

North-South Bypass Tunnel - Stage 1

Phase 2 - Feasibility Study

INITIAL ADVICE STATEMENT

- March 2004

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Executive Summary

Brisbane City Council recognises that, along with managing travel demand, further investment in the transport system is required to ensure the continued prosperity of Brisbane. A key part of the investment strategy is to continue to work towards a safer and more efficient road network. In 2001, Council commenced investigations into the Strategic Transport Opportunities for Brisbane to identify major infrastructure that could be delivered and financed by the private sector, to address deficiencies in the orbital road network.

Proposed new infrastructure (outlined in the *Transport Plan for Brisbane 2002-2016*) includes the three stages of the North-South Bypass Tunnel (NSBT). Stage 1 would provide the completion of the Inner City Orbital Road network, and the purpose of the inner orbital is to remove unnecessary through traffic from the Brisbane CBD and Fortitude Valley areas. The NSBT Stage 1 would complete the inner orbital by providing a bypass of the Central Business District between Woolloongabba and Bowen Hills and relieve Brisbane CBD peak hour congestion for north-south road travel. It is expected to intercept traffic from the major radial corridors of the City to free up road space for bus, pedestrian and cyclist priority traffic in the CBD, Story Bridge and Fortitude Valley.

Proponent

Brisbane City Council is the proponent for the North-South Bypass Tunnel Stage 1 project. Council is seeking to have the environmental and planning approvals required for the project carried out under the *State Development and Public Works Organisation Act, 1971* (SDA). This Initial Advice Statement has been prepared to provide sufficient information to:

- Enable determination of the significance of the project to the State; and
- Provide information to enable advisory agencies and the public to have input into the Terms of Reference for the Environmental Impact Statement (EIS).

Project Information

The approximate alignment of the proposed North-South Bypass Tunnel Stage 1 is shown in Figure 1. The North-South Bypass Tunnel is intended to connect the M1 (Pacific Motorway) and Ipswich Road to the south with the Inner City Bypass to the north of the CBD / Fortitude Valley. The proposed route will generally follow the alignment of Ipswich Road/Main Street, cross under the Brisbane River beneath the Story Bridge, and then proceed through Fortitude Valley and exit at Bowen Hills north-east of the RNA Showgrounds, where it would connect with the Inner City Bypass. There would also be connections in the vicinity of Shafston Avenue to provide for traffic to and from the eastern suburbs.

Level of Investment

A very preliminary evaluation of costs has been undertaken and costing will be refined as the project is further developed. The current capital cost estimate of the project is \$900 million, but it will vary depending on the construction methodology and time as well as further development of the concept design.

Policy and Planning Framework and Strategic Significance of the Project

The strategic planning framework overlaying and guiding development in South East Queensland is multi-layered and implemented by a number of different agencies in different jurisdictions. The principal layers include:

Queensland Government

Strategy

- Regional Framework for Growth Management
- Integrated Regional Transport Plan
- Transport 2007

Implementation & Responsibility

Whole of government
 Queensland Transport
 Queensland Transport, Department of Main Roads

Local Government

- | | |
|---|---|
| <ul style="list-style-type: none"> ▪ Transport Plan for Brisbane 2002 – 2016 ▪ Living in Brisbane 2010 ▪ City Plan | Brisbane City Council
Brisbane City Council
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The North-South Bypass Tunnel Stage 1 is part of an overall strategy to improve the efficiency of Brisbane's road network, consistent with long-established and accepted regional and citywide transport planning objectives. The project is one part of the implementation of the *Transport Plan for Brisbane 2002 – 2016*, which has been public policy of the Brisbane City Council and is an outcome of the integrated local transport planning process.

Complexity of Government Requirements

The detailed process and wide range of potential approvals are outlined, demonstrating the complex range of local, State and Commonwealth requirements for the project. To ensure all requirements are met and addressed adequately, extensive agency consultation will be undertaken throughout the EIS preparation.

Effects on Relevant Infrastructure

Potential effects on road infrastructure include connections to the State road network, as well as changes in traffic volumes on other roads which would result from the construction of the proposal. Other infrastructure – services such as water supply, drainage, energy and telecommunications – may be affected by the proposal.

Potential Environmental Effects

The NSBT Stage 1 will have substantial environmental, social and economic benefits at the regional, city and local scales, and a number of potentially adverse environmental and social impacts, especially at the local level, which will need to be carefully considered and mitigated against through considered design and management approaches. Benefits are expected to include:

- Improved network travel time and reduced traffic accidents and congestion, with associated social benefits;
- Increased road capacity which will be converted to the advantage of buses and high-occupancy vehicles, pedestrians and cyclists;
- Reduced noise levels and air quality impacts over significant areas, where the diversion of traffic from the existing road network will occur into the tunnel. This will result in a reduction in severance effects, amenity and access improvements, with associated economic (property values and urban renewal) benefits.

Employment Opportunities

The construction of the NSBT Stage 1 will potentially be a major generator of employment both directly to those employed on the assessment, design, construction and on-going management of the infrastructure, and through the opportunities for the supply of materials and equipment to the project.

1. Introduction

1.1 Background

The importance of Brisbane as the administrative, commercial and cultural heart of Queensland is well recognised through the regional framework for growth management for the South East Queensland region. The City's role as the centre for the nation's major growth region is also well recognised.

A key aspect of achieving sustainable growth in the region is the development of a safe, attractive and efficient transport system. Brisbane City Council has recognised the importance to the region of continuing the development of the transport system within the City. To this end Council has prepared a *Transport Plan for Brisbane 2002-2016*¹, the objectives of which are achieving a balanced position in relation to travel demand policy, public transport expansion and the introduction of new road infrastructure.

Both the Queensland Government and Council have been working beyond *Transport 2007*² to consider a range of options for improving cross-river transport options. Options identified include the duplication of the Gateway Bridge and the construction of the North-South Bypass Tunnel. The Gateway project is currently the subject of an environmental impact statement investigation, due for completion later in 2004.

With continuing population growth within and external to the City, Brisbane City Council is concerned that pressures on the City's key infrastructure and its livable qualities will also increase. In recognition and anticipation of these challenges, the Council has established its vision for a sustainable future in *Living in Brisbane 2010*³. The major themes supporting a livable Brisbane are:

- a clean and green City;
- an accessible City;
- a City designed for tropical living;
- a smart and prosperous City;

¹ *Transport Plan for Brisbane 2002-2016*, Brisbane City Council, 2003

² *Transport 2007 – An Action Plan for South East Queensland*, Queensland Transport 2001

³ *Living in Brisbane 2010*, Brisbane City Council, 2002

- a creative City;
- an inclusive City;
- an active and healthy City; and
- a regional leader and a world City.

Accessibility is a key element to a sustainable and livable City. Council is seeking to achieve its accessibility vision through the implementation of its Transport Plan. Analysis undertaken in support of Council's Transport Plan shows that the demand for travel in the South East Queensland will continue to outpace this population growth. The issues challenging the achievement of an efficient and effective transport system in the City include⁴:

- **Population growth and dispersal** - The City's population is expected to grow at a rate of approximately 1.04% per annum from an estimated 930,000 residents to approximately 1,050,000 residents in 2016. Complicating this predicted trend is the uneven dispersal of growth across the City, with much of it occurring in the outer suburbs;
- **Changing demography** – The City's population is ageing and living in smaller households, leading to an increased demand on services, including transport and mobility;
- **Employment dispersal** – Employment growth to 2016 is expected to become more decentralised, with an emphasis on major and suburban centres and the Australia Trade Coast;
- **Journey to work** – With changing 'journey-to-work' trends combining with dispersed workplace options, peak hour commuter transport pressures are expected to continue. The pattern of travel to work from beyond the City also adds pressure on the City's transport infrastructure;
- **Car ownership** – Public transport use in the City has decreased as the level of car ownership has increased. Public transport patronage, as a proportion of total transport movements, has favoured the privately owned vehicle since the mid-1970s.

Brisbane City Council has recognised that, along with managing travel demand, further investment in its transport system is required. The *Transport Plan for Brisbane 2002 - 2016* has been aligned with Council's *Living in Brisbane 2010* vision in seeking to achieve a balanced position in relation to travel demand policy, public transport expansion, the integration of land use and transport planning and the introduction of new road infrastructure.

⁴ *Transport Plan for Brisbane 2002 – 2016*, Brisbane City Council, 2003

Council has invested heavily in the transport system for Brisbane. Recent initiatives include:

- Construction and delivery of major projects such as the Inner City Bypass, Waterworks Road Transit Lane Project, the Inner Northern Busway, and planning for the Green Bridge Link and the Coronation Drive Buslane Project;
- Improvements to public transport services such as the service expansion and purchase of new gas buses; and
- The introduction of policies and systems aimed at kerbing travel demand and improving urban amenity.

1.2 Need for the Project

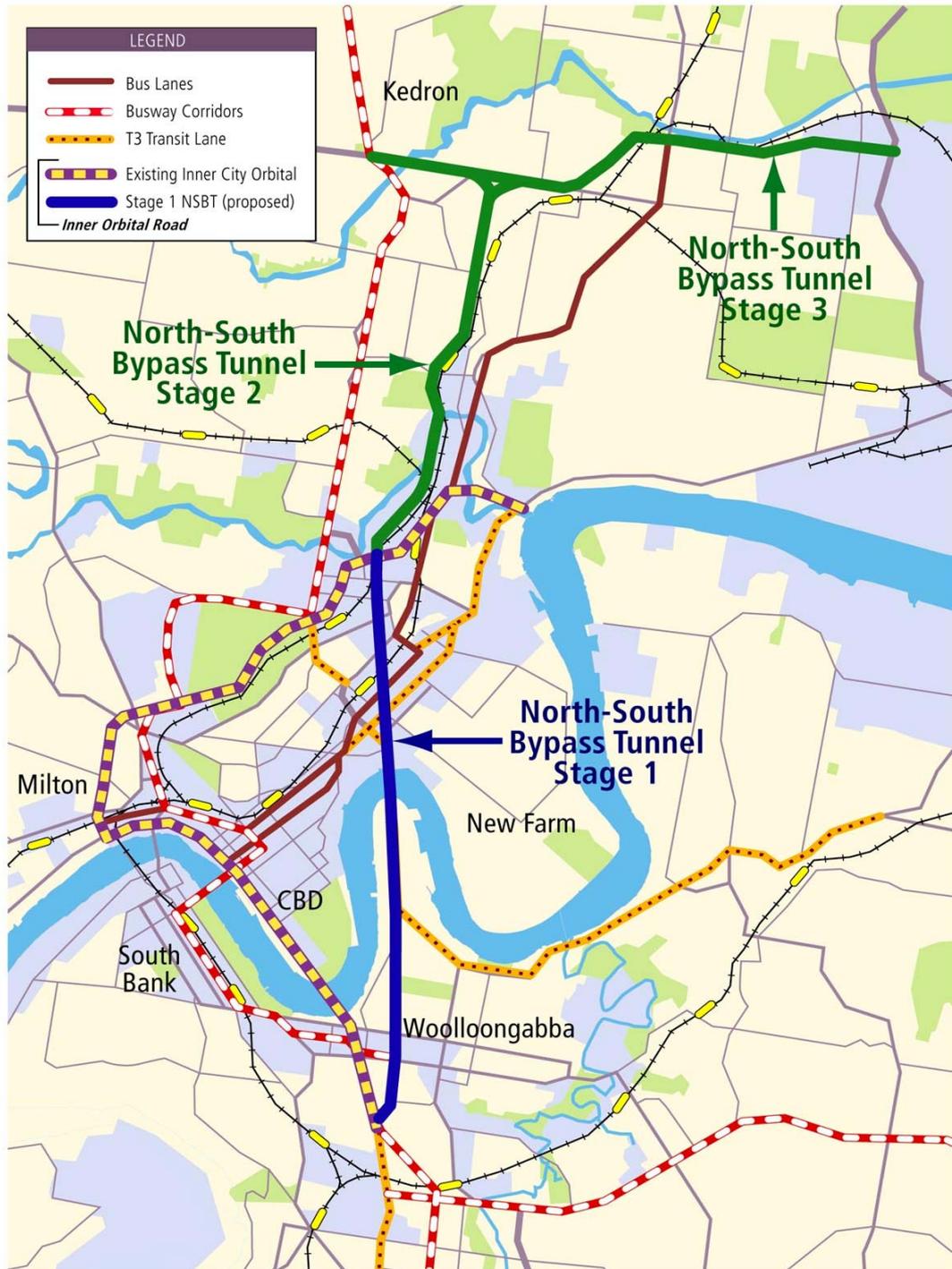
Council recognises that, along with managing travel demand, further investment in the transport system is required to ensure the continued prosperity of Brisbane. A key part of the investment strategy is to continue to work towards a safer and more efficient road network. In 2001, Council commenced investigations into the Strategic Transport Opportunities for Brisbane to identify major infrastructure that could be delivered and financed by the private sector, to address deficiencies in the orbital road network.

Proposed new infrastructure (outlined in the *Transport Plan for Brisbane 2002-2016*) includes the three stages of the North-South Bypass Tunnel (NSBT). The three stages are shown in Figure 1, and Stage 1 would provide the completion of the Inner City Orbital Road network. The purpose of the inner orbital is to remove unnecessary through traffic from the Brisbane CBD and Fortitude Valley areas, in response to predicted growth in cross-river traffic from 88,000 trips in 2001 to 116,000 trips in 2016 (1.9%pa growth compared with 1.04% pa population growth).

The NSBT Stage 1 would complete the inner orbital by providing a bypass of the Central Business District between Woolloongabba and Bowen Hills and relieve Brisbane CBD peak hour congestion for north-south road travel. It is expected to intercept traffic from the major radial corridors of the City to free up road space for bus, pedestrian and cyclist priority traffic in the CBD, Story Bridge and Fortitude Valley.



Figure 1 North-South Bypass Tunnel Stages



The NSBT is considered to be Council's highest priority for infrastructure development and Council is proceeding to undertake a feasibility study for Stage 1 of the project. A prefeasibility assessment for Stages 2 and 3 will commence later this year and, subject to the results of the prefeasibility studies, these stages may be subject to detailed feasibility studies and separate future environmental assessment and approvals processes.

According to investigations in 2003⁵, the potential impacts of Stage 1 included major reductions in traffic volume (up to 45%) on the Storey Bridge, as well as smaller but significant reductions on Captain Cook Bridge. The NSBT Stage 1 will divert a significant volume of traffic from passing through the inner city with resulting environmental and urban amenity benefits as well as major opportunities for public transport improvements.

A number of benefits to the City will flow directly, and indirectly, from the completing of the project. These benefits include:

- reduced traffic congestion in the Fortitude Valley and Woolloongabba areas and along major thoroughfares servicing the CBD;
- more efficient movement of cross-City trips along a safe, high speed bypass of an existing highly congested area;
- increased capacity for priority public transport services along the route through bus and/or transit lanes; and
- opportunities for rejuvenation and renewal of established areas affected by current high traffic flows and diminished environmental conditions (eg Woolloongabba, Kangaroo Point, Fortitude Valley, Bowen Hills).

The improvements produced by the NSBT Stage 1 in environmental and urban amenity outcomes are likely to generate changed urban development patterns with the residential and commercial rejuvenation of beneficially affected parts of the city.

The proposed NSBT Stage 1 will provide economic benefits to the entire Brisbane City area, South East Queensland and the entire State. A detailed Economic Assessment will be undertaken as an important component of the EIS.

1.3 Proponent

Brisbane City Council is the proponent for the North-South Bypass Tunnel Stage 1 project.

⁵ Brisbane City Council, *North South By-Pass Tunnel Stage 1, Report of the Engineering Task Force, 2003*

Council has undertaken prefeasibility work⁶ which shows that, to finance the project, it is appropriate that the tunnel be tolled.

The proposal requires Queensland Government approval, primarily in the areas of allowing tolling and collection of revenue, road management arrangements and approval to borrow funds required to finance the project⁷. Environmental and planning approvals will also be required under Queensland Government statutes.

The Queensland Government sees the proposal as having the potential to make a significant contribution to the transport needs of Brisbane, and Council is preparing the feasibility study for Stage 1 of the North-South Bypass Tunnel. The feasibility study will include the development of the business case, as well as the concept design and environmental impact assessment.

1.4 Purpose of Initial Advice Statement

Brisbane City Council is seeking to have the environmental and planning approvals required for the project carried out under the *State Development and Public Works Organisation Act, 1971* (SDA). This Initial Advice Statement has been prepared to provide sufficient information to:

- Enable determination of the significance of the project to the State; and
- Provide information to enable advisory agencies and the public to have input into the Terms of Reference for the Environmental Impact Statement (EIS).

The SDA enables the Coordinator-General to declare certain developments to be “significant projects”, for which an EIS is required. In making a declaration about a significant project, the Co-ordinator General must have regard to one of more of the following⁸:

- (a) *detailed information about the project given by the proponent in an initial advice statement;*
- (b) *relevant planning schemes or policy frameworks, including those of a relevant local government or of the State or the Commonwealth;*
- (c) *the project’s potential effect on relevant infrastructure;*

⁶ *North South Bypass Tunnel .Financing Issues and Options. Report of the Financial Taskforce.* Brisbane City Council, 2003.

⁷ *Correspondence between the Premier and the Lord Mayor of Brisbane,* October 2003

⁸ *State Development & Public Works Organisation Act 1971, section 27*

Initial Advice Statement

- (d) *the employment opportunities that will be provided by the project;*
- (e) *the potential environmental effects of the project;*
- (f) *the complexity of local, State and Commonwealth requirements for the project;*
- (g) *the level of investment necessary for the proponent to carry out the project;*
- (h) *the strategic significance of the project to the locality, region or the State.*

This report is the Initial Advice Statement (IAS) required of the proponent and addresses items listed as (a) to (h) above. If the project is declared to be “significant” under the Act, Section 29 of the SDA notes:

The Coordinator-General must—

- (a) *advise the proponent that an EIS is required for the project; and*
- (b) *publicly notify—*
 - (i) *that an EIS is required for the project; and*
 - (ii) *where copies of the draft terms of reference may be obtained; and*
 - (iii) *that comments on the draft terms of reference are invited.*

This IAS is intended to provide an overview of the existing environment of the area of influence of the proposal, and to identify the level of potential impacts that will be investigated in the EIS. An EIS is to be prepared as part of the approval process. The Terms of Reference (ToR) for the EIS will be developed, based on the outcomes of this report and the requirements of relevant agencies.

2. Project Information

2.1 Location

The approximate alignment of the proposed North-South Bypass Tunnel Stage 1 is shown in Figures 1 and 2. The North-South Bypass Tunnel is intended to connect the M1 (Pacific Motorway) and Ipswich Road to the south with the Inner City Bypass to the north of the CBD / Fortitude Valley. The proposed route will generally follow the alignment of Ipswich Road/Main Street, cross under the Brisbane River beneath the Story Bridge, and then proceed through Fortitude Valley and exit at Bowen Hills north-east of the RNA Showgrounds, where it would connect with the Inner City Bypass. There would also be connections in the vicinity of Shafston Avenue to provide for traffic to and from the eastern suburbs.

2.2 Studies to date

Since 2000, Brisbane City Council has been active in developing and defining the Stage 1 proposal. In September 2001, a prefeasibility report⁹ was prepared by Council, outlining the development of the project concept, the project description, environmental, engineering and development issues and financial considerations.

In 2002, two independent taskforces were formed to address the engineering feasibility and financial viability of the project. The initial report of the Engineering Taskforce¹⁰ was delivered in February 2003. It reviewed all the pre-feasibility studies undertaken and presented a report, which provided details of a technically feasible project which was viable and should proceed to a detailed feasibility stage. In developing a solution for the project, the major risks were considered and addressed.

The document, although describing the most recent work defining the project, did not provide the level of investigation and study of the proposal or its options and alternatives required for a comprehensive environmental impact assessment. This detailed feasibility phase of the project will revisit all earlier work, undertake concept development to the required level, consider feasible and relevant options, and undertake the environmental assessment of the preferred option.

⁹ *Strategic Transport Opportunities. Brisbane North-South Bypass Tunnel, Prefeasibility Report*, Brisbane City Council, 2001

¹⁰ *North-South ByPass Tunnel Stage 1, Report of the Engineering Task Force*, Brisbane City Council 2003

2.3 Project Details

The project described below represents the output of the prefeasibility report and the engineering task force report. The project design will be subject to change through more detailed design work and consideration of options as well as environmental assessment and community input.

2.3.1 Design Criteria and Route Geometry

The criteria adopted for the design of the project would be consistent with its functional objectives. Design references would consider Austroads criteria, supplemented where appropriate by Queensland Department of Main Roads and Brisbane City Council standards. Tunnel standards would consider those specified by the Permanent International Association of Road Congress (PIARC).

The proposed tunnel would comprise two tubes carrying two traffic lanes each and running for approximately 4.7 kilometres. The horizontal alignment south of the river is largely but not wholly underneath the road reserves of Ipswich Road, Main Street and Shafston Avenue. North of the river the route is partly beneath developed properties and partly beneath road reserves. The vertical alignment of the tunnels would pass through the metamorphic rock beneath the Brisbane River, and would be constructed by direct bore using primarily tunnel-boring machines (TBMs) or rock header equipment to minimise any surface disturbance.

2.3.2 Network Connections

Northbound and southbound connections to Ipswich Road would be provided, as will northbound and southbound connections to the Pacific Motorway (M1).

Northbound connections will be provided to the Inner City Bypass (ICB) for vehicles travelling east on the ICB. This may involve ramps beneath the ICB and over Horace Street. A direct extension to Lutwyche Road will also be provided. Vehicles travelling from the east on the ICB will be able to enter the tunnel southbound.

The connection in the vicinity of Shafston Ave would provide northbound connections to the tunnel and southbound connections from the tunnel.

Allowance will be made in the concept design for connections to future network developments. Of note is that the NSBT Stages 2 and 3 is in the Transport Plan for Brisbane and may be constructed in the future.

2.3.3 Ventilation

Options for ventilation are being considered. It is possible that the tunnels would be ventilated by a longitudinal flow system by which air will be taken in at the tunnel portals and at two intermediate fresh air supply points and be ventilated at the other portals and by two ventilation

outlets located near the northern and southern portals. Alternatively, a semi transverse ventilation system may be developed, whereby the exhaust air would be extracted into a dedicated exhaust duct that would run the length of the tunnel before being ventilated to the two outlets. The choice of the ventilation outlet sites would be governed by engineering requirements, such as the choice of system, and the potential environmental and social impacts associated with their location.

2.3.4 Other Works

Works which are not part of the tunnel, but which form an important element in the project, need to be considered and assessed in the environmental impact statement. Of note would be surface works associated with construction, ramp connections to the existing road network, intersection and other improvements to the existing surface network, and reconfiguration of surface areas to provide for improved public transport (bus lanes), cycleways and community use areas.

Careful consideration is required of the means and location of construction spoil, as well as selection of and the impacts associated with spoil haulage from the construction sites to the disposal sites.

3. Level of Investment

3.1 Project Cost and Timing

A very preliminary evaluation of costs has been undertaken and costing will be refined as the project is further developed. The current capital cost estimate of the project is \$900 million, but it will vary depending on the construction methodology and time as well as further development of the concept design.

The construction time will take up to 4 years, subject to construction methodology and engineering and environmental constraints.

3.2 Financial Issues

The financial taskforce¹¹ was asked to consider issues associated with financing the project. To this end, it considered the financial viability of the tunnel on a whole of project life basis, the ability of Council to service debt obligations, funding options, project risks and governance options.

A financial analysis model was developed, with assumptions amongst other things made on borrowing sources, project life, tolled traffic volumes and growth, toll rate per vehicle, operation and maintenance costs and debt financing. Scenarios modelled delivered positive whole of life net present values, and the taskforce concluded that the project was sufficiently attractive in financial terms to warrant an in-depth financial analysis. Sources of funding were also considered and options outlined.

Concurrent with the development of the concept design and the environmental impact assessment, Council is preparing a business case which is developing a full financial analysis of the project and assisting Council to evaluate the means by which the project can be delivered, including mechanisms to involve private investment in the project.

¹¹ *North-South Bypass Tunnel. Financing Issues and Options.* Report of the Financial Task Force, Brisbane City Council 2003

4. Planning and Policy Framework

4.1 Strategic Planning Framework

The strategic planning framework overlaying and guiding development in South East Queensland is multi-layered and implemented by a number of different agencies in different jurisdictions. The principal layers include:

Queensland Government

Strategy

- Regional Framework for Growth Management
- Integrated Regional Transport Plan
- Transport 2007

Implementation & Responsibility

Whole of government
 Queensland Transport
 Queensland Transport, Department of Main Roads

Local Government

- | | |
|---|---|
| <ul style="list-style-type: none"> ▪ Transport Plan for Brisbane 2002 – 2016 ▪ Living in Brisbane 2010 ▪ City Plan | Brisbane City Council
Brisbane City Council
Brisbane City Council |
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4.2 Regional Planning Context

The over-arching strategic planning framework for the sustainable development of the South East Queensland region is the *Regional Framework for Growth Management*. The Queensland Government is presently reviewing the RFGM with the intention of developing a regional framework for growth management in South East Queensland to the year 2021. An important element of the RFGM for 2021 will be enhancing the regional transport system, including road transport and road-based public transport. The efficiency of the road transport system within Brisbane and its connections to the State road transport network is vital to the achievement of the overall outcomes for the RFGM.

The *Integrated Regional Transport Plan* (IRTP) is now somewhat dated and has been overtaken by its implementation, leading to the development of *Transport 2007 - An Action Plan for South East Queensland*. *Transport 2007* anticipated the maintenance of a high level of service on the regional highway network for freight, by-passing communities and linking important industrial areas to freight handling facilities. The plan also anticipates that a number of local roads in the Brisbane sub-region will be upgraded to facilitate local movements and provide for new urban development. The plan goes on to say that increased road space will be provided for bus and high occupancy vehicles, in preference to private car use, especially during peak periods.

For the planning period 1999 to 2007, the IRTP anticipated an increase in private car trips of approximately 34% and a 24% increase in public transport person trips. Part of the strategic

approach in the plan is to increase the public transport mode share at peak times, with other benefits of reducing vehicle emissions and increased vehicle occupancies.

The IRTP did not go beyond the Inner City Bypass, the Gateway Arterial upgrade and the Port of Brisbane Motorway in proposing new infrastructure.

4.3 Local Transport Planning Context

Consistent with the intentions of the *Integrated Regional Transport Plan* and *Transport 2007*, the Brisbane City Council prepared an integrated local transport plan, known as the *Transport Plan for Brisbane 2002 – 2016*. This comprehensive plan represents the findings of detailed investigations into the transport needs of the City over a 15 year planning period.

The strategy elements of the *Transport Plan for Brisbane* include:

- Quality public transport;
- Managed travel demand;
- Co-ordinated transport and land use;
- A safe and efficient road network;
- Delivering the goods on time to the right place;
- Cleaner and greener personal transport options.

It is anticipated that the implementation of the Transport Plan will lead to benefits in improved air quality, reductions in greenhouse gases, improved urban design and amenity particularly in the suburbs of Woolloongabba, Kangaroo Point and Fortitude Valley, opportunities for on-going economic growth through an efficient road network, increased accessibility especially through enhanced public transport opportunities.

One of the key elements identified in the road network is the completion of the 'inner orbital road' formed by the South East Freeway, the Inner City Bypass, and the proposed North-South Bypass Tunnel Stage 1. The proposed bypass will connect State road infrastructure (Pacific Motorway) in the south to the Inner City Bypass in the north and will intercept other radial arterials to relieve congestion in the inner city area.

5. Strategic Significance of the Project

5.1 The Need for a Transport Strategy

Brisbane is the centre of the fastest growing urban region in Australia, and increasing pressure is being placed on developing an integrated transport network catering for accessibility and mobility demands, whilst meeting economic, environmental and social goals.

Increasing transport congestion will have a major detrimental impact on both the economic growth and urban amenity of Brisbane and South-East Queensland and urgent action is required at a State, city and local level. Failure to provide the necessary infrastructure to manage these adverse impacts, including public transport and roads, will result in additional cost to the community and a decline in environmental and economic values.

The future economic and social development of the South East Queensland region, and in particular the City of Brisbane, will rely on the provision of an efficient and effective transport network supported by travel demand management strategies addressing public transport, traffic management, parking and travel behaviour.

Analysis undertaken for Brisbane City Council demonstrated that if no new road, public transport or travel demand management initiatives were implemented, extreme and untenable congestion would exist throughout the Brisbane metropolitan area by 2016. The number of private vehicle kilometres travelled is projected to double, reducing traffic flow on almost all road corridors to Level of Service (LOS) E or worse. LOS E occurs when traffic volumes are at or close to capacity, flow is unstable, and minor disturbances will cause a breakdown of traffic flow. The number of new traffic lanes required to accommodate this traffic growth will exceed the physical ability to accommodate them, and the government's capacity to fund them. A significant residual road program will be required to deal with congestion, even with major shifts in public transport use.

A balanced transport strategy including public transport projects and services, orbital road improvements/river crossings and road pricing measures is needed over the next 15 years to ensure that congestion does not exceed acceptable levels. A system of radial and ring or orbital capabilities is a solution to those deficiencies and to the problems caused by growing demands. Brisbane City's road and public transport network, however, has distinct gaps that complicate the establishment of a logical ring road network. These gaps have a significant impact on public transport performance due to a reliance on buses that necessarily use road space.

5.2 Development of a Transport Plan

The *Transport Plan for Brisbane 2002-2016* aims to reduce traffic congestion, improve public transport and protect the environment. Council's objectives for the city are accessibility, economic prosperity and livability, and economic development must not come at the expense of

the environment. Development must be environmentally sustainable and must enhance livability. To do nothing would be contrary to these objectives. Increased road congestion will have an adverse economic impact on the community, diminish accessibility and degrade the environment. Public transport has been shown not to provide a complete solution as patronage has continued to decline in relative terms irrespective of the delivery of new infrastructure and an increasing financial commitment to public transport subsidies.

The Transport Plan will, in general:

- Provide a ring road system to move traffic across and around the CBD away from congested areas;
- Remove 50,000 vehicle trips per day from the CBD area of Brisbane;
- Give priority to efficient passenger transport by providing new bus and transit lanes;
- Free up bottlenecks at major centres, bridge approaches, and major intersections where traffic capacity is chronically constrained: and
- Improve road connections to new growth areas.

5.3 Conclusion

The North-South Bypass Tunnel Stage 1 is part of an overall strategy to improve the efficiency of Brisbane's road network, consistent with long-established and accepted regional and city-wide transport planning objectives. The project is one part of the implementation of the *Transport Plan for Brisbane 2002 – 2016* which has been public policy of the Brisbane City Council and is an outcome of the integrated local transport planning process.

6. Complexity of Government Requirements

6.1 Planning Approvals Framework

6.1.1 Introduction

The North-South Bypass Tunnel is a major project for the City in terms of its capital cost, its beneficial impacts on the City's road and transport networks, and its benefits to inner city communities, the City's air quality, levels of accessibility and livability.

The development of the tunnel project requires a range of approvals. As a major project, a number of options are available to gain the necessary approvals and proceed to construction. The options include:

- declaration as a 'significant project' under the *State Development & Public Works Organisation Act*, leading on to either an application for a designation of community infrastructure or a development permit under the *Integrated Planning Act*;
- proceed with a declaration as a 'significant project', leading into a development application under the *Integrated Planning Act*;
- proceed with any necessary development applications under the *Integrated Planning Act* for the whole of the process;
- a range of other, less direct options, including the dedication of the route as a 'road' under the Local Government Act, with acquisition under the Acquisition of Land Act, with subsequent risks for various financing options.

Council is seeking to proceed with the project under the *State Development and Public Works Organisation Act 1971*.

Some aspects of the project are likely to be considered as 'development' and are likely to be assessable under the City Plan. Other aspects are also likely to constitute development, including environmentally relevant activities, which is assessable through the integrated development assessment system.

The EIS process will involve an extensive process of consultation, integrated with the technical environmental studies and concept development. The consultation process will include the statutory notifications for the draft terms of reference for the EIS, and the draft EIS.

6.1.2 State Development and Public Works Organisation Act

Brisbane City Council is seeking declaration of the NSBT Project as a 'significant project' under the *State Development and Public Works Organisation Act 1971* (SDA). This Act sets out the requirements for environmental assessment and public review of an Environmental

Impact Statement (EIS) and associated process specified in the Act. It also outlines the relationship of the environmental impact assessment process with the *Integrated Planning Act, 1997* (IPA).

Matters to be addressed in an EIS prepared under the SDA are prescribed in Schedule 1 of the *State Development and Public Works Organisation Regulation 1999*.

The EIS process includes provision for:

- the public notification and development of the Terms of Reference (ToR) for the EIS;
- public notification of the EIS which must address the finalised ToR;
- the receipt and review of public submissions on the EIS;
- the evaluation of the EIS and public submissions and preparation of an Evaluation Report by the Coordinator-General, (the Coordinator-General's Report).

6.1.3 The Integrated Planning Act

The *Integrated Planning Act 1997* (IPA) seeks to achieve ecological sustainability through:

- the coordination and integration of planning at the local, regional and State levels;
- managing the process by which development occurs; and
- managing the effects of development on the environment.

While the impact assessment process under the integrated development assessment system (IDAS) closely resembles an "EIS styled" process, there is currently no formal and transparent process under the IPA requiring the preparation of a statutory EIS for major projects such as the proposed NSBT Stage 1. The SDA explicitly provides for an environmental impact assessment process and is considered to be more appropriate to this significant project.

If the NSBT project and its various activities or works is defined as a material change of use or impact assessable development (or both), then the EIS process (under the SDA) is taken to be the referral and notification stages of the development application process through IDAS.

The Co-ordinator General's Report on the EIS has the same effect as if it were a concurrence agency's response to a development application under IPA through the IDAS process. The Report on the EIS may direct that certain conditions be attached to the approval, that the approval be for part only of the proposed development, that a preliminary approval only may be given, or that the application be refused.

The EIS process may be undertaken before or during the application for development approval. If undertaken prior to the development application the IDAS process would go directly from

development application stage to decision stage based on the Co-ordinator General's assessment of the EIS and recommended conditions for approval or otherwise to the Assessment Manager.

Public submissions on the impact assessment components are taken to be submissions for consideration in the decision stage of IDAS and attract appeal rights.

6.1.4 Development and Other Approvals

Those aspects of the NSBT Stage 1 Project which will require an application for development approval will be reviewed during the EIS process. Assessable development aspects of the project will be defined by both by relevant planning scheme (Brisbane City Plan 2000) and the IPA (Schedule 8).

Development under City Plan

Under the provisions of City Plan the tunnel and associated road infrastructure works would be defined generally as a 'Utility Installation' unless explicitly exempted by special provisions. There will be above ground surface works associated with the portal entries and connections to the existing road infrastructure that would include a range of development definitions including:

- carrying out building work;
- carrying out operational work;
- reconfiguring a lot;
- making a material change of use of premises.

There will also be extensive works below the surface of the land. These aspects will need to be fully explored during the EIS process and prior to the making of any development application, if and where required.

The deposition of the spoil, depending on its final location may also trigger a development application for Operational Works application for Filling and Excavation. This may also apply to the tunnel construction.

Approvals which may be required for some aspects of the development remain unresolved at this stage and it is anticipated that during the impact assessment process the uses will be defined and the level of assessment required under the provisions of City Plan will be determined.

City Plan Codes

The following list provides an indication of the City Plan codes likely to be relevant to the project in any assessment of development for the project under City Plan. The identified codes address both the impact of the construction and the operation of the tunnel, and cover all aspects

of the development. The potential off-site impacts through activities such as transport and disposal of spoil has also been considered in the compilation of this list.

The preparation of an EIS enables the provisions of the relevant codes to be addressed specifically.

- Acid Sulfate Soils Code;
- Biodiversity Code;
- Filling and Excavation Code;
- Industrial Amenity and Performance Code;
- Industrial Design Code;
- Landscaping Code;
- Light Nuisance Code;
- Operational Works Code;
- Services, Works and Infrastructure Code;
- Stormwater Management Code;
- Subdivision Code;
- Transport, Access, Parking and Servicing Code;
- Waterway Code;
- Wetland Code.

City Plan Policies

The following list provides an indication of the City Plan Policies likely to be relevant to the project in any assessment of development for the project under City Plan:

- Acid Sulfate Soils Planning Scheme Policy;
- Air Quality Planning Scheme Policy;
- Brisbane River Corridor Planning Scheme Policy;
- Community Impact Assessment Planning Scheme Policy;
- Consultation Planning Scheme Policy;
- Environmental Impact Assessment Planning Scheme Policy;
- Hazard and Risk Assessment Planning Scheme Policy;
- Heritage Register Planning Scheme Policy;
- Impact Assessable Uses Planning Scheme Policy;

- Management of Urban Stormwater Planning Scheme Policy;
- Natural Assets Planning Scheme Policy;
- Noise Impact Assessment Planning Scheme Policy;
- Planting Species Planning Scheme Policy;
- Transport, Access, Parking and Servicing Planning Scheme Policy;
- Transport and Traffic Facilities Planning Scheme Policy;
- Urban Design Advisory Panel Planning Scheme Policy.

Brisbane City Council Local Laws

The following list provides an indication of Council Local Laws likely to be relevant to the project in any assessment of development for the project under City Plan:

- The ‘Gabba Traffic Area Local Law 2000;
- Heavy and Long Vehicle Parking Local Law 1999;
- Lang Park Traffic Area Local Law 2002;
- Natural Assets Local Law 2003;
- Streets, Bridges and Culverts;
- Chapter 12 – Public Health, Safety and Convenience;
- No. 14 – Parking and Control of Traffic.

6.1.5 Community Infrastructure and Development

Brisbane City Council may choose to designate land associated with the NSBT Stage 1 Project for Community Infrastructure under Part 6 of the IPA. Alternatively, the Council may request that a Minister of the Queensland Government designate the land for community infrastructure, subject to appropriate arrangements for the transfer of acquisition costs and responsibilities. Development under a designation is regarded as exempt development and does not require a development permit – but only to the extent that the development would be self-assessable or assessable development under the City Plan. The effect of designation does not affect self-assessable or assessable development listed in Schedule 8 of the IPA.

Schedule 8 could include for the NSBT Stage 1 Project the following assessable development requirements:

- Reconfiguring a lot under the *Land Title Act 1994*, unless it is for various things including acquisition (either under or not under the *Acquisition of Land Act 1967*), by a constructing authority defined in the Act and for a purpose set out in the schedule of the Act;

- Development prescribed under the Environmental Protection Regulations for carrying out an Environmentally Relevant Activity under the Environmental Protection Act – this may include the following ERAs:
 - ERA 7 - Chemical storage - storage of ozone depleting substances, gases or dangerous goods in containers > 10m³.
 - ERA 11 – Crude oil or petroleum product storage – storage in tanks or containers with a combined volume >10,000L.
 - ERA 17 - Fuel burning – including for a standby generator capable of burning 500kg or more of fuel per hour.
 - ERA 19 – Dredging material – dredging material from the bed of any waters – no minimum trigger.
 - ERA 20 – Extracting rock, sand, clay, gravel, loam or other material – no minimum trigger.
 - ERA 22 - Screening materials– Includes screening, washing, crushing, grinding, milling, sizing or separating material extracted from the earth with a design capacity > 50t a year.
 - ERA 28 – Motor vehicle workshop – motor vehicle mechanical or panel repairs are carried out in the course of a commercial or municipal enterprise.
 - ERA 62 - Concrete batching – producing concrete or a concrete product by mixing cement, sand, rock, aggregate or similar materials in works having a design production capacity >100t a year.
 - ERA 83 – Transporting “regulated waste” (Schedule 7 of the Environmental Protection Regulation b1998) in quantities >250kg / load.

The application of these ERAs to the NSBT Project and their effect on the requirements for assessable development and the applications required for development permits under the IPA would be assessed during the EIS process.

A Local Government Designation for Community Infrastructure can also only be done by:

- including the designation as a substantive provision of its planning scheme (ie making amendments to City Plan through the IPA plan making process; and
- on land it does not own by giving written notice of the proposed designation to land owners before the start of the consultation period for making or amending the planning scheme intended to include the designation.

6.1.6 Other Legislation and Approvals

An assessment of relevant Commonwealth and Queensland State Legislation and the associated approvals has been undertaken to provide a preliminary understanding of the approvals phase of

the project and the extent of approvals required. Table 6.1 is a summary of the permits and approvals which may be relevant to the project.

■ **Table 6.1 – Statutory Approvals**

Legislation	Department	Trigger	Permit/Licence
Commonwealth Legislation			
Environmental Protection and Biodiversity Conservation Act 2000	Environment Australia	Development affecting: <ul style="list-style-type: none"> ▪ World Heritage Areas; ▪ RAMSAR wetlands areas; ▪ Nationally listed threatened species or communities; ▪ Listed migratory species; ▪ Development involving a Commonwealth marine area; ▪ Nuclear actions 	Commonwealth Minister for Environment approval required if activity is likely to have a significant impact on a matter of national environmental significance. The possible EPBC triggers from the NSBT project are impacts on Ramsar wetlands, nationally listed threatened species and ecological communities, and listed migratory species.
Queensland State Legislation			
Aboriginal Cultural Heritage Act 2003 (not yet in force)	NRM	Duty of care to take all reasonable and practicable measures not to harm Aboriginal cultural heritage (S23).	CHMP required.
Coastal Protection and Management Act 1995	EPA	Operational works, carrying out tidal works in, on and above tidal waters	Development Permit for Operational Works
Environmental Protection Act 1994	EPA	Conducting an environmentally relevant activity	Development Approval
Environmental Protection Regulation 1998	EPA	ERA 7: Storage of chemicals	Approval or license required depending on amount to be stored
Environmental Protection Regulation 1998	EPA	ERA 11: Storage of petroleum	Approval or license required depending on amount to be stored
Environmental Protection Regulation 1998	EPA	ERA 17: Fuel Burning	Approval or license required depending on amount to be stored
Environmental Protection Regulation 1998	EPA	ERA 20: Extracting rock or other material	Approval or license required depending on amount to be removed
Environmental Protection Regulation 1998	EPA	ERA 22: screening, washing, crushing, grinding, milling, sizing or separating material extracted from the earth	Approval or license required depending on amount to be removed
Environmental Protection Regulation 1998	EPA	ERA 62: Concrete Batching	License required

Legislation	Department	Trigger	Permit/Licence
Environmental Protection Regulation 1998	EPA	ERA 83: Transporting Waste	License required
Explosives Act 1999	NRM	Possession, storage and use of explosives	
Fisheries Act 1994	Qld. Fisheries Management Authority	Undertake works or related activity in a fish habitat area	Permit required
Marine Parks Act 1982	EPA	Section 20, works within a zoned area within a marine park.	Authorisation from Minister required.
Marine Parks Regulation 1990	EPA	Section 3, part 9: dumping soil, road works or other works in a marine park area	Permit required
Nature Conservation Act 1992	EPA	Taking, using, keeping or interfering with cultural or natural resource of a protected area.	License or Permit required (s62)
Nature Conservation Act 1992	EPA	Taking, using, keeping or interfering with a protected animal.	License or Permit required (s88)
Nature Conservation Act 1992	EPA	Taking, using, keeping or interfering with a protected plant.	License or Permit required (s89)
Nature Conservation Act 1992	EPA	Taking, using, keeping or interfering with wildlife not protected under the Act, but found in an area identified as a critical habitat, or major interest by a conservation plan	License or Permit required (s97)
Nature Conservation Regulation 1994	EPA	Clearing of protected plants	Permit required (s107)
Queensland Heritage Act 1992	EPA	Crown carrying out a development in heritage registered places.	Approval required. Prepare a report with respect to the provisions of section 6 of the Regulations
Soil Conservation Act 1986	NRM	Part 4 and Part 7. A project plan will be developed by NRM for the project area detailing soil conservation measure	Must comply with the soil conservation plan.
Integrated Planning Act	EPA	IPA Schedule 8 (incorporated State Coastal Management Plan). Operational works, carrying out of tidal works in on and above tidal waters	Development Permit for Operational Works
Transport Infrastructure Act 1994	Main Roads	Connection to a State road	

Legislation	Department	Trigger	Permit/Licence
Transport Operations (Road Use Management – Dangerous Goods) Regulation 1998	Queensland Transport	Transportation of dangerous goods.	Must ensure that vehicles and operators are licensed.
Transport Operations (Road Use Management) Regulation 1998	Queensland Transport	Development of road infrastructure	Prepare road use management strategy
Vegetation Management Act 1999 and Land Act 1994.	NRM	Clearing of remnant vegetation	Permit required
Water Act 2000	NRM	Chapter 2, Part 8: Destroy vegetation, place fill or excavate in a watercourse	Permit required (s266)

6.2 Agency consultation

Given the range of potential approvals demonstrated above, there will be a complex range of local, State and Commonwealth requirements for the project. To ensure all requirements are met and addressed adequately, extensive agency consultation will be undertaken throughout the EIS preparation. In relation to the EIS, the following referral agencies and advisory groups will be contacted during the preparation of the EIS (in addition to local groups, residents and community associations):

Local Government

- Brisbane City Council (internal branches)

Commonwealth Government

- Federal Department of Transport and Regional Services;
- Federal Department of Environmental and Heritage (previously Environment Australia);
- Civil Aviation and Safety Authority.

State Government

- Queensland Department of Environment and Heritage (particularly the EPA);
- Queensland Department of Families, Youth and Community Care;
- Queensland Department of Education;
- Queensland Health;
- Queensland Treasury;

Initial Advice Statement

- Queensland Department of Natural Resources, Mines and Energy;
- Queensland Department of Local Government and Planning;
- Queensland Department of Main Roads;
- Queensland Department of State Development;
- Queensland Police Service;
- Queensland Department of The Premier and Cabinet;
- Queensland Rail;
- Queensland Transport;
- Translink;
- Queensland Department of Public Works and Housing;
- Queensland Emergency Services (Queensland Ambulance Service, Fire Service, and State Emergency Service).

Other Stakeholders

These include but are not limited to:

- Disability Services Queensland;
- Princess Alexandra Hospital;
- Royal Brisbane Hospital;
- Electricity authorities, gas supply agencies, communication service agencies;
- Brisbane Transport;
- Bus & Coach Association;
- Indigenous / Native Title representatives;
- Queensland Conservation Council;
- Bicycle Queensland;
- Taxi Council of Queensland;
- RACQ;
- Queensland Trucking Association;
- Local business groups and Chambers of Commerce; and
- Other community groups.

7. Effects on Relevant Infrastructure

7.1 Transport Infrastructure

7.1.1 Road Network

Traffic modelling undertaken to date suggest that there will continue to be traffic growth on the road network, regardless of whether the NSBT is built or not and there will be diversions of vehicles on the network to provide for changes in users travel requirements once the tunnel is operational. It is likely that the tunnel will result in major reductions in traffic on key roads, although other streets may have some increase in traffic volume.

It is not known whether there will be an overall increase in vehicle kilometres travelled (VKT) under the NSBT development compared with the network without the NSBT. It is possible, however, that improved public transport opportunities (such as dedicated bus lanes and more efficient travel) which would result from the proposal may cause some overall relative reduction in VKT. Further modelling will determine the extent to which car travellers would divert to public transport and whether the NSBT Stage 1 would result in induced car travel demand.

The construction phase of the project has potential to provide additional traffic, including heavy vehicles, on the regional and local road network. Of particular note would be the use of heavy vehicles to remove spoil from the site to an appropriate disposal or storage location. It is possible, however, that barging of spoil on the Brisbane River may be considered, and consideration of this option for spoil removal would be undertaken as part of the EIS. Other traffic movements during construction would be related to the delivery of construction equipment and materials to the site.

7.1.2 Rail Network

The proximity of the rail network to parts of the proposed development allows consideration to the transport of equipment and spoil by rail. Options for this will be assessed during the EIS.

At this stage of concept development it is unlikely the rail network would be affected directly by the construction of the NSBT stage 1, although the capacity of the rail network to carry spoil and other materials will need to be assessed if that transport option is considered.

7.2 Public Utility Services

7.2.1 Water Supply and Drainage

Water will be required to assist compaction of road base and embankments, for dust suppression during construction activities and for amenity use at construction compounds. It is likely that water will be drawn from Brisbane Water supplies and disposed off to the sewer or stormwater (following appropriate treatment).

Water supply, sewer and stormwater pipes may need to be relocated during construction.

The provision of the fire emergency system in the operating tunnel may require augmentation of the water supply system in the area.

7.2.2 Energy Usage

Energy usage during construction would be of some significance if equipment such as tunnel boring machines (TBMs) are used. Similarly, the operation of ventilation systems in tunnels of this size can rely on significant energy usage. The EIS will need to assess the extent to which these energy requirements will be met by Energex.

Transmission lines and underground cables and gas mains may be considered for relocation throughout the project.

7.2.3 Telecommunications

It is possible that Telstra and other agencies may be required to relocate lines. Further work will be undertaken during concept development to assess the extent of this.

8. Potential Environmental Effects

For the purposes of this chapter, environmental effects (listed in SDA Section 27) includes environmental, social and economic effects, both positive and negative. The NSBT Stage 1 will have substantial environmental, social and economic benefits at the regional, city and local scales, and a number of potentially adverse environmental and social impacts, especially at the local level, which will need to be carefully considered and mitigated against through considered design and management approaches. Benefits are expected to include:

- Improved network travel time and reduced traffic accidents and congestion, with associated social benefits;
- Increased road capacity which will be converted to the advantage of buses and high-occupancy vehicles, pedestrians and cyclists;
- Reduced noise levels and air quality impacts over significant areas, where the diversion of traffic from the existing road network will occur into the tunnel. This will result in a reduction in severance effects, amenity and access improvements, with associated economic (property values and urban renewal) benefits. There may also be better regional air quality outcomes due to improved vehicle operation.

The facility will also be constructed to current standards, with particular attention to road spillage and road pollution run-off. These improved measures are not features of existing road infrastructure.

The Prefeasibility and the Engineering Taskforce reports provided information on potential environmental issues that may arise. Based on this material and a general understanding of potential environmental issues, major areas of environmental interest were examined. These preliminary views are provided below to indicate the possible areas of environmental benefit, environmental concern, and the risks that may need to be managed.

The area of the proposed works is shown on the attached aerial photograph (Figure 2).



Figure 2

8.1 Land Use, Land Acquisition and Urban Renewal

8.1.1 Direct changes in use and acquisition

Changes in land use will occur at key locations along the route. This will involve the conversion of usage along the existing road network adjacent to the proposed portals and ventilation outlets, whereby current usage (residential, commercial, industry) will be replaced by road facilities. Some of these areas (primarily at the northern end of the project) are already in the ownership of Brisbane City Council, while other areas will need to be acquired.

As well as the need to acquire some surface land, land acquisition in strata will be needed where the tunnel will pass under a variety of buildings and lands in private ownership. The process of acquisition and change of title on the surface and in strata (tunnel) may be undertaken through the provisions of the *Land Acquisition Act, 1967*. This process will be developed throughout the EIS.

The issue of residual land and its use, consolidation or disposal will also be considered throughout the project.

8.1.2 Local Planning

Parts of the project may be subject to the provisions of City Plan 2000 and associated Local Plans. City Plan designations for the route are mostly residential and commercial.

Seven local plans cover the route, as follows:

- Kangaroo Point Peninsula;
- East Brisbane Coorparoo;
- West End Woolloongabba;
- New Farm Teneriffe Hill;
- Fortitude Valley;
- Bowen Hills; and
- Grange District.

These have been prepared in consultation with the local community and government stakeholders and provide an integrated plan for each locality. These plans do not have any reference to the proposed tunnel. Accordingly, the EIS will need to assess the consequences of the proposed works on the plans, either directly where land use changes may result from tunnel construction or indirectly where land use changes may be induced through improved amenity and economic development.

8.1.3 Urban Renewal

Locations where traffic volumes will reduce (Fortitude Valley, Kangaroo Point, Woolloongabba), resulting in reduced congestion and improved amenity for residents and/or businesses, will be considered in the context of the community and economic impacts on neighbourhoods and businesses, and the general opportunities for urban renewal.

Other areas where traffic flows are likely to increase (near the portals at Bowen Hills, Kangaroo Point) will also require careful consideration to ensure the urban environment does not deteriorate and that enduring and acceptable outcomes are achieved for the local communities.

The EIS process will need to engage with local communities (residents, businesses, other interest groups) to identify matters of local value or significance, and matters of concern now and upon commencement of tunnel operations. Of note there are a number of major landowners and interest groups in the corridor of interest (eg RNA, Urban Renewal Task Force, Major Sporting Venues Authority, Education Queensland) whose needs and aspirations ought to be considered in the concept design and impact assessment stages of the process.

8.2 Landscape and Visual Effects

The condition of urban areas and visual values along the proposed alignment vary from poor (eg run down and in poor repair) to high. The project will be assessed for its visual values and the possible effects of the proposal on those values in the existing urban context.

It is possible that landscape mitigation measures (including appropriate urban design) may be required where the proposed tunnel construction will have an impact on the existing surface features. The direct impact areas such as connections to the existing road network will require landscape works to minimise the visual impacts of the project on the surrounding areas. In particular, there is potential for visual impacts from the flyover on- and off-ramps. A detailed assessment will be undertaken to determine the nature and extent of such impacts on residents and surrounding areas, and how those potential impacts can be made into a benefit.

Similarly, ventilation outlets will be considered in their urban context to ensure their integration into the built urban form.

8.3 Geology and Soils

The geology of the study area comprises Alluvium, the Upper Ipswich Coal Measures (Tingalpa Formation) of predominantly mudstones with interbedded sandstones and conglomerates, Brisbane Tuff and the Neranleigh Fernvale Formation.

The project area contains different soil types including prairie soils with some sandy alluvial surface soils, lithosols and shallow podzolic soils. Most surface soils are classed as *easily erodable to erodable*.

Acid sulfate soils (ASS) and potential acid sulfate soils (PASS) are expected in the project area. Low ASS may exist around the Main Street area near the Brisbane River and in the vicinity of Wickham Street. The intersections of Ipswich Road with Broadway Street and with Balaclava Street also have low ASS potential, and the proposed route near Enoggera Creek runs through areas with low to moderate ASS potential. Testing will be undertaken along the length of the route and areas where disturbance may occur and management measures for handling ASS identified.

8.4 Hydrology and Water Quality

The Brisbane River is the main waterway potentially affected by works, with Enoggera Creek and Breakfast Creek as a tributary of the Brisbane River being located near the northern portal area.

Water quality in these waterways may be affected by the works. It is likely that tunnelling would be beneath the bed level of the Brisbane River, so few if any water quality issues would be encountered. There is potential, however, for water quality to be affected through erosion of surface disturbed areas (soils with highly erodable characteristics were noted above) and sedimentation entering the stormwater system and the nearby waterways.

There is also the likelihood of encountering groundwater when excavating the tunnel, with any groundwater disposal during construction and operation of the tunnel requiring careful management. Alteration of the groundwater flow could occur, and further investigation will be undertaken to determine groundwater flows, volumes and quality. A detailed assessment will be required for options for disposal of groundwater from the tunnel.

The potential for flooding is an issue, and the design of the tunnel will need to ensure it is not subject to flood inundation, nor has any effects on the existing flood regime for the Brisbane River.

8.5 Natural Environment

The natural environment in the vicinity of the project is limited in its extent. Except for the banks of Enoggera Creek, existing flora is mostly within the Pacific Motorway buffer zones or comprises planted street trees, and is not considered environmentally significant. However, it should be noted that much of the planting was undertaken as a community environmental program by Greening Australia.

In Enoggera Creek and its tributary, the works may have an impact on estuarine vegetation, including mangroves, and estuarine fauna. Detailed impact assessment of flora and fauna along the creek, including possible mitigation measures, will be undertaken.

Several Vegetation Protection Orders (VPOs) are in effect in the vicinity of the project. These trees are valued for amenity and for cultural reasons and the potential impacts of the proposal, including groundwater draw-down, will be assessed.

8.6 Air quality

8.6.1 Construction

Air quality issues associated with construction could include dust generation due to excavation and wind erosion activities and exhaust emissions from increased traffic and machinery use on site.

The soil types in the area have been identified as *easily erodable* to *erodable* and this increases the potential for dust generation, especially during dry weather. Potential impacts on residential properties near the project sites will be assessed using dust gauging and dispersion prediction techniques, and negative impacts identified would need to be mitigated against by appropriate site management practices and dust monitoring programs.

Emissions from construction machinery can be managed by appropriate maintenance and control of vehicle exhausts.

8.6.2 Operation

Vehicle emissions from the tunnel will have air quality implications in terms of air quality in the tunnel and emissions from ventilation outlets and the tunnel portals. Ventilation of the tunnel, using designed ventilation outlets and/or the tunnel portals is necessary to ensure that air quality levels in the tunnel do not affect vehicle occupants and maintenance personnel.

Potential effects of ventilation outlets on the surrounding community will be assessed using dispersion modelling and assessment of concentrations of potential pollutants and background levels against established criteria for those pollutants. Changes in air quality on the surface road network resulting from increased or reduced traffic volumes will be assessed. In areas where surface traffic volumes are significantly reduced, it is expected that air quality would be improved.

8.7 Noise and Vibration

Due to the type of construction equipment generally used on such a project, high noise levels are possible during construction. There are several noise-sensitive areas along the site, including the Mt Olivet Hospital, Southbank Institute of TAFE, All Hallows College and Fortitude Valley Primary School, along with residential areas. A detailed assessment of construction noise impacts will be undertaken and consultation with these and other potentially affected institutions and with the residents involved will be undertaken during the study, to inform them of likely construction noise issues.

There is limited risk of long-term noise impact from use of the proposed route since most of it is underground. Use of the tunnel by vehicles may also reduce the use of surrounding roads, and thus lead to reduced noise levels in local areas, with a consequential social benefit. A detailed noise assessment will be undertaken to determine impacts and to provide measures to mitigate noise, if required.

There is potential for vibrational impacts from the construction activities, in particular the tunnelling activities. Impacts on sensitive equipment (for example, hospital equipment) and the stability of heritage sites must also be considered. A detailed assessment will be undertaken to determine the impacts and how to manage any potentially negative effects.

8.8 Cultural Heritage

8.8.1 Non Indigenous

There are two types of sites on Council's Heritage list: those listed on the Queensland Heritage Register of the *Queensland Heritage Act 1992* and those listed for significance to Brisbane City. The NSBT will pass by or beneath a number of listed heritage sites and the potential exists for direct or indirect (vibration) effects to occur during construction. A detailed assessment of the potential impacts of the proposed works on heritage listed structures or other buildings of merit will be undertaken during the EIS.

8.8.2 Indigenous

Historic use by indigenous peoples of the area through which the NSBT passes is likely to have been quite significant. However, the footprint of the works is largely within an already constructed roadway.

Consultation with the Cultural Heritage Branch of the EPA will be undertaken to determine if there are any sites of indigenous significance within the project area. One site within the project area has been identified as a site of known indigenous cultural heritage significance. This is the Yungaba Migrant Centre at Kangaroo Point. This site is also listed on the Queensland Heritage Register pursuant to the Queensland Heritage Act. However, it is likely that there are other sites of significance to the indigenous people of the area and accordingly an indigenous cultural heritage survey be undertaken along the length of the route.

A detailed consultation process will be undertaken with the recognised indigenous groups and Native Title claimants, as part of the EIS.

8.9 Socioeconomic Effects

The existing social conditions of the study area will be assessed during the EIS, although it is clear that the community is densely populated, culturally diverse and from a wide range of socioeconomic backgrounds.

As outlined at the beginning of this chapter there are many potentially positive social outcomes which may result from this project. These may include:

- Improved access to services and public transport;
- Improved amenity, especially in terms of air quality, noise, visual effects and urban renewal;
- Reduced severance;
- Employment opportunities and economic development.

There are also a number of potentially negative effects which may occur in the project area, during both construction and operation, and these may relate to:

- Land acquisition and potential displacement;
- Disruption of local access during construction;
- Effects on community structure and functioning, including severance;
- Effects on residential amenity;
- Effects on workplace amenity;
- Psychological effects; and
- Socioeconomic impacts.

A social impact assessment will be undertaken which will involve assessing social changes – effects of the proposal on the local community -which may result from the proposed works, assessing the significance of those changes and identifying means of mitigating those potential impacts. The social costs in economic terms will also be evaluated, and the impacts of and opportunities for the project on local businesses and urban renewal will be considered.

8.10 Waste Management

There is the potential for a significant amount of waste to be generated and managed during both the construction and operational phases of the project. This would include:

- Construction and demolition waste – primarily spoil from tunnelling activities, but also concrete and pavement materials.

The location for the disposal of material excavated from the tunnel has not been selected, the tunnelling method not yet specified with a resulting impact on the nature of the excavated material, and the potential environmental impacts that may arise from the excavated material have not been assessed. Careful assessment and the selection of suitable disposal locations and methods will be undertaken.

Further testing needs be undertaken where the works are in the vicinity of any contaminated land to determine the extent of contamination and management required. To remove soil from sites registered on the Environmental Management Register, approval will be required from the EPA.

- Solid– this may include plastics, paper and putrescible wastes such as food or canteen matter – and green waste – including environmental weed species.

Strategies will be developed for maximising the recycling of as much waste as practicable, and appropriately disposing of the rest.

9. Employment Opportunities

The construction of the NSBT Stage 1 will potentially be a major generator of employment both directly to those employed on the assessment, design, management and construction of the infrastructure, and through the opportunities for the supply of materials and equipment to the project. As an indication of the employment benefits generated during construction, an assessment was made using the BTCE (1996) general equilibrium model of the Australian economy to estimate the contemporaneous employment effects of road construction. The modelling exercise estimated total employment gains of 13.4 jobs per million dollars (2003-2004) of road expenditure during the construction period. Applying the BTCE (1996) factors, the construction expenditure associated with the proposal would stimulate the creation of the order of 11,000 full time equivalent positions, of which some 2,500 would be direct jobs. In other words, over the expected four year construction period, 2 750 full-time equivalent jobs per year would be created, of which 625 would be direct jobs.

The operational NSBT project will generate additional employment opportunities through the City of Brisbane, the South East Queensland region and the State of Queensland through improved transport opportunities, improved connectivity, urban renewal, and multiplier effects from the economic activity generated by the project.

A detailed assessment of job creation, skills development and training opportunities will be included within the EIS.

10. Consultation

Limited public and stakeholder consultation has been undertaken for the project, although there is some level of awareness of the project within the community. A comprehensive Consultation Program will be undertaken throughout the study and will inform both impact assessment and design construction.

Consultation is an essential element in the EIS program as it will assist in identifying issues and potential impacts, in disseminating information on the project to the community and stakeholders and in building relationships between Council, the community and Government agencies. It will assist community members to explore the benefits, impacts and issues affecting the project's ability to meet its objectives. This will be achieved by providing information about issues, impacts and benefits, facilitating community participation in scoping and reviewing study outputs and enabling community review of project documentation. This, in turn, will assist to ensure the project's design provides the best "fit" for the local needs.

The consultation program will include:

- Public exhibition of the draft terms of reference for the EIS;
- The establishment of community reference or interest groups, and regular briefing of these groups by members of the study team;
- Community information sessions;
- Stakeholder briefings;
- Public displays of information, either at specific exhibition areas or in newspapers;
- Provision of newsletters, information sheets and access to a web site specific to this project;
- A 1800 telephone line for ease of contact between the community and the study team;
- Public exhibition of the draft EIS; and
- Continued contact with the community through later phases of the project.

All residents, businesses and community groups in the study corridor and adjacent suburbs will be invited to participate in the consultation. Communities to be consulted throughout the project include Windsor, Bowen Hills, Newstead, Herston, Fortitude Valley, Kangaroo Point, East Brisbane, Woolloongabba, and adjacent suburbs of City, Spring Hill and New Farm.

11. References

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