Gateway Upgrade Project

EIS

Supplementary Environmental Impact Statement

Queensland Government
Department of Main Roads

Australian Government
Department of Transport and Regional Services

Connell Wagner

March 2005

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Gateway Upgrade Project Supplementary Environmental Impact Statement

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Summary of GUP EIS Submissions

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1. Introduction

The Gateway Upgrade Project (GUP) Environmental Impact Statement (EIS) was completed by Connell Wagner in mid August 2004. The EIS was on public display between 23 August 2004 and 4 October 2004. During the public display period 16 advisory agency submissions, one industry submission, two submissions from community groups and three submissions from members of the public were received by the Department of State Development and Innovation (DSDI). Submissions were received from the following:

Advisory Agencies

- Brisbane Airport Corporation;
- Brisbane City Council;
- Department of Aboriginal and Torres Strait Islander Policy;
- Department of Communities;
- Department of Emergency Services;
- Department of Employment and Training;
- Department of Housing;
- Department of Local Government, Sports and Recreation;
- Department of Primary Industries and Fisheries;
- Environmental Protection Agency;
- Natural Resources, Mines and Energy;
- Port of Brisbane Corporation;
- Powerlink Queensland;
- Queensland Health;
- Queensland Transport (including Queensland Rail); and
- Sport and Recreation Queensland.

Industry

- New Products Development.

Community Groups

- Bicycle Queensland Inc; and
- Public Transport Alliance.

Public

- Mr Greg Sim;
- Mr A de Smidt; and
- Mr Malcolm Wade.

The Department of State Development and Innovation assessed all the EIS submissions and notified Main Roads which issues required additional information. Table 1.1 summarises the main issues raised by each submission and outlines the relevant Supplementary EIS section which responds to these issues. The response to other issues raised in submissions is contained in Appendix A.

The format of the Supplementary EIS corresponds to each of the environmental sections as presented in the EIS, with Main Roads' response to submission issues provided under the relevant environmental area.

Table 1.1 Summary of Main Issues Raised in EIS Submissions

Name	Main Issued Raised	Supplementary EIS Response
Brisbane Airport Corporation (BAC)	• Construction access to BAC land; • Contaminate site remediation; • Stormwater discharge into airport drains; • Retention of tidal flushing to airport drains; • Land resumption and corridor tenure; • Impact on water truck main and high voltage line; • Groundwater and acid sulphate soil management; • Noise management; and • Construction Environmental Management Plan (EMP).	All issues addressed in GUP Draft Major Development Plan (MDP) and via further consultation and negotiation between Main Roads and BAC.
Brisbane City Council (BCC)	• Projections from the Office of Urban Management to be considered throughout the analysis;	Refer Section 5.1
	• Reliability of generalised cost as the main method for forecasting toll care;	Refer Section 5.2
	• Responsibility for upgrading interchange intersections;	Refer Section 5.3
	• Project impact on local road network;	Refer Section 5.4
	• Provision of cycleways as part of project;	Refer Section 6.1
	• Obstruction to east west fauna movement;	Refer Section 16.1
	• Provision of additional fauna movement structures such as poles for gliders; and	Refer Section 16.1.3
	• Consequences of the project on Grass Owl and Swamp Harrier that utilise the Kedron Brook floodplain.	Refer Section 16.3

Name	Main Issued Raised	Supplementary EIS Response
Department of Emergency Services	• Earthquake immunity of the project.	Refer Section 21.2
Department of Housing	• No provision for noise monitoring after construction of noise barriers.	Refer Section 15.4
Environmental Protection Agency	• Reduce the risk of injury and death to koalas from the project; • Area of vegetation loss in Koala Coast Area; • Project compliance with State Coastal Management Plan 2002; • Acid Sulphate Soils (ASS) investigation must be undertaken; and • Groundwater monitoring program needs to be further defined.	Refer Sections 16.1.2, 16.2 and 23.4.11 Refer Section 8.2 Refer Section 8.3 and Appendix B Refer Section 10.1 Refer Section 13.1
Department of Natural Resources and Mines	• Full ASS investigation required; and • Preparation and approval of Cultural Heritage Management Plan (CHMP) under the *Aboriginal Cultural Heritage Act 2003.*	Refer Section 10.1 Refer Section 18.1
Powerlink Queensland	• Address potential impacts on Powerlink's existing and planned infrastructure.	Refer Section 7.1
Queensland Health	• Potential light impacts on the affected community; • Use of National Environment Protection Measure (NEPM) standard in assessment of dust levels; • Clarify PM_{10} column in Table 14.6 of EIS; and • Vibration sensitive health care equipment or instruments maybe located adjacent to project.	Refer Section 19.1 Refer Section 14.1 Refer Section 14.2 Refer Section 15.5

Name	Main Issued Raised	Supplementary EIS Response
Queensland Transport	• Navigational issues in Brisbane River associated with new Gateway Bridge; • All proposed developments included in traffic modelling; • Proposed Gateway Bridge penetrates Obstacle Limitation Surface; • Traffic operation and flows on GUP; and • Pedestrian and cycle facility should be designed to cater for the passage of emergency vehicles.	Refer Section 3.4 Refer Section 5.1 Issue addressed in GUP Draft MDP Refer Section 3.3 Refer Section 6.2
Queensland Rail	• Impact of GUP on modal shift to rail, particularly to the Port of Brisbane.	Refer Section 5.5
New Product Development (NPD)	• Acoustic impact of rapidly growing traffic flow on the GUP in close proximity to the NPD site; • Acoustic impact of heavy vehicle movement and earth moving equipment during construction; • Vibration impact of heavy vehicle movement and earth moving equipment during construction; • Deterioration in air quality caused by increased traffic flows closer to the site and contamination risk; • Dust generation during construction requiring sophisticated filtering and cleaning; • Traffic impact: change in vehicle access onto the NPD site caused by the shortening of Fison Avenue; • Increase in heavy construction traffic accessing the GUP site along Fison Avenue East;	The Supplementary EIS responses to these issues are commercial in confidence for the NPD operation and have been addressed in a standalone report prepared by Connell Wagner. The report forms part of Supplementary EIS process.

Name	Main Issued Raised	Supplementary EIS Response
	• Loss of off street parking for staff as a result of the shortening of Fison Avenue East; • Potential temporary loss of site utilities (planned and accidental) during the construction of the GUP; • Loss of access to Percival Park located adjacent NPD and currently providing staff amenity; • Risk of incidental need for evacuation of NPD (effects of hazardous spills on the new freeway); • Reduction in commercial appeal of the NPD site, impacting on the value of the property; and • Lower economic viability for future expansion of the site eg cost premium of constructing additional floor level because of high acoustic attenuation and vibration isolation requirements.	
Public Transport Alliance	• Planning for public transport.	Refer Section 5.6
Malcolm Wade	• Recognise habitat value of Kedron Brook floodplain; and • Impact on raptors feeding and roosting areas.	Refer Section 16.3 Refer Section 16.3

2. EIS Introduction and General Description of Site

No additional information has been requested for the EIS Introduction (Section 1) and General Description of Site (Section 2) of the EIS.

3. Project Description

3.1 Government Announcement of Project

The Minister for Transport and Main Roads Mr Paul Lucas announced the GUP on 17 February 2005. The following matters were announced which are relevant to the EIS:

- The project delivery method for the project will be via the government financed option using a Design, Construct and Maintain (DCM) type delivery;
- Second Gateway Bridge would include a pedestrian/bikeway facility;
- The Gateway Bridges will have full electronic tolling by 2011; and
- Tolls will be increased in a CPI catch-up that will reinstate the real value of the tolls which have not risen since 1998, except for a GST increase in 2000. The catch-up will be in three stages from 2005 to 2011:
  - 20 cents for cars and 50 cents for trucks from July 1 this year;
  - Approximately 20 cents for cars and 50 cents for trucks by 2008; and
  - Approximately 7 cents for cars and 18 cents for trucks by 2011.

  The catch-up increases will also include the CPI component for the year in question. The first July 1 catch-up increase will be to $2.40 for cars (currently $2.20) and $6 for heavy vehicles (currently $5.50). The latter two increases are timed to coincide with major improvements in the capacity of the upgraded Motorway.

3.2 Changes to EIS Project Description

The GUP infrastructure will be delivered by the Queensland Government using a DCM type delivery. Whilst the general alignment and form of the project will be as depicted and evaluated in the EIS and Supplementary EIS, the very nature of a DCM will result in some imperative enhancements to the design (eg more structures and less embankments in the northern interchange area).

During the approval process for the Business Case the following refinements of the EIS Project Description have occurred:

- The decision to include the shared pedestrian and bicycle pathway on the duplicated Gateway Bridge;
- Road improvement works on Wynnum Road in the vicinity of the Gateway Motorway, including the intersections with the Motorway ramps, will be included within the scope of the GUP;
- Confirmation of the decision to introduce full Electronic Tolling Collection (ETC) system on the Gateway Bridge/s in lieu of a combination of automatic and manual toll collection facilities;
- Following the receipt of further geotechnical information alternative interchange options are being investigated for the Northern Access Interchange. Options being considered include the potential for the interchange to be located slightly to the south of the current position shown in the EIS with a slight realignment required for the access road to the Brisbane Airport; and
- The length of the Kedron Brook bridge/s has been increased by moving the southern abutment approximately 560m southwards to avoid a significant zone of underlying soft alluvial deposits.

The above changes do not alter the findings of the environmental assessment undertaken as part of the EIS.

3.3 Future Traffic Flows on Gateway

Traffic flows on the upgraded Gateway Motorway will operate under motorway conditions. The Motorway corridor will be restricted to use by only registered vehicles. Pedestrians and cyclists will only be permitted on the shared pedestrian and bicycle pathway on the second Gateway Bridge between Lytton Road and Kingsford Smith Drive. The shared pathway will be physically separated from the adjacent traffic lanes by appropriate barriers.
The vertical and horizontal alignment of the Motorway will be to the highest standard possible within the corridor for normal motorway design.

The use of a Intelligent Transport System (ITS) linked to a Traffic Operations Centre equipped with an appropriate Incident Management Plan (IMP) will be able to monitor, manage and respond to any incident that may affect the safe operations of the Motorway.

The shared pathway will be designed for conventional traffic loading so as to allow the passage of emergency vehicles along it in the event of an accident on the new Gateway Bridge that blocks the adjacent traffic lane.

3.4 Brisbane River Navigational Issues

The construction of a new Gateway Bridge downstream from the existing bridge impacts on the existing navigation channel of the Brisbane River. The Gateway Bridge/s cross the Brisbane River at the location of the Quarries Reach (Bearing 075°39' – 255°39') (refer to the official Brisbane River Navigation Chart AUS238 1:12,500).

The centreline of the navigation channel of the Quarries Reach passes directly under the centre of the existing Gateway Bridge at a skew angle to the bridge of approximately 79 degrees. Approximately 250m to the east of the existing bridge the navigation channel bends into the Parker Island Reach (Bearing 061°46' – 241°46').

The positioning of the duplicated Gateway Bridge downstream (to the east) of the existing bridge has the effect of reducing the overall effective clearance to the soffit of the bridge due to the skew angle between the river channel and the bridge. However, the reduction in clearance when compared to the overall navigation clearance is marginal.

The main issue which requires management is the positioning of the bridge some 70m closer to the bend in the river channel between the Parker Island the Quarries Reaches.

It is necessary to reposition the vessel turning point in the navigation channel so that the turning point in the river is equivalent to its current position, some 250m to the east of the existing bridge. This repositioning of the turning point requires a turning point in the river some 250m to the west of the existing bridge so that shipping traffic passes effectively through the middle of the combined Gateway Bridges. This new river reach has been nominally called the "Gateway Reach". The proposed Gateway Reach has a bearing of 074°18' – 254°18'. The introduction of the new Gateway Reach may be possible within the extent of the current minimum maintained channel depth of 9.1m. This removes the need to undertake any additional dredging of the river bed as a result of the GUP. This will be confirmed by the GUP team in consultation with the Regional Harbour Master.

The introduction of a new Gateway Reach in the river will require the installation of new navigation lights for the reach. The existing Quarries Reach has two (2) sets of six (6) navigation lead lights located on or near the bank of the river at each end of the Quarries Reach, where the navigation channel extent lines intersect the river bank. At each side of the Gateway Bridge two (2) lead lights mark the centreline of the channel, two (2) lead lights mark the port edge and two (2) lead lights mark the starboard edge of the "inner channel". Of these lights the port and starboard inner channel edge lead lights are to be removed with the centreline lead lights to remain.

For the Gateway Reach new navigation lights will be required each side of the reach. To avoid confusion with the lead lights of the Quarries Reach different technology, such as Port Entry Lights (PELs) are currently being investigated.

The existing computer simulation of the Brisbane River, used to train the Moreton Bay and Brisbane River shipping pilots, has already been upgraded to include the duplicated Gateway Bridge. Ongoing training of pilots will include the provision of the new bridge.

During construction of the new bridge the formwork systems that will be used will hang beneath the soffit of the balanced cantilever of the bridge. Consultation with the Regional Harbour Master has indicated that the reduction in clearance may be mitigated by the careful coordination of the construction works of the balanced cantilever as it approaches the middle of the navigation channel and any anticipated river traffic.

Consultation will continue with the Regional Harbour Master to resolve the details of the new channel reach, the navigation lights and construction impacts.

3.5 Consequences of Not Undertaking the GUP

Future development in the ATC area will be largely dependent upon increased activity at the seaport and airport that in turn requires efficient and convenient landside transportation links. However, without improvements to rectify emerging constraints in the Gateway Motorway corridor, including the Gateway Bridge, the following negative impacts are predicted to occur:

- Unacceptable delays in traffic, causing traffic to divert to other river crossings closer to the CBD and local arterial roads, with attendant traffic intrusion into local communities;
- Increasing accident rates in the corridor, and attendant road user and social costs, as traffic volumes exceed acceptable design standards;
- Reduced accessibility to the Port of Brisbane and to the Brisbane Airport at a time when seaport trade throughput and passenger movements are growing strongly;
- Unacceptable economic outcomes for the ATC area resulting from loss of opportunities for strategically important and commercial development; and
- Failure to achieve acceptable service and performance requirements on this strategically important transport corridor.

4. Land Use

4.1 Belmont Rifle Range

The Belmont Rifle Range was not included in Tables 4.3 and 19.3 of the EIS as it will not be directly affected in terms of either a full or partial resumption of land. Table 4.1 below includes the rifle range.

The Belmont Rifle Range was originally deemed not to be a sensitive community and commercial land use due to the existing expose to traffic noise and being a noise source in its own right. The GUP may increase road traffic noise levels at the rifle range, however this is considered minor in comparison to the noise generated by the rifle range patrons.

Table 4.1 Sensitive Community and Commercial Land Uses (Southern Section)

Sub-Section	Facility Name	Approximate Distance to Existing Motorway (m)
Mt Gravatt-Capalaba Road – Wecker Road	FR Caterson Park (Sports Fields)	50
	Belmont Rifle Range	80
	Mt Petrie Primary School	450
	Southgate Wesleyan Methodist Church	300
	Mansfield Primary School	560
	Mansfield High School	700
Wecker Road to Old Cleveland Road	Christian Outreach College, Mansfield	250
	Allan Inness Fields (Easts Junior Rugby League Club)	600
	Belmont Primary School	850
Old Cleveland Road to Meadowlands Road	Church, 35 Wright Street, Carindale (Jehovah's Witnesses)	130
	Gateway Life Centre, 1374 Old Cleveland Road, Carindale (Assembles of God)	100
	Palm Lakes Relocatable Home Resort	Directly Adjacent
	Gumdale Pony Club Grounds	150
	Belmont Girl Guides	150
Meadowlands Road to Wynnum Road	Meadowlands Picnic Ground	100
	Minnippi Parklands	30
	Model Aero Club	160
	Church and Cemetery	500
	Lutheran Church	850
	Kianawah Park	400
	Christ Church, Tingalpa (Anglican)	390
Wynnum Road to Cleveland Branch Railway Line	Brisbane Polo Grounds	200
	Murarrie Recreation Ground	550
	Tingalpa State School	900
	Wynnum District Cricket and Soccer	400

5. Transportation

5.1 Developments Included in Traffic Modelling

At the time the transport modelling for the EIS was conducted, the most recent demographic and employment projections for Brisbane were utilised. Additionally, particular attention was given to the Australia TradeCoast (ATC) and other potential development areas with consultation undertaken with stakeholders to ensure that potential developments were identified and included in the analysis.

The demographic and traffic demand forecasts for the GUP EIS were developed in early 2004, prior to the establishment of the Office of Urban Management (OUM) in April 2004. At this time, the "North Shore" development was in preliminary design stages. Accordingly, a conservative allowance was made in the GUP EIS demographics.

5.2 Method for Forecasting Toll Road Demand

The transport model developed for use in the GUP was based on the Brisbane Strategic Transport Model (BSTM) calibrated to provide the most accurate representation of traffic, current and forecast, under various network, tolling and demographic scenarios.

Two approaches to forecasting demand for toll roads in Brisbane were adopted for the GUP:

- BRC Model (behavioural route choice method); and
- TDP Model (assignment with toll incorporated into generalised cost through a toll delay penalty).

The TDP model was adopted as the application model for the GUP. However, sensitivity testing was undertaken by MWT (although not reported) using a BRC model. In the case of the GUP, either a BRC model or a TDP model should give similar results because:

- The average travel time savings using the tolled Gateway Bridge, in both peak and offpeak periods, are considerably higher than the toll delay penalty, even at the higher toll levels; and
- The tolling strategy is a simple single point toll on the Gateway Bridge.

The parameter estimates for both the BRC and TDP models were obtained from the same stated preference/revealed preference surveys undertaken for the GUP.

In the case of the North-South Bypass Tunnel (and associated extensions), where the average travel times savings may be similar to the toll delay penalty, a TDP model can have excessive sensitivity of demand responses as a tolled route changes from being the shortest (generalised cost) route to the "second best" route as either toll levels are increased or alternative travel times decrease (eg by increasing surface road capacity by removing bus lanes, transit lanes or bus priority at intersections). The use of a balanced probability based consumer choice function such as a BRC model removes some of this excessive sensitivity. In addition, a TDP model struggles to predict demand under the more complex tolling strategies permitted by electronic tolling such as distance-based or section-based tolls with toll caps, and discounts if more than two toll roads are used in a single trip.

5.3 Interchange Intersection Upgrades

5.3.1 Wynnum Road Interchange

The GUP will now allow for the localised upgrading of Wynnum Road at the ramp terminals to three (3) lanes in each direction, provision of additional turning lanes to the Motorway and bicycle lanes in the immediate vicinity of the Gateway Motorway.

5.3.2 Kingsford Smith Drive and Fison Avenue Intersection

The scope of the proposed works within the GUP do not physically impact on the intersection of Kingsford Smith Drive and Fison Avenue. All Motorway widening works required within the GUP are restricted to the eastern side of the Gateway Motorway, the opposite side to the Fison Avenue/Kingsford Smith Drive intersection.

Traffic modelling of the proposed Motorway and local road network in the area shows that the introduction of the Northern Deviation and the associated Northern Access Interchange to the Brisbane Airport removes substantial traffic from the Gateway Motorway between Kingsford Smith Drive and Airport Drive. This improves traffic operations on the western approach to the Gateway Motorway along Kingsford Smith Drive. Modelling also identifies that the capacity of Kingsford Smith Drive, to the west of the Gateway Motorway is a significant constraint to improving traffic operations in the area.

5.3.3 Other Intersection Upgrades

Currently the existing intersections associated with the Motorway interchanges suffer delays as a result of inadequate Motorway capacity and poor on and off-ramp operations. By providing increased traffic capacity on the Motorway, with the introduction of Electronic Tolling and the removal of the toll plaza at Lytton Road and improving the operational characteristics of the ramps the GUP will reduce the traffic congestion associated with the Motorway that currently congests the adjacent intersections, thereby extending the design life of the intersections to that more aligned with the connecting arterial roads.

5.4 Potential Impact on Local Road Network

As presented in Section 5.7.1 of the EIS, the GUP is forecast to result in a significant increase in traffic using the Gateway Bridge and Motorway sections. The forecast changes to traffic flows at the screenlines evaluated in Section 5.7.2 of the EIS shows that the distributional effect of this change to the transport network is complex. This section evaluates in further detail the forecast impacts on lower order or local roads in the surrounding road network.

Figures 5.1 to 5.6 shows the expected changes in daily traffic volumes with the GUP in 2011 relative to the future base 2011 volumes, in graphical form. Overall, from these figures it can be concluded that the GUP brings relief to the surrounding road network, moving through traffic back to higher order roads where these trips ideally should be. Specific impacts identified in Figures 5.1 to 5.6 are:

- Major reduction in traffic, including:
  - Nudgee Road;
  - Airport Drive; and
  - Lytton Road to the east of the Gateway Motorway due to better access to the Port of Brisbane Motorway.
- Reduction in traffic, including:
  - Sandgate Road;
  - Toombul Road;
  - Other roads in Clayfield area (eg Kitchener/ Zillman/ Widdop/ Melton Roads);
  - Wynnum Road (east and west of Gateway Motorway);
  - Creek Road;
  - Belmont Road;
  - Mt Petrie Road;
  - Newnham Road;
  - Old Cleveland Road to the west of Gateway Motorway (westbound);
  - Logan Road; and

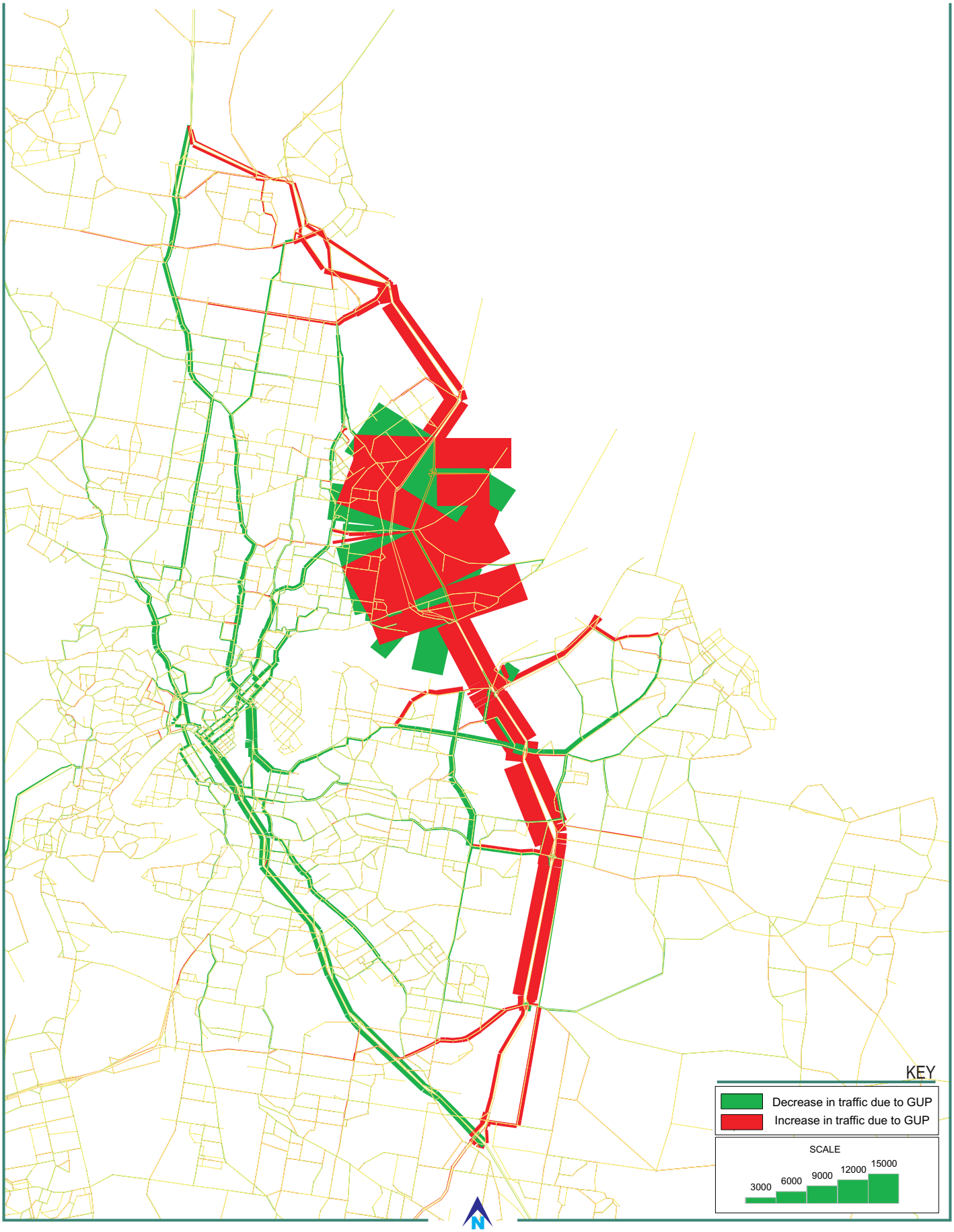

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FIGURE 5.1
Change in Traffic Resulting from Gateway Upgrade Project - 2011 Weekday Totals

Gateway Upgrade Project

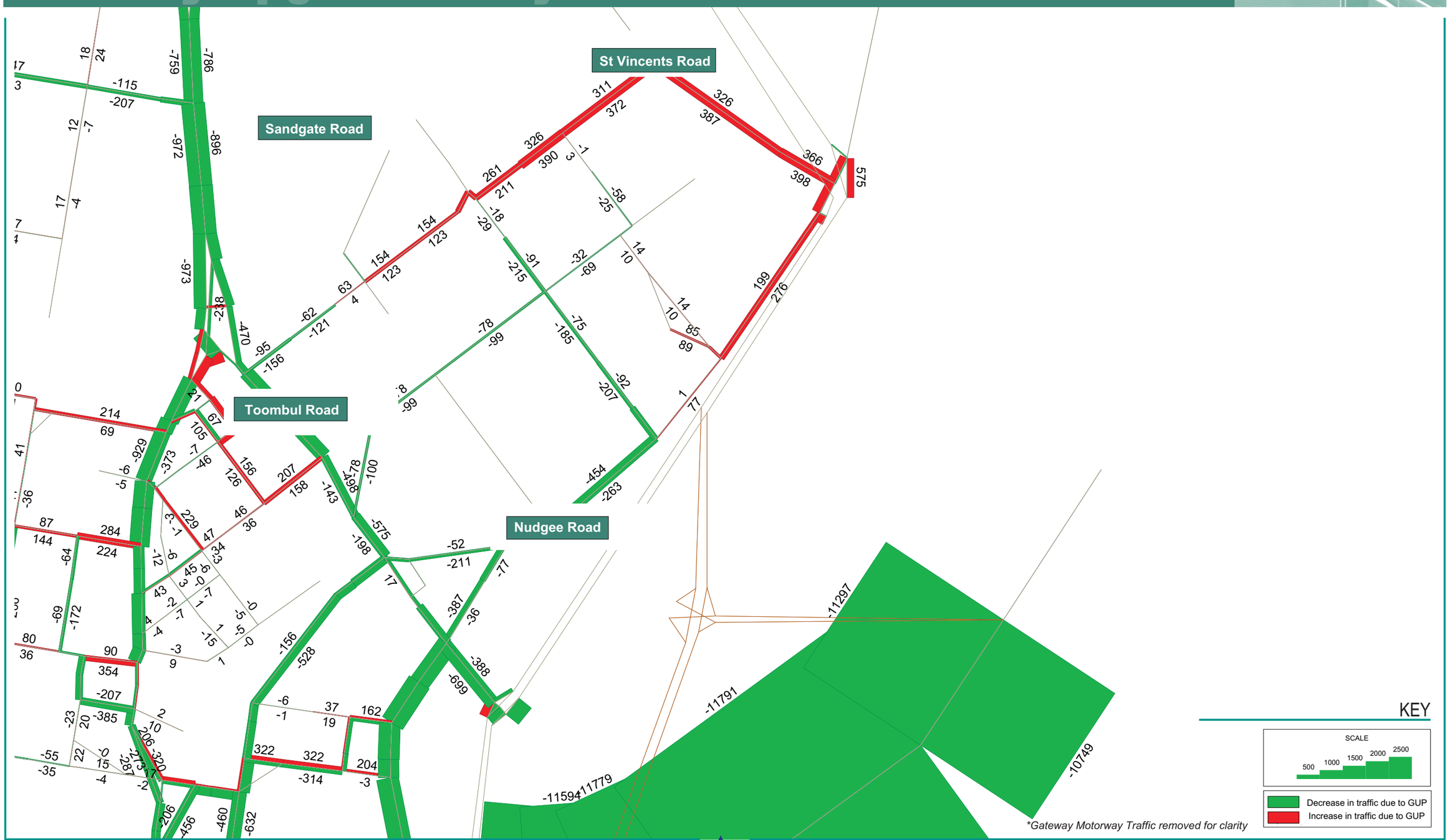

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FIGURE 5.2
Change in Traffic Resulting from Gateway Upgrade Project - 2011 Weekday Totals

Gateway Upgrade Project ..

East West Arterial

Nudgee Road

Lomandra Drive

Kingsford Smith Drive

Gateway Bridge

*Gateway Motorway Traffic removed for clarity

KEY

SCALE

500 1000 1500 2000 2500

Decrease in traffic due to GUP

Increase in traffic due to GUP

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FIGURE 5.3
Change in Traffic Resulting from Gateway Upgrade Project - 2011 Weekday Totals

Gateway Upgrade Project ..

Gateway Bridge

Lytton Road

Wynnum Road

*Gateway Motorway Traffic removed for clarity

KEY

SCALE

500 1000 1500 2000 2500

Decrease in traffic due to GUP

Increase in traffic due to GUP

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FIGURE 5.4
Change in Traffic Resulting from Gateway Upgrade Project - 2011 Weekday Totals

Gateway Upgrade Project ..

Meadowlands Road

Grassdale Road

Old Cleveland Road

*Gateway Motorway Traffic removed for clarity

KEY

SCALE

500 1000 1500 2000 2500

Decrease in traffic due to GUP

Increase in traffic due to GUP

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FIGURE 5.5
Change in Traffic Resulting from Gateway Upgrade Project - 2011 Weekday Totals

Logan Road

Mt Gravatt- Capalaba Road

Gateway Mwy
sth of Reference Project

Gardner Road

KEY

SCALE
500 1000 1500 2000 2500

Decrease in traffic due to GUP
Increase in traffic due to GUP

*Gateway Motorway Traffic removed for clarity

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FIGURE 5.6
Change in Traffic Resulting from Gateway Upgrade Project - 2011 Weekday Totals

  - Other roads in Wynnum area (eg Hemmant Road, Pritchard Road).
- Increased traffic, including:
  - East-West Arterial as a feeder to GUP;
  - Mt Gravatt-Capalaba Road to the west (largely due to the Pacific Motorway to Mt Gravatt-Capalaba Road section of the Gateway Motorway operating at capacity);
  - Kingsford Smith Drive west of GUP. (Kingsford Smith Drive is close to capacity in 2011 therefore small localised increase and decreases only);
  - Bicentennial Road (Boondall);
  - Depot Road (Deagon);
  - St Vincents/ Childs Roads as a feeder to the GUP;
  - Lytton Road on the west (due to a redistribution of traffic from Wynnum and Creek Roads);
  - Old Cleveland Road to the west of Gateway Motorway (eastbound);
  - Local roads that feed to/from the south of Mt Gravatt-Capalaba Road (eg Grieve/Rochedale Road, Gardner Road,) because the Pacific Motorway to Mt Gravatt-Capalaba Road section of the Gateway Motorway will be at capacity and users will "rat-run" through these areas to avoid this section; and
  - Port of Brisbane Motorway (due to a redistribution of traffic previously "rat-running" through Wynnum).

Figures showing the volume changes for 2021 equivalent to those shown for 2011 have not been produced as the patterns of traffic volume increases and decreases are very similar to those presented for 2011.

5.5 Potential Impact on Modal Shift to Rail

5.5.1 Heavy Rail Network

Rail freight movements through South East Queensland currently comprise approximately 2% of the total freight task, but closer to 6% in terms of tonne kilometres (Queensland Transport 2001). The GUP crosses a major strategic rail freight corridor which provides access to the Port of Brisbane. Rail transport plays a significant role in the movement of freight to and from the Port of Brisbane. Almost all bulk coal and a high percentage of grain exports are transported by rail as are approximately 25% of containers (Economic Associates Pty Ltd 2001). The Port of Brisbane is serviced by a dual gauge rail link and the Brisbane Multimodal Terminal (BMT) which is the interface between rail, road, and the container terminals on Fisherman Islands. The BMT allows the efficient transfer of imported and exported containers to and from the container terminals.

5.5.2 Heavy Rail Impacts

As congestion on the road network continues to increase in South East Queensland, the operational efficiencies of heavy haul rail will be improved as long as the expansion of the rail network continues in line with demand and is not constrained by capacity deficiencies in either the track, access (multimodal facilities) or supply chains. Rail will become an increasingly important component of the freight task associated with the Port of Brisbane especially due to forecast growth. Trade projections for the Port of Brisbane to the year 2025 show anticipated growth in all cargo types, with strong growth expected in containers (6.9% average annual growth), motor vehicles (4.7% average annual growth) and break bulk (2.9% average annual growth). Total container numbers are projected to reach up to 1.9 million TEUs (twenty foot equivalent units) by 2025 up from 639,570 TEUs in 2003/04. Total trade is projected to reach up to 61.4 million tonnes by the year 2025 (Port of Brisbane Corporation 2000), a 140% increase above 2003/04 total trade levels of 25.1 million tonnes (Port of Brisbane Corporation 2004).

The GUP will significantly improve road access to/from the Port of Brisbane and for regional road freight movements bypassing Brisbane City. However, it is not envisaged that the GUP will result in a significant change in the freight modal share, as the operational efficiencies of heavy rail will continue to be observed for bulk movements, particularly as multimodal facilities are expanded and improved to provide seamless integration and a more effective and efficient land transport network.

5.6 Planning for Public Transport

The planning for public transport within GUP allows for easier movement along the Motorway corridor for existing and future public transport services. By providing free flowing traffic operations any bus based public transport services within the Motorway are able to be operated more reliably and efficiently.

Integration with the existing public transport services is enhanced by:

- The possibility of re-routing the existing Great Circle 598/599 bus route along Administration Road to a proposed bus stop under the southern abutment of the existing bridge. The 598/599 route already carries bike racks on each bus under the current BCC "Bikes on Buses" policy. This route currently connects to the Murarrie railway station;
- Existing Brisbane Transport bus routes 302 and 303 travel along Kingsford Smith Drive with bus stops located near the connection of the proposed shared pedestrian and bicycle pathway to Kingsford Smith Drive;
- Maintaining the current Great Circle 598/599 bus stop at the southern end of Links Avenue; and
- Facilitating ready access to proposed bus park and ride stations adjacent to the Motorway corridor.

Only one local bus route, the Great Circle route 598/599, travels along the Gateway Motorway. This route provides interchange with radial bus and rail routes both north and south of the Gateway Bridge. The Great Circle service has been operating for the past 18 years at the same frequency with varying performance. The route currently takes three hours to complete and is subject to large variations in travel time due to a number of delay points including the Gateway Bridge, South Pine Road and Stafford Road. The current weekday patronage on the Great Circle service is around 4,000 passengers per day and holding at this level. In addition to the Great Circle Line, there are also long distance coaches linking the Sunshine Coast and Brisbane Airport with the Gold Coast via the Gateway Motorway.

6. Pedestrian and Cycling

6.1 Provision of Pedestrian and Cycle Facility

The Queensland Government has made the decision to include the provision of a pedestrian and cycle facility on the second Gateway Bridge and approaches. It will be the responsibility of the Brisbane City Council to provide other links for the cycleway network.

The GUP presents the opportunity to deliver a significant component of planned pedestrian and bicycle networks in the form of a river crossing in the area of the Gateway Bridge in accordance with the objectives of Cycle South East, the Integrated Regional Cycle Network Plan, the Moreton Bay Cycleway and the Bicycle Brisbane Plan.

6.2 Emergency Vehicle Access on Pedestrian and Cycle Facility

The design of the pedestrian and cycle facility on the second Gateway Bridge will allow for the use of the pathway by emergency service vehicles in the event of an incident upon the bridge or the approaches.

The pathway could be used by emergency service vehicles in the event of an incident on the pathway or as a means of convenient access to the bridge in the event of an incident on the adjacent Motorway traffic lanes. Design details of access panels within the barrier between the pathway and the traffic lanes are to be resolved.

The structural design of the bridge will allow for the live load associated with emergency vehicles. Access design to the pathway will need to facilitate ready access for emergency service vehicles, yet discourage errant motor vehicles from entering the pathway.

Procedures for access to the pathway by emergency services vehicles will be addressed in the Incident Management Plan for the GUP.

7. Utility Services

7.1 Potential Transmission Line Impacts

7.1.1 110kV Line at CH 24300

The Northern Deviation for the project reconnects the existing Gateway Motorway at CH 23600 Where it passes under an overhead 110kV transmission line at CH 24300. The vertical alignment of the Motorway is not expected to be altered in this area thus maintaining current vertical clearance to the overhead power lines.

7.1.2 Brisbane Airport Feeder Cables

The structural protection system determined during the detailed design stage for the existing Brisbane Airport feeder cables will extend for the full width of the existing easements thus protecting for any potential expansion within the easement.

7.1.3 Future Utility Expansion

Future crossings of the Gateway Motorway will require that the vertical clearance of the transmission lines provide adequate clearance to the road surface, light poles or signage gantries that are located within the corridor. Details will need to be approved by Main Roads.

7.1.4 Access to Lot 49 RP207882

The GUP proposes upgrading the existing Motorway between Wynnum Road and Bulimba Creek by the widening of the existing Motorway embankments and bridges to the east of the existing Motorway. In the EIS planning it was noted that access to the transmission lines to the east of the Gateway Motorway were accessed via Murarrie Road and then under the existing Gateway Motorway bridges across Bulimba Creek.

Access under the new Bulimba Creek bridges will be maintained with the same vertical clearance as the existing bridge. It is noted that the vertical clearance would not enable the passage of vehicles any larger than a conventional 4WD passenger car.

The current access track along the eastern side of the Motorway between CH 14300 and CH 14600 could not be considered an all weather access track, particularly for heavy vehicles.

8. Regulatory Framework and Planning

8.1 Transport Infrastructure Act 1994

The GUP corridor is to be gazetted as a State Controlled Road.

8.2 Vegetation Loss in Koala Coast Area

The construction of the GUP within the Koala Coast area will result in the loss of approximately 1.6ha of Koala Coast bushland.

Table 8.3 from the EIS has been amended to include the loss in Koala Coast bushland (refer Table 8.1).

8.3 Compliance with the State Coastal Management Plan 2002

The GUP compliance with the State Coastal Management Plan 2002 is assessed in Appendix B.

Table 8.1 Summary of GUP Compliance with Relevant State, Regional and Local Policies

State, Regional and Local Policies/Strategies	Relevant Provisions	GUP Compliance	Compliance Comment
Development in the Vicinity of Certain Airports and Aviation Facilities (State Planning Policy 3/02)	Beneath, or in the vicinity of, the airports' operational airspace	Yes	• Second Gateway Bridge to penetrate OLS. Appropriate lighting to be installed on Second Gateway Bridge in accordance with CASA requirements. • MDP to address aeronautical issues. • Construction EMP to be implemented to minimise dust (refer Section 23).
	Construction and operational lighting to penetrate operational airspace.	Yes	• Construction EMP and lighting design to minimise uplighting in accordance with CASA guidelines: Lighting in the vicinity of Aerodromes.
Planning and Managing Development Involving Acid Sulfate Soils — State Planning Policy 2/02	Part of the project corridor at or below 5 metres AHD, including the majority of the project corridor north of Brisbane River. The project also involves excavating in excess of 100m^3 of soil or sediment, and filling of land involving 500m^3 or more of material at an average depth of 0.5m.	Yes	• Construction EMP to contain mitigation measures and monitoring program for management of acid sulphate soil issues. • Testing to be conducted prior to construction to confirm location of potential acid sulphate soils, in areas at or below 5 metres AHD, where the project will cause disturbance.
Mitigating the Adverse Impacts of Flood, Bushfire and Landslide – State Planning Policy 1/03	Mitigating possible adverse impacts of Landslide from adjacent land to the project corridor. The threshold for determining a landslide natural hazard management area is land with a slope of greater than 15%.	Yes	• The mapping for Landslide shows no land within or adjacent to the project corridor that has a slope greater than 10%.

State, Regional and Local Policies/Strategies	Relevant Provisions	GUP Compliance	Compliance Comment
	Mitigating possible adverse impacts of bushfire from adjacent land to the project corridor. There is a significant amount of land between Mt Gravatt-Capalaba Road and Old Cleveland Road where there is land on both sides of the project corridor that has a medium bushfire hazard.	Yes	• There is good access to the road batters on both sides of the Motorway for fire fighting vehicles and good access to the contiguous bushland on the eastern side of the Motorway from Mt Petrie Road. This road also provides a firebreak between the Motorway and the bulk of the Koala Coast bushland. • Mitigation measures to be included in EMP (refer Section 23).
	Mitigating possible adverse impacts of flooding from adjacent land to the project corridor.	Yes	• Flooding issues associated with the GUP are addressed in Section 11.
Conservation of Koalas in the Koala Coast — State Planning Policy 1/97	The area directly adjacent to the eastern side of the existing Gateway Motorway from the start of the southern section of the project corridor at Mt Gravatt-Capalaba Road to Belmont Road, is within the "*Koala Conservation Area*" of the Koala Coast Area.	Yes	• Majority of clearing to occur within existing road reserve. • Small loss in Koala Coast bushland (approximately 1.6ha). • Fauna proof fencing, and underpasses to be provided as part of GUP.
Development and the Conservation of Good Quality Agricultural Land — State Planning Policy 1/92	Good Quality Agricultural Land (GQAL) is a valuable resource and must where possible be protected from incompatible development.	Yes	• Rural holdings adjacent to the project corridor are not GQAL. • Overriding need for the GUP (refer Section 2.4).

State, Regional and Local Policies/Strategies	Relevant Provisions	GUP Compliance	Compliance Comment
The Regional Framework for Growth Management 2000	Criteria for assessing new transport projects should be the potential to achieve: *1. The desired pattern of development for the year 2011;* *2. Improved quality of life for all residents;* *3. Improved levels of accessibility;* *4. Environmental protection; and* *5. Economic development." (RFGM, p84)*	Yes	• GUP will increase the efficiency of the Gateway Motorway to better service the desired pattern of development including economic development. • Improved level of accessibility and road user benefits. • EMP to be implemented to minimise potential impacts on the environment (refer Section 23).
The Integrated Transport Planning Framework 2003	GUP is as at a stage equivalent to Step 4 (Develop Strategy) of the nine step transport planning process recommended by the framework, where the aim is to recommend an appropriate plan of action to implement the preferred option or package of measures. The desired outcomes in achieving the preferred option, include 'Environmental Responsibility', and 'Liveability, Connectivity and Amenity'.	Yes	• This EIS recommends a plan of action for implementing a package of measures that will ensure that the GUP achieves these two Desired Outcomes.
The Integrated Regional Transport Plan for South East Queensland 1997	The Gateway Motorway as a central spine for the movement of regional traffic, and there is a need to maintain the Motorway as a high standard urban bypass of Brisbane. An upgrade to the Gateway Motorway is a strategic transport opportunity that would play a key role to enhancing regional movement and economic development.	Yes	• GUP is consistent with agreed actions and strategic transport opportunities identified in the IRTP.

State, Regional and Local Policies/Strategies	Relevant Provisions	GUP Compliance	Compliance Comment
The Transport 2007 An Action Plan for South East Queensland 2001	Transport 2007 identifies that Gateway Motorway as a major road based freight corridor experiencing congestion. To alleviate this and future congestion, it states the need to widen sections of the existing Gateway Motorway to six lanes, to ensure that freight movements within the Brisbane region and between Brisbane and other regions is improved. In addition to the widening, it recommends that "*planning is needed for a possible second river crossing near the Gateway Bridge to support regional travel and freight movement along the corridor*".	Yes	• GUP is consistent with agreed actions and strategic transport opportunities identified in Transport 2007.
Cycle South East 1999	Progressively upgrade existing main roads, where practicable, to increase separation safety for all users, an in particular cyclists. A number of opportunities such as roads as roads accessing the Brisbane CBD and key regional centres should be considered.	Yes	• As part of the GUP the pedestrian/bikeway facility will provide for longer distance cycle trips by incorporating a dedicated shared pedestrian/ bikeway separated from the traffic lanes. This shared route will commence at Lytton Road, cross the proposed new bridge, then will grade separate from the proposed duplication, but continue to follow the duplication route from Lavarack Avenue up to Kingsford Smith Drive. • GUP pedestrian/bikeway provision integrates with BCC's planned bikeway network.
Integrated Regional Cycle Network Plan (IRCNP) for South-East Queensland 2003	One of the key aims of the IRCNP is to support 'cycle trips, including longer distance trips, in South East Queensland by identifying desired routes between key centres and other major cyclist attractions'.	Yes	
Land Use Strategy - Port of Brisbane Corporation, November 2001 and Development Guidelines – Port of Brisbane Corporation, January 2002	Part of the Bridge Section of the GUP (south of the Brisbane River) falls within the Queensport Precinct of the Land Use Strategy.	Yes	• The project corridor does not cross strategic port land only 'frame' land considered as "backup" land for port related activities that require a location close to port facilities.

State, Regional and Local Policies/Strategies	Relevant Provisions	GUP Compliance	Compliance Comment
Brisbane Gateway Ports Area Strategy, March 1998	The capacity of the Gateway Arterial is insufficient.	Yes	• GUP addresses capacity issues associated with the existing Gateway Motorway, and will increase the efficiency of transport to and from the Gateway Ports Area.
The SEQ Regional Water Quality Management Strategy 2001	There is a need to protect the water quality of the Brisbane River, Kedron Brook Floodway, Bulimba Creek and other waterways within the Brisbane Catchment.	Yes	• This EIS addresses potential water quality impacts (refer Section 12). • The EMP will contain appropriate mitigation measures to address, construction and operational water quality issues (refer Section 23).
The Waterways Management Plan 1998	The Brisbane River and waterways of the Moreton Bay catchment; need to be protected from pressure from a rapidly growing population.	Yes	
The Water Quality Management Strategy 1998	There is a need to manage human impacts (such as impacts from GUP) on waterways.	Yes	
Moreton Bay Strategic Plan 1993	Water quality for key waterways and water bodies in the Moreton Bay region must be maintained and/or improved.	Yes	
Transport Plan for Brisbane 2002-2016	Major economic growth areas, particularly the ATC and Western Gateway, are provided with appropriate road access and are buffered from sensitive land uses. Upgrading the Gateway Motorway to six lanes south of the river and constructing a new four lane deviation between Kingsford Smith Drive and Toombul Road. Duplicating the Gateway Bridge.	Yes	• GUP addresses capacity issues associated with the existing Gateway Motorway and will improve the efficiency of road access to the ATC and Brisbane Airport area. • GUP upgrades Motorway south of Brisbane River, new four lane deviation provided between Kingsford Smith Drive and Nudgee Road, and duplicates the Gateway Bridge.

State, Regional and Local Policies/Strategies	Relevant Provisions	GUP Compliance	Compliance Comment
Bicycle Brisbane Plan	Ensuring that pedestrian and cyclist planning is integrated with all transport initiatives early in project and policy development will maximise intermodal options.	Yes	• The GUP pedestrian/bikeway facility integrates with BCC's planned bikeway network.
BAC Airport Environmental Strategy	Minimise the impact of Brisbane Airport operations on surface water and groundwater quality. Minimise the potential for soil contamination to occur on Brisbane Airport. BAC aims to maintain an ongoing process for the identification and appropriate management of objects and matter that have natural value.	Yes	• The EIS addresses potential water quality impacts in Section 12 soil impacts in Section 10, and terrestrial flora and fauna in Section 16. • The EMP will contain appropriate mitigation measures to address, construction and operational water quality, noise and soil issues.

Further details of relevant State, regional and local policies are included in Appendix D2 of the EIS.

9. Topography/Geomorphology/Geology

No additional information has been requested for the Topography/Geomorphology/Geology (Section 9) of the EIS.

10. Soils

10.1 Preliminary Acid Sulphate Soils Investigation

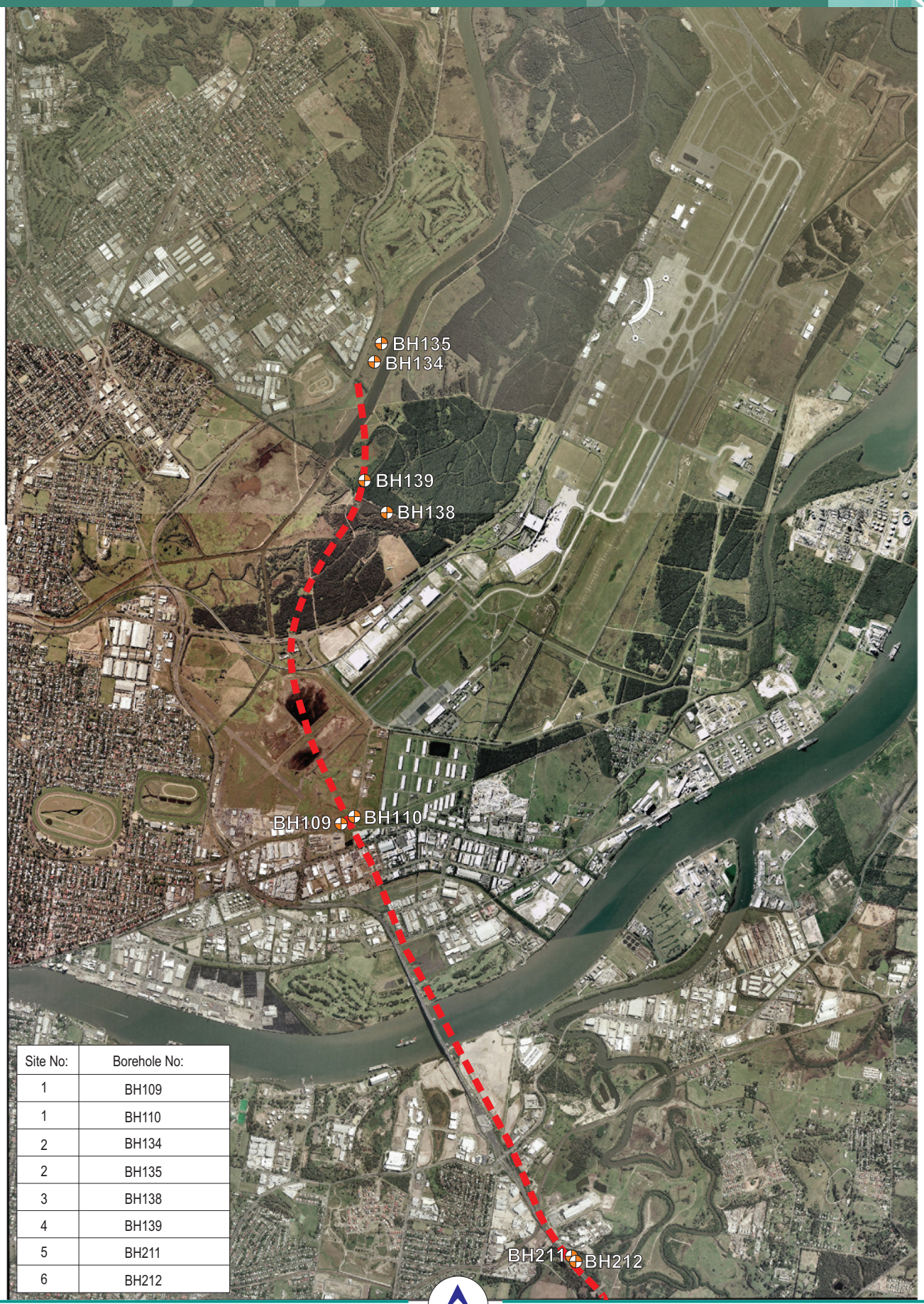
The Department of Natural Resources and Mines (DNRM) Queensland Acid Sulphate Soils Investigation Team (QASSIT) have undertaken a preliminary acid sulphate soil investigation in low lying areas (<5m AHD) of the proposed GUP. The aim of the investigation was to identify the depth and net acidity of acid sulphate soils at five sites along the GUP corridor, where disturbance of acid sulphate soils is likely to occur during road construction.

Eight boreholes were undertaken across the five sites with borehole depth ranging from 6 to 27m. The location of the boreholes is shown in Figure 10.1.

All soil profiles were described according to McDonald *et al.* (1990) and field pH tests were carried out at 0.25m intervals down each profile. 260 soil samples were collected, of which 87 samples were submitted for laboratory analyses. Laboratory analysis was carries out in accordance with the *Acid Sulphate Soils Laboratory Methods Guidelines* (Ahern *et al.* 2004).

Acid sulphate soils were identified at Sites 3, 4 and 5 with oxidisable sulphur levels up to 2.99%S (as measured by the Chromium Reducible Sulphur (S_{CR}) method). Laboratory analysis confirmed the presence of actual acid sulphate soils (AASS) in borehole 138 (Site 3), whilst some layers in borehole 139 (Site 4) were shown to contain measurable amounts of acid neutralising capacity.

The ASS investigation to full QASSIT requirements, in consultation with DNRM, is to be undertaken as a part of the detailed design process.



Site No:	Borehole No:
1	BH109
1	BH110
2	BH134
2	BH135
3	BH138
4	BH139
5	BH211
6	BH212

Queensland Government Department of Main Roads
Australian Government Department of Transport and Regional Services
Connell Wagner

Borehole Locations
Gateway Upgrade Project

FIGURE 10.1
Location of ASS Boreholes

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11. Hydrology/Hydraulics

11.1 Flood Mitigation Works on Kedron Brook Floodplain

Some concerns have been raised in relation to the excavation of 0.5m of earth on the Kedron Brook floodplain and the potential for this area to become tidally influenced. The area where the excavations are proposed are on the western bank of Kedron Brook between the proposed northern bifurcation and the southern end of Nudgee Golf Course. The existing environment in this area is mixed grassland with sporadic distribution of plants and trees.

The excavation works are necessary to compensate for the flooding impacts associated with the project within the Kedron Brook floodplain. The land where the excavations are proposed (refer to Figure 11.8 of the EIS) has ground levels ranging between 1.5m and 2.0m. The excavation works within the floodplain will result in a final surface level of approximately 1.5m within this area.

The change in surface level will not cause any inundation of tidal waters within this area of the floodplain outside of flood events. As a majority of the area to be excavated is grassland, similar species can be replanted on the site so that similar environmental values (ie raptor food source habitat) of the area can be achieved.

12. Surface Water Quality

No additional information has been requested for the Surface Water Quality (Section 12) of the EIS.

13. Groundwater

13.1 Groundwater Monitoring Program

Nine (9) groundwater monitoring wells have been established between the Eagle Farm industrial area and Nudgee Golf Course for the purposes of the project. Groundwater quality sampling will occur at these wells on a monthly basis prior to and during construction. Laboratory analysis will occur for Total Petroleum Hydrocarbons (TPH), Oil and Grease, Polynuclear Aromatic Hydrocarbons (PAH), Nitrogen (N), Phosphorus (P), Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Nickel (Ni) and Zinc (Zn).

14. Air Quality

14.1 Use of NEPM Standard

The air quality modelling in the EIS has applied the EPP (Air) guidelines at locations close to the road, while the NEPM guidelines have been applied for evaluation of regional impacts at more than 1km from the road.

Katestone Environmental undertook an air quality assessment that adds the maximum predicted increment due to the GUP to the 95th percentile concentration measured from the EPA site at Eagle Farm. Data from this site is influenced by the industries located nearby as well as existing roads, and therefore is considered to give a conservative background.

Predictions at all sensitive residential locations comply with both the EPP (Air) and the NEPM. The highest 24-hour PM_{10} concentration presented in the EIS is 48µg/m^3 at a residential location for 2011, and 45µg/m^3 for 2021 including a constant background of 35µg/m^3. Actual impacts will be lower when the background concentration is accounted for in a more realistic manner, as presented below.

14.2 Distribution of PM_{10} Values

A more refined and realistic assessment has been undertaken that adds the predicted PM_{10} increment due to the roadways to the contemporaneous background data from Eagle Farm. This accounts for how the background concentrations change with meteorological conditions and with unusual events such as bushfires.

The CAL3QHCR dispersion model used in the EIS allows analysis of only the five highest predicted concentrations at each receptor location (hence a more complete frequency distribution cannot be presented). These five highest incremental concentrations, that is the estimated contribution due to the Gateway only with no background included, are presented in Tables 14.1 to 14.10 for each scenario analysed. The tables also note the actual measured 24-hour average PM_{10} concentration from Eagle Farm data for the corresponding day, and the actual highest total PM_{10} concentration is presented. This approach allows a more realistic comparison of the predicted concentrations with the EPP (Air) and NEPM guidelines. The background concentration for days when the incremental contribution from the GUP was greatest ranges from 11.1 to 30.6µg/m^3. The assumed background of 35µg/m^3 that was used in the EIS thus represents a conservative estimate of the total 24-hour average PM_{10} concentration at receptors close to the GUP.

Tables 14.1 to 14.4 present the 24-hour average PM_{10} concentration for 2011 and 2021 without the GUP, and 2011 and 2021 with the GUP for the Mt Gravatt-Capalaba Road to Cleveland Branch Rail Line section of the project. These results show that all locations within this section of the project comply with both the NEPM and EPP (Air) guidelines for ambient air quality.

Table 14.1 Predicted Highest Five Concentrations of PM_{10} (µg/m³) at each Receptor Location for 2011 without GUP (Mt Gravatt-Capalaba Road to Cleveland Branch Rail Line)

Receptor	Predicted Incremental 24-hour Average PM_{10} Concentration Without Background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Mt Petrie Road	1.3	1.0	0.9	0.8	0.8
Sandringham Street	0.4	0.4	0.4	0.4	0.4
Weedon Street West	3.6	3.6	3.2	3.1	3.1
Weedon Street East	5.6	5.3	5.0	4.8	4.7
Wecker Road	0.8	0.7	0.7	0.7	0.7
Silky Oak Crescent	3.7	3.5	3.4	3.3	3.2
Coventry Court	6.7	6.6	6.4	6.0	5.9
Hereford Crescent	2.8	2.8	2.7	2.5	2.4
Kenilworth Place	1.8	1.7	1.7	1.6	1.6
Ridgeview Street	3.8	3.7	3.6	3.3	3.2
Mt Petrie Road 2	4.7	4.6	4.0	3.9	3.5
Old Cleveland Road	2.4	2.4	2.4	2.1	2.1
Cross Street	6.4	5.7	5.2	4.9	4.8
Palm Lakes Tourist	6.2	6.1	6.1	5.9	5.9
Belmont Road	8.4	6.5	6.3	6.1	5.8
Ambara Street 1	8.5	6.8	6.2	6.2	6.0
Ambara Street 2	9.5	7.6	7.0	6.9	6.7
Glenavon Street	3.7	3.0	2.8	2.7	2.7
Helemon Street	3.2	2.7	2.5	2.4	2.4
Brandella Place	6.4	5.3	4.9	4.9	4.8
Stanton Road 1	4.0	2.7	2.6	2.5	2.4
Stanton Road 2	4.8	3.2	3.1	3.1	2.8
Wynnum Road	3.3	3.2	3.1	2.8	2.7
Maximum increment at a receptor without background	9.5	7.6	7.0	6.9	6.7
Actual background concentration for corresponding day	23.8	20.9	26.4	23.3	11.1
Maximum increment plus actual background	33.3	28.5	33.5	30.2	17.8
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

Table 14.2 Predicted Highest Five Concentrations of PM_{10} (µg/m³) at each Receptor Location for 2021 without GUP (Mt Gravatt-Capalaba Road to Cleveland Branch Rail Line)

Receptor	Predicted Incremental 24-hour Average PM_{10} Concentration Without Background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Mt Petrie Road	1.0	0.7	0.6	0.6	0.6
Sandringham Street	0.3	0.3	0.3	0.3	0.3
Weedon Street West	2.6	2.6	2.4	2.3	2.3
Weedon Street East	4.1	3.9	3.6	3.5	3.5
Wecker Road	0.6	0.5	0.5	0.5	0.5
Silky Oak Crescent	2.7	2.6	2.5	2.4	2.4
Coventry Court	4.9	4.9	4.7	4.4	4.3
Hereford Crescent	2.1	2.0	2.0	1.8	1.7
Kenilworth Place	1.3	1.3	1.2	1.2	1.2
Ridgeview Street	2.7	2.7	2.7	2.4	2.3
Mt Petrie Road 2	3.4	3.4	2.9	2.8	2.6
Old Cleveland Road	1.7	1.7	1.6	1.5	1.5
Cross Street	4.4	4.0	3.6	3.4	3.3
Palm Lakes Tourist	4.3	4.3	4.2	4.1	4.1
Belmont Road	5.8	4.5	4.3	4.3	4.0
Ambara Street 1	5.9	4.7	4.3	4.3	4.1
Ambara Street 2	6.6	5.2	4.9	4.8	4.6
Glenavon Street	2.5	2.1	2.0	1.9	1.9
Helemon Street	2.2	1.8	1.8	1.7	1.7
Brandella Place	4.4	3.7	3.4	3.4	3.3
Stanton Road 1	2.7	1.9	1.8	1.7	1.7
Stanton Road 2	3.2	2.1	2.1	2.1	1.9
Wynnum Road	2.2	2.1	2.0	1.8	1.8
Maximum increment at a receptor without background	6.6	5.2	4.9	4.8	4.6
Actual background concentration for corresponding day	23.8	20.9	26.4	23.3	11.1
Maximum increment plus actual background	30.4	26.2	31.3	28.1	15.8
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

Table 14.3 Predicted Highest Five Concentrations of PM_{10} (µg/m³) at each Receptor Location for 2011 with GUP (Mt Gravatt-Capalaba Road to Cleveland Branch Rail Line)

Receptor	Predicted Incremental 24-hour Average PM_{10} Concentration Without Background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Mt Petrie Road	1.7	1.2	1.1	1.1	1.0
Sandringham Street	0.6	0.6	0.6	0.6	0.5
Weedon Street West	4.8	4.6	4.3	4.1	4.0
Weedon Street East	7.4	7.0	6.6	6.4	6.3
Wecker Road	1.0	0.9	0.9	0.9	0.9
Silky Oak Crescent	4.8	4.7	4.4	4.3	4.3
Coventry Court	8.9	8.9	8.6	8.0	8.0
Hereford Crescent	3.7	3.7	3.6	3.2	3.1
Kenilworth Place	2.4	2.3	2.2	2.1	2.0
Ridgeview Street	5.0	4.8	4.7	4.3	4.2
Mt Petrie Road 2	6.1	6.0	5.3	5.1	4.7
Old Cleveland Road	3.4	3.4	3.3	3.0	2.9
Cross Street	8.9	8.0	7.2	6.9	6.8
Palm Lakes Tourist	9.0	8.9	8.7	8.5	8.4
Belmont Road	11.6	9.3	8.9	8.7	8.3
Ambara Street 1	11.9	9.7	9.0	8.9	8.6
Ambara Street 2	13.3	10.9	10.2	10.0	9.7
Glenavon Street	5.0	4.2	3.9	3.9	3.8
Helemon Street	4.3	3.7	3.4	3.4	3.3
Brandella Place	9.0	7.5	7.0	7.0	6.8
Stanton Road 1	5.5	3.8	3.6	3.5	3.5
Stanton Road 2	6.8	4.6	4.5	4.4	4.2
Wynnum Road	4.9	4.8	4.6	4.1	4.0
Maximum increment at a receptor without background	13.3	10.9	10.2	10.0	9.7
Actual background concentration for corresponding day	23.8	20.9	26.4	23.3	11.1
Maximum increment plus actual background	37.1	31.8	36.6	33.3	20.8
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

Table 14.4 Predicted Highest Five Concentrations of PM_{10} (µg/m³) at each Receptor Location for 2021 with GUP (Mt Gravatt-Capalaba Road to Cleveland Branch Rail Line)

Receptor	Predicted Incremental 24-hour Average PM_{10} Concentration Without Background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Mt Petrie Road	1.3	1.0	0.9	0.8	0.8
Sandringham Street	0.5	0.4	0.4	0.4	0.4
Weedon Street West	3.8	3.7	3.4	3.2	3.2
Weedon Street East	5.8	5.5	5.2	5.0	4.9
Wecker Road	0.8	0.7	0.7	0.7	0.7
Silky Oak Crescent	3.7	3.7	3.5	3.4	3.4
Coventry Court	7.0	7.0	6.8	6.3	6.3
Hereford Crescent	2.9	2.9	2.8	2.5	2.5
Kenilworth Place	1.9	1.8	1.8	1.7	1.6
Ridgeview Street	3.9	3.8	3.7	3.4	3.3
Mt Petrie Road 2	4.8	4.7	4.1	4.0	3.7
Old Cleveland Road	2.6	2.5	2.5	2.3	2.2
Cross Street	6.7	6.0	5.4	5.2	5.1
Palm Lakes Tourist	6.8	6.7	6.5	6.4	6.4
Belmont Road	8.8	7.0	6.7	6.6	6.3
Ambara Street 1	9.0	7.3	6.8	6.7	6.5
Ambara Street 2	10.1	8.2	7.7	7.6	7.3
Glenavon Street	3.8	3.2	3.0	2.9	2.9
Helemon Street	3.3	2.8	2.6	2.6	2.5
Brandella Place	6.8	5.7	5.3	5.3	5.1
Stanton Road 1	4.2	2.9	2.8	2.7	2.6
Stanton Road 2	5.2	3.5	3.4	3.4	3.2
Wynnum Road	3.7	3.7	3.5	3.1	3.1
Maximum increment at a receptor without background	10.1	8.2	7.7	7.6	7.3
Actual background concentration for corresponding day	23.8	20.9	26.4	23.3	11.1
Maximum increment plus actual background	33.9	29.2	34.1	30.9	18.4
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

Table 14.5 presents the 24-hour average PM_{10} results for 2011 without GUP and with GUP, and Table 14.6 presents the results for 2021 without GUP and with GUP for the Cleveland Branch Rail Line to Pinkenba Rail Line section of the project. These results show that both the NEPM and EPP (Air) guidelines are met at all locations within this section. The highest predicted result is 42µg/m³ (increment of 18.2µg/m³, background of 23.8µg/m³) at the proposed bikeway, which is alongside the duplicated Gateway Bridge traffic lanes. This result is not regarded as a significant indicator of potential health impacts because a cyclist's exposure to air pollution will be for a relatively short duration compared with the 24-hour averaging period of predictions.

Table 14.5 Predicted Highest Five Concentrations of PM_{10} (µg/m³) at Each Receptor Location for 2011 without and with GUP (Cleveland Branch Rail Line to Pinkenba Rail Line)

Receptor	Predicted incremental 24-hour average PM_{10} concentration without background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Without Gateway Upgrade					
Brisbane TAFE campus	3.6	2.3	2.3	2.2	2.2
Maximum increment at a receptor without background	12.9	11.6	11.0	10.4	10.3
Actual background concentration for corresponding day	23.8	20.9	26.4	11.1	23.3
Maximum increment plus actual background	36.7	32.5	37.4	21.5	33.6
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50
With Gateway Upgrade					
Bikeway 1	10.4	9.8	9.5	9.2	9.1
Bikeway 2	11.3	9.9	9.4	9.3	9.2
Bikeway 3	18.2	16.5	15.9	15.2	15.1
Bikeway 4	14.4	13.5	13.1	12.7	12.6
Bikeway 5	14.2	13.6	13.3	12.9	12.8
Bikeway 6	13.2	12.9	12.8	12.7	12.5
Bikeway 7	8.9	7.6	7.1	6.8	6.8
Bikeway 8	13.6	11.4	10.8	10.2	10.1
Brisbane TAFE campus	3.2	2.1	2.1	2.0	2.0
Maximum increment at a receptor without background	18.2	16.5	15.9	15.2	15.1
Actual background concentration for corresponding day	23.8	20.9	26.4	23.3	11.1
Maximum increment plus actual background	42.0	37.4	42.3	38.5	26.3
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

Table 14.6 Predicted Highest Five Concentrations of PM_{10} (µg/m³) at Each Receptor Location for 2021 without and with GUP (Cleveland Branch Rail Line to Pinkenba Rail Line)

Receptor	Predicted Incremental 24 Hour Average PM_{10} Concentration without Background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Without Gateway Upgrade					
Brisbane TAFE campus	2.8	1.8	1.7	1.7	1.7
Maximum increment at a receptor without background	9.8	8.8	8.4	7.9	7.9
Actual background concentration for corresponding day	23.8	20.9	26.4	11.1	23.3
Maximum increment plus actual background	33.6	29.8	34.8	19.0	31.2
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50
With Gateway Upgrade					
Bikeway 1	8.2	7.5	7.2	7.0	7.0
Bikeway 2	9.2	7.8	7.3	7.2	7.1
Bikeway 3	15.6	14.2	13.7	13.1	13.0
Bikeway 4	12.3	11.6	11.3	10.9	10.8
Bikeway 5	12.1	11.6	11.4	11.1	11.0
Bikeway 6	10.9	10.9	10.9	10.8	10.7
Bikeway 7	7.1	6.0	5.6	5.4	5.4
Bikeway 8	10.9	9.1	8.6	8.1	8.0
Brisbane TAFE campus	2.7	1.7	1.7	1.7	1.7
Maximum increment at a receptor without background	15.6	14.2	13.7	13.1	13.0
Actual background concentration for corresponding day	23.8	20.9	26.4	23.3	11.1
Maximum increment plus actual background	39.4	35.1	40.1	36.4	24.2
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

Tables 14.7 to 14.10 present the 24-hour average PM_{10} concentration for 2011 and 2021 without the GUP, and 2011 and 2021 with the GUP for the Cleveland Branch Rail Line to Pinkenba Rail Line section of the project. These results show that all locations within this section of the project comply with both the NEPM and EPP (Air) guidelines for ambient air quality.

Table 14.7 Predicted Highest Five Concentrations of PM_{10} ($\mu g/m^3$) at each Receptor Location for 2011 without GUP (Pinkenba Rail Line to Nudgee Golf Course)

Receptor	Predicted Incremental 24 hour Average PM_{10} Concentration without Background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Viola Place south	0.7	0.7	0.6	0.6	0.6
Viola Place central	0.6	0.6	0.6	0.6	0.6
Viola Place north	0.5	0.5	0.5	0.5	0.4
Lomandra Drive north	0.4	0.4	0.3	0.3	0.3
Lomandra Drive south	0.4	0.4	0.4	0.4	0.3
Cassia Place	0.4	0.4	0.3	0.3	0.3
Auction house	4.9	4.9	4.8	4.7	4.5
Maximum increment at a receptor without background	4.9	4.9	4.8	4.7	4.5
Actual background concentration for corresponding day	26.4	20.9	11.1	23.3	30.6
Maximum increment plus actual background	31.3	25.8	16.0	28.0	35.1
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

Table 14.8 Predicted Highest Five Concentrations of PM_{10} (µg/m³) at each Receptor Location for 2021 without GUP (Pinkenba Rail Line to Nudgee Golf Course)

Receptor	Predicted Incremental 24 hour Average PM_{10} Concentration without Background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Viola Place south	0.5	0.5	0.5	0.5	0.5
Viola Place central	0.5	0.5	0.4	0.4	0.4
Viola Place north	0.4	0.4	0.4	0.4	0.3
Lomandra Drive north	0.3	0.3	0.3	0.2	0.2
Lomandra Drive south	0.3	0.3	0.3	0.3	0.3
Cassia Place	0.3	0.3	0.3	0.2	0.2
Auction house	3.8	3.8	3.8	3.7	3.5
Maximum increment at a receptor without background	3.8	3.8	3.8	3.7	3.5
Actual background concentration for corresponding day	26.4	20.9	11.1	23.3	30.6
Maximum increment plus actual background	30.3	24.7	14.9	27.0	34.1
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

Table 14.9 Predicted Highest Five Concentrations of PM_{10} (µg/m³) at Each Receptor Location for 2011 with GUP (Pinkenba Rail Line to Nudgee Golf Course)

Receptor	Predicted Incremental 24 hour Average PM_{10} Concentration without Background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Viola Place south	1.4	1.4	1.3	1.3	1.3
Viola Place central	1.3	1.2	1.1	1.1	1.1
Viola Place north	0.8	0.8	0.8	0.8	0.7
Lomandra Drive north	1.0	1.0	0.9	0.9	0.9
Lomandra Drive south	0.8	0.8	0.8	0.7	0.7
Cassia Place	1.3	1.2	1.2	1.2	1.1
Auction house	4.1	4.1	4.1	3.9	3.8
Maximum increment at a receptor without background	4.1	4.1	4.1	3.9	3.8
Actual background concentration for corresponding day	26.4	20.9	11.1	23.3	30.6
Maximum increment plus actual background	30.5	25.0	15.2	27.2	34.4
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

Table 14.10 Predicted Highest Five Concentrations of PM_{10} (µg/m³) at each Receptor Location for 2021 with GUP (Pinkenba Rail Line to Nudgee Golf Course)

Receptor	Predicted Incremental 24 hour Average PM_{10} Concentration without Background				
	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	5th Highest Value
Viola Place south	1.3	1.3	1.2	1.2	1.2
Viola Place central	1.1	1.1	1.0	1.0	1.0
Viola Place north	0.7	0.7	0.7	0.7	0.7
Lomandra Drive north	0.9	0.9	0.8	0.8	0.8
Lomandra Drive south	0.7	0.7	0.7	0.7	0.6
Cassia Place	1.2	1.1	1.1	1.0	1.0
Auction house	3.4	3.4	3.4	3.3	3.2
Maximum increment at a receptor without background	3.4	3.4	3.4	3.3	3.2
Actual background concentration for corresponding day	26.4	20.9	11.1	23.3	28.4
Maximum increment plus actual background	29.9	24.3	14.5	26.6	31.6
EPP (Air) Guideline	150	150	150	150	150
NEPM Guideline	50	50	50	50	50

14.3 Reducing Particle Emissions from the Motorway

There are a number of aspects that influence the emission of particles from a road network. In particular, road design and fleet emissions are important. The GUP can influence only the road design directly. Fleet emissions and legislation for vehicle emissions standards are a matter for the Federal Government, with some input from the states, and cannot be influenced by this project.

The following aspects of this project will ensure that emissions of particles from the project will be minimised:

- Improved vehicle speeds will reduce particulate emissions per km travelled;
- Changes in road grade have been minimised where possible; and
- Improved roadway efficiency and reduced congestion.

Various changes to motor vehicle and fuel regulations will reduce emissions of air pollutants from the Brisbane vehicle fleet over the coming years. For example, the Fuel Quality Regulations adopted by the Federal Government in 2001 are expected to result in improvements in air quality. Reductions in PM_{10} emissions of between 25 to 33% (between 2000 and 2020) as a result of implementing the Fuel Quality Standards have been noted in the Fuel Quality Standards Bill 2000, Revised Explanatory Memorandum (http://scaleplus.law.gov.au/html/ems/0/2000/0/0642454620.htm).

14.4 Pre and Post Monitoring of Ambient Air Quality

Queensland Health has suggested that monitoring of air pollutants should be conducted before and after construction of the GUP. The air quality assessment has shown very low increments in air quality due to the GUP at sensitive locations. Whilst air quality monitoring could be undertaken, the cost of monitoring would be significant and the benefit would be minimal. Measured levels are likely to be dominated by regional influences and the local impacts due to the road will be difficult to differentiate under most circumstances. The current ambient air quality monitoring network run by the EPA provides a reasonable characterisation of population exposure to air pollution.

14.5 PM_{10} Column in Amended Table 14.6

Table 14.6 of the EIS presents a summary of the ambient air quality monitoring data collected at Eagle Farm. For NO_2, NO_x and O_3, these data and the relevant guidelines are a 1 hour average. For PM_{10}, the monitoring data are presented as 24 hour averages for consistency with the EPP (Air) and NEPM guidelines.

15. Noise and Vibration

15.1 Structural Integrity of the Rail Infrastructure

Further details on the likely vibration intensive construction activities in areas adjacent to rail infrastructure is summarised below.

Pinkenba Rail Line

- Existing Alignment – Vibratory rollers will be used on the abutment of the existing bridge (approximately 20m from the track). No pile driving will be required as existing bridge remains.
- New Alignment – Pile driving would probably be used up to approximately 20m north and 10m south of the rail line. Vibratory rollers will be used at the end of the bridge, approximately 40m north of the rail line.

Cleveland Branch Rail Line

- Pile driving and vibratory rollers would probably be required in order to construct a new bridge over the Cleveland Branch Railway Line. This activity could occur up to approximately 10m from the rail line.
- A new south-bound off ramp, and an existing south-bound on ramp which will be relocated, cross over the (currently unused) Incitec rail line. On the south-bound off ramp, pile driving and vibratory rollers would probably be used up to approximately 10m from the rail line. The Incitec rail line will be relocated to allow construction of the south-bound on ramp, and pile driving and vibratory rollers would again probably be used up to approximately 10m from the (relocated) rail line.

In order to assess the potential vibration impact of these activities on the rail infrastructure, vibration criteria for "Industrial and heavy commercial buildings" from British Standard 7385: Part 2 – 1993 "*Evaluation and measurement for vibration in buildings Part 2*" has been adopted and may be seen in Table 15.1.This an appropriate guideline in the absence of any known regulations or standards applicable to vibration induced damage to rail infrastructure.

Table 15.1 Vibration Criteria for Rail Infrastructure

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4Hz to 15 Hz	15Hz and Above
1	Reinforced or framed structures – Industrial and heavy commercial buildings	50mm/s at 4Hz and above	

Since some construction activities (such as vibratory rolling) could potentially result in resonant effects in the rail infrastructure, a conservative continuous damage criterion of 25mm/s at 4Hz and above has been adopted for such continuous vibration activities, in line with the approach recommended in BS 7385.

Vibration levels at the rail lines due to vibration intensive construction activities have been predicted based on the type of adjacent construction activity and the distance to the nearest rail line and may be seen in Table 15.2.

Table 15.2 Predicted Vibration Levels at Rail Infrastructure

Plant	Distance from Rail Infrastructure	Predicted Vibration Levels[1]	Project Criteria
Impact Pile Driver	10 m	7 – 24 mm/s	50mm at 4Hz and above
	20 m	4 – 12 mm/s	
Vibratory Pile Driver	10 m	< 5 mm/s	25mm/s at 4Hz and above
Vibratory Roller > 300 kN (> 12 tonnes)	10 m	4 mm/s	
	20 m	2 mm/s	
	40 m	1 mm/s	

Table Notes
1 The predicted vibration levels are based on vibration propagation through clay and source data from Heggies database for typical such plant.

The results of the vibration assessment indicate that, for the activities and offset distances which are likely to be adopted, vibration levels are expected to be well below the rail infrastructure criteria recommended as adopted from British Standard 7385: Part 2 – 1993.

15.2 Blasting Criteria

Blasting criteria are presented in Section 15.2.2 of the EIS. It is also stated in the EIS, that no blasting is expected to occur at any time on this project.

15.3 Night Time Road Traffic Noise Criteria

The noise criteria contained within the *Environmental Protection (Noise) Policy 1997* are planning levels and not design criteria. Design levels for road traffic noise from state controlled roads (such as the Gateway Motorway) are specified by Main Roads in their document entitled "*Road Traffic Noise Measurement: Code of Practice January 2000"* (Code of Practice). These design levels were adopted, in consultation with Main Roads, as the preferred criteria for the assessment of road traffic noise from the proposed upgrade.

15.4 Ongoing Traffic Noise Monitoring

All noise barriers must be constructed in accordance with Main Roads' document entitled *"Main Roads Standard Specification – Noise Barriers"* (MRS 11.15). This document contains many specifications for the construction and performance of noise barriers including:

- Panel and post materials;
- Minimum section properties;
- Impact and vandal resistance requirements;
- Structural design, wind loading and acoustic sealing; and
- Serviceability requirements.

Compliance with the MRS 11.15 specification will provide appropriate noise barriers.

Section 15.2.8 of the EIS states the following with regards to the timeliness of the construction of noise barriers:

Noise Barrier Control Strategies

Where possible, consider the installation of operational (ie permanent works) noise barriers as early as possible to provide additional construction phase noise mitigation.

Operational noise barriers will be erected as soon as possible during construction and certainly prior to completion of construction of the upgraded Motorway.

Future Noise Monitoring

In addition to the noise monitoring already undertaken, pre and post construction noise monitoring will also be undertaken.

Noise monitoring will be required prior to the start of the construction process in 2006. The noise monitoring will be conducted at the same locations along the corridor that were used in the EIS. Additional monitoring will be undertaken 6 to 12 months post construction (2011) when the Motorway is experiencing normal operation.

The proposed post construction noise monitoring will be undertaken to evaluate if the recommended mitigation measures have been effective in meeting the Departmental Code of Practice. The recommended locations for future noise monitoring should be, as close as possible, to those locations selected during the EIS (ie for consistency and comparison with the EIS findings). However, additional locations may be warranted following community consultation and/or detailed design.

15.5 Vibration

Discussions with Queensland Health staff within the Asset Management Unit have indicated that there are no Queensland Health property interests within 300m of the proposed GUP. It is expected that vibration due to construction activities will not be evident beyond 300m.

A review of the licensed private health facilities listed by Queensland Health has indicated that the nearest (licensed) facility is in excess of 2km from proposed construction. Again, no impact due to construction vibration is expected.

A recommendation could be made to undertake operational vibration monitoring as required to address any unforeseen circumstances or credible community concerns however, following the assessment undertaken for the EIS, this is highly unlikely at even the closest sensitive locations to the upgraded Motorway let alone at distances of 300m or more, such is the offset distance to the nearest Queensland Health facilities.

16. Terrestrial Ecology

16.1 Fauna Movement

This area was focused on during the EIS and mitigation measures such as exclusion fencing, fauna underpasses and culverts (including "arbour tunnels"), changes to the median strip structures as well as more promoted awareness will help to reduce the loss of connectivity for animals moving between eastern and western habitats. Further details on the proposed mitigation measures are included in Section 23.4.12.

16.1.1 Clear Span Bridges

Whilst clear span bridges are an ideal environmental solution, the culverts were seen as the best compromise between cost and practicality.

16.1.2 Fauna Exclusion Fencing

It is highly unlikely that the fauna exclusion fencing will prevent all ground dwelling fauna such as frogs, reptiles and some small mammals (and invertebrates) from entering onto the Motorway. While the fencing is likely to deter smaller fauna, the fencing will be designed to exclude larger fauna such as Koalas and macropods. Fauna underpasses with planted complementary food and shelter vegetation at the entrances, are more likely to be used by ground dwelling fauna in preference to crossing the road. It has also been proposed that the design of the median strips should consider high-tension wire as an alternative to the concrete barriers that fauna can negotiate more easily if they do cross the road.

16.1.3 Sugar Glider Crossing

Studies of the Sugar Glider (*Petaurus breviceps),* which though a smaller species, has very similar gliding ability to the Squirrel Glider *(Peturus norfolcenus).* Suckling (1984) as cited in AMBS (2001) found that the average glide angle was 29.7° (Jackson 1999 cited in AMBS 2001). For the purposes of providing land/launch poles for the GUP, the poles would need to be a minimum of 22 metres in height and spaced on the immediate edges and middle of the carriageway as to accommodate movement over the Motorway.

The installation of Squirrel Glider land/launch poles on either side and middle of the Gateway Motorway is not considered a desirable solution for the following reasons:

- The significant height of the poles in close proximity to the Motorway;
- Vehicular safety issues by encouraging glider movement over the carriageway; and
- High volume of vehicular traffic and light from the Motorway which is likely to deter gliders from utilising the poles.

The introduction of the arbour tunnel/s will assist in improving the movement of the Squirrel Gliders under the carriageway. Squirrel Glider movement may also occur at the Bulimba Creek area under the Motorway (ie structures over Bulimba Creek floodplain and Minimum Energy Loss Culverts).

16.2 Koala Issues

As stated in the EIS, an experienced animal spotter is to be present during the clearing of trees. In cases where a spotter detects a koala, the tree is to be clearly identified and left undisturbed with the crown left in tact until the koala leaves the tree of its own accord or in the event that there is no immediate surrounding suitable habitat, Queensland Parks and Wildlife is to be contacted to source an approved "catcher" to relocate the koala into a suitable habitat to be designated before commencement of tree clearing. To further reduce the risk associated of disrupting koalas while they are most active, removal of vegetation should occur outside the period between August and December.

As stated in the EIS, fauna exclusion fencing will be utilised along the Motorway corridor in the Koala Coast Bushland and the Belmont Hills Bushland areas. In addition to the Main Roads preferred exclusion fencing, other measures should be incorporated into the detailed design of the upgrade such as:

- Separating the carriageways with high tension cable as opposed to the concrete dividers extending past the on/off ramps to the north and south of this stretch of the Motorway to assist in the crossing of koalas once on the road;
- Use more lighting in this stretch for better visibility at night;
- Provide signage for the area to increase awareness of koalas in the area and to increase safety in the event of sudden braking;
- Digital or fixed signs providing contact details of animal rescue teams if fauna is spotted on the Motorway;
- Use "arbour tunnels" in conjunction with the culverts recommended in the EIS at Wecker Road and Coventry Court; and
- Consider alternative construction site fencing in the Belmont Hills and Koala Coast Bushland areas especially if construction is to take place between the months of August and December to provide "koala friendly" passages through or around these sites.

16.3 Bird Use of Kedron Brook Floodplain

16.3.1 Existing Environmental Values

The existing environment of the Kedron Brook floodplain area proposed for development is comprised of a mixture of native and exotic grasses, plants and trees (planted and existing), including some weed species.

While the ecological integrity of the Kedron Brook floodplains is very low, some fauna species have adapted to the area and use it as a nesting and foraging habitat. However in terms of raptor usage of the area the environmental value of the habitat is notable. The existing environment provides habitats and shelter for many grassland species including rodent and grass associated bird species such as quails and pigeons. These species are in the common diet of Raptor species including the Black-shouldered Kite, Brahminy Kite, Whistling Kite, White bellied Sea-eagle and Swamp Harriers all of which are known to feed in the area with all but the Swamp Harriers nesting in this area as well.

Due to the low numbers of suitable nesting sites, the trees in the Kedron Brook floodplain and associated area are of significant environmental value. The low numbers of suitable nesting sights also explain the relatively low species abundances of the raptors in this area.

In terms of the terrestrial environment utilised by the raptors in the Kedron Brook floodplain, the nesting and foraging sites are of environmental value. However outside of the short term construction disruption, it is unlikely that the proposed deviation will cause significant damage to this habitat. This is due to the fact that raptors generally benefit from disturbed environments and the species found in this area have been documented as foraging in disturbed habitats elsewhere in South East Queensland.

16.3.2 Black-Shouldered Kite

This species is not listed as a "significant" species under the BCC's Natural Assets Planning Scheme Policy indicating that it is not particularly rare or uncommon within the Brisbane City Council area. Marchant and Higgins (1993) note that its range and numbers have increased greatly since European Settlement due to man made changes to the landscape such as clearing, agriculture and the introduction of the House Mouse *(Mus musculus)*. Indeed plantations with a closed canopy such as the Swamp Oak plantations which are extensive on Brisbane Airport land nearby are unsuitable as habitat for this species.

Population numbers of this species are most likely response to the numbers of house mice.

It should be noted that through the re-establishment of grasslands and the extensive utilisation of structures in the Kedron Brook area, there is potential to benefit this species. As noted in the submission, the only known nest site in proximity to the project corridor will not be directly impacted upon by the proposed works.

16.3.3 Brahminy Kite

This species is not listed as a "significant" species under the BCC's Natural Assets Planning Policy, indicating that it is not particularly rare or uncommon within the Brisbane City Council Area. The proposed works will only affect a small area of the probable territory of this species.

As noted in the submission, fish forms a major part of this species diet. This project is unlikely to have any long term impacts on fish population numbers due to the installation of water quality treatment train systems.

It should be noted that this species scavenge and occasionally nest in towns and cities (Garnett 1983 cited in Marchant and Higgins 1993). Indeed Brahminy Kites may be observed within the City reaches of the Brisbane River despite the presence of Coronation Drive (and its heavy traffic volumes) and the numerous bridges which cross this busy waterway. It would indicate that this species is reasonably tolerant of man made change.

Whilst the proposed project may cause temporary disturbance to this particular pair of Brahminy Kites it is unlikely to have a significant impact long term or to overall populations regionally.

16.3.4 White-bellied Sea Eagles

White-bellied Sea Eagles is listed as a "significant" species under the BCC's Natural Assets Planning Policy indicating that it is rare in Brisbane or uncommon in Brisbane and becoming rare. The noted sightings for this species are confined to the Kedron Brook Floodway. The proposed works will result in the construction of a road crossing over this waterway but the effects of this will only be very localised. The majority of this waterway will be unaffected by the proposed works. Its major food items such as birds, reptiles, fish, mammals, crustaceans and carrion are unlikely to be affected over the long term if at all. Its breeding will not be impacted by the GUP.

16.3.5 Grass Owl and Swamp Harriers

The territory indicated in the submission does not show a significant overlap with the project corridor. Most of the noted sightings are located outside the project corridor. Any adverse affects are likely to be short term. Considerable landscape works are proposed as part of the project which should substantially reduce the long term overall effects of this project. It should also be noted that the major breeding area for the Swamp Harriers is in Tasmania (Marchant and Higgins 1993).

16.4 Shore Birds

16.4.1 Sightings of Shore Bird Activity

The areas of habitat for migratory and shore bird species along the route of the proposed GUP are not extensive or well-integrated with larger habitat further downstream in Moreton Bay. Recent survey work for the BAC indicates that the numbers of listed migratory species that visit the small areas of affected wetlands within the study area are minor compared with the tens of thousands that use Moreton Bay proper.

16.4.2 Bird Count Numbers

Although the bird count commissioned by BAC had numbers listed in their hundreds, the duration of the survey is not known even though it was conducted during summer when most migratory species would have been present. In addition, the GUP EIS stated that the migratory wader birds, that number in their thousands, utilise not only the airport but also the ecologically connected foreshore and associated areas, Hence the reason for the discrepancy between the numbers stated in the EIS from the field survey data and the BAC commissioned migratory bird count.

16.4.3 Koala Crossings

The existing Gateway Motorway contains no formal koala crossing which is illustrated by the number of koala casualties that occurred on the Motorway. The upgrade of the Gateway Motorway presents an opportunity to enhance the safe movement of native fauna across the Gateway Motorway. The locations indicated in the EIS for additional fauna crossings were the best practicable within the constraints of topography and nearby urban development. However, through the instalment of additional fauna culverts (including arbour tunnels) together with changes to the design of median strip dividers and fauna (particularly Koala) exclusion fencing on both sides of the Motorway, it is expected that the movement of fauna across the Gateway Motorway will be managed and expedited when compared to its present situation, resulting in an anticipated reduction in mortality.

17.Aquatic Biology

17.1 Tidal Connection to Mangrove and Saltmarsh Areas

The tidal connection to mangrove and saltmarsh communities on the BAC land is important to both the health and integrity of the ecology of both the Brisbane Airport land and its associated estuarine drains and the Kedron Brook Floodway and Boggy, Jackson, Jubilee and Serpentine Creeks.

Tidal connection will remain as part of the GUP (refer Section 23.4.6).

This issue will also be addressed in the GUP Draft MDP.

18. Cultural Heritage

18.1 Cultural Heritage Management Plan

The *Aboriginal Cultural Heritage Act 2003* replaced the *Cultural Record Act* in April 2004. One of the principles underlying the new legislation is recognition of Aboriginal people as 'the primary guardians, keepers and interpreters of Aboriginal cultural heritage'. The Act also proposes major changes to procedures by which Aboriginal cultural heritage will be conserved and protected. Like the existing legislation, it will continue to provide blanket protection for all cultural heritage, supported by a general 'duty of care' to take all reasonable and practical steps to be aware of, and to avoid harming Aboriginal cultural heritage. Guidelines on how to meet the 'duty of care' have been prepared.

The penalties for damaging registered cultural heritage are tenfold following the passing of the new legislation. The system under the *Cultural Record Act* was replaced by agreement-based arrangements including Cultural Heritage Management Plans. Wherever an Environmental Impact Statement is necessary, a Cultural Heritage Management Plan (CHMP) will be mandatory. This means that potential high impact development will only proceed when an effective balance with cultural heritage protection is achieved.

Notwithstanding the requirements of the *Aboriginal Cultural Heritage Act 2003*, Section 168 of the Transitional Provisions applies to the GUP. As a result, the preparation of a CHMP in accordance with the *Aboriginal Cultural Heritage Act 2003* is not required for the project. However, a CHMP will be implemented during the construction phase of the project (refer Appendix Q of the EIS).

19. Social Environment

19.1 Potential Lighting Impacts

The majority of the GUP is within the existing road corridor. Therefore the impact of lighting in terms of residential, industrial and business is likely to be slight.

The second Gateway Bridge and deviation lighting will also have minor impacts on adjacent land uses given the industrial and commercial nature of this area.

Potential impacts of lighting on the operation of the Brisbane Airport will be addressed in the GUP Draft MDP.

20. Economic Environment

20.1 Introduction

This section of the EIS has been revised based on the final Business Case for the project.

20.2 Methodology

The economic impact analysis of the proposed capital works and operational expenditure for the GUP has been conducted through the application of direct expenditure (estimation for direct economic impacts only), the development of a Cost Benefit Analysis and an assessment of existing and future transport and industrial activity impacting on the GUP corridor.

This analysis has involved the following steps:

- Identification and description of existing major economic activity with particular emphasis on current trade throughput at the Port of Brisbane facilities passenger throughput at Brisbane Airport and commercial industrial activity in the Australia TradeCoast precinct;
- Description and assessment of future economic activity in the Gateway Motorway corridor to 2012 and beyond identifying proposed developments in the Australia TradeCoast including Brisbane Airport and the Port of Brisbane, which have been endorsed in master planning documents;
- The development of the CBA model to identify project benefits in terms of travel time savings, vehicle operating costs savings, road safety savings and environmental savings; and
- The application of the direct expenditure estimation process to identify a range of direct economic impacts on the regional or state economies for the construction and operational phases through the estimation of additional Gross Output, Gross Regional Product/Gross State Product (ie value added), household income (ie wages and salaries) and employment.

The methodology, therefore, identifies and addresses the existing and future economic environment in and around the GUP corridor by considering the commercial/industrial development opportunities that may be reasonably expected to arise over the next decade and beyond and also the quantifiable regional and state direct economic and investment impacts which have been modelled to result from the construction and subsequent operation of the GUP.

20.3 Existing Economic Environment

20.3.1 Background

The Gateway Motorway provides Brisbane's most significant bridge crossing and north south road bypassing the CBD. The transport significance of Gateway Motorway is such that it connects the Bruce Highway to the north, the Pacific Motorway in the south and to the Logan and Ipswich Motorways in the west. The Gateway Motorway is a primary business and freight related corridor and is also a state nominated dangerous goods route.

Traffic using the Gateway Motorway is a function of existing and forecast population and commercial/industrial land use in and surrounding the Gateway Motorway corridor. This section of the EIS covers the commercial and industrial precincts and economic activity which directly impacts on the Gateway Motorway environment namely:

- Australia TradeCoast;
- Brisbane Airport;
- Port of Brisbane; and
- Western industrial areas.

20.3.2 Australia TradeCoast

The Australia TradeCoast (ATC) precinct is situated on both sides of the Gateway Motorway and is fast becoming the major manufacturing, transport, warehousing and logistics hub in South East Queensland and on the eastern seaboard. The ATC has been identified as the key generator of traffic on the Gateway Bridge. It contributes around 46% of average weekday traffic volume which is estimated in 2003 to be around 87,000 vehicles per day. Brisbane's sea port and airport are critical infrastructure and service elements of the ATC which have been instrumental in attracting business and general land take up in the precinct.

Traffic monitoring has identified that the Gateway Motorway south of Airport Drive has been operating at its capacity in peak directions for at least the past 5 years. Flows in contra peak directions are also approaching capacity. The peak flows have been spreading as a result of the capacity issues.

Southern Side of Brisbane River

Key international and national businesses have established and/or expanded their activities in the ATC commercial and industrial estates over the past 10 years supplementing long standing businesses in the area.

The Port of Brisbane Corporation (PBC) is a significant landholder on the southern side of the Brisbane River and controls approximately 120 hectares of developed and undeveloped land holdings, namely:

- Port of Brisbane Business Park comprising 60 hectares of commercial offices, industrial premises, warehousing and storage on Fisherman Islands which is predicted to be fully occupied in the next 2 years and possibly earlier;
- Colmslie Business Park comprising 16 hectares to accommodate coldstores, industrial warehousing, distribution and commercial offices; and
- Whyte Island Industrial Estate comprising 40 hectares of land partially accommodating the Caltex Refinery and with the potential to accommodate transport, storage, and distribution activities when Fisherman Islands is fully occupied.

A number of significant business and industrial parks have been constructed to supplement the pre-existing industrial parks in the ATC precinct. In particular, Metroplex on Gateway which is owned by Macquarie Goodman has been a major commercial success with many prominent international and national companies recently locating to this complex.

Major business and industrial parks on the southern side of the Brisbane and their key tenants include:

Metroplex on Gateway (corner Lytton Road and the Gateway Motorway)

- Capral Aluminium
- Fisher and Paykel
- LG Electronics
- Volvo Penta
- Edwards Dunlop Paper
- HPA
- Filtronics

Queensport Area

- Swire Cold Storage and Distribution Services
- LEP Mainfreight

Hemmant (Gosport St)

- Bunning's Distribution
- Gateway Container Park
- Longreach Logistics
- One Steel Distribution
- CC Container Services

Lytton Industrial Estate (DSDI)

- Berri
- ACI Plastics
- Yamaha

Whyte Island (PBC)

- Caltex
- Patricks Logistics (Hazardous Goods only)

Fisherman Islands (PBC)

- P&O
- Patricks
- Island Packing and Storage
- Smith Bros
- Chalmers Industries
- The Warehouse Group

Murarrie Industrial Estate (adjacent to Gateway Motorway)

- Nestle
- P&O Cold Storage
- Swire Distribution
- Inghams Chickens
- Goldman Fielder
- Protran Logistics

Colmslie

- Patricks Intemodal
- Mobil

Northern Side of Brisbane River

The existing commercial and industrial land uses on the northern side of the Brisbane River within the direct influence of the GUP are the following:

- Brisbane Airport's Export Park precinct which has Crazy Clarks distribution facility, Sandvik and Qantas Freight among its major tenants.
- Brisbane Airport's Export Park East (former international airport area) housing the air freight and logistics companies DHL and Brambles.

- Brisbane Airport's Aerotech Park with Qantas and Virgin Blue maintenance facilities, Aviation Australia Training College, Australian Aerospace, EADS and other aviation companies.
- PBC's Eagle Farm Estate comprising 26ha, which accommodates industrial warehousing, commercial offices and distribution.
- private commercial and industrial parks including Citiport Industrial Estate (Eagle Farm) and Brisbane Gate Industrial Park (Hendra).

The northern side of the Brisbane River has some of the regions largest freight logistics and distribution centres at Eagle Farm and Hendra including Toll, NQX, Coles Myer (Target). Similarly a number of significant and large manufacturers are located there including Smorgon Steel, G James Glass and Aluminium, BP, Shell and Incitec.

20.3.3 Brisbane Airport

The airport is accessed from the Gateway Motorway at Airport Drive and has a full 24-hour operations (no curfew) and is 2,700 hectares in size.

Brisbane Airport Corporation (BAC) purchased the long term lease (50 years plus an option for an additional 49 years) for Brisbane Airport from the Commonwealth Government in 1997.

Over the past 7 years, BAC has invested over $450 million in significant development works as part of its strategic vision to transform Brisbane Airport from a traditional state capital air passenger hub to the Airport City concept.

Total passenger movements at Brisbane Airport were 14.1 million for the year ending 30 June 2004 comprising of 10.9 million domestic air passengers and 3.2 million international air passengers. Domestic air passenger movements have grown at an average annual rate of 4% since 1996, while international passengers have grown steadily despite the unsettled international scene resulting from September 11, SARS, the demise of Ansett and route rationalisation. In late 2004, BAC passenger forecasts are 5% to 10% per year for Brisbane Airport.

Air freight at Brisbane Airport has doubled over the past decade with over 150,000 tonnes transported to/from Brisbane Airport in 2003.

Brisbane Airport currently has a significant economic impact on South East Queensland (SEQ) with more than 8,000 people working full time at the airport precinct and more than 18,000 people (inclusive of the full time employees) directly dependent on the airport's activity for their income.

BAC has produced the Brisbane Airport 2003 Master Plan which contains the planning framework for the development of the airport to 2023 and which will create significant business, industry and employment opportunities for the region.

20.3.4 Port of Brisbane

The Port of Brisbane, particularly its port facilities at Fisherman Islands, is a major driver of economic activity in SEQ and Queensland in general. Total trade through the port in 2003 was approximately 25 million tonnes including container throughput of 570,256 twenty foot equivalent units (teus). The port accounts for over $7 billion of total overseas commodity exports (91.4%) from SEQ. This existing trade currently results in significant heavy vehicle traffic from the north and south via the Gateway Motorway to the Port's Fisherman Islands facilities.

Fisherman Islands has eight deep-water container berths and three deep-water bulk berths. The first stage of the relocation of port activities from Hamilton on the northern side of the river to Fisherman Islands is currently planned to take place in early 2005 with the relocation of Patricks.

P&O Ports, in conjunction with the Port of Brisbane Corporation, is also relocating its general cargo operations from Hamilton to Fisherman Islands and also its car storage operations from Eagle Farm to Fisherman Islands. This relocation will be completed by 2005. Twenty eight hectares of land on Fisherman Islands have been allocated to a long term motor vehicle precinct.

20.3.5 Western Industrial Areas

The western industrial areas of Brisbane, Ipswich and Logan are those areas of commercial/industrial activity from Salisbury westward along the Ipswich Motorway and Logan Motorway corridors to Ipswich. These areas includes some of the major generators of heavy vehicle traffic including:

- Rocklea Markets
- Major supermarket distribution centres around Acacia Ridge and Richlands
- Major transport and logistic depots (Toll, FLC Interstate Transport, Linfox, etc)
- Building and construction materials establishments
- Australia Meat Holdings at Dinmore
- Carole Park Industrial Estate
- food manufacturers
- Acacia Ridge rail terminal

The western industrial areas are major sources of transportation (containers, general freight and other commodities) has a major influence on moving freight to/from the Port of Brisbane, Brisbane Airport and generally to other northern destinations via the Gateway Motorway. It is estimated in the Brisbane Urban Corridor (BUC) Study (2003) that over 2,500 trucks per day access the Gateway Motorway from the BUC.

20.4 Future Environment

20.4.1 Brisbane Airport

Brisbane Airport's 2003 Master Plan identifies significant aviation and industrial development opportunities over the next 20 years. The BAC has a vision in which the Brisbane Airport will develop into a premier Gateway Airport, serving as a major international hub and a major centre for aviation maintenance and training.

The major precincts to be developed are:

Brisbane Airport Domestic Precinct: Proposed terminal expansion including additional retail, commercial and hotel development to accommodate domestic passenger throughput of approximately 15 million by 2012/2013 at an average annual growth rate of 5.7%.

Brisbane Airport International Precinct: Terminal expansion, hotels, car parking, commercial offices and logistics centre to accommodate increases in international passenger throughput of approximately 6.5 million by 2012/2013 at an average annual growth rate of 6.5%.

Export Park: Expansion of existing area to accommodate major freight, warehousing and distribution uses. Other activities planned include training and education facilities such as flight simulator pilot training and aircraft maintenance training.

Banksia Place: Business park adjacent to Airport Drive comprising a mix of business, commercial, express freight and hotel activities.

Number 1 Airport Drive: Fully integrated airport business retail and leisure centre including direct factory outlets, mixed use business, retail and offices.

Airport Industrial Park: Light industry and general industry purposes.

Aerotech Park: Continued presence as Brisbane's major aviation and aerospace businesses including heavy maintenance facilities for Qantas, Alliance Atlantics, National Jet Systems, EADs and Department of Defence.

Northern Development Area: Expansion of precinct in line with general aviation activity, airport support activities and proposed parallel airway development.

BAC has indicated in its 2003 Master Plan that proposed developments will be staged to match future industry trends and demands and that the timing of investments may be subject to global influences outside the control of BAC. Notwithstanding there are compelling reasons which indicate that the proposed developments at the airport are likely to proceed as planned over the next decade and that the upgraded Gateway Motorway will be required to support this planned development.

20.4.2 Port of Brisbane

The Port of Brisbane is likely to consolidate its position as Australia's fastest growing port with continued population growth of over 2% in the SEQ and expanded industrial and business activity in the region.

The Port of Brisbane is in a similar situation to other Australian capital city ports in that its trade throughput is heavily influenced by the prevailing and forecast economic conditions in the USA, Japan and the expanding markets of South East and North Asia.

Total trade throughput is forecast to increase from 24.6 million tonnes in 2003 to 37 million tonnes in 2013 (an average annual growth of 5.3%) while container throughput was 570,256 twenty-foot equivalent units (teus) in 2003 and is forecast to increase to 1,377,020 million teus in 2013 (an average annual growth of 13.4%).

The provision of port, road and services infrastructure to support this forecast growth in trade will be required over the next decade. The failure to do so could have deleterious impacts on the continued success of the port in attracting trade and more importantly on the ongoing ability of SEQ to capitalise on continued population and economic growth.

To address port related infrastructure requirements for the future, the Port of Brisbane Corporation (PBC) commenced work in 2003 to reclaim 230 hectares of land at Fisherman Islands. The Future Port Expansion Seawall project will, when completed in mid 2005, will add an extra 1,800 metres of quay line to provide for additional berths and port land. The seawall will be progressively filled with material from maintenance dredging over the next 20-25 years.

The other significant strategic decision of the PBC has been to relocate port related operations, primarily general cargo and car import and storage activities of P&O Ports/Patricks, from Hamilton to Fisherman Islands by 2005.

As a result of this proposed relocation, a major urban renewal riverside project at Hamilton will be planned. The PBC has established the Northshore Development Group to develop a master plan for the 80 hectare site between the Royal Queensland Golf Club to the proposed Portside Wharf Cruise Terminal. It is proposed to progressively develop this land over the next 15 years in line with market demand.

This major initiative signals the longer term vision for current commercial/industrial land west of the Gateway Motorway at Eagle Farm to be earmarked for urban renewal.

20.4.3 Other Commercial and Industrial Developments

The proposed commercial and industrial developments which have been planned to accommodate airport and port related growth are significant and have been described in detail above.

There are a number of other new and/or planned developments on both the northern and southern side of the Brisbane River within the ATC area which will increase the volume and concentration of industry in and around the Gateway Motorway.

The DSDI has developed the Rivergate Marine Precinct to the immediate east of and adjacent to the southern toll plaza on the Gateway Motorway. Laminex Industries is currently constructing its production headquarters on the site and other major companies such as City Beach and Big Country will follow.

The other major industrial precinct in which DSDI has been involved are the Murarrie and Lytton Industrial Estate. A number of leading companies have already leased land for further industrial development.

To the west of Rivergate on the other side of the Gateway Motorway, the Queensport Quays Business Park is being marketed. This 62 hectare site is the final stage of the highly successful Metroplex on Gateway development and will provide industrial land for development ranging from 2,000 sq.m to 12,000 sq.m.

The Portlink Estate at Hemmant is another project which is currently being marketed to the industrial and commercial market.

The above proposed developments are indicative of the strong commercial interest in the Australia TradeCoast area. These developments are meeting existing strong demand which is likely to continue into the future. Sales of 1 hectare industrial allotments in the Metroplex on Gateway Estate were reported to be around $120 sq.m in 1999/2000. Prices have continued to escalate strongly over the past 4 years with recent sales above $150 sq.m. The commercial property sector has stated that prices have risen by up to 25% to 30% and that new developments such as the Portlink Estate on Lytton Road, Hemmant could possibly sell for up to $200 sq.m.

The market for quality industrial land has been very strong over the past 4 years and the proposed investment in the Gateway Motorway and also seaport and airport infrastructure will more than likely have a sustained beneficial impact on commercial and industrial land prices in the corridor.

20.4.4 Network Performance

Traffic modelling which has been undertaken in conjunction with this EIS has predicted that the Gateway Motorway, if not upgraded, will result in the deterioration of the road network performance causing in turn substantial delays, congestion, diversion of traffic to elsewhere in the network, increased accident rates and associated economic and social costs.

The substandard performance of the Gateway Motorway would have deleterious impacts on South East Queensland with businesses in these corridors including the Brisbane Airport and Port of Brisbane likely to bear these impacts and costs at a time when these businesses are projected to increase in commercial activity.

The proposed upgraded Gateway Motorway including the duplication of the Gateway Bridge would provide additional road capacity thereby increasing travel speed, relieving congestion and improving accessibility to businesses in the ATC and beyond relative to without those improvements. Regional arterial roads would be benefited by the Gateway upgrade with reductions in daily traffic (primarily north south traffic), estimated in the order of 5% in 2011 and 10% in 2021.

20.5 Construction and Operations Impacts

20.5.1 Introduction

The purpose of the economic impact analysis is to estimate the direct economic impact and potential economic value of the GUP. The study presents results of the economic impact analysis in terms of gross regional product, value added, household income (wages and salaries) and employment (FTE) at the regional (Brisbane Moreton Statistical Division) and state levels.

20.5.2 Approach

The Gateway Upgrade Project will have an economic impact on the economies under consideration in a number of different ways, and primarily in terms of its *construction* and *operational* phases. The activity of both phases will have linkages with other regional firms through the purchases of goods and services as inputs into their operations, and through the employment of workers who will in turn spend most of their wages in the local economy.

The *'Economic impact'* refers to the effects of an economic activity (eg, that of the GUP project) on an economic system such as the regional or state economy.

The most common way to measure these impacts is through estimation of the effects of the activity on key economic indicators, such as gross output, gross regional product (GRP) of the region through value-adding, household income earned in the form of wages and salaries, and level of regional employment. These effects are measured in terms of monetary units and employment measured as full time equivalents.

Estimations of the impact of the construction and operational activity of the GUP on these indicators are measured using project cost schedules and estimations of labour and wages and salaries. The local region for the purpose of this study is defined as the Brisbane Moreton Statistical Division. The State is the State of Queensland. The direct expenditure estimation process does not identify and extract any imports from interstate and hence the estimation of impacts are assumed to be the same for the regional and state levels.

20.5.3 Assumptions and Data Reconciliation

The following assumptions have been adopted in this analysis:

- The construction and expenditure profiles, including full time equivalent (FTE) employment figures, were estimated from data supplied by GUP technical consultants Evans and Peck Pty Ltd.
- All results are in real terms, that is, they represent 2004 values. Modifications were made to the tables and data supplied where necessary in order to ensure that these results are consistently represented in 2004 values.
- Capital expenditure (construction phase) will take place over 4.3 years but has been modelled as one period because project cost details were available for the total project as opposed to specific cost items allocated over the construction cash flow yearly timelines.
- Operating expenditure (operations phase) will take place over 30 years.
- All employment figures are in FTEs. This could be described as a technical interpretation of employment, in that it aggregates man-hours into FTE. Care should be taken in interpretation of employment results as the number of FTEs involved do not necessarily reflect the actual number of people involved.
- Full Time Employment is calculated from total hours (provided for construction phase).
- FTE based on 38 hour week, 48 weeks per year.
- Total hours during operations is calculated from total wages at $30/hr.
- Where no breakdown of components in structures could be performed due to insufficient information, all expenditure was allocated to other construction.
- All materials will be sourced locally.
- Any interpretation of results should be regarded as estimates and are indicative only.

Most importantly, the following results only include direct economic impacts from the construction and operations phases of the project. Indirect impacts that may flow through the economy as a result of the multiplier effect have not been included. Quantification of the indirect impacts of the GUP, which requires construction of a suitable economic model is progressing and will be reported in due course.

20.5.4 Construction Phase

This section presents the direct economic contributions of the Gateway Upgrade Project in terms of its construction phase.

The construction and expenditure profiles consisted of various electronic data, including spreadsheets, providing considerable detail on the construction of the Gateway Upgrade Project. Section 20.5.3 assumptions and the following should be noted:

- yearly development and construction costs include cost of labour
- the comments on FTE and interpretation also apply
- some rounding of the figures occurs

At a total cost of approximately $1,417m, the GUP construction project represents a sizeable project with estimated total full time equivalent employment of around 5,900 persons. This is the equivalent to an average of approximately 1,375 FTE per year over the construction period. This would indicate an output/FTE of approximately $240,000. Although it is estimated that construction of the GUP would take place over 4.3 years, for the purpose of this study, the impact of total construction only is measured.

Project expenditure data using the direct expenditure estimation, indicated the following direct effects:

Table 20.1 Initial (Direct) Effect, Total Construction, GUP, Brisbane Moreton and Queensland

Contribution to:	Amount
Gross Capital Expenditure	$1,417,000,000
Gross Regional Product	$683,008,612
Wages and Salaries	$465,837,097
Employment (FTE)	5,919

These figures show that the total construction cost of $1,417m is associated with $683m in value added (GRP) including $465m paid to the labour force by way of wages and salaries.

20.5.5 Operations Phase

All employment figures in this section are expressed as full time equivalents (FTE). This could be described as a technical interpretation of employment, in that it aggregates man hours into FTE's, care should be taken in interpretation of employment results as the number of FTEs involved does not necessarily reflect the actual number of people involved. Some rounding of the figures occurs.

The following initial (direct) effects of the annual operational activities of the GUP excluding major maintenance have been identified:

Table 20.2 Initial (Direct) Effect, Annual Operations, GUP

Contribution to:	Amount
Gross Output	$24,570,000
Gross Regional Product	$15,406,481
Wages and Salaries	$11,748,711
Employment (FTE)	258

Table 20.2 represents the initial or direct impact of the GUP operations and maintenance within the Brisbane Moreton and Queensland economies on an annual basis. The direct impacts of the operations phase are estimated to increase GRP by $15.4 million annually, which will include 258 FTEs generating $11.7 million in wages and salaries. The operations activity will have linkages with other regional firms through the purchases of goods and services as inputs into their operations, and through the employment of workers who will in turn spend most of their wages in the local economy.

20.6 Cost Benefit Analysis

20.6.1 Background

This report presents the findings of the Cost Benefit Analysis (CBA) which has been undertaken to comparatively assess, firstly, the Do Minimum Base Case with the Do Minimum plus Gateway Upgrade Project Reference Case.

The CBA framework has been used to assess the economic efficiency of the GUP's resource allocation by quantifying in monetary terms the project's costs (ie CAPEX and OPEX) and benefits (ie travel time savings, vehicle operating costs savings, road safety and environmental benefits). The CBA has derived investment decision criteria of Benefit Cost Ratio (BCR) and Net Present Value (NPV) which can be used by agencies to better understand the economic viability of the Reference Case from a road user benefit's perspective.

The GUP in all traffic modelling and tolling options consists of the following capital works:

- six laning of the Gateway Motorway from the Mt Gravatt – Capalaba Road to Wynnum Road (ie additional two lanes), and eight laning between Wynnum Road and Lytton Road (ie additional 4 lanes);
- duplication of the Gateway Bridge to the east of existing bridge;
- new four lane northern deviation from Lavarack Road to Nudgee Road;
- additional airport interchange; and
- existing Gateway Bridge modifications.

The Reference Case has been modelled in this CBA with the project cash flow allocated across the construction period 2006 to 2011. The Do Minimum Base Case aligns with the Traffic Model M201 while the Do Minimum plus GUP Reference Case aligns with Model M203 (ie Reference Case M203). The "Do Minimum" case comprises a number of highly probable road projects which will impact on the general road network and hence traffic volumes. It has been assumed that there will be no early staged road user benefits with the GUP being fully commissioned on 1 January 2011.

The tolling option for the Reference Case M203 assumes current toll levels ($2.20/$5.50) with CPI indexation from 2011 thereafter.

The following costs and benefits have been quantified for the Reference Case M203 within the CBA framework:

- planning, land acquisition and relocation, design, construction and construction management costs (ie CAPEX);
- state costs, contractors' minor and major maintenance and relevant operating costs including all tolling costs (ie OPEX);
- travel time savings;
- vehicle operating costs (VOC) savings;
- accident savings; and
- environmental benefits (where they can be monetised).

Expenses that are associated with a project's financing, such as depreciation and interest payments, are not included in CBA. Interest payments represent a transfer and not an actual resource use and hence are excluded from the OPEX.

Tolling revenue is not a specific identifiable benefit of the project in the context of the CBA. The tolling charge represents a means by which some of the benefits of the project in terms of reduced travel time, improved vehicle operating conditions and improved safety, all of which are already included in the CBA framework, can accrue to the toll operator.

20.6.2 Reference Case M203

Data

The CBA evaluates the net differences between the "Do Minimum" Base Case with the Reference Case M203, respectively. It is assumed that the Do Minimum Base Case equates to the Do Minimum component in the Reference Case and hence cancel each other out.

Results

The investment criteria which have been calculated for the Reference Case M203, in this CBA are NPV, Present Value (PV) of Costs and Benefits and BCR.

The *PV Benefits* has been segmented by benefit type namely travel time savings, VOC savings, accident savings and environmental savings. The *PV Costs* refers to the present value of the capital investment and OPEX (including maintenance) only. Recurring tolling and maintenance costs in line with the whole of life concept for the project have been included in the OPEX. The PV is the equivalent value in the base year of a benefit (or cost) to be incurred at some other point in time following the application of the discount rate (ie 6% in the case of this study).

The *NPV* is the value of the discounted total future benefits minus discounted total future costs over the assessment life of the Reference Case M203. A positive NPV is a criterion for proceeding with the project although risk and other non CBA factors also need to be considered.

The *BCR* is equal to the discounted total benefits over the assessment life of the Reference Case divided by the discounted total costs (ie CAPEX and OPEX). A ratio greater than 1 indicates that the Reference Case is economically viable in the context of the CBA although there maybe other non CBA factors (eg available program funding, unquantifiable social and environmental factors) which may have to be considered in bringing the project to fruition. A higher BCR indicates that the Project case has greater economic merit.

A summary table of the CBA investment criteria using a discount rate of 6% is provided in Table 20.4.

Table 20.4 PVs, NPV and BCR for Reference Case (Discount Rate 6%)

Reference Case	PV of Total Cost $m	PV of Total Benefit $m	NPV $m	BCR	Type of Benefit							
					Travel Time		VOC		Accidents		Environment	
					$million	%	$million	%	$million	%	$million	%
Reference Case M203	$1,298m	$4,758m	$3,461m	3.7	$4,248m	89.3	$458m	9.6	$26.9m	0.6	$25.7m	0.5

The main results of the CBA with regard to the discount of PV benefits Travel Time and PV Vehicle Operating Costs over the 30 year assessment period are provided in Tables 20.5 and 20.6 for the Reference Case M203.

Table 20.5 Reference Case M203 PV Travel Time Benefits by Vehicle Class

Vehicle Class	Total PV TT	% of PV TT	% of PV Total Benefits
	M203	M203	M203
Cars	$3,365m	79%	71%
Light Commercials	$302m	7%	6%
Heavy Vehicle	$581m	14%	12%
Total Travel Time Benefits	$4,248m	100%	89%

Table 20.6 Reference Case M203 PV VOC Benefits by Vehicle Class

Vehicle Class	Total PV VOC	% of PV VOC	% of PV Total Benefits
	M203	M203	M203
Cars	$299m	65%	6.3%
Light Commercials	$40.9m	9%	0.9%
2 axle	$29.9m	7%	0.6%
3 axle	$88.4m	19%	1.9%
Total VOC Benefits	$458.0m	100%	9.6%

The major findings from the CBA modelling area are as follows:

- The Reference Case M203 net returns over the assessment period are a NPV of $3,461 million which equates to a BCR of 3.7.
- The GUP Reference Case M203 returns a discounted or PV Total Benefits of $4,758 million over the 30 year assessment period.
- The PV Costs are $1,298 million with discounted OPEX comprises $143 million reflecting the impact of lesser discounted values in the latter years of the assessment period.
- PV Travel Time savings are the largest contributor to total PV Benefits with $4,248 million or 89% of Total PV Benefits for the Reference Case M203. Cars are the dominant vehicle class contributing around 79% of PV Total Travel Time savings and 71% of Total PV Benefits.
- PV VOC savings are the second largest contributor to total PV Benefits with $458 million or 9.6% for the Reference Case M203.
- Within the VOC savings stream, cars contribute $299 million or almost 65% to total PV VOC savings while 3 axle trucks contribute $88 million or 19% of total PV VOC savings.
- PV Accident savings are $26.9 million or approximately 0.6% of total PV Benefits for the Reference Case M203.
- PV Environment benefits for the Reference Case M203 are $25.7 million or 0.5% of total PV Benefits.

The NPV and BCR provide a strong economic justification to proceed with GUP Reference Case over the 2006 to 2011 construction timeline with NPV Benefits of $3,461 million and a BCR of 3.7 over the 30 year assessment period.

Economic parameter values which have been assigned to road user benefits namely travel time, vehicle operating costs and accidents are in June 2002 prices and have been taken from Austroads standards. Project CAPEX and OPEX costs are in 2004 prices. If the parameter values for road user benefits are escalated to June 2004 prices using CPI changes for Brisbane, the PV benefits would increase by 6.7% to $5,077 million over the 30 year assessment period and result in a higher project BCR of 3.9. Therefore the BCR range for the M203 would be between 3.7 and 3.9 with the latter reflecting the escalation of road user benefits to current 2004 prices.

The CBA highlights that the operation of the GUP will reduce traffic delays, congestion, accident costs and provide quantifiable environmental benefits over the 30 year assessment period. The BCR and NPV specify that the aggregate performance of the road network would be significantly positively affected by the GUP which would have its primary impacts in reducing vehicle hours and to a lesser extent vehicle kilometres travelled while having the net effect of increasing travel speeds in the network beyond 2011.

20.7 Conclusions

The GUP represents a significant investment catalyst that will result in major economic benefits accruing to the State and to the South East Queensland region.

From a regional and Queensland perspective, the major direct benefits are in terms of net additions to GRP/GSP. An alternative measure is the additional jobs created by the project. The modelling estimates that in its construction phase the project will raise GRP above its current level by $683 million which will include around 5,900 full time equivalents (or around 1,375 FTEs per year over the construction period) generating wages and salaries in the order of $466 million over the 30 year assessment period. In terms of employment, the project would play a major role in continuing the strong level of non residential construction industry in the region.

The operations phase of the GUP over the 30 year assessment period will also increase GRP by $15.4 million annually, which includes the equivalent of approximately 258 full time equivalent jobs generating wages and salaries of $11.7 million annually.

Aside from these direct impacts on the regional economy, the construction and operations phases will result in indirect impacts as the project's expenditure flows-on through other sectors of the economy. Indicatively, it is estimated that these indirect impacts will benefit the Finance, Property and Business Services sectors. Quantification of the indirect impacts of the GUP which requires the construction of a suitable economic model is progressing and will be reported in due course.

The CBA provides a strong economic justification for the Reference Case M203 proceeding with a BCR of 3.7 and a NPV of $3,461 million over the 30 year assessment period. Approximately $4,247 million in PV Benefits accrue from significantly improved travel time or alternatively reduced vehicle hours travelled in the forecast road network. It is estimated that the BCR would increase to 3.9 if economic parameter values were escalated from June 2002 prices to June 2004.

The GUP will also have beneficial impacts on the major economic drivers in the Australia TradeCoast precinct namely the Brisbane Airport and the Port of Brisbane's facilities at Fisherman Islands. Brisbane Airport's national and international passenger throughput is forecast to increase from a total 12.3 million passengers in 2003 to approximately 21.5 million passengers by 2012/13. An upgraded Gateway Motorway including a second airport interchange will be integral to the ongoing successful operations of the airport and the proposed supporting industrial/commercial development at the airport.

Similarly the Port of Brisbane's Fisherman Islands facilities and other land development in the Australia TradeCoast will also generate major additional road infrastructure demand which will add further justification to have the upgraded Gateway Motorway operational by 2011. The Port's total trade is forecast to increase from the current 22.5 million tonnes to 37 million tonnes in 2013 at an average growth rate of 5.3%. The provision of the GUP by 2011 will significantly enhance the Port's ability to attract increased trade and the ATC locational advantages as one of key commercial/industrial precincts on Australia's eastern seaboard.

Future economic development of the Australia TradeCoast and South East Queensland will require efficient and convenient landside transport links to both the Port of Brisbane's facilities and Brisbane Airport. The failure to achieve an acceptable future level or road performance on the strategically important Gateway Motorway could result in a major loss of economic opportunities for the region and Queensland.

21. Hazard and Risk

21.1 Natural and Induced Hazards

The EIS discusses the potential for induced hazards such as accidents and construction faults on the surrounding and down stream natural environment. References were made to natural hazard issues such as erosion, ASS management and flooding in their relevant EIS section.

Risks and hazard issues are included throughout the EMP under the various headings in terms of potential impacts and mitigation measures.

21.2 Earthquake Immunity of the Project

During the design phase of the existing Gateway Bridge predicted earthquake loads were analysed and the structural response examined. As a result of this investigation minor structural details were required as a result of predicted earthquake loadings.

Since the design of the original Gateway Bridge the Australian Standards has revised the standard for earthquake loading and released it as, AS1170.4 – Earthquake Loads. Similarly Australian Standards have released the new Bridge Design code suite, AS5100 – Australian Bridge Design Code. Whilst the scope of AS5100 is generally only applicable to bridges with a maximum span of 100m (Gateway Bridge main span is 260m) the general analysis and design processes within are applicable to the new Gateway Bridge.

The proposed duplicate bridge, the approach span bridges and the abutment embankments will be analysed and designed, where applicable, to the requirements of the above Standards. As with any design process the worst case combined loads (eg wind, dead weight, live load, earthquake, impact loads etc) will be used as the governing load case for the design of the bridge.

As recommended in Clause 14 of AS5100.2 a 3-dimensional, dynamic analysis is proposed in lieu of a static analysis due to the available computer processing power currently available. For a structure such as the Gateway Bridge a static analysis of the bridge is not applicable. The bridge will be analysed at various stages of construction due to the different response mechanism of the structure to lateral and vertical loads before the balanced cantilevers are structurally connected to each other and the approach bridge spans.

22. Landscape and Visual Amenity

No additional information has been requested for the Landscape and Visual Amenity (Section 22) of the EIS.

23. Environmental Management Plan

23.1 Introduction

This Preliminary EMP has been prepared for the purpose of addressing the EIS requirements. This EMP has been further refined based on submissions received during the EIS public display period. The EMP will be further expanded following the Coordinator-General's decision on the project and during the design phase of the project.

23.1.1 Basis for the Plan

An important requirement of a project of this nature is to prepare an EMP to ensure the environmental safeguards proposed as a result of the planning and environmental assessments associated with the project are enacted in an appropriate and timely fashion.

The potential exists for the degradation of the site and surrounding natural values. This would be likely to occur during the construction and operational stages of this project and has been identified during the course of the environmental studies performed for this project.

Planning and design measures are therefore necessary to ensure that all reasonable measures are taken to protect the environmental values, which may be impacted during construction and operation activities.

23.1.2 Aim of the Plan

The aim or purpose of this EMP is to detail the actions and procedures to be carried out during the implementation phase of the project in order to mitigate adverse and enhance beneficial environmental and social impacts. The environmental studies and consultation conducted as part of the EIS have identified the potential construction and operational impacts of proceeding with the project.

A range of mitigation measures have been identified from the EIS environmental studies to mitigate and manage these potential impacts and need to be implemented during the construction and operational stages of the project.

The EMP addresses the proposed mitigation measures, records environmental commitments and establishes the framework to ensure they are implemented during each stage of the project. In effect, the EMP becomes the key reference document in that it converts the undertakings and recommendations of the environmental studies into a set of actions and commitments to be followed by the designers, constructors and future operators of the proposed GUP.

The EMP will also serve as the benchmark for measuring the effectiveness of environmental protection and management. This can be achieved by specifying the monitoring, reporting and auditing requirements, with nominated responsibilities and timing to ensure the necessary mitigation measures are met. The EMP also makes provision, as appropriate, for unforseen events by outlining corrective actions which may be implemented in these situations.

23.1.3 Format of the EMP

The EMP is structured as follows:

- Relevant statutory obligations and regulatory framework within which the project will be required to progress (Section 23.2);
- Management structure and general project responsibilities for staff involved in the project (Section 23.3);

- Environmental management strategies for particular environmental aspects (Section 23.4); and
- Subsequent stages of the environmental management process during the detailed design, construction and operational stages of the project (Section 23.5).

To increase the useability of the EMP, it has been prepared as a stand alone document.

23.1.4 Main Roads Environmental Management Approach

In preparing this EMP Main Roads' environmental management approach was considered.

Main Roads key strategy document is Roads Connecting Queenslanders. This document provides the policy directions that realises Main Roads vision over the next decade and beyond.

The document focuses on four key outcomes for the Queensland road system, which contribute to the government's priorities for the state:

- Safer roads to support safer communities;
- Efficient and effective transport to support industry competitiveness and growth;
- Fair access and amenity to support livable communities; and
- Environmental management to support environmental conservation.

The key to making these outcomes a reality will be Main Roads partnerships and working relationships with communities, federal and state government agencies, local government, industry and the private sector.

23.2 Statutory Obligations

23.2.1 National Strategies and International Conventions

The following national policies provide the guiding principles for the design, construction and operation of the proposed GUP:

- National Ecologically Sustainable Development (ESD) Strategy 1992;
- National Greenhouse Response Strategy 1992; and
- Framework Convention on Climate Change 1994.

Other international conventions and agreements relevant to the GUP include:

- CAMBA – Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their environment.

- JAMBA – Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their environment.

- Ramsar Convention on Wetlands – The Convention on wetlands, signed in Ramsar, Iran, 1971, is an inter-governmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

In addition to the conventions and agreements above, a further two conventions are identified as being indirectly relevant to the GUP. These are:

- CMS or Bonn Convention – The Convention on the Conservation of Migratory Species of Wild Animals aim is to conserve terrestrial, marine and avian migratory species throughout their range.

  The convention is aimed at restricting harvesting, conserving habitats and controlling other adverse factors. The species covered include marine mammals, sea turtles and sea birds.

- Convention on Biological Diversity – is a comprehensive, binding agreement covering the use and conservation of biodiversity.

23.2.2 Regulatory Process

The following legislation is considered relevant to the project:

- *Aboriginal and Torres Strait Island Heritage Protection Act 1986*;
- *Aboriginal Cultural Heritage Act 2003*;
- *Acquisition of Land Act 1967*;
- *Airports Act 1996*;
- *Airports (Environment Protection) Regulations 1997*;
- *Animal Care and Protection Act 2001*;
- *Coastal Protection and Management Act 1995*;
- *Dangerous Goods Safety Management Act 2001*;
- *Environmental Protection Act 1994*;
- *Environment Protection and Biodiversity Conservation Act 1999*;
- *Fisheries Act 1994*;
- *Health Regulations under the Health Act*.
- *Integrated Planning Act 1997*;
- *Lands Act 1994*;
- *Nature Conservation (Wildlife) Regulation 1994*;
- *Plant Protection (Red Imported Fire Ant) Quarantine Notice 2001*;
- *Queensland Heritage Act 1992*;
- *Soil Conservation Act 1986*;
- *Transport Infrastructure Act 1994*;
- *Transport of Dangerous Goods by Road Act*;
- *Vegetation Management Act 1999*;
- *Water Act 2000; and*
- *Workplace Health and Safety Act 1995*.

A summary of the likely approvals required for the GUP are provided in Table 23.1.

Table 23.1 Summary of Likely State Approvals

Legislation	Administering Authority	Trigger	Project Response	Responsibility (Project Phase)
Coastal Protection and Management Act 1995 and *Integrated Planning Act 1997*	EPA	Operational work that is tidal works in, on or above land under tidal water. "Land" is defined to include any estate under land and also the subsoil	Development Permit for Operational Works to be obtained	Detail Designer (Detailed Design)
Dangerous Goods Safety Management Act 2001	DES	Large dangerous goods location established	Notify the Chief Executive (DES). Emergency Plans and Procedures to be prepared	Construction Contractor (Construction)
Environmental Protection Act 1994 and *Integrated Planning Act 1997*	EPA	ERA 19: Dredging ERA 20: Extracting rock or other material ERA 22: Screening, washing, crushing, grinding, milling, sizing or separating material extracted from the earth ERA 62: Concrete batching Other ERAs as required during construction	Environmental Authority to be obtained	Construction Contractor to obtain Development Permit and Environmental Authority (Prior to Construction)
		Removal of contaminated soil from sites listed on CLR or EMR	Disposal Permit to be obtained	Construction Contractor (Prior to Construction)
Fisheries Act 1994	DPIF	Work in areas causing removal, destruction or damage to marine plants	Permit to be obtained.	Main Roads (Prior to Detailed Design)
		Temporary bunding of tidal waterways	Permit to be obtained.	Construction Contractor (Construction)
Nature Conservation Act 1992	EPA	Taking, using, keeping or interfering with a protected animal or plant	Fauna to be relocated in accordance with Fauna Relocation Plan.	Construction Contractor (Construction)
			Permit to be obtained if protected plants are affected by Project.	Construction Contractor (Prior to clearing)

Legislation	Administering Authority	Trigger	Project Response	Responsibility (Project Phase)
Transport Infrastructure Act 1994	QR	Work that interferes with the railway	Railway Manager approval under Section 255 to be obtained	Construction Contractor (Prior to Construction)

Table Notes:
DES = Department of Emergency Services
DPIF = Department of Primary Industries and Fisheries
EPA = Environmental Protection Agency
ERA = Environmentally Relevant Activity
CLR = Contaminated Land Register
EMR = Environmental Management Register
QR = Queensland Rail

Some of the other key legislative requirements for the GUP are summarised in the table below. Other approvals for the GUP are to be identified during the design phase of the project.

Table 23.2 Other Key Legislative Requirements

Legislation	Administering Authority	Trigger	Project Response	Responsibility (Project Phase)
Animal Care and Protection Act 2001	DPIF	Encounter animals in the course of works/activities	Must not be cruel to an animal (eg cause pain, abuse, confine or transport inappropriately)	Construction Contractor (Construction)
			Fauna Relocation Plan to be implemented	Construction Contractor (Construction)
Environmental Protection (Waste Management) Regulation 2000	EPA	Various triggers relating to waste tracking	Waste management to comply with relevant provisions (refer Section 3.9.3 for further details)	Construction Contractor (Construction)
Land Protection (Pest and Stock Route Management) Act 2002	DNRM	Pests (ie animals or plants) must be controlled	EMP to be implemented during construction and maintenance	Construction Contractor (Construction) Operator (Operation)

Table Notes:
DNRM = Department of Natural Resources and Mines
DPIF = Department of Primary Industries and Fisheries
EPA = Environmental Protection Agency

23.2.3 Airports Act 1996

For GUP works on Brisbane Airport land a Draft Major Development Plan (MDP) has been prepared in accordance with the *Airports Act 1996*. The Draft MDP contains mitigation measures which need to be implemented during the design, construction and operational phases of the project.

The design, construction and operational phases of the GUP on airport land will need to comply with the *Airports (Environment Protection) Regulations 1997.*

The Airport Environmental Strategy (2004) requires that the GUP on airport land must submit a Construction EMP for both BAC and the Airport Environmental Officer approval prior to a Permit to Commence Works being issued under the *Airports (Building Control) Regulations 1996*.

23.2.4 Monitoring and Auditing Standards and Guidelines

The following standards apply to monitoring and auditing of performance:

Water and Wastewater

- Water Quality Sampling Manual, Third Edition, 1999 – For use in Testing for Compliance with the *Environmental Protection Act 1994*. Third Edition (Department of Environment Heritage 1999).
- Standard Methods of the Examination of Water and Wastewater – American Public Health Association (APHA)/Australian Waste Water Association (AWWA).
- AS 2031 Selection of Containers and Preservation of Water Samples for Chemical and Microbiological Analysis.

Soils

- Australian and New Zealand Environment and Conservation Council (ANZECC)/National Health and Medical Research Council (NHMRC) – Guidelines for the Assessment and Management of Contaminated Sites.
- Queensland Government Chemical Laboratory – Guidelines for Soil Sampling.
- Queensland Acid Sulfate Soil Investigation Team (QASSIT) "Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998".
- "Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland" (Department of Environment 1998).

Air

- AS 3580 Methods of Sampling and Analysis of Ambient Air.

Noise and Vibration

- "Interim Guidelines and Technical Notes for Road Traffic Noise Amelioration" (DMR 1992).
- E1 Environmental Guideline "Noise from Construction, Maintenance and Demolition Sites" (EPA 1989).
- Noise Measurement Manual, Third Edition, 2000.
- AS 1055.1 and AS 1055.2 Acoustics – Description and Management of Environmental Noise.
- AS 2187 Explosives – Storage Transport and Use (Explosives Code).
- AS 2436 Guide to Noise Control on Construction, Maintenance and Demolition Sites.
- AS 2659.1 Guide to the Use of Sound Measuring Equipment.
- AS 2659 Sound Level Meters.
- AS 2702 Acoustics – Methods for Measurement of Road Traffic Noise.
- Calculation of Road Traffic Noise (CORTN88) United Kingdom Department of Transport.

Dangerous Goods

- AS 1216 Classification, Hazard Identification and Information Systems for Dangerous Goods.
- AS 1678 Emergency Procedure Guides – Transport.
- AS 1940 Storage and Handling of Flammable and Combustible Liquids.

- AS 2508 Safe Storage and Handling Information Cards for Hazardous Materials.
- AS 2809 Road Tank Vehicles for Dangerous Goods.
- AS 2931 Selection and Use of Emergency Procedure Guides for Transport of Dangerous Goods.

23.2.5 Best Practice

For the purposes of the EMP the term "best practice" refers to the environmental management of an activity (which achieves) an ongoing minimisation of environmental harm of the activities through cost effective and practical measures currently used nationally and internationally for the activity.

23.3 Project Management

The project delivery method for the GUP will be via the government financed option using a Design, Construct and Maintain (DCM) type delivery. The EMP management structure and responsibility terminology will be developed in the next phase of the project in consultation with Main Roads, Queensland Motorways Limited (QML) and Treasury. Once the management structure has been finalised, the EMP will be amended to reflect the GUP DCM management structure.

23.4 Environmental Management Strategies

23.4.1 Structure

The structure of the environmental management strategies that follow are to assist in separate consideration of the relevant environmental issues. It is intended that this format is user-friendly and is amenable to review and amendment. Where appropriate, management strategies for individual sections of the project have been identified. The contents of a typical strategy is described below:

- Commitment or Objective;
- Mitigation Measures (design, construction and operation where relevant); and
- Monitoring (if required).

23.4.2 Land Use and Emergency Management Services

Objective

- Design construction works in order to minimise the need for land resumption and adverse impacts to adjacent land uses.
- Undertake construction activities in a manner which prevents/minimises adverse impacts to adjacent land uses and land use values.

Mitigation Measures

Design

- Private property owners will be compensated for the acquisition of their land through the resumption process.
- The Royal Queensland Golf Course will be compensated for impacts through agreement with Main Roads. Compensation will include consideration for the relocation of all fairways and greens to the west of the GUP corridor and the upgrading of the course to accommodate these changes.

- Directly affected property owners to be compensated for the acquisition of their land.
- Submit to Department of Emergency Services (DES) the location of any Large Dangerous Goods Locations, Major Hazard Facilities or possible major hazard facilities within two kilometres of the project along with the location of pipelines which cross the route.
- Prepare Emergency Management Plans to the satisfaction of DES.

Construction

- Incorporates principles for protection of the land use values of areas adjacent to the GUP corridor into the development of the EMP (Construction).

23.4.3 Transportation

Objectives

Implement construction management strategies and measures during construction and operation that ensure GUP, the arterial road network and the local street network operate in a safe and efficient manner with minimal delay to road users, cyclists, pedestrians, buses, and Queensland Rail operations.

Specific performance objectives need to be developed for the project. This will ensure that design and construction proceeds with traffic disruption not exceeding expectation. This is likely to involve traffic and transport analysis. Objectives need to identify:

- Minimum number of lanes to be maintained;
- Variation allowed with time (eg peak and off peak requirements);
- Gateway Motorway toll plaza operational requirements;
- Optimal staging configuration; and
- Network performance, including alternative route options.

Mitigation Measures

Design

The Detailed Design Consultant should apply the following design concepts:

- Ensure the design developed can be constructed in accordance with the objectives and limitations of the traffic management objectives;
- Increased width of Motorway batters should not impact on sight distance for intersections (eg intersection of Mt Petrie Road and Greendale Way);
- Liaise with BCC regarding their road upgrades and traffic management issues;
- Utility service relocations are feasible and can be constructed in accordance with traffic management objectives;
- Provide safe provisions for pedestrian and bicycle movements where appropriate;

- Amendments to the local street network including access are consistent with expectations of property owners and other road users;
- Ensure the design can be developed within limitations appropriate to Queensland Rail requirements. Queensland Rail to be consulted during design;
- Ensure the design of pedestrian and cycle pathways and any under/overpasses incorporate adequate safety measures; and
- Adopt maintenance minimisation objectives in development of design detail.

Construction

Construction works should be undertaken under the following set of conditions:

- Limit disruption to arterial roads by staggering the impacts on the various arterial roads involved. This will facilitate traffic redistribution during construction;
- All traffic control, signage and pavement markings to be carried out in accordance with the "Manual of Uniform Traffic Control Devices, Part 3 - Traffic Control for Works on Roads (AS1742.3 - 1985)";
- Comply with the requirements of Queensland Rail for all works over and adjacent to Queensland Rail track and infrastructure. These requirements will include restrictions to the hours of construction activity. These restrictions are necessary to allow continuity in train movements and may severely limit construction progress. Construction works in rail areas will have a Queensland Rail approved Safety Management Plan;
- Security Fencing along the QR boundary must be to appropriate QR standards. Plans for security fencing are required to be submitted to QR for approval;
- Plans for "Works in or about rail corridor land" are required to be submitted to Queensland Rail for approval. The Work Method Statement is to be submitted at least 30 days prior to the commencement of works;
- Prior to any works being undertaken near the rail corridor, contract should be made with the local Manager Trackside Systems (QR) to determine the location of any possible signal, local and optic fibre cables near the rail corridor. Access to any cables must not be restricted as a result of the GUP;
- Maintain two way traffic flow on all roads if at all possible. If closures are required, they are to be carried out during non-peak periods as may be necessary and with approval of the Superintendent. When necessary, arrangements are to be made for property owners directly affected;
- Allow for redirection of bus routes as required by Brisbane Transport;
- Maintain traffic lanes on arterial roads with a 60km/hr design speed including arterial road sidetracks. Requirements may be reduced for off peak periods with approval of the Superintendent;
- Allow for relocation of utility services prior to the commencement of construction wherever possible;
- Provide crash barrier protection to all work areas;
- Make provision for entry and exit of construction traffic remote from arterial road conflict;
- Consult with the community, road users, and property owners regarding all restrictions or changes to traffic arrangements;

- Make provision for all existing pedestrian and bicycle movements adjacent and across the worksite where required;
- Provide advice to Department of Emergency Services regarding changes to traffic arrangements and site access;
- Establish procedures to coordinate and facilitate responses to traffic incidents including rapid response strategies;
- Develop and implement strategies to address construction parking to minimise potential impact on the community wellbeing, business operations and community relations;
- Limit night work wherever possible. Nightwork will be to the approval of the Superintendent; and
- Evaluate the cost including user costs of all alternative traffic control measures in the selection of measures to be adopted.

Operation

Operator should ensure the following:

- A public awareness campaign is undertaken to educate road users of the new traffic network and operating characteristics.
- Appropriate signage for local access and redirected traffic.
- Develop in consultation with emergency service authorities, a rapid response system to incidents on Gateway Motorway.
- Maintenance crews are to operate in a safe and efficient manner. Operations involving lane closures are to occur in off-peak periods. Traffic control devices to be implemented in accordance with the "Manual of Uniform Traffic Control Devices: Part 3 - Traffic Control Devices for Work on Roads (AS1742.3 - 1985)".

Monitoring

Construction

The Construction Contractor should monitor the effect of the construction works by monitoring the following:

- Adverse public feedback from road users and affected property owners;
- In cooperation with Main Roads, arterial road performance including signalised intersection performance;
- In consultation with Brisbane Transport, bus performance; and
- Incidents and the response time to clear incidents.

The Superintendent should monitor the Construction Contractor schedule and progress including:

- Timing and extent of traffic closures;
- Local road and access amendments; and
- Provision for pedestrian and cyclists.

Operation

The Operator should monitor:

- Traffic performance including performance of adjacent arterial road network;
- Incidents and response to incidents; and
- Adverse public feedback.

23.4.4 Geotechnical

Mitigation Measures

Design

- Both short and long term batters will need to be assessed for global stability. The batter angles will need to be appraised during detailed design based on material strengths and other properties. Detailed investigations will be required to determine these properties. Stability analysis will be required to assess the factor of safety of these slopes;
- Where geotechnical investigations are to be carried out on airport land (especially the Kedron Brook precinct), the access tracks should be (where practical) coincident with intended construction access tracks reducing the amount of vegetation clearance required. Where new tracks are required that can not be utilised otherwise, they are to be remediated at the conclusion of the field work;
- Fill embankments during detailed design need to be assessed in terms of both settlements and stability;
- The detailed design of the GUP will need to be carried out in accordance with good engineering practice;
- In terms of geology, the design process will require the input of a comprehensive level of information on the subsurface profile, the strength and reactivity properties of the various materials and groundwater information; and
- A detailed geotechnical investigation will be required to obtain this information. Stability assessments will need to be undertaken and depending on any rock batter heights, this may need to include a rock mechanics study. Foundation design parameters will need to be derived, as will potential settlements of fill embankments and foundations.

Construction

- Bulk earthworks will need to be carried out in a controlled manner. Whilst anticipated earthworking will be dominated by filling (north of the River) and only relatively minor excavations will be required, both operations will need to be carried out under strict control;
- Drainage and overland water flows will need to be carefully controlled so as to not impact of the stability of fill embankments and natural soil slopes. Vegetation should be established as soon as practicable to ensure slope face degradation does not occur; and
- Careful construction practices will be required in the vicinity of any settlement monitoring devices to ensure damage does not occur.

Operation

- An adequate level of maintenance on surface and subsurface drains will be required; and
- Vegetation on soil slopes should be maintained to prevent face degradation.

23.4.5 Soils

Objectives

- Minimise loss of soil from the GUP corridor.
- Soils with the potential to develop acidic properties should be managed in such a way that sulphide oxidation is minimised or prevented. In the event that acid is produced, such acid should be neutralised to prevent or avoid any discharge from the construction site of any acid produced.
- No potentially hazardous contaminants should be allowed to leave the construction site, except in a controlled and EPA approved operation;
- Site contamination is to be managed to ensure that the effected areas do not present a health or environmental risk; and
- The Construction Contractor should give regard to the accepted limits for soil pollution as outlined in the *Airports (Environment Protection) Regulations 1997* for works on airport land.

Mitigation Measures

Design

It is anticipated that there will be a significant area within and adjacent to the GUP corridor that will be cleared and/or disturbed in some manner during the proposed construction activities. Therefore, it will be essential that careful planning and staging of construction activities be undertaken during the design stage of the project in order to ensure that mitigation and control measures are implemented in a proactive and timely manner to prevent/minimise the key potential impacts.

Mitigation measures to be incorporated and further developed during the detailed design stage are provided below.

a) Bank Stability and Erosion

- Planning of staged construction works is required during detailed design, which should include a detailed schedule of proposed works, which ensure that stabilisation and rehabilitation of disturbed areas is progressive and timely;
- The detailed construction works schedule is to be developed with due consideration of the timing (seasonal) of activities such as:
  - Vegetation clearing;
  - Site preparation;
  - Soil disturbance;
  - Topsoil stripping; and
  - Soil stockpiling.

- Seasonal constraints to be considered during the preparation of construction works schedules should include as a minimum the following erosion risk levels:
  - January/February (extreme risk);
  - March/April/May (high risk);
  - June/July (moderate risk);
  - August/September (low risk);
  - October/November (moderate risk); and
  - December (high risk).
- An erosion risk map should be prepared for each area within the GUP corridor identified as being moderate to extreme erosion risk as an outcome of the completion of the geotechnical investigation based on the development of individual maps for the following factors:
  - Fines hazard;
  - Soil aggregate stability;
  - Topographic factor;
  - Soil cover factor;
  - Flow paths; and
  - Habitat impact factors.

  These maps should be developed for the purpose of overlaying each other in order to highlight areas of high erosivity, which should be avoided or subject to specific protection during construction activities;
- Utilise the erosion risk map as a base for the development of a site specific erosion and sediment control plan. Maps should use mapping techniques and standard drawing symbols outlined in BCC Environmental Best Management Practices Manual (1996);
- Temporary and permanent erosion protection measures will be required to be designed for a range of construction activities and sites along the extent of the GUP corridor, which will include as a minimum:
  - Sediment control fences;
  - Sedimentation ponds and basins;
  - Check dams;
  - Cut off drains;
  - Bunding;
  - Vehicle/equipment shakedown areas;
  - Vehicle/equipment washdown areas; and
  - Stormwater and overland flow diversion structures.
- All temporary erosion and sediment control measures should be designed to ensure for non erosive channel or sheet flow for the two year ARI event and for the hydraulic capacity of channels or other control structures (excluding sediment basins and ponds) 10 year ARI time of concentration storm event;
- Permanent soil and water control devices should be designed as per the Concept Design Drawings (EIS Volume 3) and as detailed in Section 12 of the EIS;
- Design of drainage, erosion and sedimentation control devices should be in accordance with BCC Environmental Best Management Practices (1996) and the Institution of Engineers (Qld Div) Erosion and Sediment Control Manual (1996);
- Design of stormwater/overland flow diversion and drainage pathways and structures should de designed/developed with due consideration of the need to minimise erosion, sediment displacement and discharge to the surrounding environment and nearby waterways;

- Sedimentation control devices should be designed to adequately contain runoff from all areas of proposed disturbance including haul roads, access tracks, stockpiles and material storage areas prior to release;
- Chutes and flumes should be designed for progressive lengthening as fill batters are constructed and to discharge water flow to stable areas for sediment collection and treatment;
- The following design criteria should be applied by the designers:
  - The quality of runoff from the Gateway Motorway should approach the guidelines for Total Suspended Solids (TSS) <80mg/L;
  - All permanent water and quality treatment control devices must be designed for the adequate control of pollution and sediment and other coarse material in the one year ARI peak flow (minimum) and also designed for the stability of these devices in at least the 20 year ARI peak storm event;
  - Areas requiring a high level of water quality treatment control should adopt 'best practice' devices to ensure discharges into receiving waters approach the design guideline level for TSS;
  - Other pavement areas should also adopt 'best practice' where possible utilising 'natural' drainage measures rather than hard engineering design solutions; and
  - All drainage works should be stable against erosion. This should be achieved through the selection of channel dimensions, slope and lining, appropriate to individual site sections. All drainage outlets should include level spreaders.

  (Source: Institution of Engineers *Manual for Soil Erosion and Sediment Control* 1996).
- Areas suitable for the location of the following activities/areas should be identified during the detailed design stage and should be located a suitable distance from nearby watercourses (minimum of 50m), wetlands/lagoons (minimum 40m) and tidal areas (minimum of 100m):
  - Vehicle shakedown areas;
  - Vehicle washdown bays;
  - Spoil stockpile and treatment areas;
  - Material and topsoil stockpile areas;
  - Material storage areas;
  - Laydown areas;
  - Construction camp areas (for site office and amenities);
  - No-go and/or limited access areas; and
  - Haul roads and access tracks.
- Design and locate haul roads and access tracks to minimise crossings through wetlands or creek systems;
- Adequately design haul road and access track crossings of areas identified as being sensitive of vulnerable to disturbance and incorporate adequately designed erosion and sediment control measures (ie washdown areas and sediment traps at vehicle exit points from watercourse/wetland crossings and weed infested areas);
- Areas requiring specific erosion protection measures will be identified during the detailed design stage as an outcome from the geotechnical investigation, which will include areas requiring the following:
  - Chemical surface stabilisation;
  - Erosion control mats;
  - Mulching and revegetation;

  - Soil cement; and
  - Surface roughening.
- Fill batters and temporary rock batters in particular sections of the GUP may require face protection measures to be incorporated into their design specifications;
- Bank stability and protection of water quality control measures should consider the following:
  - Incorporate principles for the prevention of bank erosion into the design brief, including avoiding disturbance of riparian areas, progressive topsoiling and revegetation of disturbed areas and rehabilitation of soils associated with riparian areas; and
  - Preparation of management/mitigation strategies and erosion and sediment control management plans should be undertaken based on estimated soil loss rates for areas identified as particularly vulnerable within the corridor and proposed limits to sediment content of runoff.
- Design construction of embankments to ensure that the area of disturbance is minimised to 3m beyond the toe of the batter;
- Design and locate material storage, laydown and soil stockpile/treatment areas to ensure that stormwater and diversion measures divert upslope runoff away from potentially contaminated and/or high sediment load areas and that runoff from these areas is adequately contained for controlled release;
- Design measures adopted for the main bridge crossing of the Brisbane River, Bulimba Creek and Kedron Brook Floodway crossings will be developed to minimise localised erosion around piers;
- Stability of embankments will need to be rigorously assessed with respect to adequate design to ensure erosion protection and slope stability;
- In the event that a temporary fill platform is required for pile driving operations during construction, it should be designed and constructed to achieve the following:
  - Protect the watercourse from sedimentation by the use of geofabric and rock protection and using fill material, which does not contain fines;
  - Protect the opposite bank from diverted water where the platform does not completely cut the stream;
  - Ensure that the watercourse can still flow by installing and monitoring appropriate drainage pipes. Temporary drainage should be designed to ensure erosion of the watercourse bed does not occur; and
  - Ensure that installation and removal of temporary structures do not cause erosion and sedimentation of the watercourse or change in channel cross sections.
- The following concepts should be applied in preparing the EMP (Construction) and Erosion and Sediment Control Plan:
  - The Construction Contractor should generally comply with the BCC Environmental Best Management Practices (1996) and Manual for Soil Erosion and Sediment Control (Institution of Engineers 1996) for erosion and sediment control;
  - Training in erosion and sediment control for construction personnel;
  - Erosion and sediment controls should be installed prior to any site disturbance. All areas of high erosivity should be cordoned off and all tracks and access roads marked using star pickets, wire and marked with tape; and

– Erosive potential of runoff on disturbed areas including tracks should be reduced through the installation of check dams, bunds and/or cut off drains across the contour. This should reduce the distance of overland flow and convey water to stable drainage lines at a non erosive velocity.

b) Settlement of Weak Alluvial Material

A construction risk for the GUP is the time to achieve the required settlements. Detailed characterisation of the entire site is required to be completed during the detailed design stage in order to adequately assess potential high risk areas, particularly areas associated with the following sites:

- The East-West Arterial Road (Extension of Airport Drive) is known to have experienced significant creep settlement adjacent to the Schultz Canal. This continues to have ongoing maintenance cost; and
- Schultz Canal also cuts across this deviation and this area would need to be targeted in particular for investigation and detailed analysis of options.

During the engineering process, careful attention will need to be given to settlement and stability analysis. Consideration of techniques to control settlements will be required. Such techniques are ground improvements, installation of drainage and use of lightweight fills.

Stability of embankments will also need to be rigorously assessed with respect to adequate design for underlying material to ensure adequate settlement is achieved in a timely manner, slope stability and the prevention/minimisation of settlement creep.

c) Loss of Fertile Topsoil Material

- Develop topsoil management and rehabilitation methods and strategies for each stage of scheduled construction works including stripping, stockpiling, replacement staging activities and suitable storage times to minimise fertility degradation and soil loss;
- Where possible design construction works schedules to incorporate the progressive stripping of topsoil material and site rehabilitation/revegetation in order to minimise stockpiling times and unnecessary broadscale disturbance and exposure of vulnerable subsoils.
- Where possible design scheduled construction activities to incorporate the principles of:
  - Minimal disturbance of insitu soils and natural landforms; and
  - Location of stockpiles, treatment areas, material storage and areas of major disturbance within stable areas that are already highly disturbed/modified.

Acid Sulphate Soils

Design considerations for all proposed works are to incorporate the hierarchy of ASS management principles in line with the Queensland Acid Sulphate Soil Technical Manual Soil Management Guidelines (Version 3.8) (2002) of:

- Avoidance;
- Minimisation of disturbance;
- Neutralisation;
- Hydraulic separation; and
- Strategic reburial.

Mitigation measures to be incorporated into the detailed design include:

- Minimisation of disturbance of the natural surface and subsurface drainage regimes, such as retaining/maintaining existing flow pathways and directions for both surface water and groundwater resources and minimising changes to water table levels and tidal influences;
- Design of embankments and other construction activities should incorporate measures to minimise/prevent subsidence, uncontrolled settlement of unconsolidated alluvial material, settlement creep, surface or subsurface heaving or deformation;
- A full ASS investigation in accordance with the Guidelines for sampling and analysis of the Lowland Acid Sulfate Soils (ASS) in Queensland (Ahern et al 1998) be carried out in the project area prior to approvals being given. Laboratory analysis should be conducted in accordance with the Acid Sulfate Soils Laboratory Methods Guidelines (Ahern 2004);
- Consult with BAC before any decision to use wick drains on airport land. BAC will need to be assured of no acid sulphate soil issues with the use of wick drains;
- Management measures for ASS will address potential groundwater impacts;
- Planning and staging of proposed construction activities in areas rated as having moderate to extreme risk for ASS material to ensure that disturbance is minimised and rehabilitation/reinstatement is progressive and timely;
- Accurately quantifying the volume of ASS material likely to be disturbed through an Acid Sulphate Soil Investigation, which includes field and laboratory sampling and analysis;
- Design and locate lined and bunded ASS material treatment pads in close proximity to the area of proposed ASS disturbance, but ensure that these areas are located within stable landform areas and a minimum of 100m from a waterway. Potential locations for the management and treatment of ASS are shown Figures 3.1a to 3.1d of the EIS;
- Design runoff control measures specifically for areas of proposed ASS disturbance, stockpiling and treatment so that runoff and overland flow can be adequately captured, contained, treated and monitored prior to release and is completely separate from other drainage control/management systems;
- Identify ASS areas and consider specific management requirements and structures that will be required within and associated with these areas in line with the provisions and requirements of the EMP; and
- Design and locate washdown areas for vehicles and equipment exiting ASS areas.

Contaminated Land

The following are further investigative tasks recommended to be undertaken during the detailed design stage of the project to assess the potential for the presence/absence of contaminated land:

- General field observations during geotechnical and acid sulphate soil assessments;
- Assess the need to undertake capping, treatment and/or removal of contaminated soils for areas of known contamination prior to the commencement of construction activities;
- Ensure that a UXO specialist is engaged to be available (on call if required) throughout the duration of the geotechnical investigation site works within areas associated with the TCC site and adjacent areas in the event that material is located that requires identification and/or disarming;

- The Construction Contractor should develop a Site Based Management Plan for the management of areas of known contamination to minimise environmental impacts as a result of disturbance of contaminated soils that is in line with the provisions and recommendations of the EMP (Construction);
- Utilise terrain assessment to identify areas of potential contamination without conducting specific contaminated land specific assessments; and
- A detailed site history is recommended to be completed for each lot identified as being affected by the GUP in order to ascertain the potential level of risk associated the proposed construction activities within the GUP corridor.

The Site Based Management Plan for contaminated land that is developed by the Construction Contractor should be submitted to the Superintendent and may include any or all of the following:

- Outline strategies to address the potential environmental impacts associated with disturbance to any existing contaminated land and possible contamination of land from aspects of the project including waste, reject product and spills at chemical and fuel storage areas;
- Ensure that a UXO specialist is engaged to be available (on call if required) throughout the duration of construction works within areas associated with the TCC site and adjacent areas in the event that material is located that requires identification and/or disarming;
- Development of procedures to be implemented for contamination management in the event that contamination is discovered during construction activities;
- Provide strategies to prevent land contamination (within the meaning of the *Environmental Protection Act 1994*) particularly in areas associated with identified contamination on BAC land (ie area 2A on EIS Figure 10.4d);
- Outline proposed strategies for preventing, recording, containing and remediating any contaminated land should be outlined;
- Use in situ management and treatment measures, where it can be demonstrated that the project related impacts will not result in further mobilisation of contaminants. This may include capping or containment to limit mobilisation of contaminants;
- Removal of identified contaminated material to secure landfill or alternative suitable treatment facility (ie illegal fill material near Bulimba Creek between CH 14500 and CH 15000). The transfer of contaminated soils is required to comply with the *Environmental Protection Act 1994* and EPA waste tracking regulations; and
- Removal and onsite or offsite treatment and remediation (eg bio-remediation suited to organic contaminants). The remediation area should be located and managed to prevent the loss of any contaminated soils to receiving waterways.

Construction

Bank Stability and Erosion

- Implement appropriate sediment and erosion control techniques;
- Install suitably designed shakedown areas and contained washbays;
- Ensure minimal discharge of site runoff and overland flow to waterbodies;

- Minimise disturbed areas, undertake progressive revegetation and install temporary and permanent sediment control devices at targeted locations;
- Avoid disturbing riparian areas and steep banks along waterways;
- Ensure disturbed embankments are topsoiled, grassed and prepared in such a way that promotes the natural regeneration or riparian species;
- Rehabilitate surface soils in the vicinity of the waterway crossings to further stabilise the banks;
- All erosion and sediment control devices should be installed to current best practice for erosion and sediment control prior to the commencement of construction within each stage of the scheduled works and should be maintained on an ongoing basis as required to ensure adequate protection;
- The area of soil disturbed during staged construction works should be minimised to 3m beyond the toe of the batter or cut (ie the clearing line), stockpiling areas, the temporary bridge area and track and areas required for installation of erosion and sediment control measures;
- Soil, mulch and material stockpiles and storage areas should be located a suitable minimum distance from waterways, wetlands/lagoons and tidal areas;
- Stormwater flow from upslope areas should be diverted around stockpiles, material storage areas and other areas of disturbance and storage and water flowing from these areas should be contained, treated and subject to controlled release and other suitable management measures as required;
- Areas where construction or site works have been completed should be progressively stabilised and rehabilitated;
- Permanent soil and water control devices are to be constructed/installed prior to construction and maintained during construction by the Construction Contractor in accordance with the designs specific to each area and stage of works;
- The Construction Contractor should submit a Construction Erosion and Sediment Control Plan developed in accordance with the requirements of the Output Specification and the EMP (Construction) to the Superintendent for endorsement prior to commencing work;
- Early erosion prevention and bank stabilisation work should be in place prior to the commencement of construction activities. This should include adopting appropriate measures for works conducted in watercourses (eg stream bank stabilisation methods);
- Clearly indicate the location of haul roads and access tracks on each site and confine them to the proposed permanent road location, with wetland and watercourse crossings minimised where possible;
- All vehicle exit points from the construction site, watercourse/wetland areas and weed infested areas should have an operational washdown area;
- Install cutoff and diversion drains prior to significant land disturbance to divert runoff from undisturbed areas into stable drainage lines at non erosive velocities;
- Erosion control measures such as chemical surface stabilisation, erosion control mats, mulching, soil cement treatment and surface roughening should be applied by the Construction Contractor to exposed areas as appropriate to limit erosion;
- All vehicles must be washed down in the washdown bay before leaving the site or areas within the site that have a designated washdown area installed (ie weed infested areas);

- Gravel shakedown areas should be used by all vehicles where provided (ie exit/entrance points of the construction site);
- The Construction Contractor should be made aware of identified risk areas for erosion and sediment control and site stability and the various risk based constraints to construction activities (ie seasonal constraints);
- All runoff from disturbed areas including tracks and stockpile areas should pass through sedimentation control devices;
- Chutes and flumes should be progressively lengthened as fill batters are constructed;
- Water flowing from chutes and flumes should be dissipated and directed to stable areas for sediment collection and treatment;
- The amount of stormwater leaving the site should be minimised through on site storage and reuse in construction requirements, dust suppression and revegetation;
- Excess water from the site should not be discharged into stormwater drains, local drainage lines of streams until discharges meet the stated water quality indicators (refer Section 23.4.7); and
- Temporary erosion and sediment control structures should be checked daily, maintained/repaired as required and must remain in place until the area they are protecting is stabilised to the satisfaction of the Superintendent.

Recommended monitoring points are as follows:

- Bulimba Creek:
  - Two locations upstream of proposed works;
  - One location downstream of proposed works; and
  - One additional sample downstream of proposed works, between Gateway Motorway and Boundary Street.

- Kedron Brook Floodway area:
  - Two samples downstream of proposed works within Kedron Brook Floodway;
  - One sample upstream of proposed work within Cannery Creek; and
  - One sample upstream of proposed works within Schultz Canal.

- Additional monitoring points should be sampled by an appropriately qualified person if visual evidence of site impacts extends beyond these points.

Settlement of Weak Alluvial Material

Settlement beneath embankment and structures during construction should be monitored to ensure that it complies with the design specifications, particularly in areas identified as having underlying weak alluvial material present within the profile and/or identified as being of moderate to extreme risk as an outcome of the geotechnical investigation.

During the engineering process, careful attention will need to be given to settlement and stability analysis. Consideration of techniques and alternatives to control settlements may be required during construction in the event that estimated settlement characteristics are exceeded. Such techniques may include ground improvements, installation of drainage and use of lightweight fills.

Loss of Fertile Topsoil Material

- Implement topsoil management and rehabilitation methods and strategies for each stage of scheduled construction works including stripping, stockpiling, replacement staging activities and suitable storage times to minimise fertility degradation and soil loss;
- Ensure that progressive stripping of topsoil material and site rehabilitation/revegetation is undertaken in order to minimise stockpiling times and unnecessary broadscale disturbance and exposure of vulnerable subsoils;
- Ensure that scheduled construction activities implement the necessary measures to ensure that:
  - Minimal disturbance of insitu soils and natural landforms is achieved during construction; and
  - Location of stockpiles, treatment areas, material storage and areas of major disturbance within stable areas that are already highly disturbed/modified.
- Implement management and rehabilitation methods and strategies for each stage of scheduled construction works including stripping, stockpiling, replacement staging activities and suitable storage times to minimise fertility degradation and soil loss; and
- Ensure that progressive stripping of topsoil material and site rehabilitation/revegetation is undertaken in order to minimise stockpiling times and unnecessary broadscale disturbance and exposure of vulnerable subsoils.

Acid Sulphate Soils

- The Construction Contractor should develop a detailed site based management plan for the treatment and management of ASS material throughout construction that incorporates the provisions and recommendations in the EMP and submit it to the Superintendent for approval prior to commencement of disturbance;
- All construction works involving remediation of acid sulphate soils should be overseen by a suitably qualified person at all times;
- Ensure that site drainage infrastructure within areas identified as being of moderate to extreme risk is installed in accordance with the relevant design specifications;
- Ensure that material excavated from areas identified as being of moderate to high risk with respect to ASS is adequately segregated, stockpiled, contained and treated in accordance with the provisions of the approved EMP (Construction);
- Ensure that ASS treatment and storage areas are constructed prior to the commencement of disturbance of areas likely to or confirmed as containing ASS material and that all drainage control measures are adequately installed;
- Ensure that all leachate and runoff from areas excavated below 5m AHD and ASS treatment and stockpile areas are adequately captured, contained, analysed and treated (if necessary) prior to discharge to the site stormwater systems;
- ASS stockpile and treatment areas are to be checked daily for adequate containment integrity and captured runoff during active periods;
- Drainage control measures associated with ASS management should be checked daily and maintained/repaired as required during periods of activity associated with ASS management;
- Ensure that treated ASS material is verified for the effectiveness of neutralisation prior to reuse as ASS free fill material;

- Areas of ASS disturbance should be checked weekly for indications of acid leachate generation until reinstatement of the area has been completed to the satisfaction of the Superintendent; and
- All fill to be used onsite must be ASS free or first evaluated for the presence of ASS. If found it must first be treated in line with the provisions of the Construction Contractor's Site Based Management Plan for ASS.

Contaminated Land

Mitigation measures to be adopted by the Construction Contractor will depend on the nature and level of contamination within areas that are proposed for disturbance during construction. Potential environmental impacts from contaminated soils should be minimised by implementing one or a combination of the strategies below.

- All machinery used on site should be maintained to the specified requirements and should be inspected daily. Any leaks detected should be repaired prior to the use of that machinery on site;
- Provision will be made for the Construction Contractor to apply to EPA under Section 157 of the *Environmental Protection Act 1994* for approval of any emergency release and to comply with conditions attached to any approval;
- The Construction Contractor should give regard to the accepted limits for soil pollution as outlined in the *Airports (Environment Protection) Regulations 1997* for works on airport land.
- All areas designated for the storage of fuels, oils, chemicals or other hazardous liquids should have a compacted base and be surrounded by a bund to contain any spillage in accordance with AS1940. These areas should be covered by a roof structure to minimise the potential for infiltration and contamination of rain water;
- Areas designed for the storage of hazardous materials are to be clearly designated and storage of such materials outside these areas strictly prohibited;
- A manifest detailing the nature, quantity and location of all hazardous materials is to be maintained and regularly updated;
- The Construction Contractor will be required to ensure that dangerous goods are stored on site as far as practicable from residences and water courses and should be responsible for their security;
- If the quantities of chemicals exceed the limits for a minor storage, a licence should be obtained from BCC and the conditions observed. If storage of 10,000 litres of flammable and combustible liquid, then a permit should be obtained;
- The Construction Contractor is to provide the prescribed placarding, hazchem cards and fire extinguishers and should have an emergency response plan in place with a nominated Site Safety Officer;
- The Construction Contractor is to store used oils in the location prescribed for dangerous goods in a bunded area pending collection for recycling;
- The Construction Contractor is to render harmless any spills of dangerous goods and arrange for collection and disposal at a local government landfill site, including cleaning materials, absorbents and contaminated soils;
- The Construction Contractor is to arrange for the disposal at a local government landfill site of any waste and surplus dangerous goods and any containers which cannot be recycled;

- At the completion of the construction phase all residual stocks of hazardous materials will be removed from the construction area and returned to an appropriate storage facility or disposed of at a licensed regulated waste facility in accordance with local authority requirements; and
- Any fill introduced on-site should be sourced from an uncontaminated source, or where previously contaminated, have the necessary approval from the EPA. Any fill from an uncontaminated site should have appropriate documentation to confirm the uncontaminated nature of the fill.

Operation

Bank Stability and Erosion

Permanent soil and water control devices installed during and/or after construction should be maintained on an ongoing basis by the Operator during the post construction/operation stage to ensure that long term bank stability and protection against accelerated erosion by wind or water are achieved.

Settlement of Weak Alluvial Material

Settlement beneath embankment and structures during operation should be monitored periodically to ensure that it does not exceed the design specifications. This will be particularly important for areas identified as having underlying weak alluvial material present within the profile and/or identified as being of moderate to extreme risk as an outcome of the geotechnical investigation, project design and/or construction.

Loss of Fertile Topsoil Material

Maintain rehabilitated/revegetated areas during the post construction and operation stages to ensure that these areas are appropriately stabilised and established. These areas should be maintained as required to prevent the establishment/spread of weeds in accordance with the Landscape Management Plan.

Acid Sulphate Soils

Ongoing monitoring and maintenance may be required for areas of ASS disturbance and permanent structures installed for ASS management and drainage control to ensure that there are no delayed impacts from ASS disturbance during construction resulting from poor condition or deterioration in mitigation controls.

Contaminated Land

Long term periodic monitoring of surface water and groundwater may be required upstream and downstream of areas of known contamination throughout the duration of the operation stage of the project in order to identify mobilisation of contaminants resulting from GUP construction activities.

23.4.6 Hydrology/Hydraulics

Objective

- Achieve a "no worsening" in terms of flooding (ie existing levels of flood immunity are maintained and are consistent with current requirements) in existing watercourses and culvert locations affected by the GUP.

However, in some circumstances, some worsening may be acceptable. Those circumstances would include increased flood height, volumes or velocity in open space areas without buildings or structures. In all cases, the principal objective should be achieved in areas of existing or future development; and

- Ensure flow rate and volume of site runoff does not cause a significant increase in stream energy in downstream waters such as is likely to cause stream bank or bed erosion.

Mitigation Measures

Design

At Bulimba Creek the recommended works are those detailed in Mitigation Option 2 (refer EIS Appendix H) and include:

- Skewing of the bridge piers to streamline flow patterns and avoid locating one of the piers directly across the creek channel;
- Removal of the illegal fill material as defined in Figure 7b (EIS Appendix H);
- Localised earthworks comprising a total area of 1.16ha as defined in Figure 11 (EIS Appendix H).

At Kedron Brook Floodway the recommended works are those detailed in Mitigation Option 10 (refer EIS Appendix H) and include:

- Pier shapes and spacing as defined in the Concept Design (EIS Volume 3);
- Overbank pier widths reduced to 1.5m; and
- Earthworks to a depth of 0.5m over the area shown in Figure 24 (EIS Appendix H).

The potential impact of possible sea level rise should also be confirmed during the detailed design phase of the project.

The GUP should not cause runoff or flooding that will interfere with the railway and/or will threaten, or is likely to threaten, the railway's safety or operational integrity.

Full details of the investigative work undertaken for each mitigation option are presented in Appendix H of the EIS.

In relation to Brisbane Airport land the following issues will be addressed at the GUP design phase:

- Final GUP drainage design to be undertaken in consultation and agreement with BAC;
- GUP shall not cause runoff flows that would result in any worsening of on-airport flood levels or cause additional stormwater ponding;
- GUP design should not assume that any spare existing capacity within the airport drainage system is available for utilisation as part of the project; and
- Maintain existing tidal connections to Kedron Brook Floodway (ie cross drainage required through embankments).

Monitoring

Construction

The construction monitoring program should include the following:

- Inspection of existing waterways and culverts prior to the commencement of any construction works to identify existing areas of hydraulic concern and assess previous standards of maintenance and operation. This should be taken into account in the design of alternate drainage paths;
- Provision of rain gauges at appropriate intervals of length over the project site, which should be read at 9:00am each day, during construction, and recorded as the 24 hour rainfall for the previous day as appropriate;
- Inspection of all erosion protection measures and ensure that they are operating satisfactorily and have been constructed in accordance with the Detailed Design Document and relevant guidelines; and
- Inspection of all channels following flooding to assess the level of erosion and scour at entrances along the channels, and determine if remedial works are required.

Operation

The operational monitoring program should include the following:

- Conduct periodic inspections of waterways and culverts to identify any problem areas, for example, hydraulic performance, erosion, weed growth and scour. This is in order to monitor the condition of waterways and culverts and assess requirements for future maintenance; and
- Inspection of any erosion and sediment control devices at regular intervals.

23.4.7 Water Quality

Objective

- To ensure that water quality entering creeks and waterways downstream during and post construction meet with approved guidelines. Where the ambient water quality of existing water bodies does not comply with the guidelines, water quality objectives should reflect historic and seasonal fluctuations and ensure “no worsening” beyond acceptable limits;
- To protect the aesthetic quality of downstream water bodies, waters should be kept free from:
  - Floating debris, oil, grease and other objectionable matter;
  - Substances that produce undesirable colour, odour, taste or foaming; and
  - Substances that produce undesirable aquatic life, such as algal blooms, or dense growths of plants or insects.
- The Construction Contractor and Operator should give regard to the accepted limits for water quality as outlined in the *Airports (Environment Protection) Regulations 1997* when developing performance indicators and monitoring parameters for GUP runoff discharged onto airport land.

Mitigation Measures

Design

Design of drainage, erosion and sedimentation control devices shall be in accordance with BCC's Environmental Best Management Practices (1996) and the Institution of Engineers (Qld Div) Erosion and Sediment Control Manual (1996). Other suitable design manuals include Queensland Urban Drainage Manual (QUDM), and the NSW Department of Housing Soil and Water Management for Urban Development Handbook.

Definitions of the water treatment devices mentioned below have been extracted from the Institution of Engineers Manual for Soil Erosion and Sediment Control (1996).

The following design criteria shall be applied by the designers:

- The quality of runoff from GUP should approach the guidelines shown in the table below where possible.

Table 23.3 Water Quality Guidelines

Water Quality Indicator	Design Guideline Level
Total Suspended Solids	<80mg/L
Lead	1-5µg/L (depending on water hardness)
Zinc	5-50µg/L (depending on water hardness)
Copper	2-5µg/L (depending on water hardness)
Hydrocarbons	<10mg/L
Total Phosphorous	10-100µg/L
Total Nitrogen	100-750µg/L
Cadmium	0.2-2µg/L (depending on water hardness)
Chromium (total)	<10µg/L
Nickel	15-150µg/L (depending on water hardness)
pH	6.5-9.0

- All permanent water quality treatment control devices must be designed for the adequate control of pollution and sediment and other coarse materials in the 1 year Average Recurrence Interval (ARI) peak flow (minimum), and also designed for the stability of these devices in at least the 20 year ARI peak storm event;

A high level of water quality treatment control is required at areas which represent the highest risk decreasing water quality and waterway values. These ares are covered by proximity to sensitive receiving environment and the likelihood of contaminants entering waterways. For the GUP, areas requiring a high level treatment control include:

- The new Gateway Bridge (runoff enters Brisbane River and eventually Moreton Bay);
- Pavement runoff discharged into Bulimba Creek and associated mangroves;

- Pavement runoff discharged into Kedron Brook Floodway waterways and associated mangroves;
- Culvert extensions located along route;
- Wynnum Road interchange;
- Port of Brisbane Motorway interchange;
- Lytton Road interchange;
- Old Brisbane Airport site (TCC); and
- Northern airport access interchange.

The following stormwater management measures should be incorporated and further developed as part of the detailed design of the GUP:

- First flush surface runoff from new bridge decks will not be directly discharged into any roadway below or into any stream or watercourse, but will be diverted to the end of the structure, collected and treated to conform with the requirements of the design water quality objectives in Table 23.3;
- A stormwater quality "treatment train" approach is to be adopted where possible;
- Grassed/vegetated swales located alongside Motorway and ramps;
- Batter slopes to be grassed/vegetated and rock check dams be installed where appropriate;
- Permanent settlement ponds and detention basins to be constructed if required at key locations along the route;
- Detention basins for the management of stormwater in the vicinity of Brisbane Airport are to be carefully designed to deter bird attraction to any such water body;
- Gross pollutant traps to be installed at key locations along the route; and
- Planning and development of specific fuelling sites, concrete or bitumen waste containment areas and installation of temporary sediment basins.

Construction

- All runoff water from the structures to be constructed should be collected and treated using combinations of gross pollutant traps, or proprietary oil/water separators, or sediment basins and other properly constructed and/or configured treatment devices such as grassed filter strips, swale drains and bioretention basins. The precise nature of such treatment devices will be a function of locally specific factors such as access to stormwater infrastructure, available space, and maintenance costs;
- Piling operations present challenges for sediment erosion and control often due to the limited space available for removal and/or containment of excavated materials, particularly where piling is located within or adjoining an existing drainage line or watercourse. In such instances, the best management options may involve isolation of the working area by temporary fencing, bunding, or sheetpiling to prevent the loss of erodable soils to surrounding receiving waters or drains. Alternative drainage or flow bypass mechanisms such as pipes, culverts or geofabric liners may be temporarily required to divert drainage flows through the workspace whilst preventing or minimising their erosive potential on unvegetated soils surrounding piling operations;
- Any dewatering of trenches or excavations should be undertaken to stable ground and in a manner which prevents sediment laden water entering stormwater drains or waterways. The water should be treated to remove sediment if necessary;

- An area/s should be designated for the containment of waste concrete materials away from watercourses or drainage lines. A bunded containment area, of earthern materials or similar should be formed and maintained. Any waste concrete, concrete washings or similar construction materials should be disposed of to the designated bunded area for containment, drying and treatment where required;
- When dry or solidified, the concrete material should be removed from the site for disposal at a licenced waste disposal facility. Alternatively, the dry concrete can be re-used on site for temporary access tracks (as for gravel and rock);
- All machinery used on site shall be maintained to the specified requirements and shall be inspected daily. Any leaks detected shall be repaired prior to the use of that machinery on site;
- Provision will be made for the Construction Contractor to apply to EPA under Section 157 of the *Environmental Protection Act 1994* for approval of any emergency release and to comply with conditions attached to any approval;
- All areas designated for the storage of fuels, oils, chemicals or other hazardous liquids shall have a compacted base and be surrounded by a bund to contain any spillage in accordance with AS1940. These areas shall be covered by a roof structure to minimise the potential for infiltration and contamination of rain water;
- Areas designed for the storage of hazardous materials are to be clearly designated and storage of such materials outside these areas strictly prohibited;
- A manifest detailing the nature, quantity and location of all hazardous materials is to be maintained and regularly updated;
- The Construction Contractor will be required to ensure that dangerous goods are stored on site as far as practicable from residences and water courses and shall be responsible for their security;
- If the quantities of chemicals exceed the limits for a minor storage, a licence shall be obtained from Brisbane City Council and the conditions observed. If storage of 10,000 litres of flammable and combustible liquid, then a permit shall be obtained;
- The Construction Contractor is to provide the prescribed placarding, hazchem cards and fire extinguishers and shall have an emergency response plan in place with a nominated Site Safety Officer;
- The Construction Contractor is to store used oils in the location prescribed for dangerous goods in a bunded area pending collection for recycling;
- The Construction Contractor is to render harmless any spills of dangerous goods and arrange for collection and disposal at a local government landfill site, including cleaning materials, absorbents and contaminated soils;
- The Construction Contractor is to arrange for the disposal at a local government landfill site of any waste and surplus dangerous goods and any containers which cannot be recycled;
- At the completion of the construction phase all residual stocks of hazardous materials will be removed from the construction area and returned to an appropriate storage facility or disposed of at a licensed regulated waste facility in accordance with local authority requirements;
- Any fill introduced onsite shall be sourced from an uncontaminated source, or where previously contaminated, have the necessary approval from the EPA. Any fill from an uncontaminated site shall have appropriate documentation to confirm the uncontaminated nature of the fill;

- Any chemical or fuel spills should be cleaned up as per the chemical storage and handling management plan. Where it is reasonably believed or expected that the spill has entered a waterway, a water sample should be collected in the area of the spill and directly downstream and analysed for the parameters outlined below and the chemical or fuel spilt. Water sampling containers should be held at all times by the construction Contractor for the collection of a sample in the event of a spill;
- Notification to the EPA under Section 320 of the *Environmental Protection Act 1994* (duty to notify environmental harm) may also be required;
- The use of fertilisers during revegetation works at the site should be the minimum necessary to promote establishment, and should be incorporated into soils or seeding mixes to minimise the likelihood of fertiliser being carried offsite to watercourses;
- The Construction Contractor should monitor the bureau of meteorology weather forecasts for the area, including prior to non work periods such as Sundays. Where storms or significant rains are predicted, an inspection of the site including erosion and sediment control devices, should be undertaken and repairs and improvements undertaken as appropriate;
- Where flood rains or floods are predicted to affect the area of the construction site, works will cease and the site should be made safe and as stable as practical. Prior to work closure periods such as Easter, Christmas and other public holidays, works should be stabilised as for preparation for a significant storm event; and
- A permit should be obtained from the DNRM prior to extraction of water from any watercourse.

Operation

During operation, water discharges from the project area shall be in accordance with the *Environmental Protection (Water) Policy 1997* and any project approvals received in relation to soil and water management.

The following concepts shall be applied by the Operator in the creation of the EMP (Maintenance) for this section:

- Emergency spill contingency plans shall be designed and operational prior to the operation of GUP. These shall incorporate mitigation measures to reduce the possibility of hazardous contaminants spilt on the roadway from reaching Bulimba Creek, Brisbane River, Kedron Brook Floodway and Moreton Bay. All spilt materials shall be collected and removed to a safe area for reuse, treatment or disposal;
- All permanent erosion and sediment controls shall be functional prior to the operation of GUP; and
- The Operator shall be responsible for the maintenance and monitoring of collection and treatment systems for pavement runoff for all sections of the Motorway under their jurisdiction.

Monitoring

Sampling Procedure

Sampling methods, handling and preservation of samples shall be in accordance with the EPA's, Water Quality Sampling Manual, Third Edition, 1999. Sample analysis shall be performed by a National Association of Testing Authorities (NATA) certified laboratory.

Turbidity will be measured by appropriate equipment at the centre line at mid-depth of the water at monitoring stations 100 metres upstream and downstream of the works. If the works increase turbidity upstream, the upstream site will be located above the zone of influence. In the event that the depth of water at such monitoring stations is insufficient for representative monitoring, turbidity will be measured similarly but at mid width and depth at approved locations.

Baseline Monitoring

Main Roads is to coordinate a baseline water quality monitoring program for Bulimba Creek and Kedron Brook Floodway for rain event monitoring prior to the commencement of construction activities. Replicated water samples are to be collected from a sampling site 100m upstream and downstream of proposed construction areas. The monitoring shall be event based and include low and high flow events. In tidal systems, the monitoring should occur midway through an outgoing tide at the same time in each lunar cycle. The monitoring program should be a minimum of 6 months, but preferably 12 months to identify seasonal variations.

The monitoring program will sample for parameters referred to in Table 23.4. Flow and catchment rainfall in the previous 24 hours should also be documented and analysed against the water quality results.

Table 23.4 Water Quality Indicators

Parameter	Compliance Requirement
pH	6.5 – 9.0
Dissolved Oxygen (DO)	80 – 110 % saturation
Turbidity (NTU)	6.50
Oils	No visible films or odours
Litter	No visible litter
Total Suspended Solids (TSS)	<10% change between upstream and downstream sampling locations < 80mg/L (for non stormwater releases)
Oil and Grease (TPH)	Oil etc not visible as a film on surface of waters <10mg/L
Nitrogen	Based on background monitoring (stormwater release) |500µg/L (freshwater) 300µg/L (marine) (non stormwater release)
Phosphorus	Based on background monitoring (stormwater release) 50µg/L (freshwater) 30µg/L (marine) (non stormwater release)
Lead	0.0034mg/L (fresh) 0.0044mg/L (marine)*

Parameter	Compliance Requirement
Nickel	0.011mg/L (fresh) 0.007mg/L (marine)*
Zinc	0.008mg/L (fresh) 0.015mg/L (marine)*
Copper	0.0014mg/L (fresh) 0.0013mg/L (marine)*

Table Notes:
Based on ANZECC Water Quality Guidelines for Aquatic Ecosystems (2000) 95% protection values.
* Toxicity depends on water hardness

Construction

A water quality monitoring program will need to be implemented during the construction phase to ensure that water quality objectives are met and that potential impacts to water quality are monitored and mitigated during construction. Replicate water samples should be collected from sampling sites upstream and downstream of the construction area. Recommended sites are listed below, however as long as sampling sites are located a reasonable distance upstream and downstream from construction area (ie between 100m-200m) they will be satisfactory.

Samples should be taken on two occasions (minimum 2 week interval) at the sampling sites detailed below prior to commencement of construction to provide additional background data. One occasion should follow a rainfall event where possible. Monitoring will take place fortnightly and during or immediately following storm events equal to or greater than 25mm/hour or as directed by Main Roads.

Recommended monitoring points are as follows:

- Bulimba Creek:
  - One sample 100-200m upstream and one sample 100-200m downstream of CH11900;
  - One sample 100-200m upstream and one sample 100-200m downstream of CH14700, where it crosses Bulimba Creek;
- Kedron Brook Floodway:
  - One sample 100-200m upstream and one sample 100-200m downstream of CH21000;
  - One sample 100-200m upstream and one sample 100-200m downstream of CH23000, where it crosses Kedron Brook Floodway;
- Brisbane River:
  - One sample 50-100m upstream and one sample 100-200m downstream of the Gateway Bridge on the northside of the river;
  - One sample 50-100m upstream and one sample 100-200m downstream of the Gateway Bridge on the southside of the river;
- Additional monitoring points should be sampled by an appropriately qualified person if visual evidence of site impacts extends beyond these points; and
- If measured levels exceed the recommended water quality guidelines, then the contractor should identify the source of increase and implement strategies to achieve an acceptable downstream water quality.

The following parameters and compliance requirements in Table 23.4 are provided as the minimum monitoring requirements and shall be monitored at the sites listed above and at any additional locations specified by the Superintendent. Monitoring is required for each non stormwater release (eg dewatering). For stormwater releases monitoring is not required more frequently than once per 48 hour period (or twice in a 7 day period where rainfall is of a consistent intensity – eg prolonged light rain). Additional parameters may be required to be monitored dependent on site activities and chemical spills.

- Inspections of sediment basins shall be carried out weekly and after storm events during the construction stage. Sediment shall be removed as necessary to ensure that at least 60% capacity is available in the sediment basin to contain subsequent storm events.
- The Construction Supervisor or qualified consultant shall perform monitoring within Bulimba Creek, Brisbane River and Kedron Brook Floodway as indicated within Table 23.5. Discharges shall be sampled by the Construction Supervisor and analysed for parameters referred to in Table 23.4.

Table 23.5 Construction Monitoring

Construction Activity	Associated Potential Pollutant	Type of Monitoring Required	Indicator[1]
Earthworks	Sediment	Visual observations to determine adequacy of erosion and sediment control devices	Adopting "best practice" devices and controls
		Water quality sampling prior to off site discharge	TSS Turbidity
Excavating	Acid Sulphate Soils	Water quality sampling prior to off site discharge	pH
		Visual observations	Fish kills Iron staining
		Smell	Rotten egg odour
Use of Construction Machinery	Oils and Fuels	Visual observations	Visible as a film on surface of water
		Water quality sampling within receiving waters	TPH
Piling or Drilling Piles	Sediment	Visual observations to determine adequacy of erosion and sediment control devices	Adopting "best practice" devices and controls
		Water quality sampling prior to off site discharge	TSS Turbidity

Construction Activity	Associated Potential Pollutant	Type of Monitoring Required	Indicator[1]
Excavating and/or Removal of Contaminated Soil	Chromium, Copper, Zinc and others as identified by contaminated land investigation	Water quality sampling prior to off site discharge	To be determined during detailed design
Storage of Chemicals	Chemical Spill	Visual observations	Visible as a film and/or changes in colour of water surface
		Smell	Dependent on type of chemicals stored
		Water quality and soil sampling	Dependent on type of chemicals stored
Landscaping	Fertilisers	Water quality sampling within receiving waters	Phosphorous Nitrogen

Table Notes:
1. Water quality indicator for various water quality parameters are shown in Table 23.4.
TSS Total Suspended Solids
TPH Total Petroleum Hydrocarbons

- Monitoring should be performed after rainfall events large enough to cause the water quality structures to discharge water.
- Areas being revegetated should be periodically inspected to confirm that vegetation is becoming established.
- The Construction Supervisor shall inspect construction areas and material stockpiles daily to identify potential erosion and water quality issues which need to be addressed.
- The Construction Supervision shall undertake a survey of the channel cross sections in the vicinity of works conducted in watercourses prior to construction activities and post construction within watercourses.

Operation

- Operator should assess the need to conduct operational surface water quality monitoring following construction.
- Operator should regularly inspect the water control structures to ensure that they are functioning as per the design intent. The hydraulic capacity of the structures should be maintained. This may involve regular cleaning to remove trapped sediment and oil and/or greases. The biological integrity of any vegetated water quality control structures such as wetlands, grassed swales etc should be visually inspected at a minimum of once per month to ensure that vegetative communities have established and are self-maintaining, as per the design intent.

Reporting

Documentation for the surface water quality monitoring program shall include details of the monitoring date, time, location, number of type of samples taken and analysis (field and laboratory) results, chain of custody documentation and copies of laboratory analytical reports.

Comments should be made on the compliance or otherwise with the performance criteria, results of investigations and corrective action including modification to management measures, assessment of environmental performance and any other data or observations considered appropriate.

The Construction Contractor shall supply the results of the water quality monitoring sampling to the Superintendent at the end of every month.

All documentation must be able to be audited.

23.4.8 Groundwater

Mitigation Measures

Design

Further assessment to be undertaken during detailed design to determine both human and natural receptors that may be influenced by the works. This is needed to confirm users or environments that may be influenced by the activities. The assessment will need to include:

- Conducting a census for potential unregistered groundwater wells located in the area surrounding (up to 250 metres) locations where any dewatering activities may be undertaken; and
- Identifying any sensitive surface water receptors to site groundwater movement.

A detailed groundwater monitoring program should be developed and implemented prior to construction. On this basis, the following outline of works is proposed:

- Installation of groundwater wells at key locations along the GUP where potential impacts may occur, (such as storage and stockpile areas, or where major earthworks are being undertaken) or where local topography and geological conditions dictate. The wells would be sited within the shallow aquifer system as this represents the initial sensitive groundwater receptor. It is anticipated the wells would be between 5 and 10 metres in depth, dependent on terrain and depth to water table;
- Installation of groundwater wells may also be required in areas adjacent to the GUP, in particularly sensitive areas in order to determine local shallow groundwater flow direction. These wells should be surveyed in the appropriate height datum (mAHD); and
- Should significant dewatering works be undertaken, install up to two nested groundwater monitoring wells, sited to monitor changes to groundwater levels and quality in the upper and lower aquifer systems. It is anticipated that the shallow groundwater monitoring well should be between 5m and 10m in depth and the deeper well between 10m and 20m in depth.

Construction

Potential dewatering activities should be carefully managed during the construction works. This may be required in areas where deep excavation is being undertaken. Any dewatering activities should include the following management strategies where significant dewatering is required:

- Ensuring sufficient groundwater monitoring wells are installed prior to the commencement of works and baseline data is acquired;

- Minimal dewatering as necessary to be undertaken;
- Daily monitoring for in situ parameters should be undertaken in installed groundwater monitoring wells. Weekly monitoring of private wells should be undertaken, as permission dictates;
- Receptors to groundwater level changes, including private wells and natural receptors (lagoons or wetlands) are identified;
- Dependent on nearby receptors, an estimation of radius of effect may be required to be undertaken, based on anticipated pumping rates and dewatering requirements;
- Only the minimum required groundwater quantity should be extracted;
- Poor quality discharge water should be treated on site and water quality guidelines achieved prior to discharge;
- Significant degradation in groundwater quality or levels should be noted, in particular should it be determined that receptors are being influenced, alternative water supply arrangements shall be required in the interim recovery period until water levels recover to acceptable levels; and
- Should water quality degrade significantly (ie due to salt water intrusion), longer term alternative water supply arrangements may be required and a longer term monitoring program should be implemented until groundwater quality returns to acceptable level.

Operation

The ongoing management strategies would remain similar to the existing Gateway Motorway management system including:

- Management and upkeep of stormwater and road runoff;
- Management of incidents such as fuel spills through appropriate clean up mechanisms; and
- Upkeep of general services along the Motorway.

Post construction assessment will be undertaken to determine the need and duration for groundwater monitoring to continue during the operation phase.

Water Quality Monitoring Parameters and Frequency

Baseline monitoring should be undertaken for physical parameters and water quality at all installed monitoring well locations prior to the commencement of works. Groundwater samples should be taken and monitored for the insitu parameters outlined in the table below.

Table 23.6 In situ Monitoring Parameters

Parameter	Compliance Requirement
Water level (mbRL)	NA
PH	6.5 to 9.0
Electrical Conductivity	No significant change
Oils	No visible films or odours

Table Notes:
mbRL Metres below Reference Level

As part of the baseline monitoring, the table below provides the laboratory analyses that should also be undertaken.

Table 23.7 Laboratory Analysis Parameters

Parameter	Compliance Requirement
Total Petroleum Hydrocarbons	<10 mg/l*
Oil and Grease	<20 mg/L (in line with surface water quality)
Polynuclear Aromatic Hydrocarbons (PAHs)	<0.003mg/l**
Nitrogen	No significant increase above baseline levels.
Phosphorus	No significant increase above baseline levels.
Heavy Metals (As, Cd, Cr, Cu, Pb, Ni, Zn)	<relevant ANZECC 2000 water quality guidelines (marine ecosystem, 95% protection)

Table Notes:
* New South Wales EPA (2002) - Experienced based guideline for Service Stations
** NEPC (1999) Groundwater Investigation Guidelines – Marine ecosystems

Monitoring should be undertaken on a regular basis throughout the project, with a frequency of once a month considered appropriate. More frequent monitoring may be required should an environmental incident occur, such as a chemical or oil spill, or after a significant rainfall or flooding.

Construction

Should dewatering activities be undertaken, daily groundwater monitoring for *in situ* parameters (refer Table 23.6) should be undertaken in all installed shallow and deeper system groundwater wells in the vicinity where dewatering activities are undertaken. With permission, groundwater monitoring should also be undertaken in any identified private wells.

23.4.9 Air Quality

Objective

- To minimise the generation of dust and exhaust emissions during the construction of the GUP and to mitigate any air quality impacts; and
- To minimise the emission of air pollutants from the GUP while it is operating and to mitigate any negative air quality impacts.

Mitigation Measures

Design

- Roadway, on ramps and off ramps to minimise steep slopes and maximise traffic speeds within safety and design criteria.
- Prepare a site specific Dust Management Control Plan for construction activities in the vicinity of the NPD site. This Plan is to be prepared in consultation with NPD staff.

Construction

The Construction Contractor shall ensure that the following actions are performed during construction on an as required basis:

- Dust suppression of haul roads, unsealed roads and work areas using a water truck;
- Damping of stockpiles, primarily using water;
- Provision of adequate water supply for the above activities;
- Use of waste oil for dust suppression shall be prohibited;
- Water pumped from the oxbow lake may be used for dust suppression, providing water does not escape to adjoining properties or waterways;
- Location of stockpiles away from sensitive locations;
- Construction should be timed so that dust generating activities are not carried out during high wind events;
- Limiting the amount of topsoil removal to that required for quarrying, backfill etc;
- Loaded haul trucks travelling to and from the site will be covered or loads will be levelled to avoid spillage;
- Enforcing speed limits for haul trucks along both internal and external roads;
- No pit burning of cleared vegetation;
- Avoid multiple access points during earthwork stages to the existing road networks so that dirt is not tracked onto the roads (particularly following wet weather);
- Carrying out progressive rehabilitation of cleared land;
- Regular maintenance of all construction machinery and vehicles;
- Direction of exhaust emission of mobile plant away from the ground; and
- The Construction Contractor should give regard to the accepted limits for air quality as outlined in the *Airports (Environment Protection) Regulations 1997* for air emissions in the vicinity of airport land.

Monitoring

The Construction Contractor will carry out the following monitoring activities:

- Daily inspection of stockpiles, exposed work areas and construction work practices to ensure dust mitigation measures are being employed;
- Real time monitoring of PM_{10} and TSP should be carried out to assess the levels of dust generated by construction activities. The monitoring location will be nearby sensitive receptors (ie representative residential dwellings, NPD site and other sites as approved by the Superintendent). Monitoring frequency will need to be increased if dust compliants occur; and
- Formal monthly inspections of stockpiles, exposed work areas and construction work practices with the Superintendent to ensure dust mitigation measures are being employed.

23.4.10 Noise and Vibration

Objective

- Construction noise and vibration impacts to be reduced as far as practicable be appropriate management procedures, including use of low noise equipment and management of construction hour.
- Operational noise levels to be maintained by appropriate mitigation measures, including appropriate road pavement design and noise barriers.
- The Construction Contractor and Operator should give regard to the guidelines for excessive noise as outlined in the *Airports (Environment Protection) Regulations 1997* when developing performance indicators and monitoring parameters for inclusion in the EMP (Construction) and EMP (Maintenance), respectively.
- Construction noise and vibration impacts to be reduced as far as practicable by appropriate management procedures, including use of low-noise equipment and management of construction hour.
- Operational noise levels to be maintained by appropriate mitigation measures, including appropriate road pavement design and noise barriers.

Mitigation Measures

Design

The Main Roads *"Road Traffic Noise Measurement: Code of Practice January 2000"* (Code of Practice) outlines the operational road traffic noise criteria applicable to this project. The Code of Practice provides road traffic noise criteria for proposed roads, road upgrades, existing roads, residential land use developments as well as criteria for other noise sensitive land uses.

Table 23.8 presents relevant noise criteria for this project, from the Code of Practice.

Table 23.8 Main Roads Code of Practice Noise Criteria

Description	Noise Criteria (within 10 years of completion of construction)
Existing Residences	*External Noise Level $L_{A10(18hour)}$*
Upgrading Existing Roads (Priority 2)	68 dBA (or greater) and an increase of at least 3 dBA above the pre construction level. Measures for noise attenuation will be considered within the road reserve with the aim of reducing levels to 68 dBA or less
Upgrading Existing Roads (Priority 3)	68 dBA (or greater) and an increase of less than 3 dBA above the pre construction level. Measures for noise attenuation will be considered within the road reserve with the aim of reducing levels to 68 dBA or less
Educational & Health Buildings	*Internal Noise Level $L_{A10(1hour)}$*
Upgrading Existing Access – Controlled Roads	55 dBA $L_{A10(1hour)}$ or greater and an increase of less than 3 dBA above the pre construction level Measures for noise attenuation will be considered as part of initial planning and design, with the aim of reducing indoor noise levels to 55 dBA or less
Parks, Outdoor Educational and Recreational Areas	*Free Field Noise Level $L_{A10(12hour)}$*
All Roads	63 dBA

Therefore, the applicable criteria needing to be achieved for the GUP design are:

- 68dBA $L_{A10(18hour)}$ for residences;
- 55dBA $L_{A10(1hour)}$ internal for educational and health buildings; and
- 63dBA $L_{A10(12hour)}$ (free field) for parks, outdoor educational and recreational areas.

Actual façade noise reduction measurements should be undertaken during detailed design to determine the specific noise reduction for each health and educational building.

Noise fencing along QR boundary must be to appropriate QR standards for the adjoining land use.

Construction

a) Work Practice Controls

- Engines not started before 7:00am where possible and queuing of trucks in front of residential areas prior to the normal 7:00am start time to be avoided wherever possible.
- Loading and unloading of goods and material away from sensitive areas.
- The batch plants for the Gateway Bridge duplication are currently located away from residential areas. This approach should be kept in mind if/when other batching plants are proposed.
- Reversing alarms within construction areas cannot be avoided for safety reasons. Consideration should therefore be given to sourcing "quiet" white-noise alarms whose annoying character diminishes quickly with distance and self adjusting alarms which adjust emission levels to the local background noise level.

- "Real time" feedback on noise emissions to plant operators. This greatly assists operators to minimise emissions for certain types of plant and equipment.
- Large rocks to be placed in dump trucks not dropped.
- Where possible, park mobile equipment in 'cut' areas and carry out warm-up in 'cut' the next day to take advantage of shielding.
- Horn signals should be kept at a low volume where feasible.
- Areas to be paved should be as large as possible to reduce the number of passes of the paver.
- Noise on road plats will be controlled by the use of damping material such as soft wood and pin on slopes.

b) Source Noise Controls.

- Noise measurements of plant and equipment to maintain/check noise emissions.
- Mobile plant such as excavators, front end loaders and other diesel powered equipment to be fitted with residential class mufflers.
- Minimise the usage of truck exhaust brakes on site.
- Use of compactors rather than vibrating rollers where possible.
- Saw cutting of the road surface by necessity may have to take place in the evening and night. Machines with built in screens will be used. Saw cutting will be conducted as early as is practically allowed by the curing process of the concrete. Where possible, night work will be programmed so that disturbance at any dwelling is limited to two consecutive nights, and six nights in any month.
  It is important that residents are pre-warned of night time concrete cutting and the reason for its necessity is explained. This public notification will be in a manner satisfactory to the EPA, in accordance with relevant conditions. The use of built in shrouds is also recommended.
- Bored piling instead of impact pile driving wherever possible. If driven piling is required the only effective noise control is the use of shrouds although the noise attenuation is moderate (possibly up to 10dBA). Bored piles are typically at least 20dBA quieter.
- Where possible, use silenced air compressors on site.

c) Community Liaison Controls

- Construction site personnel to be made aware of all community attitudes and complaints.
- Residents be made aware of times and duration they will be affected. Making residents aware of likely future occurrence of noise significantly reduces annoyance and allows people to arrange themselves accordingly.
- 24 hour/day complaints phone number.
- Monitoring of noise and vibration during critical stages, especially at night time.
- Nominated person to receive, log, track and respond to complaints with an appropriate timeframe and to record what actions were taken.

d) Source Noise Control Strategies

- Quietest plant and equipment that can economically undertake the work should be selected wherever possible.
- Regular maintenance of equipment to keep it in good working order.

e) Work Practice Control Strategies

- Construction work to occur wherever possible within the day (7:00am to 6:00pm) period.
- Where possible, avoid the coincidence of plant and equipment working simultaneously close together and near sensitive sites.
- Maintenance work and access points to the alignment to be located as far as possible from sensitive areas wherever feasible.
- Operators of construction equipment to be made aware of potential noise problems and of techniques to minimise noise emission through a continuous process of operator education.

f) Noise Barrier Control Strategies

- Where possible, consider the installation of operational (ie permanent works) noise barriers as early as possible to provide additional construction phase noise mitigation.
- Where possible, use hoarding stockpiles and site sheds/buildings as noise barriers between equipment and sensitive areas.

g) Community Liaison Strategies

- Active community consultation and the maintenance of positive relations with residents.
- Where construction noise levels exceed the recommended criteria or in the event of complaints, a detailed investigation of construction noise will be required.

Performance Criteria for Monitoring

a) Noise

For construction work occurring during normal daytime hours and provided all mechanically powered plant is fitted with appropriate mufflers, specific noise limits are generally not warranted. In this regard it may be noted that the Queensland *Environmental Protection Policy (Noise) 1997* (EPP(Noise)) does not include construction noise or vibration limits (other than those which apply to blasting). Noise impacts are usually minimised by limiting hours of operation and, in particular circumstances, scheduling the noisiest activities to occur at times when they would generate least disruption if possible. This needs to be balanced with traffic management to ensure traffic disruption is minimised.

Where construction noise may affect adjacent residential premises or other residential accommodation (including hotels, motels, serviced units or backpacker accommodation), limitations to the hours of operation as stated below are recommended.

Monday to Friday:
7:00 am to 6:00 pm

Saturday:
7:00 am to 12 noon

b) Blasting

The *EPP(Noise) Environment Protection Amendment Regulation (No 2) 1999* contains the following blast emissions criteria:

"6I Noise from blasting is not unlawful environmental nuisance for an affected building if:

- *the airblast overpressure is no more than 115 dB Linear Peak for 4 out of 5 consecutive blasts; and*

the ground vibration is:

- *for vibrations of more than 35 Hz - no more than 25 m/s ground vibration, peak particle velocity; or*
- *for vibrations of no more than 35 Hz - no more than 10 mm/s ground vibration, peak particle velocity."*

Applicable Vibration Criteria

Structural Damage Criteria

British Standard 7385:Part 2-1993 "*Evaluation and measurement for vibration in buildings Part 2*" provides criteria against which the likelihood of building damage from ground vibration can be assessed.

Sources of vibration which are considered in the standard include blasting (carried out during mineral extractions or construction excavation), demolition, piling, ground treatments (compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to ensure minimal risk of *cosmetic* damage to commercial and residential buildings are presented numerically in Table 23.9.

Table 23.9 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures - Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures - Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

The standard states that the guide values in Table 23.9 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 23.9 may need to be reduced by up to 50%.

Since the buildings adjacent to the road are residential (refer Table 23.9) and could potentially experience resonance effects, a conservative continuous cosmetic damage criterion of 7.5mm/s at 4Hz increasing to 10mm/s at 15Hz has been adopted for the purposes of this vibration assessment.

Safe Vibration Levels for Common Services

Vibration due to the construction process has the potential to effect services such as buried pipes, electrical and telecommunication cables.

German Standard DIN 4150-3 1999 *"Structural Vibration – Part 3: Effects of vibration on structures"* provides guidance on safe vibration levels for buried pipe work. The levels assume "current technology" as special considerations must be applied for systems associated with older structures such as might occur in the vicinity of heritage listed buildings. Table 15.29 details the DIN 4150-3 limits for short term vibration. The levels apply at the wall of the pipe. For long term vibration the guideline levels presented in Table 23.10 should be halved.

Table 23.10 DIN 4150 Part 3 – Damage to Buried Pipes – Guidelines for Short-term Vibration

Pipe Material	Peak Wall Vibration Velocity
Steel (including welded pipes)	100mm/s
Clay, concrete, reinforced concrete, prestressed concrete, metal with or without flange (other than steel)	80mm/s
Masonry, plastic	50mm/s

Table Notes:
For gas and water supply pipes within 2m of buildings, the levels given in Table 23.9 should be applied. Consideration must also be given to pipe junctions with the building structure as potential significant changes in mechanical loads on the pipe must be considered.

Recommended vibration criteria for electrical cables and telecommunication services such as fibre optic cables range from between 50mm/s and 100mm/s.

It is noted however that although the cables may sustain these vibration levels, the services they are connected to, such as transformers and switch blocks, may not. It is recommended that should such equipment be encountered during the construction process an individual vibration assessment be made.

Human Comfort Criteria

Guidance in relation to assessing potential disturbance from ground-borne vibration is set out in British Standard 6472-1992 "*Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*". This standard nominates criteria for various categories of disturbance, the most stringent of which are the levels of building vibration associated with a "*low probability of adverse comment*" from occupants. The applicable levels for daytime activities in residential buildings, offices and workshops for this category are shown in Table 23.11.

Table 23.11 Vibration Levels Corresponding to "Low Probability of Adverse Comment" (1Hz to 80Hz)

Building Type	Peak Floor Vibration (X, Y Horizontal)	Peak Floor Vibration (Z Vertical)
Residential	0.8 mm/s to 1.6 mm/s	0.3 mm/s to 0.6 mm/s
Offices	1.6 mm/s	0.6 mm/s
Workshops	3.2 mm/s	1.2 mm/s

The vibration levels given in Table 23.11 for continuous vibration apply to a 16 hour daytime exposure period.

Vibration Dose Limits

The permissible rms particle velocity levels corresponding to the vibration dose value varies according to the duration of exposure. Table 23.12 shows the range of satisfactory vibration dose values for which various degrees of adverse comment may be expected in residential buildings.

Table 23.12 Vibration Dose Values (m/s1.75) above which Various Degrees of Adverse Comment may be Expected in Residential Buildings

Location	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Residential buildings 16 hour day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hour night	0.13	0.26	0.51

Based on the relationship between the vibration levels for residences, offices and workshops, the corresponding daytime vibration dose values are given in Table 23.13 - *"Vibration dose Values above which Various Degree of Adverse Comment Expected in Offices and Workshops"*.

Table 23.13 Vibration Dose Values (m/s) above which Various Degree of Adverse Comment Expected in Offices and Workshops

Location	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Offices 16 hour day	0.4 to 0.8	0.8 to 1.6	1.6 to 3.2
Workshops 16 hour day	0.8 to 1.6	1.6 to 3.2	3.2 to 6.4

Situations exist where motion magnitudes above the dose levels given in BS 6472 can be acceptable, particularly for temporary disturbances and infrequent events of short-term duration. An example is a construction or excavation project.

In certain circumstances, the use of higher magnitudes of acceptability may be considered, for example for projects having social worth or broader community benefits, or in view of the economic or practical feasibility of reducing vibration to the recommended levels. In such cases, best management practices should be employed to reduce levels as far as practical.

Vibration monitoring is recommended for site-specific activities and in any situations where there is some doubt regarding the suitability of the plant or where there is believed to be a risk of exceeding the applicable vibration criteria.

Table 23.14 Safe Working Distances for Vibration Intensive Plant Items

Item	Rating	"Safe" Working Distance to avoid	
		Cosmetic Damage (refer BS 7385)	Human Response (refer BS 6472)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5m	15 to 20m
	< 100 kN (Typically 2-4 tonnes)	6m	20m
	< 200 kN (Typically 4-6 tonnes)	12m	40m
	< 300 kN (Typically 7-11 tonnes)	25m	100m
	> 300 kN (> 12 tonnes)	25m	100m
Impact Pile Driver		20m to 40m	80m to 120m
Vibratory Pile Driver		5m to 15m	20m to 50m
Pile Boring	(< 800mm)	2m (nominal)	na
Jack hammer	-	1m (nominal)	Avoid contact with structure

On the basis of the data provided in Table 23.14, vibration buffer zones have been developed for the GUP construction works. These zones are dictated primarily by two activities:

- Bulk earthwork compaction (vibratory roller); and
- Impact pile driving.

QR Considerations

Vibration impacts in the design shall be considered to ensure long term and intermittent exposure of freight and passenger rail services are addressed.

Specific NPD Management Measures

The following measures will be implemented to minimise potential vibration impacts from the GUP:

- During the design phase of the project a site specific Vibration Control Plan will be prepared in consultation with NPD staff;
- The use of vibratory rollers and vibroflots (adjacent to NPD's western building) outside the hours of operation of the reception area where the final product is weighted. (It should also be noted that the maximum vibration emissions from vibratory rollers takes place during start-up and shut down. It is therefore also a requirement that vibratory rollers are not started or stopped near the NPD site);

  OR

  The use of alternative road construction techniques (adjacent to NPD's western building) such as static rolling and/or soil mixing to ensure that vibration levels are below those required for effective use of the A&D electronic scales located in the reception area;
- Vibration monitoring on the western building for construction activities within 50m of the western building to ensure vibration levels remain below recognised limits (nominally a conservative 10mm/s to also cover settlement) for building damage;

- Building condition surveys are undertaken prior to construction to accurately document the pre-construction condition of the two NPD buildings;
- Surveys of both NPD buildings prior to construction to ascertain whether any settlement of the building foundations takes place throughout construction; and
- Once detailed information is available in relation to proposed construction machinery and operating hours, a human comfort investigation to access the probability of worker's annoyance due to construction vibration within the NPD facility.

Monitoring

Construction

The construction monitoring program should include the following:

- Construction Supervisor should undertake noise monitoring for at least 7 days at key noise sensitive receptors prior to construction commencing;
- Construction Supervisor should regularly review the effectiveness of noise mitigation controls and instruct repair/replacement as necessary;
- Noise monitoring should be carried out at representative dwellings and other noise-sensitive areas close to the works during typical construction activities (ie residential dwellings). The monitoring should comprise a combination of attended, short-term measurements (of typically 15 minutes to one hour duration), and long-term unattended noise measurements;
- The long-term measurements should be carried out with environmental noise loggers recording statistical noise levels (including LAmax (maximum single noise event), LA90, LA10 (for an 18 hour period, the arithmetic average of 18 individual L10 levels measured between 6:00am and midnight on the day) and LAeq (for a 24 hour period, means the time average A-weighted noise level, within the meaning given by AS 1055.1) over consecutive 15 minute intervals. Each long-term monitoring station may include a tape recorder or be attended for short periods so that the noise source can be positively identified in the case of a dispute. The number of locations monitored and length of monitoring required at each location should be specified in the EMP (Construction);
- Specific construction activities being undertaken in the proximity of the noise monitoring locations for the duration of the noise monitoring should be recorded. The recording should include the type of activity being undertaken, the start time and the finish time, hours of operation of fixed plant should also be recorded. This should constitute the "Construction Activity Log";
- Ground vibration should be monitored at the closest buildings during any vibration generating activities (eg piledriving), closest to compaction or fill sites;
- Construction Supervisor to ensure that noise and vibration trials are undertaken on plant and equipment to predict emission levels prior to commencing activity on the site to identify procedures to control emissions; and
- A register of complaints concerning excessive construction noise and/or vibration should be set up by the Construction Supervisor and Community Liaison Officer. Any complaints should be investigated within 24 hours if possible, but not longer than 3 days of their receipt. The investigations should include noise and/or vibration measurements at a representative location to the site of the complaint(s) at an appropriate time and over a representative time period.

Operation

The operational monitoring program should include the following:

- Noise monitoring at representative noise sensitive receivers. The monitoring should include L_{10} (18 hr) and L_{eq} (1 hr) be conducted using unattended noise measurements of at least 48 hours duration (using environmental noise loggers) and attended monitoring of at least 1 hour duration (to identify the maximum passby noise levels); and
- The monitoring should be carried out within the first 12 months of operation.

Complaints

Any complaints about construction noise or vibration should be investigated by the Construction Contractor within 24 hours. The investigations should record noise and/or vibration measurements at a representative location to the complaint at an appropriate time and over a representative time period, unless the source of the noise causing the complaint is rectified immediately.

Repeat complaints should be recorded as a non compliance.

Vibration Levels (Without Explosive Blasting Activities)

Vibration criteria should apply to excavation and construction works in the vicinity of buildings adjacent to construction activities.

Vibration from construction activities, when measured in the vertical or horizontal axes on a footing of or on any adjacent building at a position closest to the dominant vibration source, should not exceed:

a) No more than 10% of any 15 minute period —

   i) $RMS_{(1\ sec)}$ Velocity 0.4mm/s;
   ii) $Peak_{(1\ sec)}$ Velocity 1.6mm/s;

b) At any time —

   i) Peak Velocity 3.0mm/s, unless otherwise approved by the Superintendent.

Construction activities within the vicinity of the Moonie-Brisbane Oil Pipeline and Ampol Oil Pipeline should have a maximum particle velocity above the pipelines of 10mm/s.

Plant equipment and construction vibration which exceeds the levels set out above should be recorded as a non compliance.

Corrective Actions

- The Community Liaison Officer should personally meet with the person making the complaint to resolve issues raised by the complainant; and
- Remove excessively noisy plant from the site and replace with complying plant.

23.4.11 Terrestrial Ecology

Objective

- To minimise the loss of terrestrial and wetland vegetation and habitat;
- Minimise the impact of runoff waters on adjoining wetland areas, watercourses, Bulimba Creek, Kedron Brook Floodway, Brisbane River and Moreton Bay.

Mitigation Measures

To minimise the potential of the GUP on terrestrial ecology values of the area the following mitigation measures should be implemented:

Design

a) General

- Prepare a Vegetation Management Plan during the design phase to minimise the impact of the project on existing vegetation and fauna habitat, and address the measures outlined below.
- Prepare a Bushfire Management Plan and submit to the Department of Emergency Services (DES) for approval. Construction works shall not commence until DES approval has been received.
- Except where this compromises safety, retain koala food trees and plant additional koala food trees in the vicinity of Greendale Way. Suitable species include: forest red gum (*Eucalyptus tereticornis*), spotted gum (*Corymbia citriodora* var. *variegata*); pink bloodwood (*C. intermedia*), narrow leaved ironbark (*Eucalyptus crebra*), tallowwood (*E. microcorys*), small fruited grey gum (*E. propinqua*), grey ironbark (*E. siderophloiai*), and scribbly gum (*E. racemosa*) (Barnes & Moran 2001).
- Design measures should be adopted for the new bridge crossing the Brisbane River to minimise localised erosion around piers (refer Section 23.4.7).
- Supporting piers should stand a sufficient distance from the banks to ensure that existing mangrove communities remain or re-establish beneath or immediately adjacent to the bridge.
- During construction disturbance to mangroves and existing amenity landscaping should be minimised.
- Minimise the loss or disturbance of estuarine or freshwater wetland vegetation.
- Minimise the area of disturbance along the banks of Bulimba Creek, Brisbane River and Kedron Brook Floodway and implement stormwater management plans to minimise the entry of sediment into Bulimba Creek (refer Section 23.4.7).
- Avoid loss of significant canopy vegetation and works that will lead to enhanced proliferation of weed species and implement a Weed Management Plan.
- Minimise habitat loss for migratory birds especially the Lewin's Rail habitat.
- Drainage design to continue the function of Kedron Brook Floodway and other tidal channels as ecological corridors and low tide feeding areas for waders.
- Retain existing rank grassland/freshwater wetland corridor potential also the eastern edge of Kedron Brook Floodway.
- Bridge designs using minimal footprints could conceivably accommodate this corridor on their approach (from the east) to Kedron Brook Floodway.

- Disturbance to the habitat on the southern side of the Kedron Brook floodplain should be minimised and allowed to regenerate once construction is completed.
- Sufficient distance should be maintained from the active White-bellied sea eagle nest (located outside GUP corridor just off site on BAC land) and the Motorway and associated works.
- Bridges over Kedron Brook Floodway should contain a minimum footprint design, and the supporting piers should stand a sufficient distance from the banks to ensure that mangrove communities can survive or establish beneath or immediately adjacent to the bridge. Bridges should run perpendicular to channel direction in order to maintain the shortest possible span within the above constraints. Using a minimal footprint design (eg pylons) would also be advantageous in terms of minimising alteration to stream flows, particularly during flood events.

b) Fauna Underpasses

Consider installing fauna underpasses at Wecker Road (CH6100) and the culvert east of Coventry Court (CH7100). These may be dual purpose to accommodate stormwater flows or to facilitate pedestrian/bicycle access. These positions have been chosen for the following reasons:

- To give a good spread of underpasses along this section of the GUP corridor. This gives several underpasses to provide alternate routes to avoid disturbance, predators and to allow for a more natural population distribution (AMBS 1997);
- Because the topography allows them to be installed without altering the vertical profile of the road;
- Because there is medium to high quality habit on both sides of the GUP corridor in these locations, which is more or less linked to larger areas of habitat beyond; and
- These locations are away from sources of disturbance such as houses that may deter use by fauna from using the underpasses (AMBS 1997).

It is recommended that 3m x 3m box culverts be used. A structure length of 20m or less seems to be optimal (AMBS 2001b) so minimise the length of culvert structures.

c) Fauna Fencing

Consider installing fauna exclusion fencing on both sides of the Motorway between Mt Gravatt-Capalaba Road (CH5200) and Old Cleveland Road (CH9900) for the safety of fauna and road users alike and to funnel fauna towards suggested underpasses at chainages 6100 and 7100 and Greendale Way (CH8800). Exclusion fencing should be located to funnel animals towards underpasses and to prevent them entering the carriageway. The following types are recommended (AMBS 1997):

- Floppy top fences consisting of chain-wire with the top 20cm unsupported and fence posts angled away from the carriageway at the top.
- Chain-wire fencing with a 600mm wide strip of sheet metal or plastic attached to the upper part of the fence. By attaching the sheeting to the non-carriageway side of the fence, animals can still climb the fence from the carriageway side of the fence and escape from the traffic. This is the preferred fence type for excluding koalas. A clear zone with no trees should be maintained for 3 metres either side of the fence to maintain its effectiveness (Main Roads 2000).

- Exclusion fencing may be particularly important in this section of the GUP corridor where there are a number of state and locally significant fauna species adjacent to the GUP corridor. Such species are generally in lower numbers and therefore deaths caused by vehicular collision are more significant when compared with common species. Such fencing needs to be inspected and maintained after construction to ensure its continual effectiveness.
- Landscaping on the verges adjacent to the Motorway should be confined to native trees and shrubs (as appropriate for safety) to deter macropods from grazing close to the Motorway where they are likely to come into collision with motor vehicles.

Construction

- Ensure a suitably qualified animal spotter and catcher is present during the initial clearing to relocate any fauna that is disturbed.
- The patch of large mature eucalypts adjacent to the existing Gateway Bridge should be retained and their root zones protected from vehicular traffic, the storage of materials and the deposition of deleterious materials such as cement.
- During vegetation clearing, an appropriately skilled and qualified "spotter and catcher" shall be engaged to visually check for any fauna present in trees or other vegetation. Fauna shall be either persuaded by reasonable means to leave or be captured and relocated in the local environment prior to felling or trimming.
- Site works, such as trenches and culverts, shall be checked each morning and after periods of inactivity, to ensure fauna are not trapped or likely to be harmed by construction activities.
- All native fauna is protected (including snakes) and shall not be intentionally harmed as a result of the works or worker actions.
- During bridge construction disturbance to mangroves should be kept to a minimum. Mangroves have important ecological functions as nursery grounds for fish, biofiltration beds and as providers of organic detritus to marine ecosystems. In the context of Kedron Brook Floodway, they also provide visual barriers for waders feeding at lowtide, helping reduce disturbance from human activities on the banks.
- Flagging tape, barricade webbing or similar highly visible markers shall be used to define the limits of clearing.
- Trees with trunks outside the 3m line adjoining the edge of works site shall be trimmed (branch lopping) by sawing rather than felled where branches may interfere with the works or future traffic safety.
- Small trees and shrubs shall be removed in preference to large trees where possible. Trees shall be felled to ground level with roots left in the ground. Vegetation to be removed shall be clearly marked by paint or flagging.
- Streetscape vegetation removal shall be limited to the removal of trunks within the works area and trimming of limbs overhanging the work area.
- Streetscape vegetation shall be inspected by the Construction Contractor prior to trimming and a determination of vegetation to be cleared or trimmed shall be made.
- Vegetation to be removed shall be clearly marked with paint or flagging tape prior to clearing.
- Riparian vegetation (vegetation along the edge of Bulimba Creek, Brisbane River and Kedron Brook) removal shall be minimised to the smallest clearance area to undertake the bridge works and install the temporary bridge.

- Where practical, removal shall be limited to pruning branches or where the trunk is felled, leaving the root mass in place.
- A weekly inspection for weeds within and adjoining the works site shall be undertaken by an appropriately skilled officer.
- Where weeds are detected within the work site, the weeds shall be removed or destroyed. Herbicides shall not be used within 20m of the banks of watercourses and drainage lines.
- Revegetation of disturbed soil areas such as batters, inlets and outlets of drainage structures and street landscaping areas, shall be revegetated as soon as practical (but not more that 4 weeks) after completion of earthworks final trim or associated works. Revegetation shall be either through seeding, hydro mulching, or direct planting.
- Revegetation works shall be maintained (watered etc) to ensure establishment.
- Areas ponding water are to be monitored and corrective action taken to prevent the harbourage or breeding of mosquitos and other pests of public health.
- Rehabilitate Lewins Rail habitat located within and near the Kedron Brook floodplain.

The works are within a Red Imported Fire Ant (RIFA) restricted zone, therefore controls on the movement of materials that may be of risk of transporting RIFA are required. The management actions detailed below reflect the "Red Imported Fire Ant Procedure" of Roads and Drainage Provider Unit. The Red Imported Fire Ant Management Plan shall be implemented prior to the commencement of any construction work.

Table 23.15 Red Imported Fire Ant Management Plan

Investigation Threshold	Strategy	Management Action
Inspection of site for RIFA not undertaken prior to commencement and monthly thereafter.	To inspect the site for the presence of fire ants prior to the start of works and at monthly intervals during the works period.	Prior to commencement of works, a Department of Primary Industries and Fisheries (DPIF) approved person shall carry out an inspection of the site. This inspection will identify whether the site is visually free or visually infested with RIFA. The inspection of the site shall be repeated every 28 days. The approved inspector will complete the Site Inspection Form (Issued by the DPIF).
Importation to the site of materials capable of transporting fire ants without inspection and clearance.	To only source restricted items (soil, plants etc) which are free of RIFA.	All incoming restricted items (soil, plants etc) must be visually inspected by an DPIF authorised person prior to entry into the site and shall only be sourced from providers outside the restricted area or with a DPIF Approved Risk Management Plan, and be accompanied by a written assurance that the material is Fire Ant free.
No records of imported materials from the restricted area.	To maintain records of any imported materials from the restricted area.	All incoming restricted items must be recorded detailing the nature, quantity and source of materials imported to the site. All records to be held on site by Project Manager.

Investigation Threshold	Strategy	Management Action
Importation to the site of materials capable of transporting fire ants without inspection and clearance.	To minimise the risk of RIFA being transported to the site by equipment and machinery.	All equipment and machinery to be visually free of loose soil or other material capable of containing Fire Ants prior to entry on to site.
Materials being exported from the site without inspection and clearance.	Movement of materials from the site shall not increase the risk of spread of RIFA.	Materials shall only leave the site within 28 days of a site inspection, which finds no visible evidence of RIFA.
Visual evidence of RIFA on site.	Visual evidence or suspicion of RIFA to be reported.	In the event that RIFA are detected or reasonable suspicion is held that RIFA are present on the site, the Project Manager shall be immediately notified. The area under suspicion shall be barricaded and works in that area shall cease. The Construction Contractor should notify the DPIF.
	Additional management measures to be implemented on detection of RIFA.	In the event of RIFA being detected on site, additional management measure shall be implemented which are in accordance with Attachment 4 of the Red Imported Fire Ant Risk Management Plan.

Operation

- Implement weed management plan.
- Liaise with the appropriate agency to carry out a long term study of population dynamics and movement patterns of koalas, squirrel gliders, sugar gliders and other significant species with populations on both sides of the GUP corridor to ascertain what effects if any the road is having on local populations.

Monitoring

Construction

During construction clearing, the Construction Contractor should inspect the site to assess compliance with the performance criteria and the EMP (Construction) requirements.

The Construction Contractor should ensure that the area to be cleared is clearly delineated and that impacts on flora are minimised.

Operation

Operator should undertake regular monitoring along the GUP corridor to ensure landscaped areas are being maintained in accordance with the EMP.

23.4.12 Aquatic Biology

Mitigation Measures

Design

- Avoid saltmarsh/mangrove area south of Cannery Creek at Northgate.
- Avoid the loss or disturbance of estuarine or freshwater wetland vegetation.
- Avoid habitat of migratory birds, including areas for feeding and roosting, particularly the wetlands associated with Kedron Brook Floodway and Shultz Canal and the saltmarsh area south of the Cannery Crain at Northgate.
- Design waterway crossings that retain as much as practicable of the natural features of the waterway so as not to unnecessarily cause degradation or sever the waterways.
- Design refinement to occur to minimise the physical disturbance of fringing riparian vegetation and waters where bridge buttresses are placed landward of the riparian zone at the Bulimba Creek crossing (CH14800) and Kedron Brook floodplain (CH21900-22100).
- Bridges to be designed to ensure sufficient light penetration to support marine plants;
- Design elements should seek to maintain existing patterns of flow and bed levels at Bulimba Creek (CH14800);
- Provision is made for the collection and treatment of stormwater runoff.
- Stormwater runoff collection and treatment ponds are designed to minimise the breeding of mosquitoes.
- The number and size of piers are minimised, and their shape produces minimal hydraulic 'interference'.
- Design elements should seek to maintain existing patterns of flow and bed levels within the airport precinct (CH21900 – 22100).

Construction

- Construction activities to minimise the loss or disturbance of riparian flora (and in particular 'marine plants'), at the Bulimba Creek crossing (CH 14800), Brisbane River (CH6900), airport land (CH21900-22100) and Kedron Brook floodplain (CH23100-23150).
- Rehabilitation of damaged vegetation communities (particularly 'marine plants') to be undertaken where appropriate (refer Section 17.3.7 of EIS).
- Sediments, particularly fine sediments, to be prevented from being transported from the construction corridor to waterways. The minimisation of sediment disturbance and subsequent erosion, and the effective adoption of sediment management strategies are likely to be critical.
- Acidified waters are to be prevented from entering Bulimba Creek, Brisbane River, Kedron Brook Floodway and any wetland and waterway. Where acidified waters accidentally enter a water body, remedial action should be taken to prevent the receiving waters from falling more than 2 pH units below ambient.

- The spillage and subsequent transport of contaminants (including hydrocarbons, heavy metals) from the construction corridor to Bulimba Creek, Brisbane River and Kedron Brook Floodway is to be prevented. Spill management plans (Refer Section 23.4.7) should be developed for the construction phase.
- A mosquito management plan is to be implemented.
- A comprehensive environmental monitoring program is to be developed and implemented. Baseline data should be gathered prior to any construction activity (refer Section 23.4.7).

Operation

- Sediments, particularly fine sediments, are to be prevented from being transported from the GUP to waterways where possible.
- 'Best practice' surface water quality management is to be undertaken during operation.
- Runoff from roadways (including bridges) is to be treated before release to natural waterways.

23.4.13 Social Environment

Mitigation Measures

The following mitigation measures are recommended to manage potential social impacts:

- In approving any new housing estates in Emerging Community Zones, Brisbane City Council should be requested to ensure that appropriate noise mitigation measures are incorporated.
- The proposed installation of noise barriers along the Gateway Motorway which has been progressively implemented from Mount Gravatt-Capalaba Road to Lytton Road should be completed at the earliest opportunity, taking into account the new conditions following the upgrade proposal. The timing of noise barrier installation will be important to residents in the vicinity of the Motorway and certainly in installation timing should be provided.
- Areas of affordable housing should be considered a priority for the implementation of mitigation measures.
- Consideration should be given to the re-establishment of a local park in the vicinity of Percival Park on surplus GUP land following completion of construction. Landscaping other surplus land in this area should also be considered.
- Maintain opportunities to pedestrian and cycle movement under the Kedron Brook Floodway bridge so as not to limit future recreational use of the floodplain.
- Provide certainty to directly affected landowners to enable relocation plans to be prepared in a timely fashion. This will apply particularly to manufacturing industry which has a long lead time for relocation.
- Maintain access to recreation areas, community facilities and businesses during construction using temporary access arrangements, if necessary.
- Avoiding impacts on local and onsite services that may disrupt manufacturing.

- Implementing an effective consultation and communication program during the construction phase. This program to include:
  - regular publication and distribution of information on construction activities, their timing and any temporary arrangements;
  - publication and distribution of information to take into account the needs of local communities, affected landowners, nearby businesses, nearby workers as well as the broader metropolitan community;
  - appointment of Community Liaison Officers (CLO) during the construction period;
  - maintaining a free call information line for the community to access the project delivery team including the CLOs;
  - keeping of a complaints register for recording action taken in response to complaints; and
  - monthly reporting of all consultation and communication activities including issues raised and action taken.

23.4.14 Waste Management

Objectives

To prevent any adverse impacts from wastes generated by the construction and operation of the GUP through the implementation of waste management principles and best practice disposal strategies.

The material from demolished structures should be retained onsite and reused wherever possible to:

- Reduce the amount of waste generated by these new works;
- Reduce the need to remove material from the site and import other material;
- Reduce the need for the use of new products if suitable materials may be reused in their place; and
- Reduce the cost where possible.

Mitigation Measures

Design

The Detailed Design Consultant should take into account all likely waste generators and where possible allow for their reuse in the final design. The main materials likely to be salvaged from the existing infrastructure would be include asphalt, cement treated gravel, concrete, steel and vegetative matter.

The Detailed Design Consultant should apply the following concepts for waste minimisation (as appropriate) of the following materials, as a minimum requirement:

- Asphalt. The asphalt should, where possible, be reused for recycled asphalt or if it is not of sufficient quality it should be placed into a material suitable to be used as either select fill or embankment material.

- Gravel. If testing shows that gravel meets all the required standards, it may be used as a lower sub-base material. If testing shows that it does not reach the required Main Roads standards for pavement material, it should be used as a select fill material or consequently it may be used as an embankment materials.
- Cement treated gravel. Cement related pavements would require a level of rehabilitation prior to being used as a fill material. The cement bonds the material into a bound pavement that is relatively thick. Cement treated gravel should be reduced to a useful size (eg < 75mm diameter) prior to use as an embankment materials.
- Concrete. Reinforced concrete structures that require removal could be demolished by the use of excavators with rock breakers. These would produce smaller pieces of reinforced concrete that could be treated to remove the excess steel prior to being used as embankment material. This material could be placed in the lowest layers of the embankments. The excess steel would be recycled.
- Structures to be reused. Structures such as culverts, poles, cables and other structures to be removed or demolished during construction should be identified at this stage. Structural elements which can possibly be reused on site or used for temporary works should also be identified.
- Steel. Any steel removed as part of the new works, such as guard rails, reinforcing steel, or sign posts, would be removed from site and recycled.
- Vegetative material. The main vegetative materials would be existing grass, shrubs and trees. Where appropriate the grass would be collected with the topsoil and stockpiled separately as a composted material and used for landscaping. Larger vegetation which needs to be cleared should be mulched. The topsoil and mulched material should be stockpiled separately such that it does not create a nuisance in the form of air borne dust by covering and "wetting down" of the stockpiles as appropriate. Stockpiles should also be maintained to prevent the growth of weeds.
- Soil. If not contaminated or an actual or potential acid sulphate material, excess soil removed as a result of construction should be reused in landscaping, embankments or other such design elements of GUP.

The Detailed Design Consultant should document all methods and procedures for minimising the generation of waste in the drawings and specification. The procedures should state clearly the anticipated volumes of waste generated and the methods to be used to meet the waste management objectives.

Construction

The Construction Contractor should:

- Apply any waste minimisation and management strategies as nominated in the drawings and specifications;
- Ensure any regulated wastes generated on site are transported and disposed of by an appropriately licenced contractor, as per the provisions of the *Environmental Protection Act 1994*;
- Consider the reuse of stockpiled structural elements for reuse in the construction or for use in temporary works on site. Prior to reuse, the Construction Supervisor should perform an assessment and testing (if required) of these stockpiled structural elements to ensure they meet the required standards and will perform satisfactorily;

- Ensure that there is the adequate provision of correctly signed waste receptacles made available at convenient locations for the disposal of wastes. If practicable, separate receptacles should be provided for wastes which can be source separated, eg steel, paper etc, which will allow easier and more efficient collection and later processing;
- Ensure adequate toilet and ablution facilities are provided for the duration of the contract. Domestic sewage and grey water from these facilities should be retained on-site and collected by a licensed waste disposal contractor at regular periods. Under no circumstances are wastes to be discharged directly into the environment;
- Ensure adequate ground surface area is made for the safe storage of wastes prior to collection;
- Ensure that all wastes on site are suitably contained and prevented from escaping into neighbouring bushland, properties, waterways and that the waste contained does not contaminate soil, surface or ground water or create unpleasant odours for neighbours or workers; and
- Ensure the site is regularly cleaned and waste materials appropriately removed. Material which can be economically recycled, (eg steel, oil etc) should be sent to recyclers. All other waste that cannot be reused on site should be disposed of to a licenced land fill in accordance with Brisbane City Council regulations.

Operation

- Operator should ensure waste and litter is removed and disposal of in accordance with Brisbane City Council regulations.

23.4.15 Landscape and Visual Amenity

Objectives

- To provide a memorable visual experience for road travellers and adjacent land owners, urban design and landscape treatments should be developed to reflect a local and easily identifiable theme at special feature precincts.
- To enhance the visual values of the journey along the Motorway and the adjoining land.
- To promote the use of native Australian vegetation species.
- Through the landscape treatment along the road corridor, contribute of the rehabilitation and enhancement of the environment and in turn act as a catalyst for the general environment improvement of the area.

Design Mitigation Measures

Themes identified in Table 23.16 should be incorporated into the detailed design.

Table 23.16 Road User Themes and Level of Visual Significance

Character Precinct	Theme	Level of Visual Significance
Southern Section		
Mt Gravatt – Capalaba Road to Wynnum Road	Forest Lined Motorway	Low
Wynnum Road to Bulimba Creek	Bulimba Creek floodplain	Low
Bulimba Creek to Lytton Road	Industrial	Moderate
Lytton Road to Gateway Bridge	Gateway Approach	High
Northern Section		
Gateway Bridge	Gateway	High
Gateway Bridge to Curtin Road	Gateway Approach	High
Curtin Road to Kingsford Smith Drive/Pinkenba Rail Line	Industrial	Moderate
Pinkenba Rail Line to Airtrain	Industrial	Moderate
Airtrain to Airport Drive	Airport Gateway	High
Airport Drive to Kedron Brook Floodway	Intertidal	Moderate
Kedron Brook Floodway to Nudgee Road	Kedron Brook Floodplain	Moderate

Landscape Mitigation Measures

Landscape treatments need to aim to integrate the GUP into the existing visual environment based on identified themes. To mitigate the identified levels of visual impact listed above, the following themed landscape planting measures summarised below are proposed.

a) General

Proposed plant species are to be native and endemic to the various ecological communities and environmental conditions along the corridor. A strictly native Forest Line Motorway theme is recommended and includes only species that perform in harsh roadside conditions and have a proven track record for minimal ongoing maintenance requirements. No exotic species are to be included.

Specific recommendations for each of the GUP sections are set out below.

b) Mt Gravatt-Capalaba Road to Cleveland Branch Rail Line

- Road interchanges treated with a combination of broad scale massed planting of batters with shrubs and groundcovers with semi advanced feature tree planting to batters;
- Majority of carriageway to be planted with frangible and non frangible native species;
- Acoustic barriers to be planted both sides to screen and minimise visual impacts;
- Investigate opportunities for rehabilitation of koala habitat within the GUP corridor;
- Planting arrangements and species mix for revegetation beyond clear zones to blend visually with the existing forest edge; and
- Plant riparian and swamp species to batters adjacent to the Bulimba Creek floodplain.

The Landscape Concept Plan is shown in Figures 22.4a and 22.4b of the EIS and includes proposed plant species and landscape treatments.

c) Cleveland Branch Rail Line to Pinkenba Rail Line

- Majority of carriageway to be planted with frangible and non frangible native species as appropriate for safety;
- Batters to works undertaken in the Port of Brisbane Motorway interchange and the southern Gateway Approach to be planted with species similar to those installed on recent landscaping. Species located to ensure screening of major batters;
- Level areas adjacent to the northern Gateway approach planted with large spreading tree species to provide a local feature. Batters planted similarly to southern Gateway approach to minimise visual impact of the Approach batters; and
- Bikeway planted with ornamental trees to frame the bikeway corridor.

d) Pinkenba Rail Line to Nudgee Road

- Batters planted with selected mix of trees and shrubs to provide visual screening of batters;
- Storm water collection ponds planted with suitable aquatic macrophytes to maintain water quality and provide visual amenity ;
- Storm water swales planted with selected tufting vegetation for visual amenity and to protect from erosion;
- Medians planted with lineal strips of massed native tufting groundcovers;
- Areas disturbed adjacent to the Airport interchange revegetated with the same Casuarina species to reinstate pre-existing conditions to minimise risk to aircraft from bird strike. For aesthetics, edges to carriageways, within clear zones are to be planted with massed, lineal plantings of tufting groundcovers;
- Northern interchange with its riparian theme to have areas outside clear zones massed planted with Melaleuca trees for dominant visual statement. This approach will effectively screen the Motorway from the nearby golf course; and
- For aesthetics, edges to carriageways, within clear zones planted with massed, lineal plantings of tufting groundcovers.

Indicative section details of landscape treatments to the Gateway Bridge approach batters and northern junction with existing Gateway Motorway are provided in Appendix P2 of the EIS.

e) Urban Design Mitigation Measures

Mitigation measures aim to address mainly the visual impacts along the Motorway as viewed by the Motorway road users. However visually significant structures will have mitigation measures to improve aesthetics from external viewers. Where possible, visual integration into the existing landscape will be proposed. To minimise visual impacts, visually recessive colours are proposed for the more visible elements of bridge structures and architectural elements.

f) Urban Design Philosophy

The urban design philosophy of the GUP is to provide uniformity in the appearance of the Gateway Motorway corridor by adopting a consistent overall urban design theme based on:

- Adopting similar urban design treatments as used on the Port of Brisbane Motorway interchange;
- Similarity in design of 'iconic' architectural structures at high profile locations;
- Similar architectural style and materials selection for toll plaza buildings;
- Applying similar design and colour treatments to bridge structures except for the new Gateway Bridge which should be similar in design and colour to the existing bridge;
- Similarity in road lighting colour and pole assembly design; and
- Uniform acoustic barrier design and colour.

Table 23.17 summarises the suggested urban design measures at significant locations. The measures are based on local variations in theme.

Table 23.17 Suggested Urban Design Themes

Location	Theme
South of Port Road	Forest Lined Motorway
Gateway Bridge Approaches	Gateway
Airport Interchange	Intertidal
Airport Drive	Aviation
Northern Interchange	Kedron Brook floodplain

The urban design mitigation measures are summarised in Figures 22.5a to 22.5d and in the "Matrix of Urban Design Treatments" in Appendix P3 of the EIS.

23.5 Environmental Management Process

23.5.1 Preamble

The Main Roads' environmental management process and documentation requirements are summarised below.

This EMP has been prepared as a Preliminary EMP and will be finalised prior to the detailed design tender phase of the project.

Construction

The Construction Contractor will be responsible for the creation of an EMP (Construction). This document should provide the Construction Contractors' the proposed methods of mitigating any environmental impacts, which may be incurred as a result of their construction activities.

The checklist below provides the methodology, which should be followed by the Construction Contractor to create an EMP (Construction).

- Identify the relevant works;
- Identify which environmental aspects are required to be addressed in the EMP (Construction);
- Refer to the relevant sections ie 'Construction' of the various Environmental Management Strategies (provided in the EMP), which address the environmental aspects (as identified in step 2) which are required to be included in the EMP (Construction);
- Create the EMP (Construction) in accordance with the requirements of the Environmental Management Strategies (as identified in step 3). Section 23.5.2 provides guidance on the format and content of the EMPs; and
- Submit the EMP (Construction) to the Superintendent, who will then submit the EMP to the Main Roads Representative for approval.

Operation

The nominated Operation Contractor will prepare an EMP (Maintenance). This document should provide the Operator with the proposed method of mitigating any environmental impacts caused by operation of GUP.

The Operator should follow the processes noted above, except that the submission of the EMP for approval should be to the GUP Director.

23.5.2 Content of an EMP

The Construction and Operation EMPs should address the requirements of the relevant environmental management strategies outlined in the EMP in separate sections. The EMPs should provide information under several different headings (which complement those in the environmental management strategies) as outlined below.

- Overview of Impacts and Existing Situation – The anticipated construction and/or operational impacts of the projects section as determined in the EIS and final EMP should be detailed.
- Objectives – This section should provide the management objectives or environmental commitments to be achieved, as included in the 'objectives' section of the relevant environmental management strategy.
- Non Compliance – This section should provide information on the corrective actions to be implemented. The level or extent of corrective actions implemented should reflect the seriousness of the event. The various indicators which should trigger the implementation of corrective actions are provided in the 'corrective actions' section of the relevant environmental management strategy under the subheadings of "minor non-compliance", "major non-compliance" and "environmental issues".
- Mitigation Measures – This section should provide details of the actions to be performed on-site. These actions should be developed from the requirements provided in the 'mitigation measures' section of the relevant environmental management strategy.
- Monitoring - This section should provide information on the monitoring activities to be performed. The actions included in this section may be sourced from the 'Monitoring' section of the relevant environmental management strategy.

- Reporting - This section should provide information on the reporting which will be performed by the Construction Contractor. The details included in this section may be able to be sourced from the 'Reporting' section of the relevant environmental management strategy.
- Corrective Actions – This section should outline the action, or the commitment for action, to be implemented when a specified mitigation measures is not met or legislative requirements have been exceeded.

23.5.3 Submission of an EMP (Construction)

The Construction Contractor should submit a EMP (Construction) to the Main Roads Representative for approval at least 3 months prior to construction commencing. The Main Roads Representative should refer the EMP(Construction) to the GUP Environmental Advisor for review.

The Main Roads Representative should liaise with the Superintendent and should subsequently notify the Construction Contractor of the acceptance or otherwise of the EMP within 2 months of it's submittal. Should the EMP not be accepted, the Construction Contractor should submit a revised EMP within 10 working days of the advice of non acceptance.

A Hold Point should occur and no site construction works should proceed until written approval of the amended EMP (Construction), or a section of the EMP (Construction) relevant to a particular construction operation, is received from Main Roads Representative.
The Construction Contractor should be solely responsible for the full and complete implementation of the EMP (Construction). The Construction Contractor should pay all penalties, costs and expenses which may be incurred in respect of offences committed or alleged to be committed under the provisions of the *Environmental Protection Act 1994*.

23.5.4 Auditing

The Construction Contractor should include in the reporting section of the EMP (Construction) the requirement to submit weekly checklist audit reports to the Main Roads Representative.

The Superintendent should audit the Construction Contractor's implementation of their EMP (Construction). The Construction Contractor is responsible for all impacts onsite until completion of the Defects Liability Period. This will be done to ensure that works being undertaken comply with the Contract Documents. The frequency of the audits will depend upon the activities being undertaken but it is envisaged that these audits should be undertaken on a monthly basis. Any changes to this frequency will be authorised by the Main Roads Representative. An audit report would be issued within 2 weeks and distributed to the Main Roads Representative and Construction Contractors and if necessary, to a relevant authority for action as necessary.

Actions to be undertaken by the Superintendent during the audit are likely to include:

- Check monitoring program and reporting procedures;
- Undertake investigations where necessary;
- Review performance standards and criteria against results;
- Prepare audit reports over time (with respect to agreed schedule) and submit to the Main Roads Representative; and
- Procedures for non compliance and exceedence/investigation/intervention of indicators identification.

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Glossary

Acid Sulphate Soil (ASS)	A soil or soil horizon which contains sulphides or an acid soil horizon affected by oxidation of sulphides. This is the definition used in Queensland's Environmental Protection Policy. Acid sulfate soils are the common name given to naturally occurring sediments and soils containing iron sulphides (principally iron sulphide or iron disulphide or their precursors). The exposure of the sulfide in these soils to oxygen by drainage or excavation leads to the generation of sulphuric acid. Note: The term acid sulphate soil generally includes both actual and potential acid sulphate soils. Actual and potential acid sulphate soils are often found in the same soil profile, with actual acid sulphate soils generally overlying potential acid sulphate soil horizons.
Actual Acid Sulphate Soils (AASS)	Soils containing highly acidic soil horizons or layers resulting from the aeration of soil materials that are rich in iron sulphides, primarily sulphide. This oxidation produces hydrogen ions in excess of sediment's capacity to neutralise the acidity resulting in soils of pH of 4 or less when measured in dry season conditions. These soils can usually be identified by the presence of yellow mottles and coatings of jarosite.
Advisory body	Any Commonwealth, State or local Government entity; corporation, statutory authority, local body or private organisation which has expertise or legislative responsibility in relation to the development proposal.
Alluvium	A general term for all detrital material deposited or in transit by streams, including gravel, sand, silt clay, and all variations of these. Unless otherwise noted, alluvium in unconsolidated.
Alternative	A proposition or situation offering a choice between two or more options.
Anthropogenic	Produced or caused by human activity
Arboreal	Primarily tree dwelling.
Audit	See environmental audit.
Australia TradeCoast (ATC)	A marketing initiative that involves a partnership between Port of Brisbane Corporation, BAC, DSDI and the VELOCITY (formerly The Office of Economic Development for the City of Brisbane – alliance between sectors for the purpose of attracting investment to Brisbane lead by BCC). It promotes 8,000 hectares of industrial land that is located, adjacent to the airport and seaport to national and international markets.
Baseline studies	Studies undertaken on the condition/trends of the existing environment.
Benefit-cost analysis	A method of comparing alternatives according to the relative costs incurred (technical, environmental and economic) and the relative benefits gained. The analysis can incorporate discounting calculations to take into account the time value of money.

Biodiversity	Means the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, and includes— (a) diversity within species and between species; and(b) diversity of ecosystems (*Vegetation Management Act 1999*).
Biological diversity	See biodiversity
Bioregion	Means a bioregion shown on map number V0001 held by the Department of Natural Resources, Mines and Energy (*Vegetation Management Act 1999*).
Biota	All the organisms, including animals, plants, fungi and microorganisms in a given area.
Burra Charter	The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance; a document prepared by the Australian Committee for the International Council for Monuments and Sites (Australia ICOMOS) to guide conservation philosophy and practice for cultural heritage places in Australia
Carrying capacity	The rate of resource consumption and waste discharge that can be sustained indefinitely in a defined impact region without progressively impairing bioproductivity and ecological integrity.
Catchment	The area of land where rainwater falls and flows naturally or is directed into a watercourse, lake or other water storage (*Water Resources Act 1989*).
Clay	(1) A soil separate consisting of particles <0.002mm in equivalent diamter. (2) A soil textural class containing >40% clay, <45% sand, and 40% silt.
Colluvium	Sediment accumulated at the foot of a slope
Confined Aquifer	An aquifer bounded above and below by confining units of distinctly lower permeability than that of the aquifer itself
Compensation	Something that constitutes an equivalent or recompense.
Conservation	Is the protection and maintenance of nature while allowing for its ecologically sustainable use (*Nature Conservation Act 1992*).
Coordinator-General	The corporation sole constituted under the *State Development and Public Works Organisation Act 1938* and preserved, continued in existence and constituted under the *State Development and Public Works Organisation Act 1971*.
Cost-benefit analysis	See benefit-cost analysis.
Crepuscular	Active at dusk and or dawn.
Crustacea	A phylum of chiefly aquatic arthropods, such as lobsters, prawns, barnacles etc., commonly having the body covered with a hard exoskeleton or carapace.
Cultural landscapes	Areas or features within Queensland that: (a) have been or are being used, altered or affected in some way by humans; and (b) are of significance to humans for any anthropological, cultural, historic, prehistoric or societal reason

Discretionary process/decision	A process or decision which the decision-maker is able to base on personal preference.
Diurnal	Active during the day.
Ecological processes	Processes which play an essential part in maintaining ecosystem integrity. Fundamental ecological processes include the cycling of water, the cycling of nutrients and the flow of energy.
Ecosystem	A dynamic complex of plant, animal, fungal and microorganism communities and associated non-living environment interacting as an ecological unit to form a recognisable self-contained entity.
Endangered regional ecosystem"	Means a regional ecosystem that is prescribed under a regulation and has either— (a) less than 10% of its pre-clearing extent remaining; or (b) 10% to 30% of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10 000 ha (*Vegetation Management Act 1999*).
Endemic	Restricted to a specific region or locality.
Environment	There is no generally agreed definition of environment in EIA. Increasingly, it means the complex web of inter-relationships between abiotic and biotic components, which sustain all life on earth, including the social/health aspects of human group existence. The Environment as defined in Section 8 of the *Environmental Protection Act 1994* includes: (a) Ecosystems and their constituent parts, including people and communities; (b) all natural and physical resources; (c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community; and (d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).
Environment Australia	Environment Australia incorporates the environment program of the Department of the Environment, the Australian Nature Conservation Agency and the Australian Heritage Commission
Environment Minister	The Commonwealth Minister for the Environment
Environmental assessment	See Environmental Impact Assessment.
Environmental audit	Process focusing on an existing site or activity which involves a systematic, periodic evaluation of environmental management to objectively review the performance of an organisation, management and/or equipment.
Environmental effects	The beneficial as well as the detrimental effects of any development on the physical, biological, or social systems within which such development occurs.

Environmental Impact Assessment (EIA)	The process of identifying, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made (The International Association of Impact Assessment, 1999).
Environmentally significant areas	Environmentally significant areas include: • "Protected Areas" (as defined under the *Nature Conservation Act 1992);* • "Critical Habitat" (as defined under the *Nature Conservation Act 1992*); • Koala Coast Area (as defined under *Conservation of Koalas in the Koala Coast — State Planning Policy 1/97*); and • Waterways.
Environmentally Sustainable Development (ESD)	Development that focuses on making social, economic, and political progress to satisfy global human needs, desires, aspirations, and potential without damaging the environment.
Exceedance	An occasion when a goal, guideline or standard is exceeded
Exotic, species	A plant or animal introduced from anther region.
Fauna	Animals found in a given area.
Feral, animals	Animals that have reverted to a wild state from domestication
Flora	Plants found in a given area.
Flow-on or indirect effects	The effects which extend beyond the initial round of purchases and employment, and represent the additional value adding, income and employment generated resulting from second, third, and subsequent-round purchases flowing throughout the regional economy. For example, local suppliers to the construction operations who in turn purchase goods and services from other local firms, and so on, as part of the chain of production. Similarly, households receive income as employees of these firms and spend some of their income on local goods and services. These purchases result in additional local jobs. Some of the income from these additional employees is in turn spent on local goods and services, thereby creating further jobs and income for local households.
Fragmentation, vegetation	When used in the context of vegetation or habitat, refers to division and isolation of vegetation/habitat by vegetation clearing, isolating species and limiting genetic flow
Freehold	Land owned privately *see also* leasehold
Gley soil	Soil developed under conditions of poor drainage resulting in reduction of iron and other elements and in grey colours and mottles.
Ground truth	To verify on-site data deduced from a model, satellite picture or aerial photograph
Gross Output	This represents the total value of production or total expenditure of the industries under consideration on all goods and services purchased in the chain of production by firms in the region.

Gross Regional Product (GRP) and Gross State Product (GSP)	Gross expenditure measures are susceptible to multiple counting because they sum all the intermediate transactions over all stages of production during the production process. Consequentially, they can substantially overstate the contribution to economic activity. A preferred measure of the contribution to economic growth is value added. This is technically defined as compensation of employees (wages and salaries and supplements) paid to labour plus gross operating surplus and mixed income plus taxes on products and production less subsidies, but for practical purposes measures payments to factors of production (labour and capital), including net taxes on production. The sum of all industry value added is equal to gross regional product (GRP), so value added impacts refer to the contribution to GRP (or gross state product (GSP) at the state level and gross domestic product (GDP) at the national level). This is the accepted economic measure of what an economy produces.
Habitat	The place where an animal or a plant normally lives and reproduces
Heritage	Places, objects and indigenous languages that have aesthetic, architectural, historical, scientific, technological or social significance or other special value for future generations as well as for the community today.
Household Income	This is the income earned by employees as part of the normal operations of the economy.
Horizon, soil	A layer of soil, approximately parallel to the soil surface, differing in properties and characteristics from adjacent layers below or above it.
Humus	That more or less stable fraction of the soil organic matter remaining after the major portions of added plant and animal residues have decomposed. Usually it is dark in colour.
Initial Advice Statement	A report containing a brief, preliminary evaluation of the types of impacts that would result from an action. Often used as a screening process to assess whether or not proposals should undergo full scale EIA.
Interdisciplinary team	A group of people, from a range of disciplinary backgrounds.
Invertebrate	An animal without a backbone composed of vertebrae, that is, segments or bone comprising a column through which the spinal cord passes, not including protozoans *see also* vertebrate
Initial or direct effects	These impact on the industry *per se* associated with direct purchases and employment by organisations supplying goods or services to the construction activity, and represent the initial round of value adding, income and employment generated by the activity. For example, the construction activity purchases inputs (eg, materials) from local suppliers. This is the first round impact.
Landform	A component used in the description of the dominant land surface features, which enables the terrain of an area to be described and communicated.
Landform Element	Enables the description of dominant land surface features, which are 40m or more across.

Landform Pattern	Enables the description of dominant land surface features, which are more than 600m across.
Leasehold	land owned by government but leased to a specific person or organisation for a specific purpose *see also* freehold
Macro-invertebrates	Animals without backbones, visible to the naked eye
Microrelief	Refers to the land surface plane that is up to a few metres across.
Mitigation	The purposeful implementation of decisions or activities that are designed to reduce the undesirable impacts of a proposed action on the affected environment.
Monitoring	Activity involving repeated observation, according to a pre-determined schedule, of one or more elements of the environment to detect their characteristics (status and trends).
Native title	Recognition of rights held by Aboriginal or Torres Strait Islander people according to their laws and customs involving location of land, the rights held, and identification of the holder of the rights
Natural resources	Natural features that have ecological, economic, recreational, educational or aesthetic value.
Noise sensitive land uses	Noise sensitive land uses are as defined in Main Roads Road Traffic Noise Management Code of Practice 2000, which states: *"Noise-Sensitive can be applied to:* • *A dwelling; or* • *A library , child care centre, kindergarten, school, college, university, or other educational institution; or* • *A hospital, surgery or other medical centre; or* • *A protected area, or an area identified under a conservation plan as a critical habitat or an area of major interest under the Nature Conservation Act 1992;* *A public park or gardens that is open to the public (whether or not on payment of a fee) for use other than for sport or organised entertainment.*"
Notifiable Activity	An activity that has been identified as a potentially contaminating activity under Schedule 3 of the *Environmental Protection Act 1994*.
Of-concern regional ecosystem"	Means a regional ecosystem that is prescribed under a regulation and has either— (a) 10% to 30% of its pre-clearing extent remaining; or (b) more than 30% of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10 000 ha (*Vegetation Management Act 1999*).
Oxidise	The process of reacting with oxygen
Peat	Unconsolidated soil material consisting of largely undecomposed, or only slightly decomposed, organic matter accumulated under conditions of excessive moisture.
Permeable	A rock unit with interconnected pore spaces that allow movement of water.

pH	A measure of acidity or alkalinity, expressed on a logarithmic scale from 1 to 14. 1 is most acid, 7 is neutral and 14 is most alkaline.
Potential Acid Sulphate Soils (PASS)	Soils which contain iron sulphides or sulphidic material which have not been exposed to air or oxidised. The field pH of these soils in their undisturbed state can be pH4 or more and may be neutral or slightly alkaline. However, they pose a considerable environmental risk when disturbed, as they will become very acidic when exposed to air and oxidised.
Potentiometric Surface	An imaginary surface representing the static head of ground water and defined by the level to which water will rise in a tightly cased well.
Precautionary principle	The principle that advises that uncertain outcomes or the lack of full scientific certainty should be fully addressed to prevent environmental degradation.
Proposal	Any project, policy, program, plan or other activity.
Public consultation	*See public involvement*.
Public involvement	A range of techniques that can be used to inform, consult or interact with stakeholders affected by a proposal.
Ramsar	Convention on Wetlands of International Importance Especially as Waterfowl Habitat, entered into force in 1975. The Convention, including the List of Wetlands of International Importance established under it, is administered by the IUCN.
Regional Ecosystem (RE)	Means a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil (*Vegetation Management Act 1999*).
Register of the National Estate	A national heritage register that covers significant natural, historic and Aboriginal and Torres Strait Islander places across Australia
Saltflat	Wide expanse of flat country in which the soil is very salty
Saltmarsh	An intertidal plant community complex dominated by herbs and low shrubs
Saltpan	A basin flooded by salt deposits; the remains of evaporated salt water deep water and warmer upper layers that can develop in spring and summer months.
Sand	A soil particle between 0.05 and 2.0mm in diameter; a soil textural class.
Scoping	An early activity to identify the impacts that are most likely to be significant and require investigation during the EIA.
Screening	Preliminary activity undertaken to classify proposals according to the level of assessment that should occur.
Secondary impact	Indirect or induced changes in the environment, population, economic growth and land use and other environmental effects resulting from any action. The potential effects of additional changes that are likely to occur later in time or at a different place as a result of the implementation of a particular action.

Semi-confined Aquifer	An aquifer partially confined by soil layers of low permeability through which recharge and discharge can still occur.
Sensitive land uses	Sensitive land uses are defined as residential uses (noise sensitive land use – dwelling), sensitive community and commercial uses (Noise sensitive land uses other than a protected area or a dwelling) or environmentally significant areas.
Silt	(1) A soil separate consisting of particles between 0.05 and 0.002mm in equivalent diameter. (2) A soil textural class.
Stakeholders	Those who may be potentially affected by a proposal. Stakeholders may include government agencies; conservation groups; relevant business groups; relevant industry groups; local/ regional Chambers of Commerce; Aboriginal groups/ Land Councils/ Councils of Elders; residents/ businesses within hearing, sight or smell of project or project related activities; potential competitors; community groups; and politicians/ elected representatives.
Suspended solids	Suspended particles in a water body *see* turbidity
Targeted survey (flora and fauna)	A survey with the specific objective of determining the presence or absence, in the survey area, of species and communities of conservation significance and/or their habitats.
Terms of Reference (TOR)	Documented requirements governing EIA implementation, consultations to be held, data to be produced and form/contents of the EIA report.
Tertiary	A period of time between sixty five and three million years ago, prior to the Quaternary period.
teus	Twenty foot equivalent unit. A teus is a measurement of containers. Container are two sizes, namely 20 foot and 40 foot. One teu is one 20 foot container and two teus is two 20 foot containers or one 40 foot container.
Threatened species	A plant or animal that is endangered, vulnerable or presumed extinct
Total impact	The sum of the initial and flow-on effects.
Total Suspended Particles (TSP)	Total suspended particles (in air). Includes all particles from the smallest up to those 50μm in diameter. Particles less than 10 μm (PM10) and particles less than 2.5 μm (PM2.5) are of greatest concern for human health because they are inhaled deeply into the lungs.
Transboundary impacts	Any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party (i.e. greenhouse gases).
Unconfined Aquifer	An aquifer containing water that is not under pressure; the water level in a well is the same as the water table outside the well.
Value judgement	The use of opinion or belief in analysis or decision making.
Vascular plants	A grouping of plants that include the flowering plants, ferns and gymnosperms

Vertebrate	An animal with a backbone composed of vertebrae, that is, segments or bone comprising a column through which the spinal cord passes *see also* invertebrate
Vulnerable species	A plant or animal whose population is decreasing, has been seriously depleted or is at risk due to threatening processes
Wetland	Areas of permanent or periodic or intermittent inundation, whether natural or artificial, static or flowing, fresh, brackish or saline and including areas of marine water the depth of which does not exceed six metres. Wetlands typically include areas which show evidence of adaptation of soil or vegetation to periodic waterlogging, such as lakes, swamps, marshes, ponded pastures, rivers, streams and springs, intertidal sand flats, mud flats and mangroves, and shallow seagrass beds or fringing coral reefs (*Department of Environment 1996*).

Abbreviations

µg/m³	Micrograms per cubic metre
1,3-But	1,3-Butadiene
AADT	Annual Average Daily Traffic
AAR	Allens Arthur Robinson
AASS	Actual Acid Sulphate Soils
AAWT	Annual Average Weekday Traffic
ABS	Australian Bureau of Statistics
ADCQ	Anti-Discrimination Council Queensland
AHD	Australian Height Datum
ALS	Aerial Laser Survey
ANZECC	Australian and New Zealand Environment and Conservation Council
ARCHAEO	ARCHAEO Cultural Heritage Services
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARI	Average Recurrence Interval
ARRB	Australian Road Research Board
AS	Australian Standard
ASS	Acid Sulphate Soils
ATC	Australia Trade Coast
AUSRIVAS	Australian River Assessment System; a rapid prediction system used to assess the biological health of Australian rivers.
BAC	Brisbane Airport Corporation
BCC	Brisbane City Council
Benz	Benzene
BNST	Brisbane North South Tunnel
BOM	Bureau of Meteorology
BSD	Brisbane Statistical Division
BSTM	Brisbane Strategic Transport Model
BT	Brisbane Transport
CAMBA	China/Australia Migratory Bird Agreement
CAPEX	Capital Expenditure
CATI	Computer Activated Travel Interview
CBD	Central Business District
CEPM	Queensland's Centre for Economic Policy Modelling

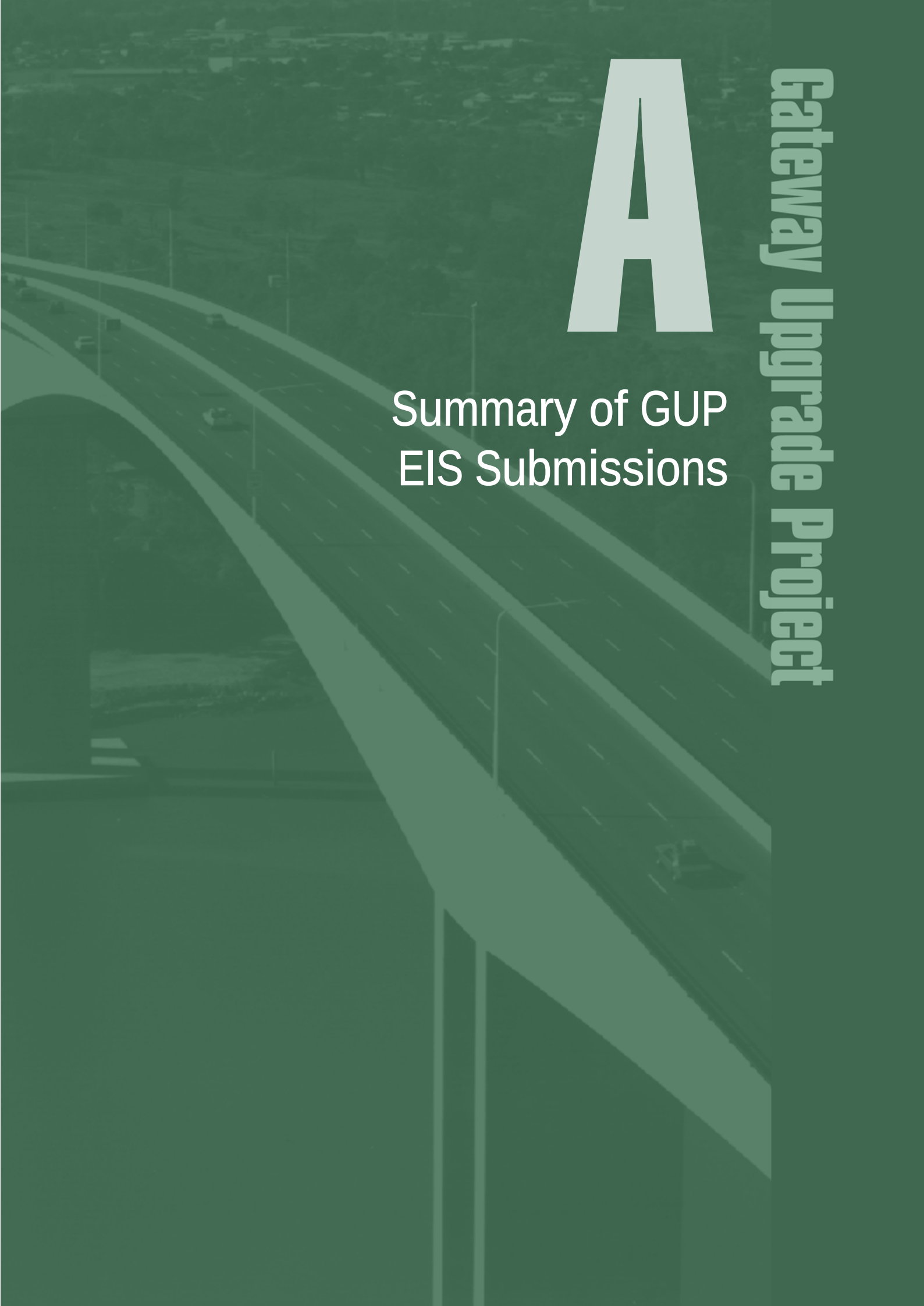
CH	Chainage
CH_4	Methane
CHA	Cultural Heritage Assessment
CHMP	Cultural Heritage Management Plan
CLR	Contaminated Land Register
CO	Carbon monoxide
CO_2	Carbon dioxide
CoG	Coordinator-General
Contractor	Design, construction and commission.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSO	Community Services Obligation
DB	Decibel
DBFO	Design Build Finance Operate
DBYD	Dial Before You Dig
DCM	Design Construct Maintain
DDA	*Disability Discrimination Act*
DGA	Dense Graded Asphalt
DoTaRS	Department of Transport and Regional Services (Cth)
DPI	Department of Primary Industries
DSDI	Department of State Development and Innovation
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environmental Management Register
EOP	Eppell Olsen & Partners
EP Act	*Environment Protection Act 1994*
EPA	Environmental Protection Agency
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPP	Environmental Protection Policy
EPP (Noise)	*Environmental Protection Policy (Noise) 1997*
ERA	Environmentally Relevant Activity
ES	Environment Services
ESD	Ecological Sustainable Development
ETC	Electronic Toll Collection
FRL	Flood Regulation Line

FTE	Full Time Equivalent. Jobs which are created on a full time basis over a full year
GHD	GHD Pty Ltd
GIS	Geographic Information Systems
GOC	Government Owned Corporation
GPT	Government Project Team
GUP	Gateway Upgrade Project
ha	Hectare
HC	Hydrocarbons
HREOC	Human Rights and Equal Opportunity Commission
HTS	Household Travel Survey
IAS	Initial Advice Statement
ICOMOS	International Council for Monuments and Sites
IDAS	Integrated Development Approval System
IPA	*Integrated Planning Act 1997*
IR	Industrial Relations
IRCNP	Integrated Regional Cycle Network Plan
IRTP	Integrated Regional Transport Plan
ITS	Integrated Transport System
IUCN	International Union for Conservation of Nature and Natural Resources
JAMBA	Japan/Australia Migratory Bird Agreement
JUHI	Joint Usage Hydrant Installation
km	Kilometre
KPI	Key Performance Indicators
$L_{A\ eq}$	Average A-weighted sound pressure level
$L_{A\ MAX}$	Maximum A-weighted sound pressure level
$L_{A\ MIN}$	Minimum A-weighted sound pressure level
L_{A10}	A-weighted sound pressure level exceeded for 10% of the time
L_{A90}	A-weighted sound pressure level exceeded for 90% of the time (background)
LGA	Local Government Area
LGAs	Local Government Areas
m	Metre
MAE	Material Adverse Effect
MDP	Major Development Plan
MEL	Minimum Energy Loss

Mt	Mount
MWT	Masson Wilson Twiney
N_2O	Nitrous oxide
NEPM	National Environment Protection Measure
NES	National Environmental Significance
NESB	Non-English Speaking Background(s)
NHMRC	National Health and Medical Research Council
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPV	Net Present Value
DNRM	Department of Natural Resources and Mines
NRTC	National Road Transport Commission
NSBT	North South Bypass Tunnel
NTU	Nephelometric Turbidity Unit, used to measure turbidity (water clarity).
OESR	Office of Economic and Statistical Research
OLS	Obstacle Limitation Surface
Operator	Operation
OPEX	Operational Expenditure
ORP	Oxidation Reduction Potential; the reduction and oxidation characteristics of water, which gives an indication of what oxygen levels are likely to be
PAH	Polynuclear Aromatic Hydrocarbons
PAS	Preliminary Assessment
PASS	Potential Acid Sulphate Soils
PBC	Port of Brisbane Corporation
PCU	Passenger Car Units
PCWG	Pedestrian and Cycle Working Group
PER	Public Environmental Report
PIFU	Planning, Information and Forecasting Unit
PM_{10}	Particulate matter less than 10 μm is aerodynamic diameter
PMS	Performance Measurement System
ppb	Parts per billion (by volume)
ppm	Parts per million (by volume)
PPP	Public Private Partnership
PS	Private Sector
PSC	Public Sector Comparator

PWC	Price Waterhouse Coopers
Q Build	Department of Public Works
QASSIT	Queensland Acid Sulphate Soil Investigation Team
Qld	Queensland
QML	Queensland Motorways Limited
QT	Queensland Transport
QTC	Qld Treasury Corporation
QSIA	Queensland Seafood Industry Association, the body representing the interests of commercial fishers in Queensland
RA	Risk Assessment
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
REF	Review of Environmental Factors
RFGM	The Regional Framework for Growth Management
RIFA	Red Imported Fire Ant
RP	Revealed Preference
RQGC	Royal Queensland Golf Club
SACTRA	Standing Advisory Committee on Track Road Assessment
SC	Steering Committee
SD	Statistical Division
SEQ	South East Queensland
SIG	Special Interest Groups
SIGNAL (2)	Stream Invertebrate Grade Number — Average Level (version 2); an index of macroinvertebrate communities that gives an indication of the types of pollution and other physical and chemical factors affecting a site.
SLA	Statistical Local Areas
SOI	Southern Oscillation Index
SPDWO Act	*State Development and Public Works Organisation Act 1971*
SPP	State Planning Policy
SPP02/02	State Planning Policy SPP02/02 Planning and Managing Development Involving Acid Sulphate Soils
SPS	Stated Performance Survey
STOB	Strategic Transport Opportunities for Brisbane
Strata	Layers or beds of sedimentary rock deposited on top of each other.
SWL	Standing water level
TA	Technical Advisory

TCC	TradeCoast Central
TER	Tax Equivalent Resume
TFM	Traffic Forecasting & Modelling
TOR	Terms of Reference
TPH	Total Petroleum Hydrocarbons
TSP	Total Suspended Particulates
UK	United Kingdom
UXO	Unexploded Ordinance
VFM	Value for Money
VHT	Vehicle Hours of Travel
VKT	Vehicle Kilometres Travel
VM Act	*Vegetation Management Act 1999*
VOC	Volatile Organic Compounds
Vpd	vehicles per day
WOL	Whole of Life



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Summary of GUP EIS Submissions

Gateway Upgrade Project

Summary of GUP EIS Submissions

No.	Summary of Comment	Response
	Agency Responses	
BAC 1	Construction access issue – provide sufficient detail to enable BAC to determine impacts to airport land and existing tenants.	Addressed in Draft MDP.
BAC 2	The GUP shall not cause runoff flows that would result in any worsening of on-airport flood levels or cause additional stormwater ponding.	Addressed in Draft MDP and refer revised EMP Section 23.4.6.
BAC 3	The GUP design should not assume that any spare existing capacity within the airport drainage system is available for utilisation as part of the GUP.	Addressed in Draft MDP and refer revised EMP Section 23.4.6.
BAC 4	The GUP should not cause alterations in surface water from surrounding areas into Brisbane Airport land especially in terms of contaminants.	Addressed in Draft MDP and refer revised EMP in Section 23.4.6.
BAC 5	Acid sulphate soil treatment areas on old airport site needs to be carefully assessed with QASSIT before a final decision is made to proceed with this strategy	Addressed in Draft MDP.
BAC 6	BAC operates a comprehensive water quality monitoring program to make sure there is no degradation to downstream environments.	Noted.
BAC 7	Will groundwater monitoring on Airport land require additional groundwater wells to those currently being used by BAC? If so a locality plan is required.	Addressed in Draft MDP.
BAC 8	BAC considers that groundwater monitoring should occur post construction as well.	Noted – refer revised EMP in Section 23.4.8.
BAC 9	How were existing groundwater pathways determined?	Addressed in Draft MDP.

Table Notes:

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DATSIP	Department of Aboriginal and Torres Strait Islander Policy
DC	Department of Communities
DES	Department of Emergency Services
DET	Department of Employment and Training
DH	Department of Housing
DLGSR	Department Local Government, Sports and Recreation
BCC	Brisbane City Council
DPI&F	Department of Primary Industries and Fisheries
EPA	Environmental Protection Agency
NRM	Natural Resources, Mines and Energy
PBC	Port of Brisbane Corporation
PQ	Powerlink Queensland
QH	Queensland Health
QSR	Sport and Recreation Queensland
QT	Queensland Transport
GS	Greg Sim
AdeS	A de Smidt
BQ	Bicycle Queensland Inc
MW	Malcolm Wade
PTA	Public Transport Alliance
NPD	New Products Development

No.	Summary of Comment	Response
BAC 10	In contrast to the EIS, BAC has made no decision to fill in Landers Pocket Drain and has yet to undertake any design work on the drainage system for the new parallel runway. BAC requires existing tidal connections to the Kedron Brook Floodway in the location of the new northern interchange to be maintained. Therefore cross drainage required through earthen embankments.	EIS Volume 3 Sheet 23 shows proposed culvert. Included in EMP (refer revised EMP – Section 23.4.6).
BAC 11	An agreement on the tenure of the road corridor on airport land has not yet been reached between BAC and the Queensland Government as was stated as a given in the EIS.	Addressed in Draft MDP.
BAC 12	The future planning of cycleways at Brisbane airport is the responsibility of BAC and the EIS is misleading in showing cycleways along Lomandra Drive and Airport Drive.	Addressed in Draft MDP. Refer Section 6.1 in Supplementary EIS.
BAC 13	It is considered that it is highly probable that the existing water main and its pipe joints, and the high voltage line, would be unable to tolerate these high vertical displacements expected in the settling ground under fill and surcharge conditions.	Addressed in Draft MDP. Refer Section 7.1 in Supplementary EIS.
BAC 14	The EIS stated that State law, in relation to excessive noise is not applicable on airport land. It should be expanded to state that State law for air, water and soil pollution is also not applicable on airport land as the *Airports (Environmental Protection) Regulations 1997*, schedules 1 to 4 apply.	Addressed in Draft MDP.
BAC 15	Where geotechnical investigations are to be carried out on airport land (especially the Kedron Brook precinct), the access tracks should be (where practical) coincident with intended construction access tracks reducing the amount of vegetation clearance required. Where new tracks are required that can not be utilised otherwise, they are to be remediated and the conclusion of the field work.	Addressed in Draft MDP and revised EMP in Section 23.4.4.
BAC 16	The design criteria/standards that will need to be achieved must include the *Commonwealth Airports (Environment Protection) Regulations1997* for those aspects of the project that will be on airport land, or which may result in stormwater runoff traversing the airport land.	Addressed in MDP and revised EMP in Section 23.2.3.

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No.	Summary of Comment	Response
BAC 17	BAC wishes to be consulted before any decisions to use wick drains on airport land. BAC will need to be assured of no acid sulphate soil issues with the use of wick drains.	Addressed in Draft MDP and revised EMP in Section 23.4.5.
BAC 18	In regard to the SBMP for treatment of acid sulphate material, it will also need to assess groundwater impacts. All construction works involving remediation of acid sulphate soils should be overseen by a suitably qualified person at all times.	Addressed in Draft MDP and revised EMP in Section 23.4.5.
BAC 19	The effect of imposed loading from embankment fills and surcharge, as well as intended construction methods such as wick drains, will need to be carefully assessed in terms of impacts on groundwater movements within the contaminated soils. Consolidation of the subsurface soil layers could cause further lateral spreading or leaching of contaminants to the surface.	Addressed in Draft MDP and included in the revised EMP in Section 23.4.5.
BAC 20	In regards to the area affected by the interchange footprint works which is likely to require remediation prior to construction, BAC will require further negotiation with Main Roads as to how this contaminated site will be appropriately managed.	Addressed in Draft MDP.
BAC 21	Contaminated site #29 on Figure 10.4d has recently been remediated by BAC as a part of a recent development at Viola Place.	Noted.
BAC 22	BAC will need confirmation that the 2-D modelling allowed for the ultimate development of the Brisbane Airport as shown in the BAC's 2003 Master Plan. The on-airport drainage system along the western section of the airport near the Gateway corridor will potentially change the construction of the new parallel runway, and BAC as yet to determine what the modified drainage system will be. Therefore, how was this area modelled in terms of airport stormwater runoff.	Addressed in Draft MDP.
BAC 23	Advice is sought on whether there is any increase in flood levels on BAC land as a result of the Gateway Motorway.	Addressed in Draft MDP.
BAC 24	BAC requires that any construction of detention basins for the management of stormwater in the vicinity of the airport to be carefully designed to deter bird attraction to any such water body.	To be addressed during detail design. Included in revised EMP in Section 23.4.7.

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No.	Summary of Comment	Response
BAC 25	The applicable noise criteria needs to refer to the Airports (Environmental Protection) Regulations, Schedule 4 – Excessive noise –guidelines, for applicability to airport sections of the corridor. BAC also requires advice on what the Motorways impacts are in terms of predicted noise levels for sensitive receptors on airport premises that adjoin the motorway corridor (for construction and operation).	Addressed in Draft MDP. Refer revised EMP (Section 23.4.10).
BAC 26	The open water bodies referred to in the TradeCoast central site are not a natural occurrence but are the bunded dredged spoil areas from the previous dredging of Kedron Brook.	Addressed in Draft MDP.
BAC 27	The ERM report should be referenced at the beginning of the terrestrial ecology Brisbane Airport section to indicate that all Brisbane Airport discussion is sourced from this document. Also it should mention that much of the ERM discussion of the terrestrial fauna is super seeded by the Draft Lambert and Rehbein 2004 Study.	Addressed in Draft MDP.
BAC 28	Clarification on sightings of shorebird activity needs to be more definite as many sighting are from the surrounding lands outside of Brisbane Airport.	Addressed in Draft MDP. Refer Section 16.4.1 in Supplementary EIS.
BAC 29	Migratory bird counts commissioned by BAC last summer found migratory bird numbers only in their hundreds.	Addressed in Draft MDP. Refer Section 16.4.2 in Supplementary EIS.
BAC 30	Tidal connection to mangrove and saltmarsh on the BAC site needs to be re-emphasised.	Addressed in Draft MDP. Refer Section 17.1 in Supplementary EIS.
BAC 31	Reference should be given to the Mangrove Mitigation Working Group which includes state govt. BCC and BAC who are looking for an approach to enhancing the tidal exchange to the mangroves and wetlands occurring in the Kedron Brook Floodway. The working group shows a collaborative approach between Gateway and runway projects to minimise impacts on wetlands and mangroves.	Addressed in Draft MDP.

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No.	Summary of Comment	Response
BAC 32	It is imperative that the motorway design ensures agreement and consultation with BAC in the final drainage solution for the area to avoid detrimental affects on dependant tidally influenced vegetation	To be addressed during detail design. Included in revised EMP in Section 23.4.6.
BAC 33	In accordance with the Airport Environmental Strategy (2004) all development projects on airport land must submit a mandatory construction EMP for both BAC and the airport Environmental Officer approval prior to a Permit to Commence Works being issued.	To be addressed during detail design. Included in revised EMP (Section 23.2.3).
BCC 1	In the Project Justification section, it is stated that the bridge would have substantial future capacity with the implementation of full Electronic Toll Collection (ETC), suggesting deferral of the bridge duplication (not the approaches) could be contemplated. Is there any option to defer construction of the bridge (not approaches) if full ETC functionality is implemented?	No.
BCC 2	The project rationale does not adequately address the overall function of the Gateway Upgrade Project (GUP) or how the project was developed to service demands within the context of the wider transport network.	Refer EIS Section 2.1.
BCC 3	The EIS does not adequately address the issue of the number of short car trips the Motorway attracts. Short car trips are not an appropriate use on a regional transport facility such as the Gateway Motorway. This issue has not been sufficiently considered in the formulation of the Project nor addressed in the impact assessment.	Issue considered as part of traffic modelling.
BCC 4	What delivery models are being assessed against Traditional Procurement and what is the State's preferred position?	Decision on delivery method not decided at time of EIS public display. Government decision discussed in Supplementary EIS Section 3.1.
BCC 5	State tolling policy requires that an acceptable free facility is available for use as an alternative to a tolled facility. The EIS does not adequately address this issue.	The GUP will toll vehicular movements over the existing and new Gateway Bridge. This is the same as the current situation.
BCC 6	There is no clear indication of the toll pricing structure used in the modelling.	Commercial in confidence issue.

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No.	Summary of Comment	Response
BCC 7	The EIS suggests a 75,000 trip increase in Australia Trade Coast (ATC) traffic using the Gateway Bridge increasing the share of ATC trips to around 50% of average weekday traffic volumes by 2016. This volume of trips appears inconsistent with forecast traffic flows on the bridge ie "136,000 by 2021".	Noted.
BCC 8	Given the significant forecast employment growths throughout the Australia Trade Coast areas, the examination of public transport impacts deserves much further attention including the potential for future public transport opportunities (services and facilities).	Noted.
BCC 9	The historical private vehicle growth rate for the Motorway has averaged 6.3% per annum since 1992 but a much lower rate was adopted. The percentage of trucks using the Motorway is high at 13.8%, having grown at a rate of 15.5% per annum in 1992-1997 and 6.5% per annum from 1997 to 2003. A forecast growth of 3.9% pa from 2003 – 2021 was adopted for analysis. This growth rate appears low in terms of the potential future growth in the ATC areas and future changes in freight requirements.	Noted.
BCC 10	Have projections from the Office of Urban Management been considered throughout the analysis? Has the "North Shore" development been included in the demographics, as the numbers throughout Section 5.5.1 appear to suggest that it has not?	Refer Supplementary EIS Section 5.1.
BCC 11	GUP has adopted a "generalised" cost as the main method for forecasting toll road demand". This appears simplistic, how reliable is this?	Refer Supplementary EIS Section 5.2.
BCC 12	Council is concerned with the statement "any upgrade of the intersections associated with interchanges has to occur in the context of upgrading of the arterial roads rather than upgrading of the Motorway". Does this mean that Brisbane City Council will have the sole responsibility to upgrade interchange intersections because of the GUP?	Refer Supplementary EIS Section 5.3.

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BCC 13	The overall impacts the Motorway upgrade will have on Brisbane's local road network remains unclear and is not sufficiently addressed in the EIS.	Refer Supplementary EIS Section 5.4.
BCC 14	Section 2.1.2 – "Census data for 1992 to 2001 shows declining use of public transport". 1992 is not a census year and is the comment referring to an overall declining public transport mode share? Public transport patronage has been growing within this time frame.	Noted.
BCC 15	Section 2.4 – "Need for the Project". The Terms of Reference for the GUP requires that alternatives leading to the Projects formulation are stated. The alternatives to upgrading the Motorway have not been discussed within the EIS.	Refer EIS Section 2.5.
BCC 16	Section 2.4.4 – What percentage of short trips are occurring between adjacent interchanges i.e. • Old Cleveland Road to Wynnum Road • Lytton Road to Kingsford Smith Drive • Kingsford Smith Drive to Airport Drive. Significant numbers of short trips are not an appropriate use on a regional road such as the Gateway Motorway.	Noted.
BCC 17	Section 5.3.2 – "The Road Network". The Transport Plan for Brisbane 2002-2016 does not quote the hierarchy volumes stated in this section. This section should also discuss local parallel routes that support the overall Gateway Motorway function and not just routes that intersect with it. Only Nudgee Road is included in the discussion.	Noted.
BCC 18	Section 5.4.5 – Do the accident statistics include accidents occurring at the interchanges along the Motorway or are the statistics provided only for accidents that occurred on the Motorway itself? Accidents at the interchanges could be a significant issue in the future as the implications for the local road network have not been adequately addressed.	Noted.

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BCC 19	Section 5.6.2, Table 5.23 "Commercial in confidence" 2021 forecasts. Why can't the forecast traffic volumes be published?	Noted.
BCC 20	Mt Petrie Road is designated as a Suburban Route (BCC Road Hierarchy). Depending on future development in Belmont, Mackenzie and Rochedale, Mt Petrie Road could be upgraded to 4 lanes. It is understood that the widening of the Motorway to 6 lanes adjacent to Mt Petrie Road will occur within the existing motorway corridor and should not impact on the future upgrading of Mt Petrie Road. Please confirm that this is correct.	Noted.
BCC 21	The upgrading of the Motorway should not prejudice the long-term possibility of a future connection between the eastern and western legs of Wecker Road.	Noted.
BCC 22	The Motorway batters will increase in width at the intersection of Mt Petrie Road and Greendale Way. This should not impact on sight distance for the intersection.	Detailed design issues (included in revised EMP in Section 23.4.3).
BCC 23	Council intends to signalise the intersection of Meadowlands Road and Wright Street. Preliminary design should be coordinated with Council's planning schemes.	Detailed design issue (included in revised EMP in Section 23.4.3).
BCC 24	Meadowlands Road is ultimately to be upgraded to 4 through lanes, including provisions for cyclists and pedestrians. The upgrading of the Motorway should not prejudice the future upgrading of Meadowlands Road and should be coordinated with Council's planning schemes.	Noted.
BCC 25	Access to the Wynnum Road on/off ramps causes significant congestion on the local road network during the morning and afternoon peak hours. The concept planning for the Motorway upgrade does not indicate if 6 lanes plus turning lanes can be accommodated within the structure. The EIS must show how this interchange will be configured to meet the demands of GUP and mitigate existing problems. Leaving the sole responsibility to Council to resolve this issue as part of the Wynnum Road corridor upgrade is not acceptable.	GUP to upgrade Wynnum Road interchange (refer Supplementary EIS Section 3.2).

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BCC 26	With the Gateway Deviation in place, the existing Gateway Motorway (Kingsford Smith Drive to Airport Drive) does not have to be upgraded to 6 lanes until 2011. However, the deviation is not likely to be constructed until after 2006. Therefore, the upgrading of the existing will have to occur sooner. Current congestion on the Motorway suggests that the northern sections including north of Nudgee Road will need to be upgraded very soon.	Noted.
BCC 27	The standard of the connection from the Motorway to Kingsford Smith Drive is reduced from the already poor existing connection. The intersections of Kingsford Smith Drive with Fison Avenue and Links Avenue require significant upgrading to cater for existing traffic let alone the forecast 2021 traffic volumes. The Planning Layouts do not show how this can be achieved.	Detailed design issue.
BCC 28	Access to Australia Trade Coast North still needs to be resolved. Council prefers an integrated solution servicing private, BACL and public development sites. This is likely to involve an interchange on the Gateway Motorway south of Airport Drive, Schneider Road connection and Lomandra Drive access. A local connection will be required under the Gateway Deviation and is required within the Old Airport Site. A separate local transport plan will be required to address these issues.	Not part of GUP scope.
BCC 29	Executive Summary, Page 6, Para/section 3 - Without a pedestrian/bicycle facility on the bridge, the project is inconsistent with Brisbane City Council Transport Planning Policies, particularly Strategic Objective 6 of the Transport Plan for Brisbane 2002-2016.	Noted.
BCC 30	Executive Summary, Page 8, Para/section 4 - Add “the Bicycle Brisbane Plan” to the list of planned bicycle networks in the third dot point.	Noted.
BCC 31	Background and Project Rationale, Page 2.3, Para/section 2.2 - The existing Gateway Bridge has no provision for bicycle or pedestrian access. With limited public transport opportunities in the corridor, private motor vehicle use is strongly encouraged by the current Motorway configuration.	Noted.

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BCC 32	Background and Project Rationale, Page 2.4, Para/section 2.3.2 -Research conducted by Brisbane City Council in 2003 for the Moreton Bay Cycleway project identifies significant potential to expand cycle-based tourism opportunities and associated local economic benefits through the connection of existing cycleways along the northern and southern Moreton Bay foreshores. The Moreton Bay Cycleway will give a range of new exercise and recreation options for people in the area.	Refer Supplementary EIS Section 6.1.
BCC 33	Background and Project Rationale, Page 2.7, Para/section -2.4.2 -This section should flag existing deficiencies in the bicycle and pedestrian network ie. no river crossing downstream from Story Bridge, and cross reference Section 6.0 Pedestrian and Cycling, where the matter is discussed in further detail	Noted.
BCC 34	Background and Project Rationale, Page 2.9, Section 2.4.3 - The EIS assesses the carrying capacity of the existing facility and fails to project how long it will take for the GUP to reach carrying capacity ie. the life of the proposed duplication.	Not appropriate for the GUP EIS.
BCC 35	Background and Project Rationale, Page2.13, Section 2.4.6 - Add another dot point…."No cross river pedestrian/cycle link downstream of the Story Bridge which leaves a large gap in both the local and regional cycling networks"	Noted.
BCC 36	Pedestrian and Cycling, Page 6.3, Section 6.2.1 - The GUP has potential to provide a strategic COMMUTER link in Brisbane's cycling network. This should be reflected in this section as it is of as much significance as the potential tourism/recreational benefits of an accessible bridge. The Gateway Ports area is projecting huge employment growth and potential exists to extend the life (carrying capacity) of the GUP by replacing 8% (BCC target by 2016) of local cross river commuter vehicle trips with cycle/walking trips.	Noted.

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BCC 37	Pedestrian and Cycling, Page 6.5, Section 6.2.4 - Significant gaps exist in the current cycle network. The State Government should fund and construct the missing sections of the cycle network, as part of the GUP, in lieu of providing in-corridor cycle facilities. These sections include: • Southern end of new bridge to Murarrie Recreation Reserve (see figure 1) • Northern connection between the new bridge and Kedron Brook Wetlands Bikeway (see figure 2). The option outlined in 6.2.4 is generally supported, except the convoluted route "required to be developed along the line of Kingsford Smith Drive and the Pinkenba Rail Line" which was intended as an east-west link (not part of a north-south connection) when it was included in the Bicycle Brisbane Plan. Should this preferred alignment not be physically possible (perhaps due to narrow gap between existing buildings at G James Glass and Aluminium) Council is willing to consider alternative alignments which provide a similar level of service for cyclists and pedestrians.	Noted.
BCC 38	Pedestrian and Cycling, Page 6.7, Section 7 - BCC agrees with the findings of the Pedestrian and Cycle Working Group and is happy to be involved in "further consultation and design … to determine the exact position of these facilities if the proposed pathway is included in the GUP". Council strongly advocates that pedestrian and cycle facilities be included on the duplicated bridge.	Noted.
BCC 39	Pedestrian and Cycling, Page 6.7, Section 8 - Council objects to the total exclusion of bicycle facilities in the GUP corridor and wherever in-corridor facilities cannot be provided, the GUP project should contribute to parallel out-of-corridor options.	Noted.

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BCC 40	Pedestrian and Cycling, Page 6.7/6.8, Section 9/1 - The proposed southern connection using Administration Road is considered suitable for cyclists or pedestrians who wish to drive their car to the foot of the bridge, then continue their journey across the bridge by foot/bike. However, it does not provide a "direct" north south connection with the existing Bulimba Creek bikeway, which is expected to be the major use generator for cycle trips from the south. A preferred option is to use the Lytton Road footpath to cross the Gateway Motorway, then follow the Motorway south (in corridor) to Bulimba Creek. The pathway would follow the northern bank of Bulimba Creek, pass beneath Murarrie Road then continue to Wynnum Road to connect with a new bikeway Council is proposing to construct south of Wynnum Road in 2005/06.	Noted.
BCC 41	This section has provided an accurate assessment of the potential impacts to the receiving waters during both construction and operational stages of the proposal.	Noted.
BCC 42	The high-risk locations identified in 12.10.1 are concurred with.	Noted.
BCC 43	The proposed water quality objectives as detailed in table 12.3 are concurred with.	Noted.
BCC 44	The implementation of a treatment train approach to manage the operational stage impacts water quality is generally concurred with.	Noted.
BCC 45	The report has not recognised that there will be an ongoing monitoring and maintenance requirements for all operational stage water quality treatment devices. This will need to be reflected in the detailed design documentation.	Refer revised EMP in Section 23.4.7 (Operation).
BCC 46	Generally this report provides a sound review of the ecological values of the proposed corridor and adjacent lands.	Noted.
BCC 47	The principal concern is the potential further obstruction to east – west fauna movement in particular between Mt Gravatt Capalaba Rd & Old Cleveland Rd.	Refer Supplementary EIS Section 16.1

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BCC 48	Whilst the document indicates additional culverts can be placed in some locations, it does not specify how the project will further enhance the east and west movement of fauna. The document should include enhancement works to the existing culvert/ underpass structures to further enhance fauna movement opportunities.	Refer Supplementary EIS Section 23.4.12 and Section 16.1.
BCC 49	All new waterway crossings should be spanned with clear span bridges to ensure fauna movement opportunities are maximised.	Noted.
BCC 50	The provision of a clear span bridge will likely provide enhanced fauna movement opportunities compared to 3m x 3m culverts.	Noted.
BCC 51	It is not clear if the proposed fauna fencing will exclude all ground dwelling fauna from entering the road corridor given the proposed concrete median will prohibit these groups traversing the road corridor.	Noted.
BCC 52	Additional movement enhancement structures such as poles for gliders should be included to further improve movement opportunities in the interim whilst vegetation establishes.	Refer Supplementary EIS Section 16.1.
BCC 53	The impact assessment documentation should address the consequences of the project on Grass Owl (*Tyto capensis*) & Swamp Harrier (*Circus approximans*) for the area of the Kedron Brook Flood Plain. These are both species listed in Brisbane City Council's Natural Assets Planning Scheme Policy.	Refer Supplementary EIS Section 16.3.
BCC 54	The detailed design process should endeavour to restrict batter slopes to minimise the encroachment into the Lewins Rail habitat. Furthermore an equivalent area of habitat should be rehabilitated to ensure the project has not resulted in a net loss of a significant habitat area.	Detailed design issue.
BCC 55	This section has provided an accurate assessment of the values of the alignment and the potential impacts of the proposal.	Noted.

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BCC 56	Proposed mitigation measures appear reasonable to protect aquatic ecosystem values.	Noted.
BCC 57	Significant benefits would be retained by the construction of the road way as piered structure across the Kedron Brook Flood Plain area. This would ensure existing wetland communities both freshwater and marine would not be adversely impacted by a change in flow regimes across the area.	Noted.
BCC 58	Section 23.4.7 details that the will be a "no worsening" impact. This is not an acceptable objective. The document needs to commit to the water quality guidelines as specified in table 23.3. Recorded breaches of these levels should result in a corrective action.	Noted.
BCC 59	Section 23.4.12 will need to include the additional mitigation measures for terrestrial fauna such as poles for gliders and clear span bridges and rehabilitation of Lewins Rail habitat.	Poles for gliders refer Supplementary EIS Section 16.1. Clear span bridges – Bridge incorporated into concept design. Rehabilitation of Lewins Rail habitat – Refer revised EMP (Section 23.4.11).
BCC 60	The mitigation measures should make reference to the provision of a vegetation management plan as part of the detailed design process. This allows for the engineering constraints to be integrated with the protection of vegetation to inform the vegetation retention program for the corridor.	Refer revised EMP (Section 23.4.11).
DATSIP 1	The proponent should be congratulated for working so closely with the Traditional Owners.	Noted.
DATSIP 2	Aboriginal Heritage is now being administered under the *Aboriginal Cultural Heritage Act 2003* and references should be amended.	Refer Supplementary EIS Section 18.1 and refer Draft Aboriginal Cultural Heritage Management Plan (Appendix Q, Volume 2b of EIS).
DATSIP 3	References to Indigenous People etc should be capitals.	Noted.

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DATSIP 4	DATSIP encourages the proponent to create training opportunities For Aboriginal and Torres Strait Islander People in the region in order to assist them to work on any of the project's related employment activities.	Noted.
DC 1	The Department of Communities considers the EIS has conducted and reported community consultations appropriately and generally assessed and reported the social impact assessment (Section 19) and corresponding mitigation strategies (in section 19 and 23 Environmental Management Plan) well.	Noted.
DC 2	More reference to the Brisbane Urban Corridor (BUC) needs to be made in relation to the impact the GUP will have on it. The EIS should include an assessment on the impact of the GUP on the BUC.	The potential impact of the GUP and other roads within the area is considered outside the scope of the GUP EIS.
DES 1	The Department requests a Bushfire Management Plan for consideration by DES.	Refer revised EMP (Section 23.4.11).
DES 2	The Department requests an assessment of flood immunity of infrastructure against the community infrastructure provisions of SPP 1/03. This should account for risk of flood hazard events up to the Probable Maximum Flood event and should be documented in the proposed EMP (EIS s.23).	Hydraulic assessment undertaken for the GUP EIS is considered sufficient for the purposes of addressing potential flood impacts.
DES 3	The Department requests information on earthquake immunity of the project together with mitigation measures.	Refer Supplementary EIS Section 21.2.
DES 4	The department requests the location of any Large Dangerous Goods Locations, Major Hazard Facilities or possible major hazard facilities within two kilometres of the project along with the location of pipelines which cross the route.	To be addressed during the detailed design stage (refer Section 23.4.2).
DES 5	The department requests the preparation of Emergency Management Plans to the satisfaction of the Department of Emergency Services.	Addressed in the revised EMP (Section 23.4.2).

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DES 6	The department requests a meeting to address disaster management and emergency management issues pertaining to the Queensland Ambulance Service.	QAS were involved in the GUP SIG meetings during the preparation of the EIS.
DET 1	No substantive comments	N/A.
DH 1	The EIS does not provide any indication regarding diminished property values that would result from the impacts of the project. And that the department was not directly consulted on this issue by the proponent despite their original request to be included as an Advisory Agency for the EIS process.	Noted.
DH 2	The EIS does not make any provisions for ongoing monitoring of traffic noise levels after construction of the motorway and noise barriers are completed, and suggest that testing is highly desirable in order to establish whether the proposed mitigation measures are accurate.	Refer revised EMP (Section 23.4.10).
DH 3	The EIS proposes the relocation of an existing relocatable home at the Palm Lakes Relocatable Home Resort as a result of land resumptions, and that discussions have been held with management of the resort.	Noted.
DH 4	The department is satisfied that the EIS adequately addresses the impacts of the proponent's workforce on housing affordability, and that such impacts are likely to be negligible.	Noted.
DH 5	The EIS does not address the impact of the project on future residential development in the adjacent area as requested, particularly in the Rochedale area immediately to the south of the road widening.	Addressed to sufficient detail in EIS.
DLGPSR 1	The department has reviewed the EIS and has no further comment in relation to this project.	Noted.
DLGPSR 2	Advises that the draft South East Queensland (SEQ) Regional Plan is released for public consultation by the end of October 2004 and will primarily address regional landscape and environmental issues at the broad regional level.	Noted.

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DLGPSR 3	The South East Queensland – Wide Bay Burnett Planning Division has forwarded a copy of the report to the Office of Urban Management for their information.	Noted.
DPI&F 1	Further information in relation to the disturbance to marine plants will be requested by DPI&F when application is made for marine plant permits. Also, it is advised that should any temporary bunding of waterways become necessary, approval would be required under the *Fisheries Act 1994.*	Permit – Noted. Bunding – Included in revised EMP (Table 23.1).
DPI&F 2	Full support of the proposed mitigation measures placement of bridge abutments and the minimisation of the number and size of bridge piles, and the implementation of best practice stormwater management during construction and operation phases.	Noted.
DPI&F 3	Request that Red Imported Fire Ant Management Plan be implemented prior to the commencement of any work.	Included in revised EMP (Section 23.4.11).
EPA 1	There is a lack of specific commitments as to the management options that will be used in the design, construction and operational of the project or an analysis of the effectiveness of these options to prevent or minimise environmental harm.	Commitments to be made at detailed design stage.
EPA 2	Further characterisation of ASS material along the GUP corridor and details of its management are required.	To be undertaken during detailed design.
EPA 3	The EIS should commit to the use of mitigation measures that will ensure there is no net loss of Koala habitat and mitigation measures that reduce the risk of injury and risk of injury and death to koalas from the project.	Refer design strategies in Supplementary EIS, Sections 16.1 and 23.4.11.
EPA 4	The EIS should outline source, quality and types of imported fill to be used in the embankments for the project.	To be undertaken during detailed design.

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No.	Summary of Comment	Response
EPA 5	The EIS and EMP should quantify each waste type and the measures to be used to handle, store, treat and/or dispose of generated waste, as well as re-use options and off-site movement. The mitigation measures to be used to prevent or to minimise land, surface and/or groundwater contamination should be outlined.	To be undertaken during detailed design.
EPA 6	State the area of vegetation loss in the Koala Coast in Table 8.3	Refer Supplementary EIS Section 8.2.
EPA 7	The EIS should outline how the project complies with the SCMP 2002.	Refer Supplementary EIS Section 8.3.
EPA 8	Outline the potential impacts and the nature of change to the existing landform features in a local and regional context.	N/A
EPA 9	The effectiveness of the management options for erosion and sediment control that will be used during the construction and operational phases of the development should be outlined	To be undertaken during detailed design.
EPA 10	Provide information on the quantity and sediment to removed from the sediment retention and control devices and their management.	To be undertaken during detailed design.
EPA 11	The EIS should outline the type and nature of the disturbances to be undertaken in areas containing ASS. A diagram/s should be provided showing the location of each disturbance type along the project corridor.	To be undertaken during detailed design.
EPA 12	An ASS investigation must be undertaken to identify the potential quantities and variability of ASS and its existing and potential acid generating ability. The results of the ASS investigation must be outlined in the EIS. The areas containing ASS referred to in the EIS as being of moderate to extreme risk must be clearly identified and defined.	Preliminary ASS investigation undertaken (refer Section 10.1). Detailed ASS investigation to be undertaken as part of detailed design (refer Section 23.4.5).

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No.	Summary of Comment	Response
EPA 13	EIS should provide an ASS Management Plan for the design, construction and operational project phases that describe in detail the measures to be used to handle, store and mange ASS so as to prevent or minimise acid generation. This includes the measures to be used to ensure that all fill used on site ASS free and the management of any ASS within proposed areas of flood mitigation works including ongoing maintenance requirements.	To be undertaken as part of detailed design.
EPA 14	The EIS must provide a full preliminary site investigation in accordance with the Queensland EPA's 1998 Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland.	To be undertaken as part of detailed design.
EPA 15	The volume rate and frequency of the release of stormwater to be expected from each discharge point should be provided. Also the location and types of SQID's for each specific out let should be provided.	To be undertaken as part of detailed design.
EPA 16	The monitoring program including water quality indicators, release limits, location and frequencies for each phase of the project should be adequately rationalised and clearly outlined in the EIS and EMP. The guidelines used and the reason for their use to determine the quality characteristic release limits should be outlined.	Included in revised EMP (Section 23.4.7).
EPA 17	The EIS should identity where activities that could impact on groundwater levels and/or quality will take place. It should further investigate whether impacts due to those activities could occur and describe the available mitigation measures. Commitments for mitigation measures should be carried forward into the EMP.	Included in EIS Section 13.
EPA 18	The monitoring program parameters, quality characteristic limits, locations and frequencies of groundwater for each phase of the project should be rationalised and clearly outlined in EIS and EMP.	Refer Supplementary EIS Section 13.1.

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EPA 19	The EIS should apply the EPA's guideline –Noise and Vibration from Blasting (June 2004) in its assessment of impacts.	No blasting proposed.
EPA 20	The night-time noise criteria in relation to planning for public roads should be included in the assessment of noise impacts from the project.	Not relevant for Main Roads.
EPA 21	The EIS should identify fly zones for birds within the project area and outline any impacts. Mitigation measures should be outlined in the EIS and EMP	Not considered relevant due to uncertain nature of bird movements.
EPA 22	Provide a description of how the project will achieve no net loss of koala habitat including a description of lands used to provide conservation offsets.	Opportunities for rehabilitation of koala habitat to be investigated during the detail design phase (refer Section 23.4.15).
EPA 23	Suitably qualified spotters and catchers should be employed to detect koalas in trees to be cleared etc. And State appropriate means for koalas to negotiate temporary fencing or construction areas particularly in the August to December time period.	Included in revised EMP (Section 23.4.11) and in Supplementary EIS Section 16.2.
EPA 24	Koala issues in terms of mitigation measures to provide safe/safer passages across the motorway should be committed to reduce injuries and deaths of koalas. Suggested measures and methods should be utilised and monitoring and reporting should be maintained by Main Roads during the construction and Operational phases.	Included in revised EMP (Section 23.4.11).
EPA 25	The EIS should state that noise or vibration complaints should be investigated on the day they are made.	Included in revised EMP (Section 23.4.10).
NRM 1	A full ASS investigation in accordance with the Guidelines for sampling and analysis of *the Lowland Acid Sulfate Soils (ASS) in Queensland (Ahern et al 1998)* be carried out in the project area prior to approvals being given. Laboratory analysis should be conducted in accordance with the *Acid Sulfate Soils Laboratory Methods Guidelines* (*Ahern 2004)*	Preliminary ASS investigation undertaken (refer Supplementary EIS Section 10.1). Full ASS investigation to be undertaken during detailed design (refer Section 23.4.5).

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NRM 2	The preliminary assessment by QASSIT in July 2004 does not constitute a full ASS investigation required for the project and a full investigation is required.	Noted.
NRM 3	Graham Swann at the Dept. NRM Woolloongabba office, telephone 3224 7377 for details on likely requirements under the *Water Act 2000* in regard to works within water courses.	Section 8 amended.
NRM 4	GUP is not expected to impact on the quality of the groundwater environment of the area.	Noted.
NRM 5	Work can not commence until the Minister has approved the Cultural Heritage Management Plan.	Refer Supplementary EIS Section 18.1.
NRM 6	Ongoing contact with Michael Shine, PPO – 3406 2826 will be required in relation to the proposed acquisition of non-freehold land.	Noted.
NRM 7	Ongoing contact and negotiations with Ken Brandes (Senior Land Officer- 3227 8118) will be required in relation to the tenure of the new road and duplicate Gateway Bridge.	Noted.
NRM 8	The clearing of native vegetation on all land tenures has become an "assessable Development" under the newly amended *Vegetation Management Act 1999*. However the dept. acknowledges that the GUP is exempt from requiring vegetation clearing approvals under the VMA 1999 and Schedule 8 Part 3 of the IPA 1997.	Noted.
NRM 9	Clearing on a State controlled road under the *Transport Infrastructure Act 1994* is an exempt activity under Schedule 8 part 1 of IPA. This exemption only applies once the road has been gazetted as a state controlled road. DMR does not have a general exemption to clear vegetation on any tenure.	Refer Supplementary EIS Section 8.1. GUP to be gazetted as State controlled road.
PBC 1	States importance of GUP for the logistics of transporting goods from shipping throughout the Southern Queensland region.	Noted.

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PBC 2	Main concern is the timeframe set for the construction of the GUP.	Noted.
PBC 3	Design should include provisions for a ramp to the POB motorway sooner as it could be constructed independently of the bridge.	Noted.
PBC 4	Beneficial if southern section of GUP (south from POB motorway) is completed as soon as possible.	Noted.
PBC 5	More in-depth analysis is required of how traffic will be managed during construction.	Noted.
PBC 6	The current toll on the Gateway Bridge does not discourage truck traffic from using it. A uniform toll should be applied for all vehicles.	Noted.
PQ 1	Section 7.4.1, p7.2, the section omits reference to the existing Energex aerial 110kV line located approximately at chainage 24300 (UBD Map 121K14) which is part of the Southpine to Nudgee transmission line. Any increase in height of the existing pavement level may need to be agreed with Energex. Please also be aware that discussions may progress in the near future for this line to be transferred to Powerlink.	Refer Supplementary EIS Section 7.1.1.
PQ 2	Section 7.4.1, "Brisbane Airport Feeder Cables", p7.3. Please note that an additional series of underground electrical cables may need to be located adjacent to the existing underground electrical cables should a new underground electrical reinforcement between the existing Nudgee and Meeandah electrical substations be progressed. Provision for such potential expansion should be accommodated within the Gateway Upgrade project design.	Refer Supplementary EIS Section 7.1.2.

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PQ 3	Section 7.5, Future Utility Services, p7.5. Please note that Powerlink is currently reviewing the need for an additional reinforcement of the Nudgee electrical substation at Nudgee Road. Current proposals indicate the need for an aerial connection that would cross the proposed Gateway Upgrade Project at: a) Between chainages 23400 and 23600 over the Nudgee Lane and southbound off ramp b) Pinkenba Rail Line approximately at chainage 19100	Refer Supplementary EIS Section 7.1.3.
PQ 4	Section 7.5, Future Utility services, p7.6. Construction has commenced on the Belmont to Murarrie Transmission Lines project and crossings will be undertaken approximately at the chainages shown in the EIS. Construction of the transmission line across the motorway at this locations remains scheduled for early to mid 2006 and will be undertaken by helicopter to reduce the impact on the users of the motorway.	Refer Supplementary EIS Section 7.1.3.
PQ 5	North of Wynnum Road to Bulimba Creek the Gateway Upgrade project traverses both Lot 49 RP207882 and Lot 145 RP207883. Both Powerlink and Energex retain assets on these properties for which a new gravelled access road from Murarrie Road has recently been constructed by Powerlink predominantly on the eastern side of the existing Gateway Motorway approximately between chainages 13700 and 14700. Would you please ensure that the future widening of the Gateway Motorway appropriate ensures that Powerlink and other service providers who retain facilities within these properties are able to access their respective infrastructure on an access road of at least similar standard.	Refer Supplementary EIS Section 7.1.4.
PQ 6	Access to Lot 49 RP207882 for vehicles that are too tall to traverse under the Gateway Motorway bridge at Bulimba Creek, obtain access through the property gate located at approximately chainage 141500. Future access for emergency service mobile equipment to maintain electrical infrastructure on this property is required to be retained.	Refer Supplementary EIS Section 7.1.4.

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No.	Summary of Comment	Response
QH 1	Support inclusion of complimentary public transport infrastructure such as the pedestrian and cycle lane as a part of the new bridge.	Noted.
QH 2	There appears to be no discussion on mitigation measures to prevent the harbourage or breeding of mosquitos and other pests of public health.	Included in revised EMP (Section 23.4.12).
QH 3	Spelling of Sulfate in terms of SPP 2/02	Noted.
QH 4	Clarification required on the scope of infrastructure (3.11 and 23.2.1) referred to in this section because it is not clear whether an onsite food service facility is to be included.	To be determined during detail design phase.
QH 5	Discussion and strategies should be included that address inappropriate parking in adjoining residential or business areas by site workers during the term of this project. This has the potential to impact on the community well being, business operations and community relations.	Included in revised EMP (Section 23.4.3).
QH 6	Should include a commitment to make the results of water quality monitoring publicly available.	MR considering this issue on a case by case basis.
QH 7	Should include a discussion of light impacts on the affected community – residential, industry and business	Refer Supplementary EIS Section 19.1.
QH 8	EIS does not appear to discuss vulnerability of the area to natural or induced hazards as noted in TOR for this section	Major hazards addressed in EIS, including flooding (Section 11) and bushfires (Appendix D2).
QH 9	The proponent should aim to reduce emissions such that the NEPM is not exceeded.	Refer Supplementary EIS Section 14.1.
QH 10	Though the Max. 24 hour PM_{10} values have been predicted for sensitive receptors, no information is provided on the distribution of 24 hr avg. PM_{10} at the receptors.	Refer Supplementary EIS Section 14.2.

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QH 11	Though Appendix J3 indicates predicted PM10 levels in 2011 and 2031 are below NEPM standards, the background in the area appears to be high. The additional contribution from the roadway means that the 24 hour levels in some locations will approach the NEPM standard. All measures should be taken to reduce particle emissions from the motorway in order to protect the respiratory health of people living near the motorway.	Refer Supplementary EIS Section 14.3.
QH 12	The PM_{10} column and table notes are confusing with respect to the asterisks and their appropriateness.	Refer Supplementary EIS Section 14.5.
QH 13	Air quality monitoring results should be made publicly available	Refer Supplementary EIS Section 14.4.
QH 14	Noise monitoring results should be made publicly available	Main Roads will consider this issue on a case by case basis.
QH 15	Of particular concern to Queensland Health is that there may be vibration sensitive health care equipment or instruments located within the identified building vibration zone and there are no strategies to identify vibration or measures to mitigate potential impacts.	Refer Supplementary EIS Section 15.5.
QH 16	Vibration monitoring results should be made publicly available	Main Roads will consider this issue on a case by case basis.
QH 17	There is no reference of consultation with private health care or aged care providers during the community consultation process.	A comprehensive consultation program has been undertaken as part of the EIS.
QH 18	Risks and hazards should be included as an element of the EMP.	Included in other sections of EMP, not specific element.
QH 19	Flammable and combustible liquids regulation was replaced by the *Dangerous Goods Safety Management Act 2001*.	Included in revised EMP (Section 23.2).
QH 20	Correct version of the reference in water and waste water section should be the Queensland Department of Environment and Heritage *Water sampling Manual, 3rd edition, 1999.*	Included in revised EMP (Section 23.2.4).

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QH 21	Reference should reflect the latest version and title as: Ahern CR, Ahern MR and Powell B (1998). *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998.* QASSIT, Dept. Natural Resources, Indooroopilly	Included in revised EMP (Section 23.2.4).
QH 22	Noise and vibration reference should be: Noise Measurement Manual, 3rd Edition, 2000.	Included in revised EMP (Section 23.2).
QR 1	The EIS has not elaborated in much detail how the proposed GUP will impact upon this modal shift to rail, particularly to the Port of Brisbane.	Refer Supplementary EIS Section 5.5.
QR 2	There is very limited explanation in the EIS on how the proposed GUP contributes to the Coordinated Transport and Land Use of the Transport Plan for Brisbane in terms of Passenger and freight movements.	The objectives of the GUP are outlined in Section 3 of the EIS.
QR 3	The reference to railway should recognise the freight transportation to the Port of Brisbane as well as the passenger operations.	Noted.
QR 4	Should mention the increased risk of a level crossing accident due to increased traffic in local areas. Also any work in rail areas should have a QR approved Safety Management Plan.	Accident risk – Noted. SMP – Included in revised EMP (Section 23.4.3).
QR 5	Greater detail is required on the effect on access points/gates/roads to the rail corridor affected by the proposed GUP.	To be addressed in the detailed design stage. To be consulted .during detailed design (refer Section 23.4.3).
QR 6	Given the space constraints of working with the rail corridors, it is conceivable that such safe working distance may be encroached on occasions and may affect the structural integrity of the track infrastructure.	Noted.
QR 7	Visual amenity from a rail passenger perspective should give consideration to potential to graffiti on rail bridge structure	Noted.

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QR 8	Further consultation will be required at the detailed design phase to ensure minimal disruptions to rail corridor access, as well as to determine the likely impacts on QR infrastructure and resultant safety implications.	Noted.
QR 9	The proposed GUP works outlined in the EIS will interfere with the railway. The proponent must obtain the railway manager's written approval in accordance with section 255 of the *Transport Infrastructure Act 1994*	Included in revised EMP (Table 23.1).
QR 10	Plans for "Works In or About Rail Corridor Land" are required to be submitted to QR for approval. The Work Method Statement is to be submitted at least 30 days in advance.	Included in revised EMP (Section 23.4.3).
QR 11	Access to any cables must not be restricted as a result of the proposed development.	Included in revised EMP (Section 23.4.3).
QR 12	The proposed development should not cause run-off or flooding that will interfere with the railway and/or will threaten or is likely to threaten the railways safety or operational integrity.	To be addressed during the detailed design (refer Section 23.4.6).
QR 13	Plans for security fencing in adjoining properties to QR are required to be submitted to QR for approval.	To be addressed during the detailed design (refer Section 23.4.3).
QR 14	Noise fencing at the corridor boundary must be appropriate QR standards for the adjoining land use.	To be addressed during the detailed design (refer Section 23.4.10).
QR 15	The proponent shall consider vibration, noise and dust impacts in the design of the development to ensure that they address the ongoing railway operations.	Addressed in EMP (refer Section 23).
QR 16	It is the proponent's responsibility to design the development so that any uses potentially affect by electrical effects are appropriately located away from the rail corridor.	To be addressed during the detailed design stage.
QR 17	The Regional Manager (Network Infrastructure), Network Access Group (QR) should be contacted to discuss railway crossing issues.	To be addressed during the detailed design stage.

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QSR 1	It appears that the resumption of any part of Belmont Rifle Range is not required by the GUP.	Noted.
QSR 2	Whilst Belmont Rifle Range is in close proximity to the widened corridor of the Gateway Motorway, it is not listed as a Sensitive Community and Commercial Land Use (Table 4.3) or as a Potentially Affected Recreation Facility (Table 19.3). It is unclear why the Belmont Rifle Range is not included in these tables whilst other recreation sites located further away from the GUP corridor are listed. It is therefore suggested that further investigation be undertaken to determine impacts specific to the Belmont Rifle Range.	Refer Section 4.1. Table 19.3 amended and included in Supplementary EIS (refer Table 4.1).
QSR 3	Note that the shared pedestrian and cycle pathway which forms part of the bridge structure has been investigated linking into existing bikeways or nearby street networks. This could potentially enhance cycling experiences from a recreational and commuting perspective.	Noted.
QT 1	It is noted that the inclusion of pedestrian and cycling facilities on the Gateway Bridge duplication will be part of the Gateway Upgrade Project (GUP) Business Case. The *Integrated Regional Cycle Network Plan* (IRCNP) suggests an investigation into a bike link from Lytton Rd to Nudgee Rd (along the Gateway Bridge). Further corridor investigation work will be required to determine the precise route and desired standard of cycle facility	Noted.
QT 2	Austroads states the maximum desirable grade for cyclists is about 5%. Short flatter sections at regular intervals should be provided to give cyclists travelling both uphill and downhill some relief from the gradient. Bicycle user groups would need to be further consulted to determine whether the proposed 5.3% gradients along the Gateway Bridge duplication would be acceptable. Wheelchair access would also be an issue at these grades. Disability groups would need to be consulted to ensure their requirements are met.	Noted.
QT 3	BCC will need to be further consulted with reference to their proposed cycle paths either end of the bridge and how they link to the proposed bikeway on the duplicated Gateway Bridge.	Noted.

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QT 4	Non-climbable barriers with angled returns on the pedestrian and cycle path would be required to ensure the safety of users.	Noted.
QT 5	Queensland Transport (QT) noted that the GUP will impact the rail corridor at the following locations: • South-bound lanes crossing the Cleveland rail line • South-bound on-ramp from the Port of Brisbane – Incitec private rail line • South-bound off-ramp to the Port of Brisbane • Relocation of the Incitec rail line and its turnout connection at the Cleveland rail line • A new bridge over the Pinkenba rail line It is recommended that Queensland Rail (QR) be consulted to secure the necessary approvals for access to operational rail corridor land for works associated with the construction and operation of the GUP. Owners of the private Incitec Rail Line also need to be consulted.	Noted.
QT 6	It is noted that none of the proposed bridge crossings will impact on stations or depot facilities. However, it is not clear how bridge supports and clearances will impact on future upgrades of the rail infrastructure, particularly with regard to signalling and extra tracks. The study team will need to obtain QT and QR agreement for the design of all bridge crossings over rail corridor land.	Detailed design issue.
QT 7	The EIS does not consider the potential impacts of increased traffic at rail/road level crossings during construction and changed traffic patterns longer term. The study team should assess traffic impacts on existing level crossings in the area both during construction and long term. It is also noted that Chapter 5 only refers to impacts on passenger services and does not consider the impact on freight services using the Cleveland Line.	Noted.

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QT 8	Several impacts of construction on the rail corridor and rail operations have not been considered in the EIS: • Requirements for safe railway operations • Potential disruptions to freight and passenger rail services • Access to rail corridor land for construction and operation of the GUP. QT holds a perpetual lease for existing rail corridor land and is the owner of the rail corridor land for the purposes of the *Integrated Planning Act 1997*. The study team should seek approval from QR prior to the commencement of any construction works within rail corridor land.	Issues to be addressed as part of detailed design.
QT 9	Navigation issues need to be fully addressed in the EIS. These types of issues if not addressed adequately at an early stage, could significantly increase the cost of a new bridge. Some of the navigation issues (as discussed at a meeting held on 17 August 2004) include: • Impact on navigation during construction • Realignment of current navigation channel so that the bridges are approached at right angles from both sides • Relocate about 16 navigation aids to mark the new channel • Dredging • Ship simulation to assess the new channel	Refer Section 3.4 of Supplementary EIS.
QT 10	The EIS (Pg 5.38) incorrectly states that the IRTP 2011 target for cycling trips is 8%. The IRTP (Pg 24) states that the target for 2011 cycling trips is 5%. However, *Transport 2007* (Pg 8) revised the target for 2011 cycling trips to 8%. The previous Minister for Transport and Minister for Main Roads, the Honourable Steve Bredhauer, made this decision shortly after his appointment as minister.	Noted.

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No.	Summary of Comment	Response
QT 11	The GUP deals with the upgrade of the Gateway Motorway between Mt Gravatt-Capalaba Road and Kingsford Smith Drive, including the duplication of the existing Gateway Bridge and construction of a new motorway across the Kedron Brooke Floodway to connect to the existing motorway. This is proposed to be completed in 2011. Any proposal to upgrade the remaining Gateway Motorway should be mentioned in the context of the lifecycle of the facility. A programme for these upgrades should be provided as well as indicative costs.	This issue is considered outside the scope of the GUP.
QT 12	The Gateway Motorway off-ramp to the Brisbane Entertainment Centre has traffic issues when major events are held. Queensland Transport understands that this area is not within the scope of the study, but any future upgrades to this section of the motorway need to be addressed to alleviate the traffic issues on the motorway when these major events occur.	Noted.
QT 13	The implementation of the GUP should not restrict government policy such as possible provision of additional river crossing structures and services.	Noted.
QT 14	The EIS mentions there are no private bus operators using the Gateway Motorway between Mt Gravett-Capalaba Road and Nudgee Road. This is incorrect (based on TransInfo data March 2004). Coachtrans and Suncoast Pacific currently travel along this corridor.	Noted.
QT 15	The potential to run additional bus services along the motorway to capture the north-south movements should be further investigated with TransLink and included in the final EIS. There could also be the potential to provide cross-modal interchanges at various locations along the GUP to assist in providing an integrated transport network in South East Queensland.	These opportunities could occur in the future. Currently these issues are considered outside the scope of the GUP.
QT 16	To minimise conflicts with private vehicles and freight vehicles, a heavy commercial vehicle (HCV) lane could be implemented along the GUP and existing motorway. A designated HCV lane could be warranted, given that the Gateway Motorway carries a large proportion of South East Queensland's freight traffic.	Noted.

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No.	Summary of Comment	Response
QT 17	Have high occupancy vehicle (HOV) lanes been investigated as an option along the GUP and existing Gateway Motorway?	Was considered during development of the reference project. HOV not considered appropriate for the Gateway Motorway.
QT 18	The EIS mentions that GUP will have impacts on major intersection in the vicinity of the GUP. However, it does not provide a summary of the results (levels of service, degree of saturation, queue numbers and so on) for these intersections along the corridor. Impacts on surrounding state owned/managed roads also need to be investigated.	Main Roads has a strategy for addressing this issue and it is considered outside the scope of the EIS.
QT 19	For modelling purposes, all proposed developments in the study area need to be accounted. These proposed developments will greatly influence the way traffic behaves on the Gateway Motorway and remaining surrounding road network.	Refer Supplementary EIS Section 5.1.
QT 20	Figure 5.9 Pg 5.28 of the EIS indicates some road network improvements. To ensure consistency with the *SEQ Regional Plan*, these improvements should be compared to the improvements to the 2026 transport network in the draft SEQ Regional Plan.	Outside scope of EIS. Noted.
QT 21	The EIS acknowledges that the Gateway Motorway is nominated as a dangerous goods route. It also details a number of scenarios and mitigation strategies in the event of an incident.	Noted.
QT 22	The proposed Gateway Bridge duplication sits slightly higher than the existing Gateway Bridge and penetrates the obstacle limitation surface (OSL) of the airport. The Department of Transport and Regional Services (DoTaRS) will need to assess this and approve the bridge duplication. When is the study team proposing to approach the DoTaRS?	OLS issues will be addressed in the Draft MDP. Consultation has occurred with DoTaRS.
QT 23	The EIS does not clearly state the traffic operation on the GUP once it is constructed. The EIS should make it clear as to how traffic flows will operate on the existing motorway	Refer Supplementary EIS Section 3.3.
QT 24	Further work is required in the final EIS to explain the proposed tolling option and how it affects casual users of the bridge/motorway without E-tags and daily passes	Refer Supplementary EIS Section 3.1 and Government announcement on 17 February 2005.

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No.	Summary of Comment	Response
QT 25	The GUP allows for provision of a 3m outside shoulder along the full length of both carriageways (except at some bridges) to allow for storage of broken down vehicles and passage for emergency vehicles. The proposed bike lanes on the bridge duplication should also be designed to cater for the passage of emergency vehicles, in case the bridge is congested and there is no other alternative.	Refer Supplementary EIS Section 6.2.
QT 26	It is noted that the EIS has proposed to install noise barriers between the GUP and properties to protect residential properties in the surrounding suburbs that are indirectly affected by the GUP. It is also noted that the EIS has addressed noise mitigation strategies during construction activities to ensure there is minimal impact to surrounding residents.	Noted.
QT 27	The EIS makes reference to public transport services and how the IRTP targets will be achieved (Pg 5.39). There are a few projects that need clarification:	
	Northern Busway corridor between RBH and Chermside. The findings of the recently completed Northern Bus Priority Study recommend a HOV (T3) lane from the RBH to Chermside in the short to medium term. Future bus operations (post 2011) are likely to lead to an increase in the number of buses, that operate in the corridor during peak periods, to a level at which it may be justifiable for a designated bus lane, not busway.	Noted.
	Rail extension from Petrie to Kippa-Ring. Queensland Transport completed the Petrie to Kippa-Ring Public Transport Corridor Study in 2003. Subsequently, the Government considered that the estimated $300m in capital costs for construction of a heavy rail link and the purchase of the rolling stock would place too great a financial burden on Queensland taxpayers. To meet the needs of people living along the Petrie to Kippa-Ring corridor in the short to medium term, State Government has allocated $7m as part of the Smart State Building Fund for new bus infrastructure between Petrie and Kippa-Ring. Travellers will benefit from improved bus running times, shorter waiting times and improved access to major centres.	Noted.

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No.	Summary of Comment	Response
	Eastern Busway. Should be between Buranda and Capalaba (not Carindale). Although, bus lanes along Old Cleveland Road are proposed by 2007 between Buranda and Camp Hill and other priority sections to Carindale.	Noted.
	Rail extension to Browns Plain. This would need further investigation to determine if Browns Plains would best be services by a rail or bus corridor.	Noted.

	Community Responses	
AdeS 1	Safety issues of the road design	Noted.
BQ 1	Provision of the pedestrian and cycle shared pathway, as detailed in chapter 6 of the EIS, not only furthers the improvement of the transport system in the area of the GUP in a direct and positive manner, but also can be amply justified on simple benefit cost grounds as well as on its conformity with the policies of both Queensland Transport and the department of Main Roads.	Noted.
GS 1	Miscellaneous design issues.	Noted.
MW 1	Concerns of hazardous goods entering into Kedron Brook and related environments; Construction access through Lewins Rail and Swamp Harrier habitats; Concern over the removal of carbon sinking trees (Airport/Kedron Brook).	
MW 2	ASS – more clear definition on time of year for disturbance and mitigation measures.	Noted.
MW 3	Surface water quality-ARI needs to be adequate for at least 5 or 10 year periods not just 1.	Noted.
MW 4	Noise should be kept minimal 1 hr before sunset and 1 hr after sunrise as some birds are roosting/sleeping at these times.	Noted.

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No.	Summary of Comment	Response
MW 5	Terrestrial ecology- Airport precinct of Kedron Brook requires more studying over a longer time period. The use of the term "locally Common" is more Meaningful that "common" in regional perspective.	Noted.
MW 6	Issue with grading of habitat value of Kedron Brook not being regarded as high. Especially in terms of Raptors and wildlife corridor.	Refer Supplementary EIS Section 16.3.
MW 7	Issue with impact of GUP on Raptors feeding and roosting areas.	Refer Supplementary EIS Section 16.3.
MW 8	Red-bellied black snake classification should be rare or uncommon (Queensland Museum and BCC) and more reptile survey work should be completed in this area.	Noted.
MW 9	Raptors are of cultural significance.	Noted.
MW 10	No mention of ASS in Hazards and Risk section.	Noted.
MW 11	Issues with colours of Kedron Brook Bridge	Noted.
MW 12	Mitigation measures need to address the relocation of fauna in greater detail as they aren't mentioned at all.	To be addressed during detailed design phase.
MW 13	The Western option would be more favourable.	Noted.
NPD 1	Acoustic impact of rapidly growing traffic flow on the GUP in close proximity to the NPD site.	NPD issues have been addressed in a standalone Connell Wagner report which is not included in this Supplementary EIS due to commercial in confidence issues associated with the response. However, the report, which addresses the NPD EIS submission, forms part of the Supplementary EIS process.
NPD 2	Acoustic impact of heavy vehicle movement and earth moving equipment during construction.	
NPD 3	Vibration impact of heavy vehicle movement and earth moving equipment during construction.	
NPD 4	Deterioration in air quality caused by increased traffic flows closer to the site and contamination risk.	

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No.	Summary of Comment	Response
NPD 5	Dust generation during construction requiring sophisticated filtering and cleaning.	
NPD 6	Traffic impact: change in vehicle access onto the NPD site caused by the shortening of Fison Ave.	
NPD 7	Increase in heavy construction traffic accessing the GUP site along Fison Ave. East.	
NPD 8	Loss of off-street parking for staff as a result of the shortening of Fison Ave. East.	
NPD 9	Potential temporary loss of site utilities (planned and accidental) during the construction of the GUP.	
NPD 10	Loss of access to Percival Park located adjacent NPD and currently providing staff amenity.	
NPD 11	Risk of incidental need for evacuation of NPD (effects of hazardous spills on the new freeway).	
NPD 12	Reduction in commercial appeal of the NPD site, impacting on the value of the property.	
NPD 13	Lower economic viability for future expansion of the site. E.g. cost premium of constructing additional floor level because of high acoustic attenuation and vibration isolation requirements.	
PTA	Issues regarding lack of planning for public transport and no provisions for cycling/pedestrian access to the roads	Refer Supplementary EIS Section 5.6.

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Gateway Upgrade Project

B

Compliance with the State Coastal Management Plan 2002

Gateway Upgrade Project – Supplementary EIS – State Coastal Management Plan Response

1.1 Coastal Use and Development

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *Use and development of the coastal zone occurs in an ecologically sustainable manner*:

- Coastal resources are conserved, managed and restored for the wellbeing of existing and future generations;
- The interdependence of coastal resources is recognised and taken into account in planning, developing and managing the coastal zone;
- The cumulative impacts of human use are taken into account in planning and managing coastal resources;
- Coastal use and development is planned and managed to ensure that significant adverse effects of activities on the natural environment are avoided, mitigated or remediated;
- Development and use of the coast is to maintain and, where possible, enhance the quality of life for residents and visitors; and
- The precautionary principle is adopted in making decisions where there is a risk of significant adverse impacts on coastal resources.

	Policy	Proposal	Satisfactory Compliance (✓/✗)
2.1.1	Areas of state significance (social and economic)		
	The integrity and functioning of 'areas of state significance (social and economic)' are maintained and protected from incompatible land uses and activities that may adversely affect the continued use of these areas.	The proposed Gateway Upgrade Project (GUP) is consistent with the surrounding area.	✓
2.1.2	Settlement pattern and design		
	To the extent practicable, the coast is conserved in its natural or non-urban state outside of existing urban areas. Land allocation for the development of new urban land uses is limited to existing urban areas and urban growth is managed to protect coastal resources and their values by minimising adverse impacts.	The proposed GUP is consistent with the surrounding area.	✓
	Existing urban settlements on the coast should remain compact and physically separated through the identification and maintenance of non-urban areas. The provision of new infrastructure should promote consolidation and separation of urban areas on the coast. New development within existing urban areas (for example infill and redevelopment) is preferred and should be undertaken so as to avoid or minimise adverse impacts on coastal resources and their values.	Not applicable.	

	Policy	Proposal	Satisfactory Compliance (✓/✗)
	Growth of urban settlements should not occur on or within erosion prone areas, significant coastal wetlands, riparian areas, sites containing important coastal resources of economic, social, cultural and ecological value, or areas identified as having or the potential to have unacceptable risk from coastal hazards (refer to policy 2.2.4). Any new urban land uses will seek to maintain public access to the coast to protect the public's expectation of access (refer to section 2.3), and reflect water sensitive urban design principles to maintain natural water infiltration and flows to protect water quality (refer to section 2.4)	Adequate stormwater management measures will be developed during the design phase.	✓
2.1.3	Coastal-dependent land uses	Not applicable.	
2.1.4	Canals and dry land marinas	Not applicable.	
2.1.5	Maritime infrastructure	Not applicable.	
2.1.6	Extractive Industry	Not applicable.	
2.1.7	Mining and petroleum activities	Not applicable.	
2.1.8	Dredging	Not applicable.	
2.1.9	Reclamation	Not applicable.	
2.1.10	Tourism and recreation activities	Not applicable.	
2.1.11	Rural land uses	Not applicable.	
2.1.12	Managing water resources		
	Water resources are a valuable state resource and uses of water are managed to minimise adverse impacts on coastal processes and coastal ecosystems.	Stormwater management design measures such as grass swales and gross pollutant traps (at key locations) will be incorporated into the design. Erosion and sediment control measures will be implemented during site preparation and construction works (Section 23.4.5 in Supplementary EIS).	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
	In developing water allocation policy in the coastal zone, consideration should be given to the risks of dewatering acid sulphate soils and unsustainable ingress of saline waters into freshwater aquifers.	An acid sulphate soil management plan (ASSMP) will be developed for the GUP during the design phase. Dewatering activities such as groundwater extraction will be assessed prior to commencement of site extraction, and suitable management and treatment strategies will be incorporated in the ASSMP (Section 23.4.8 in Supplementary EIS).	✓ ✓
	In developing water resource plans, consideration must be given to: • Flow requirements associated with coastal processes and coastal ecosystems, consistent with the ANZECC ARMCANZ National Principles for the Provision of Water for the Ecosystems; and • The environmental values relevant to coastal resources, as set out under the Environmental Protection (Water) Policy 1997 (the EPP (Water)) or, if these values have been modified under a regional coastal plan, the environmental values set out under that regional coastal plan.	Consideration has been given and an environmental management plan has been developed for the project (refer Section 23 of the Supplementary EIS). Erosion and sediment control measures will be implemented during site preparation and construction works and improvements to site drainage and storage capacity will be incorporated into the design (refer Section 23.4.5 in Supplementary EIS).	✓
	In developing water infrastructure proposals, regard must be had to the requirements of coastal processes and coastal ecosystems in the planning and design of alternatives.	Not applicable.	✓
	In determining environmental flows, the nature of the coastal processes and coastal ecosystem requirements are to be taken into account as changes in the size and frequency of flows can have significant impacts on coastal resources and their values.	A hydraulic assessment has been undertaken for the project (refer to EIS Section 11 and Section 23.4.6).	✓
	In assessing an application for an authorisation to take water from a watercourse (for example dams, weirs and tidal barrages), regard must be had to the effects of the proposal on coastal ecosystems and coastal processes.	Not applicable.	
2.1.13	Fishing		
	The ecological health and economic and social value of the fisheries resource is protected through careful management of fishing activities, particularly in terms of the protection of endangered or vulnerable species, nursery grounds and feeding areas.	A small number of marine plants will be need to be removed for the project to take place but the numbers are small compared to the surrounding areas and will have not impact upon fisheries resources. An application will be submitted to DPIF (refer Section 17 of the EIS).	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
	In developing fisheries management plans for fishing on the coast, regard must be had to: • Managing fish stocks at ecologically sustainable levels in terms of individual target and non-target species as well as the ecosystem as a whole; • The equitable allocation of fisheries resources among the recreational, commercial, Indigenous Traditional Owner and tourist charter sectors; • Reducing and minimising by catch in fishing operations, particularly taking into account impacts on vulnerable species, including the use of devices to exclude large non-target fauna; and • Avoiding habitat degradation from fishing apparatus.	Not applicable.	
2.1.14	Aquaculture	Not applicable.	

1.2 Physical Coastal Processes

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *The coast is managed to allow for natural fluctuations to occur, including any that occur as a result of climate change and sea level rise and provide protection for life and property*:

- Trends in climate change including sea level rise, more extensive storm tide flooding and associated potential impacts are taken into account in planning processes;
- Erosion prone areas which exist on open coasts and along tidal waterways are secured and maintained largely free from development;
- The consequences of physical coastal processes are recognised and such processes generally are allowed to occur naturally;
- Risks associated with all relevant hazards including storm tide inundation and cyclone are minimised; and
- The natural topography and physical features of coastal dune systems which provide adjacent areas with protection from inland erosion are to be protected and managed on an ecologically sustainable basis.

Policy	Proposal	Satisfactory Compliance (✓/✗)
2.2.1 Adaptation to climate change		
Knowledge and understanding of greenhouse issues and climate change impacts should be improved amongst the public and private sectors with the aim of setting the foundation for cost effective adaptation measures. The four target areas are: • Avoidance of development on vulnerable areas; • Improved knowledge and understanding of climate change; • Assessments of impacts and vulnerability; and • Incorporating adaptation strategies into coastal planning and management.	A detailed hydraulic study has been undertaken for the proposal and has taken climate change into consideration (refer to EIS Section 11).	✓
Planning for the coast must address the potential impacts of climate change through the following hierarchy of approaches: • Avoid – focus on locating new development in areas not vulnerable to the impacts of climate change; • Planned retreat – focus on systematic abandonment of land, ecosystems and structures in vulnerable areas; • Accommodate – focus on continued occupation of near coastal areas but with adjustments such as altered building design; and • Protect – focus on the defence of vulnerable areas, population centres, economic activities and coastal resources.	Not applicable.	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
2.2.2	Erosion prone areas		
	To the extent practicable, erosion prone areas are to remain undeveloped apart from acceptable temporary or relocatable structures for safety and recreational purposes.	The location of the GUP, south of the Brisbane River, is governed by the existing Motorway. The location of GUP north of the Brisbane River minimises potential impacts on erosion prone areas (refer Section 10 of the EIS). Erosion and sediment control measures will be implemented during construction works (refer Section 23.4.5 in Supplementary EIS).	✓
	Where building works and activities have been undertaken within an erosion prone area, future use should not be at a greater intensity than the existing level. Redevelopment of these areas or an increase in intensity may only occur in circumstances where it can be clearly demonstrated that it would not compromise coastal management outcomes and principles.	Erosion and sediment control measures will be implemented during construction works (refer Section 23.4.5 in Supplementary EIS).	✓
	In areas under constant threat of erosion, a strategy of retreat from erosion prone areas is the preferred option. However, where an area has been developed to a scale and intensity that the retreat option is not achievable, property protection works may be needed to defend land uses and infrastructure from coastal processes. In such circumstances, any further building or infrastructure including extensions to existing buildings or the location of services (including water, power and sewerage), should not extend any further seaward than the existing building alignment for the neighbouring properties.	Proposed works are in line with the existing use of the site and the surrounding area. Erosion and sediment control measures will be implemented during construction works (refer Section 23.4.5 in Supplementary EIS).	✓
	For developed areas, structural engineering and stabilisation works will be initiated only as a last resort where erosion presents an immediate threat to public safety or property and infrastructure that is not expendable. The siting, design and materials used for works will not cause any significant adverse impacts on the coastal resources of the location nor interrupt the natural cycles of erosion and accretion of beaches.	Not applicable.	
2.2.3	Shoreline erosion management	Not applicable.	
2.2.4	Coastal hazards		
	When determining new areas for urban land uses on the coast, an evaluation is to be carried out to identify the level of potential risk to life and property from coastal hazards. This evaluation should be based on mapping of storm tide hazard areas in addition to considering the impact of physical coastal processes, including any impacts from potential sea level rise.	Not applicable.	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
	Development in areas on the coast identified as having a risk of being affected by coastal hazards needs to be carefully considered and wherever possible, be retained undeveloped. Where areas vulnerable to storm tide inundation have been developed, further development in these areas needs to address: • Its vulnerability to sea level rise and storm tide inundation; and • The proposed access to and protection of evacuation routes. In such areas, local government should have in place counter disaster plans to address these coastal hazards.	A hydraulic assessment has been undertaken for the project (refer to EIS Section 11).	✓
2.2.5	Beach protection structures	Not applicable.	

1.3 Public Access to the Coast

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *Opportunities for public access to the coast are maintained and enhanced, consistent with the conservation of coastal resources and provision of public safety*:

- The public expectation to access the coast from both land and water is recognised;
- Access to the coast is planned and managed to protect the coastal resources, their values and public safety;
- Access facilities to the foreshore, ocean and adjacent features (such as headland lookouts) are planned and managed in a coordinated manner to avoid or minimise adverse impacts; and
- Management of access to Indigenous Traditional Owner cultural resources recognises the significance of the areas to Indigenous Traditional Owners.

Policy		Proposal	Satisfactory Compliance (✓/✗)
2.3.1	Future need for access		
	There is no net loss of public access to the foreshore or of public useability of coastal waters. This is to be maintained, protected and enhanced where the provision and operation of infrastructure of state economic significance and protection of coastal (natural and cultural) resources is not compromised.	The proposed GUP retains areas adjacent to the Brisbane River. All existing bikeways and pedestrian networks will be maintained as part of the GUP works (refer Section 6 in EIS).	✓
	In planning for new urban land uses on the coast, the following additional matters are to be considered with respect to public access and use of the foreshore: • The need for new or upgraded public access facilities (such as boat ramps, jetties, boat moorings, pedestrian boardwalks, carparks and vehicle access);	Not applicable.	
	• Appropriate location and design with respect to sensitive coastal resources and their values; and • The safety of the public, if access is provided.		
	Any new private structures proposed over State land on the coast (refer to policies 2.1.5 and 2.9.4) or public waters that are not major private infrastructure of state economic importance, should not interfere with public access, useability or enjoyment of that land or water.	The GUP does not interfere with public access, useability or enjoyment of the Brisbane River.	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
2.3.2	Design of access	Not applicable.	
2.3.3	Coastal road network		
	The coastal road network is planned to minimise impacts on coastal resources and their values.	The location of the GUP and implementation of the EMP will minimise potential impacts on coastal values (refer Section 3 in EIS).	✓
	Generally, vehicular access will be provided to, rather than along the coast. In this regard: • Where roads need to run parallel to the coast, they should be set back from erosion prone areas and significant coastal resources, with only smaller access roads running to the coast; and • Minor spur roads to the foreshore and associated car parks should provide access to the foreshore at locations that are convenient to the public, have low environmental sensitivity and avoid locations that may increase storm tide hazard.	The location of the GUP and implementation of the EMP will minimise potential impacts on coastal values (refer Section 3 in EIS).	✓
	In addition, before undeveloped esplanades and roads on the coast are formally developed for vehicular purposes, their sustainability will be assessed to determine if this will have adverse impacts on coastal resources and their values. Particular regard must be had to: • Whether there is a net benefit for the region; • Any impact on adjoining landholders, where such unconstructed roads provide the only legal and dedicated access to the property; and • Opportunities for areas containing significant coastal resources or subject to erosion to be included in a network of reserves and protected areas along the coast.	Not applicable.	
2.3.4	Vehicle use on beaches	Not applicable.	

1.4 Water Quality

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *Water quality in the coastal zone is maintained at a standard that protects and maintains coastal ecosystems and their ability to support human use:*

- Environmental values and water quality objectives for coastal waters are identified and established in accordance with the EPP (Water);
- Water quality in coastal waters is managed in accordance with established environmental values and water quality objectives, and is complementary to the management of contributing catchments within the coastal zone;
- The release of contaminants into watercourses, estuaries and the ocean is eliminated where practicable and otherwise managed in accordance with best practice environmental management ensuring that the level and type of contaminants released do not exceed water quality objectives; and
- Changes to runoff quantity and quality from coastal catchments from human use and management practices are managed to minimise impacts on water quality and meet water quality objectives.

	Policy	Proposal	Satisfactory Compliance (✓/✗)
2.4.1	Water quality management		
	Where environmental values and water quality objectives have been determined for coastal waters in accordance with the EPP (Water), development and use of the coastal zone is planned and managed to protect the identified values and achieve the water quality objectives.	An EMP has been developed for the project to ensure that waters leaving the project site are treated prior to discharge (refer Section 23.4.7 of the Supplementary EIS). Stormwater leaving the site is unlikely to cause further impacts on the WQOs.	✓
	Where environmental values and water quality objectives have not been determined for coastal waters, development and use of the coastal zone is planned and managed to minimise adverse impacts on water quality and achieve the general environmental values and water quality objectives outlined in the EPP (Water).	Water quality objectives have been determined for the project (refer Section 23.4.7 of the Supplementary EIS).	✓
2.4.2	Wastewater discharges to coastal waters		
	For coastal waters where nutrients have been identified as a problem, sewage treatment works are designed and managed to enable appropriate nutrient removal within the following periods: • For discharge of effluent from islands into coastal waters – by 2005; and • For discharge of effluent from the mainland into coastal waters – by 2010.	Not applicable.	
	Proposed discharges of industrial wastewater into coastal waters must be assessed using the waste management evaluation procedure for wastewater (set out in the EPP (Water)) and will only be permitted where it is demonstrated no other feasible alternatives exist.	Not applicable.	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
	Existing industrial wastewater discharges to coastal waters will be managed in accordance with best practice to reduce discharge volumes and improve the water quality of the discharges to protect or enhance coastal resources and their values.	Not applicable.	
2.4.3	Waste disposal facilities	Not applicable.	
2.4.4	Stormwater management		
	Stormwater runoff (quality and quantity) is managed in accordance with best practice, to ensure that environmental values of the estuaries and other coastal waters are protected. Ecosystems that have experienced minimal impacts and are particularly vulnerable to effects arising from stormwater runoff will be priority areas for protection (especially partially or fully enclosed systems with low water exchange rates, including coastal wetlands, lagoons or coastal estuaries).	Water quality mitigation measures have been included in the project EMP (refer Section 23.4.7 of the Supplementary EIS).	✓
	Best practice may be achieved through the preparation and implementation of local government environmental plans for urban stormwater quality management, as set out under the EPP (Water), and implementation of relevant industry codes of practice that include stormwater management measures.	Water quality mitigation measures have been included in the project EMP (refer Section 23.4.7 of the Supplementary EIS).	✓
2.4.5	Groundwater quality		
	Groundwater quality and recharge processes are to be maintained. Extraction rates from groundwater reserves are to be managed at levels that achieve a sustainable balance between consumptive uses and the maintenance of groundwater dependent ecosystems.	Not applicable.	
	Land uses and activities are not to lower the watertable to expose acid sulphate soils or permit unsustainable ingress of saline water to freshwater aquifers. Additionally, land uses and activities such as vegetation clearing and irrigation are to be managed in a way that will not raise the watertable levels and result in movement or iron into the surface waters.	The project EMP addresses acid sulphate soil and groundwater issues (refer Sections 23.4.5 and 23.4.8 of the Supplementary EIS). Minor vegetation clearing is proposed.	✓
2.4.6	Acid sulphate soils		
	Industry codes of practice are reviewed on a regular basis to ensure that best practice management for acid sulphate soils is appropriately reflected within the code.	The project EMP addresses acid sulphate soil issues (refer Section 23.4.5 of the Supplementary EIS).	✓
	Land managers conducting rural activities involving the disturbance of acid sulphate soils are encouraged to implement current best practice environmental management as set out in the relevant industry code of practice whereby avoiding or minimising the disturbance is adopted over treatment of soil and leachate. Where disturbance is likely to occur, a planned approach is taken to managing the immediate and longer term discharge of acid leachate from these areas.	The project EMP addresses acid sulphate soil issues (refer Section 23.4.5 of the Supplementary EIS).	✓

1.5 Indigenous Traditional Owner Cultural Resources

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *the living culture of Indigenous Traditional Owners and their connection with cultural resources within the coastal zone is valued and continues for future generations of Indigenous Traditional Owners*:

- The ecologically sustainable approach of Aboriginal peoples and Torres Strait Islanders to their management of Indigenous Traditional Owner cultural resources is recognised;
- The traditional associations that Indigenous Traditional Owners have with their ancestral homeland estate and custodial obligations and customary lore relating to their land, water and air country are recognised and valued;
- The knowledge of Indigenous Traditional Owners relating to their management of their ancestral home and estate should be respected and their continuing intellectual ownership of such knowledge recognised and supported;
- Indigenous Traditional Owners' rights to be involved in a culturally appropriate way in management of their cultural resources is acknowledged; and
- The management of cultural resources on land (including water) over which Aboriginal peoples and Torres Strait Islanders have rights and interests in is recognised as a cornerstone of the wellbeing, identity, cultural significance and economy to Aboriginal and Torres Strait Island communities.

Policy		Proposal	Satisfactory Compliance (✓/✗)
2.5.1	Areas of significance (Indigenous Traditional Owner cultural resources)		
	In developing regional coastal plans, 'areas of state significance (Indigenous Traditional Owner cultural resources)' may be identified, where culturally appropriate. In determining the management of these areas, recognition and value is given to Indigenous Traditional Owners' management practices.	ARCHAEO Cultural Heritage Services and the Turrbal Association Inc. (a Traditional Owner group) have undertaken indigenous cultural heritage assessments for the project and a draft Cultural Heritage Management Plan has been developed (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓
	Where 'areas of state significance (Indigenous Traditional Owner cultural resources)' are identified, the preparation of regional planning strategies, local government planning schemes, management plans and (where applicable, the assessment of applications to develop or use the land) should reflect the requirements of the regional coastal plan.	ARCHAEO Cultural Heritage Services and the Turrbal Association Inc. (a Traditional Owner group) have undertaken indigenous cultural heritage assessments for the project and a draft Cultural Heritage Management Plan has been developed (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓
	Where 'areas of state significance (Indigenous Traditional Owner cultural resources)' are not identified by regional coastal plans, State agencies and local governments are encouraged to involve Indigenous Traditional Owners in accordance with policy 2.5.2.	ARCHAEO Cultural Heritage Services and the Turrbal Association Inc. (a Traditional Owner group) have undertaken indigenous cultural heritage assessments for the project and a draft Cultural Heritage Management Plan has been developed (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
2.5.2	Involvement of Indigenous Traditional Owners in managing their cultural resources		
	The planning for and management of Indigenous Traditional Owner cultural resources within their ancestral homeland estate is to be undertaken with the culturally appropriate involvement and acknowledgment of Indigenous Traditional Owners and their communities. Involvement mechanisms, meaningful partnerships, support and protocols should be established to facilitate this involvement.	ARCHAEO Cultural Heritage Services and the Turrbal Association Inc. (a Traditional Owner group) have undertaken indigenous cultural heritage assessments for the project and a draft Cultural Heritage Management Plan has been developed (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓
	The management of Indigenous Traditional Owner cultural resources should recognise and value Indigenous Traditional Owner environmental management practices, including the connection between saltwater and freshwater peoples and lands (which reflects a catchment wide approach to management).	ARCHAEO Cultural Heritage Services and the Turrbal Association Inc. (a Traditional Owner group) have undertaken indigenous cultural heritage assessments for the project and a draft Cultural Heritage Management Plan has been developed (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓
	Indigenous Traditional Owner involvement, including community partnerships, in the planning for and management of Indigenous Traditional Owner cultural resources is: • Particularly important and should be addressed in the preparation of regional coastal plans and regional planning strategies; and • Encouraged in the preparation of local government planning schemes, management and where applicable, the assessment of applications to develop or use the land.	ARCHAEO Cultural Heritage Services and the Turrbal Association Inc. (a Traditional Owner group) have undertaken indigenous cultural heritage assessments for the project and a draft Cultural Heritage Management Plan has been developed (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓

1.6 Cultural Heritage

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *places, buildings and objects with important cultural heritage values located on the coast are appreciated, conserved, managed and passed on to future generations*:

- Cultural heritage on the coast is identified, valued and conserved; and
- Decisions concerning cultural heritage are undertaken with the involvement of the relevant members of the community.

	Policy	Proposal	Satisfactory Compliance (✓/✗)
2.6.1	Areas of state significance (cultural heritage)		
	'Areas of state significance (cultural heritage)' on the coast are protected from incompatible land uses and activities that may adversely affect the cultural heritage values of the areas.	ARCHAEO Cultural Heritage Services have undertaken a cultural heritage assessment for the project and a draft Cultural Heritage Management Plan has been developed (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓
	Decisions regarding uses and activities adjacent to 'areas of state significance (cultural heritage)' are to be compatible with the protection of the area's values.	ARCHAEO Cultural Heritage Services have undertaken a cultural heritage assessment for the project and a draft Cultural Heritage Management Plan has been developed (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓
2.6.2	Cultural heritage		
	The development and use of the coast is to be managed to conserve cultural heritage places and objects in accordance with relevant State and Commonwealth laws. The regional coastal plans will detail provisions to manage and conserve cultural heritage within each coastal region.	ARCHAEO Cultural Heritage Services have undertaken a cultural heritage assessment for the project and a draft Cultural Heritage Management Plan has been developed (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓

1.7 Coastal Landscapes

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *the scenic and cultural values associated with coastal landscapes are protected:*

- The values of coastal landscapes are conserved and recognised for their importance to the quality of life of both residents and visitors, as well as to the economic development and growth of Queensland;
- The dominance of the natural character of the coast (excluding developed urban areas) is retained, including elements of landscape and vegetation; and
- The cultural and spiritual values of coastal landscapes are recognised and conserved through the involvement of the relevant Indigenous Traditional Owner communities.

Policy		Proposal	Satisfactory Compliance (✓/✗)
2.7.1	Areas of state significance (scenic coastal landscapes)	Not applicable.	
2.7.2	Other coastal landscape values		
	When assessing landscape values, the importance of coastal landscapes to the state and regional community is to be addressed. In particular, the relevant Indigenous Traditional Owner communities are to be involved in the assessment of landscape values (refer to policy 2.5.2).	Proposed GUP is consistent with the existing use of the area. A landscape and visual amenity assessment has been undertaken and landscape mitigation measures recommended as part of the EIS (refer to EIS Section 22). Representatives of the traditional owner groups have undertaken a cultural heritage assessment for the project and a draft Cultural Heritage Management Plan has been developed with traditional owner involvement (refer Section 18 in EIS and Appendix Q in EIS Volume 2b).	✓
	In addition to policy 2.7.1 which focuses on scenic values of coastal landscapes of state significance, regional coastal plans will assess the following: • For areas identified as 'areas of state significance (scenic coastal landscapes)' – other coastal landscape values such as cultural and spiritual values that are of state or regional importance; • For areas not identified as 'areas of state significance (scenic coastal landscapes)' – the importance of coastal landscape character and associated values; and • The coastal landscapes' sensitivity to development and change.	Proposed GUP is consistent with the existing use of the area. A landscape and visual amenity assessment has been undertaken and landscape mitigation measures recommended as part of the EIS (refer to EIS Section 22).	✓
	Investigations into landscape values will be undertaken as part of the preparation of regional coastal plans to identify the values identified in this policy. Other relevant and current landscape studies for the region will be identified and use in these investigations.	Not applicable.	

Policy	Proposal	Satisfactory Compliance (✓/✗)
Regional planning strategies and local government planning schemes for coastal area should protect areas with state and regionally important coastal landscape values, identified by regional coastal plans, from incompatible land uses.	Not applicable.	
Where state and regionally significant coastal landscape values have not been identified by a regional coastal plan, regional planning strategies and planning schemes are encouraged to protect coastal landscape values that are consistent with this policy.	Proposed GUP is consistent with the existing use of the area. A landscape and visual amenity assessment has been undertaken and landscape mitigation measures recommended as part of the EIS (refer to EIS Section 22).	✓

1.8 Conserving Nature

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *Coastal ecosystems, including their ecological processes, opportunities for survival, biological diversity and potential for continuing evolutionary adaptation, are maintained, enhanced and restored:*

- The biological diversity of marine, freshwater and terrestrial systems and the ecological processes essential for their continued existence are conserved;
- Further loss or degradation of native vegetation on the coast, particularly of endangered regional ecosystems, is avoided wherever possible;
- Further loss or degradation of coastal wetlands, including the loss of biological diversity and abundance of wetland dependent wildlife is avoided wherever possible;
- Further loss or degradation of coastal habitats, particularly habitats for rare, threatened and migratory species, is avoided wherever possible;
- The biophysical values of coastal dunes are conserved;
- Opportunities for rehabilitation of degraded coastal resources are included in evaluating management options for those resources; and
- The Indigenous Traditional Owner peoples' association with components of biological diversity and their traditional knowledge are recognised.

	Policy	Proposal	Satisfactory Compliance (✓/✗)
2.8.1	Areas of state significance (natural resources)	Not applicable.	
2.8.2	Coastal wetlands		
	Further loss or degradation of coastal wetlands is to be avoided and impacts on coastal wetlands prevented, minimised or mitigated (in order of preference).	The proposed works include the removal and/or pruning of marine plants. An application for the removal of marine plants will be submitted to DPIF (refer Section 17 of the EIS). An Erosion and Sediment Control Plan will be developed by the Construction Contractor to minimise impacts to the waterways of the area (refer Section 23.4.5 in Supplementary EIS).	✓
	The following matters are relevant to the conservation and management of Queensland's coastal wetlands, including land within 100m of a coastal wetland: • Maintenance of an area between the wetland and any adjacent use or activity of a width and with characteristics that will be determined from the size, values and vulnerability of the coastal wetland, likely natural fluctuations and the nature of potential threats to its integrity and functions from the specific activity or land use);	The proposed works include the removal and/or pruning of marine plants. An application for the removal of marine plants will be submitted to DPIF (refer Section 17 EIS). An Erosion and Sediment Control Plan will be developed by the Construction Contractor to minimise impacts to the waterways of the area (refer Section 23.4.5 in Supplementary EIS).	

Policy	Proposal	Satisfactory Compliance (✓/✗)
• Minimising any modification of the natural characteristics of the wetland, including the topography, groundwater hydrology, water quality and plant and animal species; • Minimising any adverse impact on coastal wetland values from proposed access; • Any adverse impact on the wetland as a result of proposed or potential pest insect control; • The appropriate management of acid sulphate soils (see policy 2.4.6); • Maintaining the role of wetlands in providing protection from coastal hazards, including any impacts from potential changes in sea level rise; • Minimising potential changes in fire regimes that may have adverse impacts on the coastal wetland; • The need to retain the values and functionality of saltflats, to assist in the maintenance of estuarine system viability; • The need to maintain the coastal wetland functions to provide habitat for rare, threatened and migratory species; • The potential for a proposal to introduce plant or animal species non native to the local area that may have or are likely to have adverse impacts on the coastal wetland ecosystem; • Minimising impacts on the sustainability of economic productivity, including critical inshore habitat for fisheries related species; • The need to restore and rehabilitate degraded coastal wetlands (in accordance with policy 2.8.4); and • Any long term maintenance and management implications particularly for government agencies.	The Project EMP has been prepared to address these issues where relevant (refer to Section 23 of the Supplementary EIS).	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
2.8.3	Biodiversity		
	Biodiversity on the coast is to be safeguarded through conserving and appropriately managing the diverse range of habitats including coral reefs, seagrass, soft bottom (benthic) communities, dune systems, saltflats, coastal wetlands and riparian vegetation.	A detailed flora and fauna assessment of aquatic and terrestrial ecosystems was undertaken for the project to ensure that negligible impact will occur for native flora and fauna (refer to EIS Sections 16 and 17).	✓
	The following matters are to be addressed to achieve the conservation and management of Queensland's coastal biodiversity: • The maintenance and re-establishment of the connectivity of ecosystems, particularly remnant ecosystems; • Ensuring viable populations of protected native species continue throughout their range, by maintaining opportunities for long term survival, genetic diversity and the potential for continuing evolutionary adaptation. This includes the protection of significant wildlife habitats, such as: – Protecting beaches providing significant wildlife habitats (including roosting, nesting and breeding habitat for turtles, birds or crocodiles) through suitable management measures including buffers for those habitats; – Protecting the values and integrity of intertidal communities such as tidal flats, saltflats and rocky reefs, including natural fluctuations of location; – Retaining the current extent and quality of migratory and resident shorebird roosting and feeding habitat. If habitat is to be lost it should be replaced, where practicable, before loss, by an equivalent artificial habitat in a location that minimises any alteration of distribution and abundance of shorebirds; – Maintaining the values and integrity of fish habitats and fish migratory pathways through suitable management measures including buffers for those habitats; – Protecting the values and integrity of soft bottom (benthic) communities; and – Retaining and protecting the existing extent, quality and functionality of seagrass beds, particularly in dugong protection areas or known areas of turtle habitat; • The retention of native vegetation wherever practicable;	The proposed works include the removal and/or pruning of marine plants. An application for the removal of marine plants will be submitted to DPIF (refer Section 17 in EIS). An Erosion and Sediment Control Plan will be developed by the Construction Contractor to minimise impacts to the waterways of the area (refer Section 23.4.5 of the Supplementary EIS).	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
	• The retention of and appropriate management of riparian vegetation along waterways of sufficient width to provide a corridor with a self sustainable linked network. (The width of the corridor will be determined from the size, values and functions of the riparian area and the nature of potential threats to its functions and integrity from the specific activity or land use. However, the buffer should be of sufficient width to maintain bank stability, existing water quality, maintain aquatic and wildlife habitats and movement corridors for native animals and long viability of existing isolated stands of vegetation); and • The valuing of Indigenous Traditional Owner ways of managing biological diversity.	Addressed during bridge structure detailed design. Refer Draft Aboriginal Cultural Management Plan in Appendix Q in EIS Volume 2b.	
2.8.4	Rehabilitation of coastal resources		
	Rehabilitation of degraded coastal areas and resources is encouraged. For existing activities in the coastal zone, a proactive voluntary approach to rehabilitation working in partnership with landholders, community groups (such as catchment management), local government (including Aboriginal Councils and Island Councils) and local Indigenous Traditional Owner groups is supported. The priority for rehabilitation is the restoration of degraded coastal ecosystems to their natural ecological, physical and aesthetic condition.	Landscape plantings have been incorporated into the design of the project (refer Section 23.4.15 of the Supplementary EIS).	✓
	In undertaking rehabilitation of coastal resources, regard must be had to: • Where use or activities occur in areas prone to erosion, consideration should be given to the establishment or re-establishment of locally native vegetation, including foreshore fringing vegetation to afford protection against wind and water erosion; • Where degradation and loss of coastal wetlands has occurred, consideration should be given to the re establishment or natural regeneration of the wetland; • Where acid sulphate soils have been disturbed, consideration should be given to identifying priority areas of acid soils and acid leachate and to remediating these areas; • Naturally occurring damage to mangrove communities should not normally be subject to restoration works; • All area adjacent to waterways should be recognised as having the potential to perform riparian functions and sufficient area should be maintained to provide for this, wherever possible; and • Wherever possible, vegetation native to the local area and consistent with the species composition of the natural community should be used for rehabilitation purposes.	The proposed works include the removal and/or pruning of marine plants. An application for the removal of marine plants will be submitted to DPIF (refer Section 17 in EIS). An Erosion and Sediment Control Plan will be developed by the Construction Contractor to minimise impacts to the waterways of the area (refer Section 23.4.5 of the Supplementary EIS). An acid sulphate soil management plan will be developed by the Construction Contractor for the site (refer to Section 23.4.5 of the Supplementary EIS).	✓

	Policy	Proposal	Satisfactory Compliance (✓/✗)
2.8.5	Pest species management		
	The focus of pest management activities is on minimising the risk of introducing new pest species and reducing or at least controlling the impact of pest species infestations.	Weed management and mitigation measures will be developed during the detail design stage and implemented during construction activities (refer Section 23.4.11 of the Supplementary EIS). A detailed flora and fauna assessment was undertaken for the project to ensure that negligible impact will occur for native flora and fauna (refer Sections 16 and 17 in EIS). Weed management will occur during the construction and operational phases of the project (refer Section 23.4.11 of the Supplementary EIS).	✓
	Management of pest species will have regard to: • Preventing the introduction, establishment and spread of pest species in the coastal zone; and • Managing the impacts of existing and new pest species.	Weed management and mitigation measures will be developed during the detail design stage and implemented during construction activities (refer Section 23.4.11 of the Supplementary EIS). A detailed flora and fauna assessment was undertaken for the project to ensure that negligible impact will occur for native flora and fauna (refer Sections 16 and 17 in EIS). Weed management will occur during the construction and operational phases of the project (refer Section 23.4.11 of the Supplementary EIS). Fire ant management strategies have been developed in the EIS and will be further developed in the detail design stage.	✓

Policy	Proposal	Satisfactory Compliance (✓/✗)
This will be achieved through raising community awareness of pest species, monitoring for the presence of pest species in the coastal zone and ensuring that all stakeholders are committed to and undertake, coordinated management of pests.	Weed management and mitigation measures will be developed during the detail design stage and implemented during construction activities (refer Section 23.4.11 of the Supplementary EIS). A detailed flora and fauna assessment was undertaken for the project to ensure that negligible impact will occur for native flora and fauna (refer Sections 16 and 17 in EIS). Weed management will occur during the construction and operational phases of the project (refer Section 23.4.11 of the Supplementary EIS).	✓
In managing populations of pest species in the coastal zone, priority will be given to: • Areas of high pest species concentration where coastal resources or social or economic values are being threatened; • Areas on or adjacent to the coast that contain significant coastal resources; • Areas where the presence of pest species lessens visitor enjoyment; • Pest species that are new to the area and have the potential to cause significant damage; and • Pest species that are highly invasive in waterways and other coastal ecosystems.	Fire ant management strategies have been developed in the EIS and will be further developed in the detail design stage (refer Section 23.4.11 of the Supplementary EIS).	✓

1.9 Coordinated Management

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *Coastal management is coordinated and integrated across all levels of government and within the community:*

- Planning processes and management decisions by government agencies and non government groups are integrated and coordinated and appropriately reflect the outcomes, principles and policies of the State Coastal Plan and relevant regional coastal management plans;
- All levels of government, non government groups and the community (including the Indigenous Traditional Owner communities) participate in coastal planning in an open and cooperative way; and
- The management of State land on the coast is consistent with and seeks to further the outcomes, principles and policies of the coastal plans.

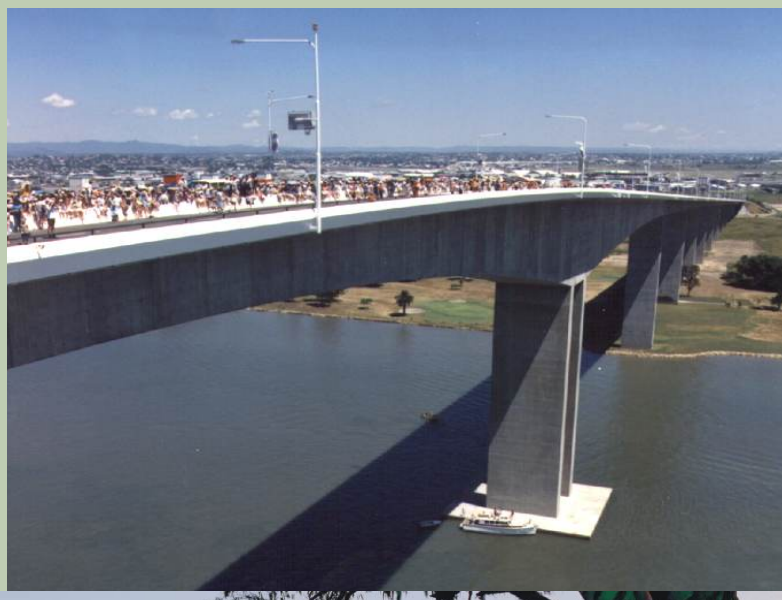
Policy		Proposal	Satisfactory Compliance (✓/✗)
2.9.1	Regional coastal management plans	Not applicable.	
2.8.2	Coordinated management of jurisdictions	Not applicable.	
2.9.3	State land on the coast	Not applicable.	
2.9.4	Private use of State land on the coast	Not applicable.	
2.9.5	Control districts	Not applicable.	

1.10 Research and Information

The following principles have been identified to ensure that future development in the coastal zone and coastal management districts achieve the *Coastal Management Outcome* of *Research programs and data and information collection and management focus on support and enhance effective coastal management:*

- Coastal information is available and accessible across all levels of government, the private sector and the community (unless ownership or confidentiality restricts public access);
- Research programs and data and information collection are coordinated and integrated with coastal management programs;
- The impacts on coastal resources and their values from human use are systematically monitored to ensure that long term impacts are managed in an ecologically sustainable manner, and to improve future decisions;
- Research and management of information related to Indigenous Traditional Owner cultural resources will recognise and value the cultural connections between Indigenous Traditional Owner and their cultural resources through their appropriate involvement in research and information management; and
- Information relating to coastal management and coastal resources and their values is used for education and awareness programs to increase the community's understanding of coastal management issues.

Policy		Proposal	Satisfactory Compliance (✓/✗)
2.10.1	Information management	Not applicable.	
2.10.2	Inter-agency coordination	Not applicable.	
2.10.3	Monitoring	Monitoring requirements are included in the SEIS EMP (refer to Section 23).	✓



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