Airport Link
Phase 2 – Detailed Feasibility Study

CHAPTER 21

CUMULATIVE IMPACTS

- October 2006

Contents

21. Cumulative Impacts

This Chapter addresses the cumulative impacts of the Airport Link Project on economic, social and environmental values directly caused by the project. The cumulative impacts are considered over time and in conjunction with other major projects, approved and known to be proceeding at the time of commencement or operations of the project.

Within the context of 'scenario testing', the potential for cumulative impacts, particularly in relation to the traffic and transport analysis, with the proposed Northern Busway and the planned North-South Bypass Tunnel is addressed based on the concepts for these projects publicly available at the time of preparation of the EIS in accordance with Sections 4.8 and 4.9 of the Terms of Reference.

21.1 Introduction

Cumulative effects occur due to the compounding and synergistic interactions on the environment arising from other developments, occurring in the same area or over similar time frames to the Project being assessed. Many of the cumulative environmental effects associated with the project are derived from traffic and transport interactions between projects. These effects are able to be measured from established traffic and transport models. Other interactive effects such as on water quality, flora and fauna, and social and economic effects such as demand and supply implications for labour and resources are much more difficult to measure and report on in regard to the Airport Link contribution.

As discussed in Chapter 5 of the EIS, details of planned or potential future traffic and transport projects and their timing were compiled from anticipated capital works programs. This included 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 No 1 – Traffic and Transport in Volume 3 of the EIS).

The wider road transport works relevant to interactions with the Airport Link Project at the time of the study are considered to be the North-South Bypass Tunnel (NSBT), Gateway Upgrade Project (GUP) and Brisbane Airport Northern Access. Key features of these projects include:

- The NSBT is a planned 4.8 km long 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. It will form part of the TransApex strategic road connections intended to allow cross-city travel movements to bypass the Brisbane Central Business District (CBD) and inner suburbs. Construction is planned to begin in August 2006 with completion by 2010
- The GUP is 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. The project is planned to start in late 2006 and be complete by 2011 at a cost of $A1.6 billion to design construct and maintain.
- Brisbane Airport Northern Access is 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.

Other potential major projects/plans in the general location of the Airport Link Project, or due for development within or through a similar timeframe to Airport Link include:

- Brisbane Airport New Parallel Runway Project. The BAC has identified a need for a new runway to cater for predicted growth in population, tourism and the economy. The Environmental Impact Statement and Major Development Plan are currently being prepared and it is expected that these will be put on public display at the end of 2006. The new runway is expected to be operational by 2015;
- Brisbane Airport Master Plan sets aside some 1,000ha of land to accommodate significant growth in business, retail and industry precincts. The development of an "Airport City" is proposed with an increase in associated employment from 10,000 employees to 42,500 by 2023. (BAC Limited *2003 Master Plan*)
- Other major development within Australia TradeCoast. This area covers approximately 8,000 hectares of land situated on the northern and southern sides of the Brisbane River. The Australia TradeCoast region includes the Brisbane Airport and the Port of Brisbane along with 1,300 hectares of greenfield land. The region provides an integrated trade precinct and is emerging as a global export gateway and national transport hub.
- The Northshore Hamilton is a residential project for up to 10,000 residents located off Kingsford Smith Drive, involving the relocation of port operations at Hamilton to the Port of Brisbane and includes 2.5 kilometres of river frontage. It is anticipated that the infrastructure work for Stage 1 will start late 2006 and that residential construction will begin in 2007. The entire project is anticipated to be completed by approximately 2026.

As well as interaction with these major projects and associated planning intentions beyond the Airport Link corridor there will be interaction between the project and on going land use change and development within the Airport Link corridor. The Brisbane City Council is currently preparing a master plan to guide land use and future development of about 106 hectares of land in Albion. The vision for the Albion Master Plan is to consolidate under-used areas to create a mix use environment. The potential for local cumulative impacts between the project and continuing local redevelopment and growth within the Airport Link corridor and the inner northern suburbs of Brisbane is recognised. These interactive impacts are however largely unmeasurable and are considered to be effectively minimised through the environmental management process for the Airport Link Project.

Northern Busway

The most significant project interaction and potential for associated cumulative impacts both for construction and operation, is considered to be with the proposed Northern Busway.

The potential for integration physically and functionally with the proposed Northern Busway has been incorporated into the reference design of both the Airport Link Project and the proposed Northern Busway.

The Northern Busway is proposed to connect the Inner Northern Busway (INB) at the Royal Children's Hospital (RCH) at Herston with Windsor, Lutwyche, Kedron, Chermside, Aspley and Bracken Ridge.

The section of the Northern Busway (from the INB to Kedron known as Northern Busway Stage 2) is subject to the preparation of a Concept Design and Impact Management Plan (CDIMP) and follows the Bowen Bridge, Lutwyche and Gympie roads corridor. The ultimate busway is proposed to be completed by 2026 and would generally be in tunnel apart from areas around the Royal Brisbane Hospital complex to Enoggera Creek (bridge structures), at Kedron Brook (Bridge structures) and busway stations proposed as part of the earlier Interim

Busway. These southern and northern ends (Ultimate Busway) are likely to be constructed by 2012 along with bus lanes along Lutwyche Road, identified as the Interim Busway.

Sections of the proposed Northern Busway and their overall relationship to the Airport Link include:

- Section 1 - RCH Busway Station to Northey Street - significant capital works, predominantly bridging structure, station near the Royal Brisbane Womens Hospital, insignificant physical interaction with Airport Link.
- Section 2 & 3 - Northey Street to Constitution Road (Sect 2) and Constitution Road to Stoneleigh Street (Sect 3) - relatively smaller scale capital works consisting predominantly of at grade bus prioritisation works (ie interim works which would be replaced in time by the Ultimate Solution). Section 2 Ultimate Solution involving a future bus station near Federation Street may have physical interaction with NSBT and Airport Link depending on how final design and construction programming of these projects interact; and
- Section 4 & 5 - Stoneleigh Street to Felix Street (Sect 4) and Felix Street to Sadlier Street (Sect 5) significant capital works, predominantly tunnel structure, stations at Lutwyche and Kedron, significant physical location interaction with Airport Link particularly in Section 5 at the Kedron Brook end and at worksites.

The potential for particular service integration features between Airport Link and the Northern Busway will depend on the detailed design and concurrent construction options for both projects. There are significant integration advantages for potential concurrent construction of Sections 4 and 5 of the busway with Airport Link. This is due largely to the considerable level of capital works in close proximity to Airport Link, the similarities of those works and the ramifications and benefits that this creates for both projects. Service integration possibilities could include:

- Detailed design leading to operational and construction benefits and risk mitigation benefits;
- Construction efficiencies such as:
  - Flexibility in application of plant, equipment and labour;
  - Integrated construction programming/timetabling;
  - Ability to reuse temporary works (such as construction ventilation, noise attenuation, sheds etc);
  - Utility relocations;
  - Efficiency in use of specialist design and construction personnel;
- Operational efficiencies such as:
  - Back-up systems;
  - Some tunnel maintenance areas such as ventilation, fire & life safety, pavement and illumination;
- Impact management such as:
  - Worksite management;
  - Spoil management;
- Risk management;
  - Traffic management during construction;
  - Construction contractor interface;
  - Community interface and stakeholder management.

Section 2 & 3 is quite different to Section 4 & 5 and does not lend itself to any joint construction with Airport Link.

Construction activity for the southern section 1 of the Northern Busway is predominantly bridging in nature. Compared to tunnelling, bridging uses less specialised and more readily available equipment and labour. There is less potential for joint construction efficiencies compared to the integration of Sections 4 & 5 with Airport Link. In addition the physical location of the two projects is largely, if not totally separate (including potential worksites).

In addition there is an opportunity for early construction of this section of the project (due mainly to a shorter construction period than Airport Link) and hence early service delivery and completion of the Inner Northern Busway.

The cumulative significance of the impacts associated with the joint delivery of Sections 4 and 5 of the Northern Busway with Airport Link is difficult to measure. While the extent of the works would be more extensive it is considered that the impact on the community of progressing the works simultaneously would be less due to the shorter time period associated with the combined disturbance of both projects.

Coordination will be required between both projects in regard to road traffic management (e.g. handling of road closures and through traffic along Lutwyche Road) and also construction traffic management (machinery, delivery, spoil haulage, construction site access and parking).

21.2 Traffic and Transport Effects

21.2.1 Traffic and Transport Effects with the Northern Busway

This analysis describes traffic and transport conditions in a scenario where the proposed Northern Busway is implemented and operational in conjunction with Airport Link. Traffic forecasts with the Airport Link Project implemented in conjunction with the Northern Busway were prepared using the traffic models described in Chapter 5. The full analysis can be found in the Technical Paper No1 – Traffic and Transport - in Volume 3 of the EIS.

The features and timing of the proposed Northern Busway included within the traffic and transport model were based upon the proposed Northern Busway concepts publicly available, and were:

- In 2012, to coincide with opening of Airport Link, operating up until around 2022, an Interim Northern Busway comprising:
  - Northern Busway from INB at Royal Children's Hospital (RCH) to a new busway station at Royal Brisbane and Women's Hospital (RBWH).
  - Northern Busway to Enoggera Creek and busway connection to surface road network on Lutwyche Road via Victoria Street and Northey Street. Buses would operate in general traffic between Northey Street and Newmarket Road.
  - Bus lanes and bus priority measures in Lutwyche Road corridor between Newmarket Road and Stoneleigh Street. Introduction of these works are possible due to the reduction in surface road traffic on Lutwyche Road with the implementation of Airport Link and Northern Busway.
  - Ultimate Northern Busway between Stoneleigh Street (Lutwyche) and Kedron.
  - Busway stations at Lutwyche and Kedron Brook.
- By 2026:

- Ultimate Northern Busway completed between RCH and Kedron, including Busway Stations at RBWH, Federation Street, Windsor, Albion, Lutwyche and Kedron.

In the 2026 scenario, it has been assumed that the bus lanes on Lutwyche Road would be converted to T3 use, except on Truro Street which would remain as local access and buses only.

The staged implementation of the Northern Busway, as described above, and considered in this cumulative effects scenario, involves changes to the surface road operation and lane provision on Lutwyche Road. These are tabulated in **Table 21-1**. The overall effect is that two general travel lanes in each direction will be available on Lutwyche Road between Newmarket Road and Stoneleigh Street with the Interim Busway, matching to the existing two general traffic lanes in each direction on Lutwyche Road between Stoneleigh Street and Bradshaw Street.

Table 21-1 Surface Road Lane Changes with Northern Busway

Description	No Busway[1]	Interim Busway[1]	Ultimate Busway[1]
Bowen Bridge Road, south of Northey Street: Northbound	3 lanes	3 lanes	3 lanes
Bowen Bridge Road, south of Northey Street: Southbound	3 lanes	3 lanes	3 lanes
Lutwyche Road, Northey Street – Newmarket Road: Northbound	4 lanes	4 lanes	4 lanes
Lutwyche Road, Northey Street – Newmarket Road: Southbound	4 lanes	4 lanes	4 lanes
Lutwyche Road, Newmarket Road – Fosbery Street: Northbound	3 lanes	2 lanes +BL	2 lanes +T3 [3]
Lutwyche Road, Newmarket Road – Fosbery Street: Southbound	2 lanes + T3[2]	2 lanes +BL	2 lanes + T3 [3]
Roblane Street: Northbound	Not applicable	Not applicable	Not applicable
Roblane Street: Southbound	1 lane + T3[2]	BL + Local Traffic Lane	T3[3] + Local Traffic Lane
Lutwyche Road, Fosbery Street – Stoneleigh Street: Northbound	3 lanes	2 lanes	2 lanes
Lutwyche Road, Fosbery Street – Stoneleigh Street: Southbound	1 lane	2 lanes	2 lanes
Truro Street: Northbound	Not Applicable	BL	BL
Truro Street: Southbound	3 lanes + T3[2]	BL + Local Traffic Lane	T3[3] + Local Traffic Lane
Lutwyche Road, Stoneleigh Street – Bradshaw Street: Northbound	2 lanes	2 lanes	2 lanes
Lutwyche Road, Stoneleigh Street – Bradshaw Street: Southbound	2 lanes	2 lanes	2 lanes
Lutwyche Road/Gympie Road, north of Bradshaw Street: Northbound	3 lanes	3 lanes	3 lanes
Lutwyche Road/Gympie Road, north of Bradshaw Street: Northbound	3 lanes	3 lanes	3 lanes

Table Notes:

1) The lane numbers listed above are typical general traffic through lanes for each road segment. The figures do not include ancillary lanes at intersections (for example, turn pockets).

2) The T3 lane in the No Busway case is the existing AM Peak facility.

3) Assumed for transport modelling purposes

The Northern Busway service plan for 2012 would result in a daily total of approximately 1,400 services crossing Enoggera Creek rising to 3,300 by 2026 compared to 800 bus services currently. At Lutwyche, currently serviced by 600 buses per day, bus numbers would rise from over 900 daily in 2012 to 2,400 daily by 2026.

Effect on Brisbane Metropolitan Area

Demand for Airport Link

Weekday traffic flows on the Airport Link Project are marginally higher in the cumulative effects scenario with Northern Busway.

Use of the Airport Link north-south tunnel in 2012, prior to traffic ramping-up to full modelled forecast volumes, is estimated as 52,800 vpd (compared to 51,000 vpd without the Northern Busway). By 2026, the north-south tunnel would carry a forecast 95,800 vpd (compared to 93,150 vpd without the Northern Busway). Forecast use of the east-west ramps is largely unaffected, modelled as 25,900 vpd in 2026. Whilst public transport use increases with the Northern Busway, the small change in overall forecast use of Airport Link can be attributed to the following key factors:

- The surface road changes along Lutwyche Road due to the Busway itself have some effect on overall traffic patterns and the perceived attractiveness of the surface road route compared to the Airport Link tolled route;
- While there is a forecast reduction in number of Airport Link trips using the Bowen Hills ramps (typically Central City travellers who find public transport use an attractive option), this is compensated for by an increased use of Airport Link for cross-city and cross-river movements due to the effect described above.

It is noted that although the effects of surface road changes associated with the Northern Busway reduce traffic capacity on some parts of the corridor, with Airport Link operational the travel time along the alternative surface route remains substantially better than would prevail in the future scenario without Airport Link.

- **Traffic Volume Effect**

Changes in weekday traffic volumes on the road network in the scenario where the Northern Busway (interim 2012,2016 & 2022 and ultimate 2026) is implemented with Airport Link compared to the scenario without both Northern Busway and Airport Link has been examined and is tabulated in **Table 21-2.** This assessment indicates that a very similar range and scale of traffic effects on connecting roads will occur in the cumulative scenario, compared to the effects of the Project alone.

- **Network Performance Statistics**

The impact of the Project in combination with the Northern Busway on overall Metropolitan area road network performance is summarised in **Table 21-3**. The overall effects on road network performance are quite similar to the Airport Link only scenario, with beneficial transfer of the some of the road travel task from lower to higher order roads in the network.

Table 21-2 Volumes on Key Connecting Roads to the Project - Comparison without and with the Project in combination with Northern Busway

Reference	Road	Location	2004	Average Weekday Traffic											
				2012			2016			2022			2026		
				Without AL+ NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change	Without AL +NB	With AL +NB	% Change
Southern Connections															
-	NBST	Brisbane River	-	70,800	73,200	3%	75,600	78,700	4%	82,300	88,600	8%	89,800	97,800	9%
41	ICB	West of Bowen Bridge Road	75,000	100,500	102,800	2%	106,300	106,400	0%	106,500	110,100	3%	111,200	113,500	2%
49	Hale Street	North of Milton Road	78,000	84,200	84,400	0%	86,900	86,200	-1%	82,700	82,000	-1%	81,700	81,000	-1%
38	Bowen Bridge Road	South of O'Connell Terrace	57,000	51,200	52,000	2%	53,600	55,900	4%	55,200	58,400	6%	56,700	62,100	10%
40	Campbell Street	East of Mayne Road	12,000	21,700	26,100	20%	23,500	28,600	22%	26,300	32,000	22%	28,600	34,400	20%
39	O'Connell Terrace	East of Bowen Bridge Road	6,000	15,200	13,500	-11%	16,500	14,900	-10%	17,800	16,700	-6%	18,700	18,000	-4%
45	Brookes Street	South of St Pauls Terrace	18,000	20,500	23,200	13%	22,400	24,300	8%	23,300	25,400	9%	24,100	26,500	10%
44	St Pauls Terrace	South of Brookes Street	9,000	13,200	14,800	12%	15,000	16,900	13%	17,000	18,700	10%	19,900	20,700	4%
42	Gregory Terrace	West of Brookes Street	5,000	12,100	11,300	-7%	12,800	11,600	-9%	14,200	12,900	-9%	15,300	13,500	-12%
46	Wickham Street	West of Brookes Street	26,000	30,300	31,900	5%	32,100	33,600	5%	33,600	36,300	8%	36,500	38,000	4%
47	Ann Street	West of Brookes Street	25,000	30,900	34,700	12%	32,300	37,000	15%	36,800	40,800	11%	39,300	43,100	10%
43	Montpelier Road	West of Breakfast Creek Road	15,000	28,600	31,900	12%	31,000	34,900	13%	33,900	38,200	13%	36,900	39,800	8%
48	Gipps Street	North of Wickham Street	53,000	42,200	39,600	-6%	44,100	41,800	-5%	45,900	43,900	-4%	46,900	44,700	-5%
Northern Connections															
10	Stafford Road	West of Richmond Street	23,000	26,700	39,700	49%	27,100	41,600	54%	29,200	43,600	49%	29,100	45,200	55%
8	Stafford Road	West of Webster Road	22,000	24,600	30,800	25%	24,400	31,000	27%	25,300	33,900	34%	25,000	34,300	37%
11	Gympie Road	North of Broughton Road	59,000	76,800	93,800	22%	80,400	97,800	22%	81,700	102,600	26%	83,500	105,300	26%
3	Gympie Road	North of Rode Road	60,000	79,000	83,400	6%	81,700	85,600	5%	84,700	90,600	7%	86,600	94,900	10%
1	Gympie Road	North of Hamilton Road	70,000	82,700	86,600	5%	85,400	89,000	4%	88,500	93,900	6%	90,200	96,600	7%
2	Rode Road	West of Gympie Road	19,500	29,800	30,700	3%	31,000	31,000	0%	32,300	32,200	0%	33,200	32,600	-2%
13	Sandgate Road	North of Schultz Canal	52,000	66,800	61,000	-9%	67,600	61,700	-9%	71,600	64,200	-10%	72,700	66,300	-9%
14	East West Arterial	East of Widdop Street	35,000	59,100	75,000	27%	63,500	79,100	25%	72,000	83,600	16%	74,500	84,900	14%

Table 21-3 Network Performance by Road Type without and With Airport Link and Northern Busway

Road Hierarchy	Without Airport Link and Northern Busway			With Airport Link and Northern Busway			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		277,700[3]	22,294,000[4]		4,800	191,000	1.8%	0.9%
Motorway (AL Tunnel)	-	-		-	339,000		-	339,000	-	-
Arterial	464,300	20,819,000		452,100	20,524,000		-12,200	-295,000	-2.6%	-1.4%
Suburban	170,100	8,186,000		166,100	8,090,000		-4,000	-96,000	-2.4%	-1.2%
District	98,900	3,329,000		97,100	3,293,000		-1,800	-36,000	-1.8%	-1.1%
Local	53,800	1,317,000		53,200	1,298,000		-600	-19,000	-1.1%	-1.4%
Total	1,059,900	55,754,000	52.6	1,046,100	55,838,000	53.4	-13,800	84,000	-1.3%	0.2%
2022										
Motorway	358,000	27,777,000		363,200[3]	27,961,000[4]		5,200	184,000	1.5%	0.7%
Motorway (AL Tunnel)	-	-		-	398,000		-	398,000	-	-
Arterial	556,900	24,004,000		538,800	23,698,000		-18,000	-306,000	-3.2%	-1.3%
Suburban	204,700	9,581,000		199,000	9,452,000		-5,700	-129,000	-2.8%	-1.3%
District	120,600	3,873,000		115,700	3,806,000		-4,900	-67,000	-4.1%	-1.7%
Local	77,600	1,508,000		75,700	1,478,000		-1,900	-30,000	-2.4%	-2.0%
Total	1,317,600	66,742,000	50.7	1,292,600	66,793,000	51.7	-25,000	51,000	-1.9%	0.1%
2026										
Motorway	408,800	30,070,000		413,000[3]	30,259,000[4]		4,200	189,000	1.0%	0.6%
Motorway (AL Tunnel)	-	-		-	419,000		-	419,000	-	-
Arterial	608,000	25,238,000		588,600	24,908,000		-19,400	-330,000	-3.2%	-1.3%
Suburban	225,400	10,224,000		218,900	10,093,000		-6,500	-131,000	-2.9%	-1.3%
District	132,800	4,129,000		129,500	4,070,000		-3,300	-59,000	-2.5%	-1.4%
Local	93,100	1,608,000		91,000	1,579,000		-2,100	-29,000	-2.3%	-1.8%
Total	1,468,200	71,269,000	48.5	1,441,000	71,328,000	49.5	-27,200	59,000	-1.9%	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

Effect on Local Area

- **Traffic Volume**

Traffic reductions on many roads within the Inner North area and beyond are forecast with the Project in combination with the Northern Busway. Effects are tabulated in **Table 21-5** and **Table 21-6**. The scale of traffic reductions with the cumulative scenario is generally similar to the Project only case, with the exception of Lutwyche Road, which experiences somewhat greater traffic reductions due to the Northern Busway effects.

For example, on Lutwyche Road compared to a network without Airport Link, a decrease in traffic of 39% is forecast in 2026 with the combined projects, which is greater than the 25% reduction with Airport Link only.

On some local roads, such as Chalk Street and Kedron Park Road south of Park Road, a lessening of the traffic reduction effect occurs due to some local road network changes along Lutwyche Road associated with the Busway alignment and station locations. For example on Chalk Street, compared to a network without Airport Link, a decrease in traffic of 10% is forecast in 2026 with the combined projects, which is less than the 34% reduction with Airport Link only.

- **Intersection Performance**

The effect of the combined Airport Link and Northern Busway projects on the performance of intersections within the network has been carried out in a similar manner to the intersection performance assessment for the Airport Link Project. The intersection performance is shown in **Table 21-7** and assessment indicates that for the cumulative scenario with the Northern Busway compared to the Airport Link only:

- Similar intersection performance will occur on feeder roads to the Project and at surface road intersections in the vicinity of the connections.
- Along Lutwyche Road, intersections would operate at a similar Degree of Saturation and Level of Service with the Northern Busway modifications to the intersections. These changes are able to be accommodated without a significant adverse impact on performance as there is a lowering of vehicle demand along Lutwyche Road due to the combined influences of the public transport initiative and the diversion of vehicle trips to Airport Link.

- **Travel Times**

Peak period travel times for key routes without and with both projects are summarised in **Table 21-8**. The scenario assessed for both 2012 and 2022 includes bus lanes in the section between Stoneleigh Street at Lutwyche and Newmarket Road at Windsor as per the proposed Northern Busway interim staging.

The benefits observed in this case are similar to the Airport Link project case, and follow similar patterns across routes and times. It is notable that the benefits forecast for Lutwyche Road are negligibly different from the Airport Link only scenario. This indicates that the allocation of some of the road space freed-up by traffic reductions due to the Airport Link to public transport use (as proposed in the Northern Busway interim staging) does not significantly affect travel time on this route for general traffic.

- **Table 21-5 Volumes on Surface Roads within the Inner North Area - Comparison without and with the Project in combination with Northern Busway**

Reference	Road	Location	2004	Average Weekday Traffic											
				2012			2016			2022			2026		
				Without AL+ NB	With AL +NB	% Change	Without AL+ NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change
Arterial Roads															
17	Lutwyche Road	South of Kedron Park Road, Kedron	54,600	68,200	43,400	-36%	70,200	45,300	-35%	70,800	44,600	-37%	71,500	45,500	-36%
27	Lutwyche Road	North of Stoneleigh Street, Lutwyche	59,600	74,200	45,300	-39%	76,200	47,300	-38%	77,000	46,400	-40%	77,500	47,400	-39%
33	Lutwyche Road	South of Newmarket Road, Windsor	60,300	105,100	68,500	-35%	110,800	71,700	-35%	113,400	72,400	-36%	116,300	74,700	-36%
22	Sandgate Road	South of Junction Road, Clayfield	37,000	51,100	38,400	-25%	55,800	39,600	-29%	59,300	42,300	-29%	60,700	45,300	-25%
31	Sandgate Road	South of Bonney Avenue, Albion	35,900	57,300	43,000	-25%	62,700	45,100	-28%	67,400	47,500	-30%	71,000	51,500	-27%
18	Kedron Park Road	East of Lutwyche Road, Kedron	17,600	35,000	29,700	-15%	37,000	31,400	-15%	38,700	32,700	-16%	39,900	33,700	-16%
20	Rose Street	Melrose Park, Wooloowin	10,700	24,600	16,800	-32%	25,500	17,900	-30%	26,700	18,800	-30%	26,700	19,500	-27%
23	Junction Road	West of Sandgate Road, Clayfield	18,200	29,800	21,700	-27%	30,700	23,000	-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	19,000	-26%	27,500	20,800	-24%	28,100	21,400	-24%
15	Nudgee Road	North of E-W Arterial, Hendra	5,400	8,600	10,200	19%	10,200	12,600	24%	11,500	14,500	26%	12,800	15,500	21%
16	Nudgee Road	South of E-W Arterial, Hendra	24,600	21,800	17,800	-18%	22,200	19,100	-14%	23,900	20,700	-13%	25,600	21,300	-17%
36	Kingsford Smith Drive	East of Cooksley Street	65,600	73,500	66,900	-9%	76,500	71,000	-7%	77,200	73,900	-4%	78,000	75,900	-3%
37	Kingsford Smith Drive	East of Racecourse Road, Hamilton	54,900	71,000	64,800	-9%	74,300	69,100	-7%	75,300	72,300	-4%	76,400	74,500	-2%
7	South Pine Road	Kedron Brook, Everton Park	33,800	49,300	43,000	-13%	50,400	44,200	-12%	58,100	51,700	-11%	59,100	52,500	-11%
25	Enoggera Road	South of South Pine Road, Alderley	50,400	57,900	52,400	-10%	57,952	52,623	-9%	71,800	63,300	-12%	73,900	65,100	-12%
Suburban Roads															
32	Newmarket Road	West of Lutwyche Road,	17,600	33,900	25,500	-25%	36,900	27,400	-26%	39,400	30,200	-23%	41,900	32,200	-23%

Reference	Road	Location	2004	Average Weekday Traffic											
				2012			2016			2022			2026		
				Without AL+ NB	With AL +NB	% Change	Without AL+ NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change
		Windsor													
4	Hamilton Road	West of Sandgate Road, Wavell Heights	15,200	21,500	18,300	-15%	20,700	18,300	-12%	22,800	19,700	-14%	24,100	20,100	-17%
19	Kedron Park Road	South of Park Road, Wooloowin	7,300	11,800	13,200	12%	13,400	14,100	5%	13,700	14,500	6%	14,800	14,900	1%
29	Albion Road	East of Lutwyche Road, Windsor	15,100	19,900	15,600	-22%	21,800	17,900	-18%	23,100	19,400	-16%	23,700	20,700	-13%
30	Albion Road	At overpass, Albion	17,000	22,500	18,300	-19%	24,100	20,800	-14%	26,000	21,700	-17%	27,500	22,900	-17%
12	Shaw Road	Kedron Brook, Wooloowin	14,100	15,800	14,200	-10%	16,500	14,700	-11%	17,200	15,100	-12%	18,500	15,700	-15%
28	Chalk Street	West of Bridge Street, Wooloowin	10,700	14,400	14,600	1%	16,600	15,900	-4%	17,700	16,700	-6%	19,000	17,100	-10%
26	Maygar Street	West of Lutwyche Road, Windsor	8,300	8,100	7,200	-11%	9,100	8,000	-12%	9,900	9,300	-6%	10,600	9,800	-8%
9	Webster Road	South of Stafford Road	25,100	26,600	24,800	-7%	27,400	25,800	-6%	30,000	26,200	-13%	32,700	27,400	-16%
District Roads															
6	Edinburgh Castle Road	North of Leckie Road, Kedron	10,600	7,500	5,900	-21%	7,800	6,100	-22%	8,400	6,700	-20%	9,200	6,900	-25%
21	Dawson Street	North of Rose Street, Wooloowin	10,400	10,000	9,400	-6%	10,300	9,400	-9%	10,500	9,700	-8%	10,600	10,300	-3%
24	Dickson Street	North of Wride Street, Wooloowin	13,000	11,700	9,400	-20%	11,800	9,400	-20%	12,400	9,300	-25%	13,000	9,500	-27%

- **Table 21-6 Surface Traffic Changes within the Inner North Area - Comparison without and with the Project in Combination with Northern Busway**

Screenline	Average Weekday Traffic											
	2012			2016			2022			2026		
	Without AL + NB	With AL +NB	% Change	Without AL +NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change
Western	106,500	110,100	3%	112,900	116,900	4%	119,500	125,000	5%	123,700	129,100	4%
Central	81,600	68,600	-16%	87,300	73,900	-15%	91,400	76,300	-17%	94,200	78,700	-16%
Eastern	90,300	81,900	-9%	96,600	89,200	-8%	103,700	97,800	-6%	109,600	104,400	-5%
Northern	231,100	181,800	-21%	243,600	190,300	-22%	256,400	198,500	-23%	269,000	206,500	-23%
Screenline	**Commercial Vehicle Weekday Traffic**											
	2012			2016			2022			2026		
	Without AL + NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change	Without AL + NB	With AL +NB	% Change	Without AL+ NB	With AL +NB	% Change
Western	5,600	5,500	-2%	6,100	6,200	2%	6,300	6,300	0%	6,500	6,400	-2%
Central	5,300	4,300	-19%	5,800	4,600	-21%	5,400	3,700	-31%	5,200	3,500	-33%
Eastern	9,400	9,200	-2%	10,100	9,800	-3%	10,700	10,300	-4%	11,000	10,400	-5%
Northern	11,900	7,900	-34%	12,800	7,800	-39%	13,200	7,100	-46%	13,900	6,900	-50%

- **Table 21-7 Intersection Performance without and with Airport Link and Northern Busway – 2012 & 2022**

Intersection	Peak	2004 LOS	2012		2022	
			Without AL & NB	With AL & NB	Without AL & NB	With AL & NB
			LOS	LOS	LOS	LOS
Gympie Road/ Strathmore Street/ Castle Street	AM	B	A	A	A	A
	PM	C	A	A	A	B
Gympie Road/Sadlier Street	AM	-	B	C	B	C
	PM	-	B	B	A	C
Gympie Road/Stafford Road	AM	D	C	E	D	F
	PM	E	F	F	F	F
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	C
	PM	B	C	D	C	E
Lutwyche Road/ Kedron Park Road	AM	C	D	F	F	F
	PM	F	F	F	F	F
Lutwyche Road/ Norman Av/Norman Street	AM	A	A	B	C	D
	PM	A	B	B	C	D
Lutwyche Road/ Bradshaw Street	AM	D	C	B	C	B
	PM	B	C	A	F	A
Lutwyche Road/Chalk Street/Thistle Street	AM	E	E	A	F	B
	PM	B	C	B	E	B
Lutwyche Road/ Maygar Street	AM	C	B	B	C	C
	PM	D	F	B	F	B
Lutwyche Road/ Fosbery Street	AM	C	A	A	B	A
	PM	B	A	A	A	A
Lutwyche Road/Albion Road	AM	B	D	D	D	D
	PM	B	F	E	F	F
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	B	B	B
	PM	A	C	A	F	A
Lutwyche Road/ Newmarket Road	AM	D	E	F	F	F
	PM	C	F	D	F	F

Intersection	Peak	2004 LOS	2012		2022	
			Without AL & NB	With AL & NB	Without AL & NB	With AL & NB
			LOS	LOS	LOS	LOS
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	D	F	F
Bowen Bridge Road/ Butterfield Street	AM	E	D	B	E	C
	PM	D	F	C	F	D
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	E
	PM	B	F	C	F	C
Bowen Bridge Road/ Herston Road	AM	C	D	D	D	D
	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
Bowen Bridge Road/ Busway Access Ramp	AM	-	-	A	-	A
	PM	-	-	A	-	A
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	E	E	F
	PM	B	E	F	E	F
Brookes Street/Ann Street	AM	B	A	B	A	B
	PM	B	B	B	B	B
Campbell Street/ Mayne Road/Hamilton Place	AM	D	D	D	D	E
	PM	D	D	D	D	E
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/ Toombul Station (Parkland Street)/ Union Street/Grace Street	AM	C	C	C	F	E
	PM	D	E	E	F	F
Sandgate Road/Centro Toombul	AM	B	D	D	D	D
	PM	B	D	B	F	C
Sandgate Road/East-West Arterial Road	AM	F	F	F	F	F
	PM	E	F	E	F	F
Sandgate Road/	AM	F	F	F	F	F

Intersection	Peak	2004 LOS	2012		2022	
			Without AL & NB	With AL & NB	Without AL & NB	With AL & NB
			LOS	LOS	LOS	LOS
Junction Road	PM	E	F	F	F	F
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	D
	PM	A	F	E	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 (Albion Fiveways)	AM	F	E	B	F	C
	PM	D	F	F	F	F
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	B
	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/ Amy Street/Breakfast Creek Road	AM	B	D	C	F	C
	PM	B	F	D	D	F
Kingsford Smith Drive/ Cooksley Street	AM	F	B	B	C	B
	PM	F	F	D	F	F
Albion Road/ McLennan Street	AM	C	C	C	D	C
	PM	B	A	B	A	A
Albion Road/Hudson Road	AM	F	D	D	F	D
	PM	F	F	F	F	F
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	C	D	C

Table 21-8 Effects of Airport Link and Northern Busway Combined Scenario on Travel Times and Speeds for Key Routes

Route		Direction	Without AL		With AL and NB				AL and NB 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	9	57	13	35	6	40%	2	15%
C	Hendra to Fortitude Valley	Southbound	15	31	9	60	14	35	6	39%	2	11%
D	East Brisbane to Chermside	Northbound	19	33	12	51	17	36	7	36%	2	9%
E	Stafford to Hendra	Eastbound	13	35	9	49	12	39	4	32%	1	9%
F	Hendra to Milton	Southbound	20	34	14	52	19	36	6	30%	1	6%
2022												
A	Chermside to Fortitude Valley	Southbound	22	20	11	42	16	28	11	50%	6	29%
B	Nundah to Fortitude Valley	Southbound	19	24	10	54	14	33	9	47%	5	27%
C	Hendra to Fortitude Valley	Southbound	18	27	10	54	15	33	7	42%	3	18%
D	East Brisbane to Chermside	Northbound	23	26	15	39	20	30	8	33%	3	11%
E	Stafford to Hendra	Eastbound	19	24	11	38	15	31	7	40%	4	21%
F	Hendra to Milton	Southbound	22	30	15	46	20	32	7	31%	2	9%

Route		Direction	Without AL		With AL and NB				AL and NB 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	40%	6	26%
B	Fortitude Valley to Nundah	Northbound	22	21	14	39	18	26	8	38%	4	16%
C	Fortitude Valley to Hendra	Northbound	21	23	14	40	19	26	8	36%	2	12%
D	Chermside to East Brisbane	Southbound	23	27	14	45	19	34	9	40%	4	19%
E	Hendra to Stafford	Westbound	15	31	10	45	12	37	5	35%	2	16%
F	Milton to Hendra	Northbound	25	27	14	49	24	28	11	43%	1	4%
2022												
A	Fortitude Valley to Chermside	Northbound	30	15	17	26	21	21	13	43%	9	30%
B	Fortitude Valley to Nundah	Northbound	27	18	16	34	20	23	11	41%	6	24%
C	Fortitude Valley to Hendra	Northbound	25	19	16	35	21	23	10	39%	5	19%
D	Chermside to East Brisbane	Southbound	22	29	18	35	23	28	4	18%	-1	-4%
E	Hendra to Stafford	Westbound	24	19	10	42	17	27	14	57%	7	31%
F	Milton to Hendra	Northbound	30	22	16	44	26	26	14	46%	4	13%

Table Note: Route A 2022 PM peak time manually determined, considering 2012, 2016 and 2026 model results, to replace model time affected by local anomaly.

Local Access Effects

Some additional effects on local access will occur if the Northern Busway is implemented. The effect of both the Airport Link and Northern Busway on the various precincts has been assessed as follows:

- Kedron East Precinct - No additional effects with Busway
- Gordon Park Precinct - Suez Street would be closed off from Gympie Road due to the Busway. To provide local accessibility, a left-turn would be provided at Swan Street for movements from the south. Movements from the north are prevented in the intersection design for safety reasons. A right turn for buses only would be provided to Swan Street from Stafford Road via the signals. Left-turn out travel from Swan Street to Stafford Road would be provided for buses and local traffic. The expected bus use of Swan Street is very minor (anticipated to be a maximum of 3 services per hour in each direction by 2026). The proposed Busway service plans continue to direct almost all Stafford Road bus services via Richmond Street and Bradshaw Street to Lutwyche as per the current routes. These arrangements are not anticipated to encourage additional traffic use of the local streets such as Swan Street because traffic movements out of Swan Street at Stafford Road will be signal controlled, and will not offer significant travel time benefits compared to use of the major road network.
- Kedron West - No additional effects with Busway.
- Emergency Services - No additional effects with Busway
- Lutwyche Precinct - Perry Street will lose its connectivity to Lutwyche Road due to the Northern Busway alignment. Traffic will be able to satisfactorily use the new local street connecting to Norman Avenue.
- Southern Connection – To allow for the Busway connection to the road network at the Edgar Street/Northey Street intersection, Edgar Street will be closed to general traffic just east of its connection with Edmund Street. Local access for Edmund Street can be suitably gained via Allom Street. There will be a need to signalise the Victoria Street /Northey Street intersection to allow bus priority access to Northey Street in the Interim Busway scenario, which may cause a small inconvenience to users of Victoria Street due to additional delays.
- Effects on abutting precincts along Lutwyche Road - The introduction of the Northern Busway will have some effects along Lutwyche Road for both the Interim and Ultimate Busway scenarios. Whilst these involve quite major changes to current roadway arrangements in some sections, as described below, the design allows for suitable alternative arrangements for local access. Intersection performance under the revised traffic layout is assessed above. Key changes are summarised as follows:
  - Bradshaw Street on the eastern side of Lutwyche Road will be closed to through-traffic due to the Lutwyche Busway Station. This will result in a moderate impact for through traffic travelling between to/from the western section of Bradshaw Street (a district access road), which will need to divert to Chalk Street. However, the eastern side of Bradshaw Street is only a local road and it is preferable for such traffic to use Chalk Street which is a district access route.
  - Changes to the local network road network in the vicinity of Truro Street occur due to the Northern Busway. Changes directly occur on Lutwyche Road itself, as the section of Lutwyche Road between Stoneleigh Street and Albion Road is widened to provide two through lanes in each direction. Truro Street is converted to bus use with a one-way street provided for local access. Properties in Fosbery Street, Anna Street, Adie Street and Stoneleigh Street will need to travel via Albion Road to egress southbound.
  - Roblane Street is similarly converted for bus use with a one-way local street for local access.
  - Lutwyche Road between Albion Road and Constitution Road is modified to provide two through lanes in each direction around the western side of Memorial Park.

Bus Effects

The Northern Busway will fulfil a significant public transport task, comparable to the rail corridor and the South-East Busway. The overall benefits to bus users of the Northern Busway will be significant and an increase in bus patronage in the corridor is forecast due to the improved public transport services and the greater travel reliability, comfort, safety and convenience provided by a Busway system.

Implementation of the Northern Busway would incorporate busway stations at Kedron Brook, on the western side of Lutwyche Road and within the Lutwyche shopping and business precinct near Bradshaw Street. The affected bus stop locations with the Airport Link north-eastern connection would be replaced by the new high quality dedicated facilities. A major busway station would also be provided at the Royal Brisbane and Women's Hospital, a key travel generator in the corridor.

The Ultimate Busway, when implemented post 2020, would provide for high frequency, fast and reliable services on a completely off-road bus corridor between the Inner Northern Busway and Gympie Road north of Stafford Road. Additional high quality bus stations to those provided with the Interim Busway would be provided within the corridor at Federation Street, Windsor and Albion Road.

Pedestrian and Cyclist Effects

The implementation of the Northern Busway will have additional beneficial effects on pedestrians and cyclists are described below:

- North-western Connection - A new pedestrian/cycle bridge, providing a connection from Swan Street north of Kedron Brook, to Perry Street on the south, is proposed for the Northern Busway. This will further enhance the connectivity and accessibility of the Kedron Brook pedestrian/cycle path as well as providing convenient access to the proposed Kedron Brook Busway Station from the Gordon Park residential area.
- Lutwyche Road – a range of improvements associated with the proposed Busway will provide enhanced facilities for pedestrians and cyclists in the corridor. These include provision of cycle storage facilities at busway stations, design to ensure that stations are fully accessible for all people, and creation of safe, attractive environments for passengers though use of architecturally designed stations with 24-hour security and real-time electronic bus information. With the Ultimate Busway, a grade-separated pedestrian connection is proposed across Lutwyche Road linking between the Windsor Busway Station and the train station. This will improve general east-west pedestrian accessibility and provide good connectivity for passengers transferring between public transport modes.

Road Safety

The Bowen Bridge Road/Lutwyche Road/Gympie Road corridor between Herston and Kedron would experience significant additional safety benefits with the inclusion of public transport initiatives and further reduction of surface traffic. An increase in crash reduction in 2012 from 18% (AL only) to 28% (combined AL and Northern Busway) is estimated, increasing to 21% and 29% respectively in 2022. The Lutwyche Road section of the corridor has the greatest additional benefits, where overall accident reduction reaches 60% with Northern Busway.

In other areas, there are only minor differences in expected crash effects in the combined Project scenario compared to the Airport Link only case.

21.2.2 Traffic and Transport Effects with the North-South Bypass Tunnel

Traffic and transport effects of the Airport Link, with the NSBT in operation, are addressed in Chapter 5 of the EIS. The NSBT is an integral part of the "Do-minimum" (without the Airport Link Project) modelling for the Airport Link Project, i.e. the model assumes that NSBT is fully operational by 2012. From a traffic and transport standpoint, Airport Link will expand the road network (including the NSBT) which allows cross-city travel movements to bypass the Brisbane Central Business District (CBD) and inner suburbs.

Airport Link provides extension to the cross-river linkage provided by the NSBT to the middle orbital road within the Brisbane network, formed by the East-West Arterial route. 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 Brisbane Airport and ATC North region.

Airport Link also provides enhanced connection to the intra-state road network. The two projects in combination will provide linkage to other motorway standard connections and cater for long distance movements between locations external to South East Queensland and major economic activity areas. They will provide connection alternatives to the Gateway Motorway for the ATC precinct from southern and western areas, via the Airport Link, NSBT, and the Pacific Motorway, or via the Airport Link, NSBT and the Ipswich Motorway.

Airport Link, in its current reference configuration will require the following for connections with the NSBT:

- Widening of the NSBT to Lutwyche Road bridge, to accommodate the connection to NSBT;
- Addition of a second tier above the ICB to Lutwyche Road bridge to carry the O'Connell Terrace and Campbell Street to Airport Link Tunnel ramps; and
- Widening of the Lutwyche Road to ICB bridge to provide for connections from Airport Link to ICB, O'Connell Terrace and Campbell Street.

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.

NSBT will be under construction during the proposed commencement of the Airport Link Project with a potential construction overlap period of some two years between 2008 and 2010. Airport Link, if proceeded with would continue the construction period beyond the NSBT for a further two years to 2012. This could effectively mean that the Bowen Hills / Windsor area will be subject to extensive construction works for six years between 2006 and 2012. The significance of this impact is difficult to measure and will be managed by detailed construction programs. There is also the potential for beneficial synergies between the projects to minimise the overall impact of the projects that would be apparent if they proceeded separately rather than together.

Cumulative effects of these major road projects, having their construction periods overlapping for a considerable period, may be identified in several areas, including:

- Road Traffic Management. Temporary changes to the local road network, both for the full construction period and for shorter periods, are very likely to form part of the detailed construction plans to be formulated in the detailed design phase for each project. Coordination of such changes will be critical to maintaining functionality of the local road network. Arrangements for occasions when major public attendance is expected at the RNA Showgrounds or at Ballymore Oval will be particularly important.

- Construction Traffic Management. Each project involves transport to the respective worksites of large volumes of construction materials including steel and concrete elements for bridge structures and large machinery for excavation works and transport from each site of large volumes of earth for placement elsewhere. Planning for the removal of Airport Link spoil involves large numbers of trucks entering and leaving the construction sites 24 hours a day for 5 and one half days per week. Careful coordination will be required to enable continuity of this process in conjunction with normal private and business transport expectations in the vicinity.

  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 Airport Link 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.
- Close proximity of the Royal Brisbane Hospital which requires clear and direct access for ambulances and other emergency vehicles will require maintenance of certain routes through the general area.

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

21.2.3 Traffic and Transport Effects with Gateway Upgrade Project

Two other key road projects that have been incorporated within future traffic and transport modelling network scenarios are:

- The Gateway Upgrade Project - 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.

Traffic modelling for the do minimum scenario (without Airport Link Project) but incorporating the planned GUP and Brisbane Airport Northern Access is influenced by the significance of growth in travel demand in the ATC area without the Project. 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. This will place significant pressure on the already congested East-West Arterial/Nudgee Road signalised intersection. High congestion is forecast at the East-West Arterial/Sandgate Road intersection as well as on several approaches to the Nudgee Road intersection and the Gateway Motorway roundabout.

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. Traffic demand through both intersections following the completion of 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 that the performance of the roundabout would be significantly worse than current operations.

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 4% in the AM peak and 5% in the PM peak to volumes at roundabout. Equally however, it redistributes the traffic pressures through the intersections. There are lower demands on the Nudgee Road south approach and a reduction in demand for movements between the East-West Arterial and the Gateway Motorway south. East-west through demands, however, are increased. Overall intersection performance is forecast to improve slightly in the AM peak, and reduce slightly in the PM peak, with some queuing pressures reduced.

Without intersection improvements however, conditions at both intersections would continue to degrade, worsening significantly in terms of queuing and delay. While the Airport Link Project itself does not trigger the need for this improvement it would certainly benefit from a coordinated approach to fixing the problem generated by the range of development activities within the ATC North area.

A comprehensive investigation is required that explores 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.

21.2.4 Conclusion

A comprehensive approach to construction traffic management is required given the wide range and significance of major road and public transport projects within and surrounding the Airport Link Project corridor. A construction management strategy is recommended to include establishment of a co-ordination committee comprising the Department of Main Roads, Queensland Transport, the Coordinator General, and the Brisbane City Council, to manage effects on the transportation network arising from the delivery of major projects in northern Brisbane, including the NSBT Project, the Airport Link Project, the Northern Busway Project and the Gateway Upgrade Project. The function of such a coordination group would be to address the coordination and management of construction traffic and transport network performance during the construction phase.

21.3 Environmental Effects

21.3.1 Soils and Surface Water Quality

Potential impacts from soils including sedimentation and runoff from erodible soils and runoff from acid sulphate or contaminated soils exposed during construction works, are identified in **Chapter 6**. Surrounding

receiving waters such as Enoggera Creek or Kedron Brook are already subject to runoff from other developments in their catchments. The relative potential contribution from Airport Link and its synergistic or cumulative effects in combination with numerous developments within the catchment is considered negligible in the context of the existing water quality and the mitigation measures to be applied through the environmental management process to the project.

The assessment undertaken for the impacts of discharges from the project to the receiving waters showed that the very low volumes and loads from discharges would be adequately diluted within the river. Resultant concentrations in the river would be no higher than at present and cumulative impacts, even if they occur, would be unlikely to contribute significantly to any further deterioration of the water quality.

Mitigation measures for maintaining surface water quality on the project are outlined in Chapters 6 and 8. Mitigation measures for cumulative impacts from this and other projects relate to maintaining appropriate water quality management on new and existing projects within the relevant catchment areas. Provision of advanced water quality controls in new project design (versus the lack of controls on existing roads which would carry similar future traffic volumes as the proposed tunnels) should provide a small, unquantified cumulative benefit to receiving water quality.

21.3.2 Flooding

The additional structures of Airport Link over Enoggera Creek have the potential to provide for increases in flood levels. Given the height of the proposed connections in linking with existing networks and the requirement for 10,000-year ARI flood immunity, the decks of new bridges will be above the existing 100-year ARI flood levels. The main potential impact for the additional structure will be attributable to approach embankments that can impede existing flow paths and the additional piers in the waterway providing for additional headloss. In order to minimise hydraulic impact of structures the following design considerations have been recommended:

- Minimise the use of embankment
- Preferred construction on piers within floodplain
- Minimise number of piers

It is also recommended that the design of additional pier configurations within the floodplain be investigated.

At the north-western connection, existing pavement levels are above 100 year ARI and below 10,000 year ARI flood event water level predictions. Given the tunnel flood immunity requirements (10,000 yr ARI) and the geometry of the surface connections in this location, the existing Kedron Brook bridge proposed to be used for the Northern Busway, would need to be replaced to achieve this immunity. The replacement bridge and new bridges for the Airport Link would require increased underflow area and higher soffit levels than the existing bridge. The replacement bridges would be designed to convey the entire 10,000 year ARI discharge without overtopping.

After construction of the Northern Busway and the Airport Link works, and under a 100 year ARI design event, peak water levels upstream and downstream of the works would be no worse than for existing conditions.

21.3.3 Groundwater

Tunnelling for the Airport Link Project may be constructed concurrently with cut and cover tunnels of Section 4 and 5 of the Interim Northern Busway and well in advance of tunnelling required for the Ultimate Northern Busway. The Northern Busway runs almost along the same alignment as the Airport Link Project from

Enoggera Creek to Stafford Road. At Stafford Road, the Northern Busway crosses Kedron Brook in a north-western direction. Generally the tunnel structures of the Ultimate Northern Busway are overlaying the Airport Link Project tunnels. As a consequence of the Airport Link, the proposed Ultimate Northern Busway tunnels will likely require less dewatering and any additional impact on regional groundwater drawdown is unlikely to take place.

The modelling results suggest that dewatering requirements during construction of Sections 2 and 3 of the Ultimate Northern Busway tunnels along Lutwyche Road are quite low due to the groundwater drawdown caused by the Airport Link Project.

Additional groundwater drawdown for the Northern Busway Section 4 is only expected north-west of Kedron Brook, where the model predicts a local drawdown of less than 3m as the result of the construction of a cut and cover tunnel for the Northern Busway.

21.3.4 Air Quality

Technical study of the existing air quality in the study corridor and modelling of the effects of constructing the Airport Link tunnels and roadways were described in Chapter 9. As well as assessing discharges of key pollutants from the ventilation outlets, project contribution to changes in local and regional air quality were considered in terms of existing and predicted (future) background levels. The major contribution to existing air quality is from motor vehicles, and any future contributions to the regional air quality would be from changes in motor vehicle emissions. The study is therefore, effectively, a cumulative assessment report on the impacts of the proposed tunnel in the context of other air quality impacts caused by changes in motor vehicle emissions.

The cumulative impacts of the project with the Northern Busway were assessed by examining the differences in the traffic forecasting for the Airport Link with and without the Northern Busway operating. The average daily traffic volumes (AADT) on major roads were calculated for the two options and the results showed that most road sections were predicted to experience very little change in traffic volume as a result of the busway (±5%), and as a consequence, little change in air quality.

Table 21-9 shows the traffic projections for the AL Project with the NB. The difference between these numbers and the “AL without the NB” is shown as a percentage.

- **Table 21-9: Average Daily Traffic Volumes on major roads for the Airport Link with the Northern Busway**

Road section	AADT for Airport Link with NB			Percentage difference from the Airport Link without NB scenario		
	2012	2016	2026	2012	2016	2026
Tunnel: N/B, south of Gympie Rd	34885	38349	44480	4%	2%	3%
Tunnel: S/B, south of Gympie Rd	35623	38239	45282	3%	3%	3%
Bradfield HWY	85400	87920	95690	0%	0%	0%
Brunswick St	29320	30660	31960	-5%	-5%	-5%
Bowen Br Rd	46920	50430	55870	-6%	-5%	-5%
Lutwyche/Gympie Road	83210	87820	97120	-8%	-7%	-6%
Gympie Rd	87640	91420	98380	-4%	-3%	-1%
Pacific MWY	113940	116680	118600	0%	0%	0%
Hale St	99720	102970	109030	0%	0%	0%
ICB	96080	99430	106090	-2%	-1%	0%
ICB Nth	55080	58180	59980	1%	1%	1%
Abbotsford Rd N ICB	52350	54110	60290	4%	4%	5%
Sandgate Rd S	30300	31100	35250	1%	1%	0%
Sandgate Rd N	50520	50320	55290	0%	0%	1%
Kingsford Smith DR W	62370	66250	70950	0%	0%	0%
Kingsford Smith DR M	53310	62720	81540	0%	0%	0%
Kingsford Smith DR E	44670	50970	72090	0%	0%	0%
Gateway MWY S Lytton	113200	129830	154960	0%	0%	0%
Gateway MWY N Lytton	141770	162730	203370	0%	0%	0%
Gateway MWY N Curtin	65940	78360	101420	0%	1%	0%
Gateway MWY N KingsSmth	65940	78360	101420	0%	1%	0%
Gateway MWY N Airport Dr	52360	61390	86090	0%	1%	0%
Junction / Lytton Rd	26160	26920	31220	1%	0%	0%
Lytton Rd E MWY	22490	23890	26570	0%	0%	-1%
Port of Bris MWY	35940	39370	46980	0%	0%	0%
Creek Rd	26050	29100	33270	0%	-1%	0%
Grey St	41580	41330	47100	0%	0%	-1%
Countess / Petrie	46400	47110	54890	0%	-1%	1%
Kelvin Gr Rd	27040	27330	28760	0%	1%	1%
Kelvin Gr Rd S Newmarket	52200	52140	60940	3%	3%	1%
Enoggera	49170	49360	61050	3%	2%	1%
Samford Rd E Wardell	36490	36590	27950	-1%	0%	-2%
Samford Rd W Wardell	38080	39530	43590	0%	0%	0%
MiltonRd	64590	66680	72530	0%	0%	-1%
Waterworks / Musgrave	24980	25810	28460	3%	0%	3%
Wardell S Samford	41940	43740	47500	3%	0%	2%
Wardell N Samford	40170	41310	49100	2%	1%	0%
South Pine	43210	44740	51970	2%	1%	0%
Stafford Rd E Sth Pine	21710	22720	24730	0%	1%	-6%

Road section	AADT for Airport Link with NB			Percentage difference from the Airport Link without NB scenario		
	2012	2016	2026	2012	2016	2026
Stafford Rd E Webster	35950	37550	40440	0%	0%	0%
Webster S Stafford	25000	25920	27360	4%	5%	5%
Webster N Stafford	20700	20830	23860	2%	2%	4%
Rode Rd W Webster	28860	32220	33100	0%	0%	-2%
Rode Rd E Webster	25190	25480	26940	-1%	-1%	-1%
Rode Rd E Gympie	22480	22300	25180	1%	0%	1%
Newmarket Rd	29050	30680	35510	1%	1%	0%
Herston Rd	17030	18460	20460	0%	1%	0%
Markwell Tce	21200	23430	27140	5%	4%	6%
Breakfast Ck Rd	36340	37450	44340	0%	0%	0%
Gateway MWY S KS	75840	84380	101970	0%	0%	-1%
Gateway MWY N KS	67640	75540	89990	0%	1%	-1%
Gateway MWY N Arterial	48580	52890	69840	0%	-1%	-1%
Gateway MWY N Toombul	25970	26180	35330	1%	-1%	-2%
EW Arterial	70100	73930	79360	0%	0%	0%
Airport Dr E MWY	71240	80320	108340	0%	0%	-1%
Airport DrS E Gateway Ext	29480	38880	54470	0%	0%	0%
Airport DrN E Gateway Ext	62990	79870	126730	0%	0%	0%
Toombul Rd	29970	35930	43010	0%	0%	0%
Lutwyche Rd N Maygar	42340	44190	44260	-15%	-17%	-25%

Similar to the traffic modelling for the “do Minimum” scenario (without the Airport Link Project) for the traffic modelling, the dispersion modelling has also considered emissions from the northern ventilation outlet of the approved NSBT to enable the perceived cumulative impact of ventilation outlets in the Bowen Hills / Windsor area to be addressed.

Since the NSBT EIS, the traffic volumes in the tunnel have also been revised following modifications to the projection models. Also, there was a refinement to the northern vent location and accompanying ventilation outlet height. The air quality dispersion modelling includes emissions from the NSBT northern ventilation outlet. The key changes which affect model input data are outlined in **Table 21-10**.

Table 21-10: Revisions to NSBT following EIS

ITEM	NSBT EIS value	Current value (Airport Link Traffic Model)
NSBT northbound daily traffic in 2011 (AADT)	26,139	31,500 (2012)
NSBT northbound daily traffic in 2016 (AADT)	38,659	34,200 (2016)
NSBT northbound daily traffic in 2021 (AADT)	30,179	36,300 (2026)
Northern ventilation outlet location (AMG, m)	503180, 6963900	503038, 6963872
Northern ventilation outlet height (m)	30	36

Emissions from the NSBT northern ventilation outlet have been scaled from the NSBT EIS estimates according to the Airport Link traffic model modifications to AADT in the northbound tunnel. Accordingly the impact from the Southern ventilation station of the Airport Link in conjunction with the NSBT, is reported in Chapter 9 as

there is no cumulative effect – rather there is the impact of Airport Link on the environment at the time which includes the operation of the NSBT.

21.3.5 Noise and Vibration

The Airport Link Project impacts associated with noise and vibration were described in Chapter 10. Traffic modelling used in Chapter 10 incorporates the operation of the NSBT in the Do-Minimum traffic scenario.

The modelling of noise impacts from both the Airport Link and the Northern Busway being constructed together have been undertaken and reported in Technical Report No 6–Noise and Vibration in Volume 3 of the EIS where mitigation measures are proposed to deal with the cumulative effect of both projects where necessary.

No cumulative impacts are anticipated with the Northern Busway Section 1, 2 and 3. There will be some increased impacts associated with the potential joint construction of both projects in Sections 4 and 5 of the Northern Busway. Potentially the most significant noise issues with joint construction of both projects would be at the Gympie Road west worksite. At the adjoining residences adjacent to the site (on the western side), the noise from daytime earthworks and associated plant items are likely to significantly exceed the design goal without appropriate noise mitigation. The following mitigation measures have been recommended for the Airport Link and would similarly apply to any cumulative impact from construction of both projects in this area, guided by the 'reasonable' noise objectives for construction noise:-

- Construction of noise screens along the eastern boundary of the construction site north of Kedron Brook, where direct access to Gympie Road is not required, to reduce construction noise on the eastern side of Gympie Road due to elevated structure construction.
- Construction of noise screens along the western boundary of the construction site south of Kedron Brook, where direct access to Lutwyche Road is not required, to reduce construction noise on the western side of Lutwyche Road due to cut and cover construction
- Advance notification of the time and duration of earthworks.
- If required, assist owners of properties along Gympie Road and Lutwyche Road to temporarily upgrade the acoustical insulation and ventilation of rooms facing the worksite to address noise during both road widening/regrading and trough excavation.
- Advance notification of night roadworks.

From the noise and vibration analysis undertaken for the Airport Link it is shown that spoil traffic would generally not increase average traffic noise levels on spoil routes by more than 0.5 dBA for significant road corridors excluding O'Connell Terrace and Montpelier Road where the predicted increases are 1.6 and 1.1 dBA respectively. It is generally recognised in acoustics that changes in noise levels of 2 dBA or less are undetectable to the human ear and therefore negligible.

For the assessment of typical construction truck volumes, the night-time hourly spoil truck frequencies for the Airport Link have been assessed in **Table 21-11**.

It should be noted that this analysis takes into account the anticipated heavy vehicle traffic due to construction spoil haulage for the NSBT in the "existing" scenario. Any incremental noise impacts from construction spoil haulage associated with the Airport Link Project are then determined by calculating the change that the additional Airport Link traffic would cause to the "existing" noise levels (existing traffic plus NSBT spoil haulage traffic).

- **Table 21-11: Effect of Construction Truck Movements on Traffic Noise Levels along Spoil Routes - LA10(1hour) (2am – 3am)**

Roadway	Road Section	Change in LA10(1hour) Traffic Noise Level (dBA)
Lutwyche Rd	Norman St - Kedron Park Rd	+ 1.4
Bowen Bridge Rd	Site - O'Connell Tce	+ 1.2
O'Connell Tce	Bowen Bridge Rd - Hamilton Rd	+ 2.2
Montpelier Rd	Abbotsford Rd - Breakfast Creek Rd	+ 1.7
Breakfast Creek Rd	Montpelier Rd - ICB	+ 1.3
Kingsford Smith Drv	ICB - Crescent Rd	+ 1.3
	Crescent Rd - Riverview Tce	+ 1.3
	Racecourse Rd – Nudgee Rd	+ 1.0
	Nudgee Rd - Woonah Ave	+ 1.2
	Woonah Ave - Gateway Mwy	+ 1.4
East-west Arterial	Sandgate Rd - Widdop Rd	+ 0.0
	Widdop Rd - Gateway Mwy	+ 0.0

The changes in noise level documented in **Table 21-11** is in addition to the changes in noise levels attributable to the NSBT Project and would therefore have a cumulative effect for residences when compared to the traffic currently using these roads (prior to either project). The absolute maximum noise levels associated with vehicle pass-bys would not be altered by spoil removal, however, the frequency of such events would increase.

It is concluded that spoil traffic associated with the Airport Link project would not significantly change noise impacts on the noise environment of residential locations along the spoil routes that have been evaluated.

Operational impacts are generally related to changed noise levels along major roads.

For the properties south of Enoggera Creek in the vicinity of Campbell, Wren and Tufton Streets, there is no noticeable change in the noise environment (as reported with the Airport Link Project in Chapter 10) as a result of the Interim Busway phase of the project in 2022. For properties along Lutwyche Road, the introduction of the Interim Northern Busway results in a decrease in the noise environment of less than 1 dBA on either side of the roadway. Such decreases are of marginal impact and the noise barrier requirements resemble the barriers presented for the Airport Link project in Chapter 10. The very marginal impact from the Ultimate busway and the small change in traffic growth between 2022 and 2026, results in no change to the noise barrier requirements from the Ultimate Northern Busway. Regarding the existing NSBT barriers north of Federation Street, it is assumed that these will be in place as part of the NSBT project. All barriers adjacent Lutwyche Road, south of Federation Street, are assumed to be demolished as the busway lanes coincides with their location.

For properties along Lutwyche Road, south of Kedron Park Road, the introduction of the Interim Northern Busway results in only a marginal change in the noise environment of ± 2 dBA on either side of the roadway. Such increases are of marginal impacts. The Interim Northern Busway does not result in any significant change in the overall levels of traffic noise for the residential properties along Gympie Road, south of Somerset Street. Whilst the Interim Northern Busway does not increase the levels, they remain significantly above the 68 dBA criteria in this location. The barrier design required to achieve the appropriate 63/68 dBA LA10(18hour) criterion at residential properties adjacent to the roadworks is somewhat similar to the barrier design presented in for the Airport Link Project on its own though local conditions have acted to change the heights and locations of the barriers in some areas to accommodate the Busway. There is no change with the Ultimate Busway.

The introduction of the Interim Northern Busway has a very negligible influence (less that 0.1 dBA difference) on the road traffic noise levels in the section of the project due to changes in the traffic volumes at Sandgate Road. Therefore, the noise barrier designs for the Status Quo and 63/68 dBA LA10(18hour) scenarios without the Busway are also applicable (without any adjustments) for the Airport Link with both the Interim and Ultimate Northern Busway scenarios.

For the years 2022 and 2026, the introduction of the Airport Link is predicted to result in a small change in the levels of road traffic noise on the wider road network. Generally noise levels decrease, but at a number of locations the noise levels are predicted to increase. **Table 21-11** presents a summary of the highest and lowest changes across the wider road network without and with the Northern Busway. The expected changes in the traffic noise as a result of the introduction of the Airport Link and Busway projects are considered to be minor and not be generally noticeable.

Table 21-11: Summary of Changes in Traffic Noise Levels

	Comparison of Do Minimum to Airport Link - No Busway ($L_{A10(18hour)}$)		Comparison of Do Minimum to Airport Link - with Busway ($L_{A10(18hour)}$)	
	Highest Increase	Highest Decrease	Highest Increase	Highest Decrease
2022	+1.7	-2.2	1.8	-2.7
2026	+1.9	-2.0	1.9	-2.1

21.3.6 Flora and Fauna

Among the potential cumulative impacts associated with the biophysical environment are impacts on the mangroves associated with new or extended crossings of Enoggera Creek. The aggregate loss of mangroves in Enoggera Creek from NSBT, Airport Link and the Northern Busway is not considered significant in relation to the general extent of mangroves existing along Enoggera Creek and their inevitable return to areas disturbed by construction in due time.

The bridges will allow construction without removing existing mangroves, though some pruning may be required. Piles will be located to avoid disturbance to the mangroves on both banks of Enoggera Creek. Cumulative impacts on the mangroves will be limited to pruning and trimming of mangroves to accommodate bridge construction, site access and movement and shading of mangroves in the area under and adjacent to the new bridge structures.

Pruning may result in some loss of habitat for fauna using the fringing mangroves, however this will be only a short-term minimal disruption, and is unlikely to lead to a reduction in species diversity or abundance. Following the construction of the bridges, the mangroves will regenerate in the disturbed areas, under the existing conditions at the site.

A full marine plant survey will need to be undertaken prior to construction together with a marine plant removal permit. Although Enoggera Creek is not part of a Fish Habitat Area, marine plants have important habitat value and minimal disturbance is required.

21.3.7 Urban Design and Visual

The potential cumulative impacts of Airport Link in association with the NSBT and the Northern Busway are considered to be at the connections at Bowen Hills/Windsor and Kedron.

Bowen Hills / Windsor

The Northern Busway project proposes a busway station at the intersection of Federation Street and Lutwyche Road. The station has the potential to contribute positively to the proposed mitigation measures by adding to the viability of this developable portion. The station will enhance the active street edge required for healthy urban centres. It will connect the surrounding neighbourhood to other areas and has the potential to create a vibrant urban character in the area through the recognised branding of the busway.

The NSBT Project includes flyover structures across Enoggera Creek and other elevated roadways at Bowen Hills. Airport Link adds some significant additional structures to the area already affected by the NSBT works, primarily east of the railway line associated with the Campbell Street ramps, and also the connections to O'Connell Terrace.

Connectivity for east-west movements through Bowen Hills will be made more difficult for pedestrians and cyclists where proposed roads and ramps from the Airport Link Project and the NSBT Project impact on existing road and open space networks. The Northern Busway Station at the Royal Brisbane Womens Hospital will provide a significant pedestrian attractor in this area and safe access will be required between this station and the rail station at Bowen Hills. In Windsor, pedestrian and cycle connectivity with Bowen Hills will be maintained through connections with linkages to be provided as part of the NSBT Project.

The urban character of Bowen Hills, between Enoggera Creek and O'Connell Terrace, will be further affected by road infrastructure, taking into account the likely impact of implementation of the NSBT Project. The additional road infrastructure will create remnant spaces which require landscape treatments and on-going maintenance, but which will not have any utility.

Kedron

The Northern Busway project proposes a busway station at the south-western side of Kedron Brook at Lutwyche Road. The location of this bus station does create some additional impact for the Airport Link project through the loss of green space and potential for landscaping this significant residential / roadwork edge west of Lutwyche Road. The station does however offer the potential for some structural demarcation between the residential area and the roadworks within this area.

21.4 Social and Economic Effects

Several major economic growth centres (Brisbane Airport, Australia TradeCoast, Port of Brisbane, Centro Toombul, Westfield Chermside), are projected as important future employment generators benefiting from improved access through Airport Link. Airport Link is expected to have a positive cumulative effect on employment during the construction phase and beyond and is also projected to contribute to raising property values through the study corridor and surrounding areas.

Identified social impacts included changes to amenity during construction in the vicinity of the southern connection, especially if NSBT and the Northern Busway proceed at the same time. Construction of some sections of the Northern Busway at the same time as Airport Link will enlarge the worksite at the northwestern connection and will require changes to pedestrian connectivity in the vicinity. Changes of access to social infrastructure facilities may also be necessary during construction but on completion of construction access would likely be returned close to its original form or enhanced as appropriate.

Economic activity in the Brisbane metropolitan area is forecast to continue to expand with Brisbane Airport, the Port of Brisbane and other major commercial and industrial development in the outer North area likely to be a catalyst for substantial economic growth.

In particular, total revenue passenger movements of Brisbane Airport have increased from 9.2 million in 1995 / 96 to 15.4 million in 2004 / 05 at an average annual growth rate of 6.7%. This increase in passenger movements at Brisbane Airport over the past decade has placed heightened pressure on the road network that feeds into the airport from the Brisbane CBD and the broader Brisbane metropolitan area. The continued implementation of the Brisbane Airport 2003 Master Plan and the ongoing development of the seven master planned aviation, commercial and industrial precincts will also be a significant generator of additional traffic and employment.

The Port of Brisbane has experienced significant trade growth over the past decade which is forecast to continue in the medium to long term. The port is Australia's third largest container port and growth in container segment has increased from 249,438 containers in 1995 / 96 to 726,145 containers in 2004 / 05. Total container volumes are projected to reach around 1.9 million in 2025.

The Australia Trade Coast including Trade Coast Central and the Outer North, Outer South and Outer West areas will also be the location for future significant industrial and commercial development that will continue to fuel economic activity and economic growth in the broader Brisbane region.

The proposed increase in the region's and Brisbane's population and the projected expansion of economic activity has increased the need for new road infrastructure such as the Airport Link to support the projected growth. The Airport Link, NSBT and the proposed Northern Busway all aim to provide greater road network capacity, reduce congestion, facilitate cross-city travel, particularly to and from the Australia TradeCoast and improve the public transport system. The Airport Link Project, in conjunction with other traffic and transport initiatives will be a key influence on the future pattern and rate of economic development in the region and in Brisbane.