial are at or close to capacity at peak times, and may be sensitive even to such small volume changes. In particular, the East-West Arterial/Gateway Motorway roundabout is a significant bottleneck.
- The intersection of the East-West Arterial and Sandgate Road is also under pressure, and its operation will need to be modified to provide access to the western part of the worksite.

### Deliveries

Materials would be delivered to the five work sites, or directly to the tunnel portals or road works areas, depending on the nature of the work and material. The delivery routes would vary with the sources of materials and equipment, which are not known at this stage of the planning process. Deliveries would, however, be confined to major roads. For this reason similar effects would apply to those discussed in the previous section of this report (Haul Routes).

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 TMPs.

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 TMPs.

In general, delivery times would be restricted to daytime hours Monday to Saturday, unless the TMPs determined that further restrictions should apply (for example, limiting deliveries to off peak periods).

## 5.7.4 Impacts on Bus Routes and Operations

Acceptable traffic flow would be maintained past the worksites on all major roads throughout construction, using the management measures to be detailed in the TMPs. 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. However, some bus stops would be affected by construction works, as described below.

### Southern Connection

Additional works on Northey Street during construction of the Airport Link elements of the NSBT connection to Lutwyche Road may require a temporary relocation of the Northey Street bus stop east of Victoria Street to west of the Victoria Street intersection affecting services 346 and 353.

### North-Western Connection

The two bus stops near Norman Avenue are above a cut and cover section of the project reference design tunnel and would need to be relocated during construction of this segment. During different stages of construction the northbound traffic would either follow its existing alignment or be redirected west of its current alignment. When Lutwyche Road follows its existing alignment, interim bus stops could be constructed south of the Windsor Ave intersection (northbound) and between Colton Avenue and Windsor Avenue (southbound). When Lutwyche Road northbound is realigned, an interim bus stop could be constructed south of Norman Avenue. Both bus stops would be reinstated following construction in their current locations. Services affected by this disruption would be the 334 and 370 service northbound and the 321, 334 and 370 services southbound.

The location of the two bus stops on the western side of Gympie Road between Kedron Park Road and Stafford Road would vary during construction stages as different lanes on Gympie Road were opened and closed. However, both stops should remain operational throughout construction. These changes would affect services 358 and 370 at both stops, whilst the South stop would also affect routes 333, 334 and 338.

Corridor widening to accommodate both Airport Link and Gympie Road would affect the bus stop located on Gympie Road south-east of Kedron Brook. Construction staging would allow for construction at the potential alternate bus stop location prior to discontinuation of the current bus stop. Services 333, 334, 358 and 370 would be affected.

### North-Eastern Connection

The southbound bus stop located between the signalised Toombul Shopping Centre access and the rail over bridge on Sandgate Road requires relocation during some stages of construction to the Toombul Bus Interchange, this may become a permanent relocation. This affects services 310 and 315.

## 5.7.5 Emergency Service Vehicle Movements

The primary impact of the project on Emergency Services traffic would be the relocation of the Emergency Services Complex (ESC) further east along Kedron Park Road. Access to the site would be from Kedron Park Road, rather than its current location on Gympie Road. This would allow for easier exit to the north, although entry from the south would not be improved.

The other main concentration of Emergency Services vehicles in the area affected by the project is the Royal Brisbane Hospital complex on Bowen Bridge Road. The main effect on access to the RBH would be from works on O'Connell Terrace and Campbell Street associated with the City Connection ramps. Campbell Street would already have been severed by the NSBT, but access to Sneyd Street would be affected by bridge construction and an alternative route may need to be provided via Wren Street. Access along O'Connell Terrace would need to be maintained during the intersection works required for the new ramp connections.

Emergency vehicles approaching the RBH from the north would be affected by any increase in congestion resulting from haulage activities or from intersection works at Northey Street. The volume of trucks involved however, averaging 7 vehicles per hour in each direction, is quite small relative to the existing traffic volumes. The effect on congestion is therefore likely to be small. The TMPs will examine the effect of haulage traffic in more detail and recommend counter measures, such as avoiding haulage in peak periods, if necessary. The

TMPs will also need to ensure that the Northey Street intersection continues to operate acceptably, changing work times or staging if necessary. Therefore, the effect on emergency services vehicles is expected to be small.

### 5.7.6 Construction Impacts on Pedestrian/Cyclist Movements

Pedestrian and cyclist routes will be provided through all work areas, though temporary diversions will be required. All pedestrian crossings will be maintained throughout construction. Specific impacts in each area are discussed below.

#### Southern Connection

Pedestrian movement in this area would generally not be affected except for loss of access to resumed properties surrounding Earle Street. As Earle Street would already have been closed for the NSBT works this would not affect access to other areas. The cycle route to Enoggera Creek via Cedric Street and Earle Street would already have been relocated for the NSBT works. There may be a need for temporary pedestrian rerouting through Lutwyche Road/Northey Street during intersection works, but pedestrian crossings would be provided at all times.

#### North-Western Connection

Pedestrian access would be maintained along both sides of Lutwyche Road and Gympie Road throughout construction. The current pedestrian crossing points, which are at Gympie Road/Stafford Road, Gympie Road/Kedron Park Road and Lutwyche Road/Norman Avenue, would also be maintained.

Following the set up of the Lutwyche Road worksite it would be necessary to provide a pedestrian route along the eastern side of the worksite. Alternatively it will be necessary to provide advance signage at Norman Avenue, advising pedestrians to cross to the eastern side of Lutwyche Road before continuing north, in order to access Kedron Park Road. Pedestrian access to the western side of Gympie Road may be provided via the Norman Avenue – Perry Street service road until the northbound lanes are realigned to their permanent position. This service road would also provide access to the Kedron Brook bike path and to the eastern side of Gympie Road via the bike path.

Potential safety hazards for pedestrians and cyclists alike may be created by construction traffic leaving and entering the construction sites on Gympie Road. To increase safety at these locations, a traffic control system may need to be set up (either manual control by people or flashing/audible alarms).

The existing bike path along the southern side of Kedron Brook would not be relocated, but temporary closures may be necessary during the construction of new road bridges. Alternative bicycle arrangements would need to be put in place at these times. This would be addressed in the relevant TMPs.

#### North-Eastern Connection

Pedestrian access would be maintained around the worksite between Sandgate Road and the North Coast Railway embankment. The location and the arrangement of this access may change several times during the construction period to suit the works, however, the access would remain open at all times. Pedestrian access along Sandgate Road would not be affected.

The pedestrian/bicycle path on the southern side of Shulz Canal would need to be relocated to the northern bank to keep it clear of the works. Therefore a temporary bridge would need to be provided to connect the relocated path to the existing path further west. This bridge may be retained permanently as part of an enhanced pedestrian and cycle network.

### 5.7.7 Impacts on Rail Infrastructure and Operations

The Airport Link infrastructure will cross railway lines at four points:

- In the southern connection area, the Campbell Street on and off ramps will cross over the Exhibition Line near Tufton Street;
- North of the southern connection area, the north-south tunnels will pass under the Ferny Grove Line near Somerset Street;
- In the north-eastern connection area, the east-west tunnels will pass under the North Coast Line near Jackson Street; and
- In the north-eastern connection area, the east-west tunnels will pass under the Airtrain near Elliot Street.

The North Coast Line and Airtrain crossings of Airport Link will occur in the cut and cover tunnel sections of the north-eastern connection. To achieve this, limited closures of the rail lines will be required during construction of the cut and cover sections. The most significant effect will be on the North Coast Line, where a series of overnight closures as well as an expected four weekend closures will be required. During the closures, passengers may be bussed around the works area, as is often done during Queensland Rail track works. Freight operations on this line would need to be rescheduled.

The project design largely avoids the Airtrain piers and bridge abutment. The impact on the Airtrain is thus expected to be more limited, with only a small number of overnight closures required. The Exhibition Line would also experience only a small impact with a small number of short duration closures required to put the overpass elements in place.

At the Ferny Grove Line crossing, the Airport Link will be in driven tunnels well beneath the surface. No surface works will be required in this area, and construction is not expected to affect rail operations on this line.

### 5.7.8 Recommended Construction Mitigation Measures

Measures often adopted to reduce construction effects include, controlling working hours, providing designated parking areas with bus transport to work sites, and staging works to minimise traffic impacts (for example, using lane by lane rather than full road closures). All of these measures are likely to be used for the Airport Link Project.

The construction contractor would be required to prepare a detailed transport management plan (TMP) for all elements of the works, to minimise adverse effects. The preparation of this plan would have to include performance analysis for lane closures and other disruptions. The safety and convenience of all road users would need to be addressed by the plan.

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 TMP, 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 to and 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, for example at the RNA Exhibition Grounds, by limiting haulage times or using alternative routes during these events.

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 TMPs for spoil haulage and the delivery of goods wood need to cover specifically:

- The performance impact of the additional traffic volume on Kingsford Smith Drive would need to be analysed during preparation of the TMPs, and haulage operations managed accordingly including restrictions to outside peak hours if necessary and the monitoring of the operation of these roads during construction.
- the impact on performance of key intersections on Kingsford Smith Drive, Lutwyche Road, the Sandgate Road and East West Arterial intersection and along the East West Arterial would need to be examined during preparation of the TMPs covering both the haulage of spoil and the delivery of goods. Haulage and delivery operations will need to be managed accordingly, including restrictions to outside peak hours if necessary, and bringing forward of intersection improvements (such as at Sandgate Road and East West Arterial).
- No spoil haulage or delivery would take place on Sundays or public holidays.

A TMP outlining strategies to minimise any likely impact of the proposed works would need to be produced for each of the construction sites. 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 TMPs 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;
- 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
- Identification of any alternative routes with sufficient capacity to accommodate additional traffic, with measures to encourage drivers to use these routes.

In preparing the TMPs, it would be necessary to model the existing traffic conditions on the road network especially on major roads and in vicinity of the site and predict the effect of the likely traffic redistribution as a result of proposed temporary traffic arrangements.

Conditions surrounding the worksite would need to be monitored throughout the construction period, and the TMPs reviewed as appropriate to address any negative impacts that developed. This would include regular monitoring of traffic flows against the modelled traffic volumes.

It is desirable that all construction related parking be contained within the worksites to avoid adverse impacts on adjacent businesses or residential amenity. Each work site would also need to provide a small number of parking spaces for visitors and deliveries.

Temporary on street parking restrictions may be required in streets close to the southern connection site, such as Federation Street and Gallway Street, to ensure that safety and amenity are not affected by construction related parking. Streets on the other side of Lutwyche Road in this area are already covered by a parking scheme due to high demands from the Royal Brisbane Hospital complex. Conditions should also be monitored on streets surrounding the other work sites, particularly Windsor Avenue, Colton Avenue and Perry Street near the Lutwyche Road site. Counter measures from reminding staff of the parking policy to temporary on street parking restrictions could be applied if excessive parking was detected.