



Coordinator-General's report

Northern Link Road Tunnel

Released: April 2010

Report evaluating the Environmental Impact Statement pursuant to section 35(3) of the *State Development and Public Works Organisation Act 1971*



Coordinator-General's report – Northern Link Road Tunnel project

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Synopsis

This Coordinator-General's report has been prepared pursuant to section 35(3) of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act) and provides an evaluation of the environmental impact statement (EIS) for the Northern Link Road Tunnel Project (the project). The Department of Infrastructure and Planning (DIP) managed the impact assessment process on my behalf in accordance with the SDPWO Act.

Brisbane City Council (the proponent) is proposing to construct the project to link the Centenary Motorway at Toowong with the Inner City Bypass at Kelvin Grove. Surface works for the project extend into Mount Coot-tha and Herston.

The project was declared a 'significant project for which an EIS is required' pursuant to s.26(1)(a) of the SDPWO Act by gazette notice on 2 November 2007.

On 30 November 2007, a delegate of the Commonwealth Minister for Environment, Heritage and the Arts determined that the project was not a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). Therefore no assessment under the EPBC Act is required.

The EIS for the project proposed two separate unidirectional two-lane parallel road tunnels, 10 metres apart, from the Centenary Motorway to the Inner City Bypass with local connections to the tunnel at Milton Road, Toowong and Kelvin Grove Road, Kelvin Grove. The tunnel would pass below the suburbs of Toowong, Auchenflower, Paddington, Red Hill and Kelvin Grove and would also include cross passages between the two tunnels every 120 metres along their length.

The purpose of the project is to assist in reducing road congestion in the western and northern areas of Brisbane. As part of an overall transport strategy, the project would help relieve congestion currently experienced on major roads from the west of Brisbane and would assist in providing an effective bypass of the Brisbane CBD.

The submission period for the EIS for the project was from 25 October 2008 until 22 December 2008. A total of 213 submissions were received from State Government agencies, organisations and the public. A large majority of the submissions raised concerns with the impacts of the proposed local connections.

The proponent was requested to prepare a supplementary report to the EIS which addressed the issues raised in the submissions as well as to provide information about a number of aspects of the project, including information on the impacts of a 'no local connections' option.

On 20 April 2009, the proponent announced that it had removed the local connections at both Kelvin Grove and Toowong from the proposed project. I understand that, among other things, the proponent considered the concerns raised by submitters in making this decision.

The proponent estimates construction would commence in late 2010 and be completed by mid 2014. The capital value of the project is estimated to be \$1.7 billion and it is expected to create approximately 1400 jobs during the four year construction program. Approximately 85 jobs would be created with the ongoing operation of the project.

This report includes an assessment and conclusion about the environmental effects of the project and any associated mitigation measures. Material that has been assessed includes: the EIS; properly made submissions and other submissions that I have accepted; and any other material that I think is relevant to the project, such as comments and advice from advisory agencies and other entities as well as technical reports and legal advice.

Having regard to the above, I consider that the EIS process conducted for the project has adequately addressed the environmental and other impacts of the project and meets the requirements of the Queensland Government for impact assessment in accordance with the provisions of Part 4 of the SDPWO Act.

I am satisfied that in the broader community interest, there is a need for the project to assist in addressing road congestion in the western and northern areas of Brisbane. The project



represents a solution to a missing link of motorway standard road network connecting the western and northern suburbs and assists with the provision of an effective bypass of the Brisbane CBD. The value of the project to the Brisbane road network will be enhanced by its integration with several other major road infrastructure projects that are currently being undertaken in the Brisbane area, which will become operational during the proposed construction period for this project.

Therefore, **I recommend** that the project, as described in detail in the EIS and modified by the supplementary report and as summarised in section 2 of this report, can proceed, subject to the conditions contained in Appendix 1 of this report and the project commitments made by the proponent throughout the EIS and supplementary report.

I observe that the project does not represent the long term solution to traffic movement through the western and northern Brisbane corridors and that surrounding road networks will reach capacity prior to that of the project. Therefore, **I recommend** to both the proponent and the Department of Transport and Main Roads (TMR) that further road transport and network planning is required to develop long term solutions for greater Brisbane.

I recognise the various potential impacts that the construction and operation of the project will have on parts of the Brisbane community. These include impacts associated with the establishment and operation of worksites, tunnel excavation, support and fit-out activities, the transport of tunnel spoil and the associated support work and the more minor potential impacts of the ongoing operation of the project once it is open to traffic. These impacts were described in the EIS and supplementary report and are evidenced by the other major road infrastructure projects that are currently being constructed in Brisbane. **I acknowledge** that the impacts of the project are significantly reduced by the proponent's decision to remove the local connections from the proposed project.

Accordingly, to mitigate and manage the impacts of the construction and operation of the project, **I impose** conditions in accordance with section 54(B) of the SDPWO Act. Where appropriate, I have considered the lessons learned from the construction of the other major Brisbane road infrastructure projects in imposing conditions for this project to reduce and better manage the potential impacts. Conditions are imposed across a broad range of matters including air quality, noise and vibration, water management, traffic and transport (including pedestrian and cycling) and community engagement. Requirements of conditions include consultation procedures, setting release limits, specifying mitigation and management measures and mandating monitoring and reporting requirements.

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Colin Jensen
Coordinator-General
Date: 23 April 2010



1. Introduction

This report provides an evaluation of the environmental impact statement (EIS) process for the Northern Link Road Tunnel (NLRT) project (the project). The EIS was conducted by the proponent and prepared on its behalf by its principal consultants, SKM/Connell Wagner Joint Venture.

The objective of this report is to summarise the key issues associated with the potential impacts of the project on the physical, social and economic environments at the local, regional, State and national levels. It is not intended to record all the matters which were identified and subsequently settled. Instead, it concentrates on the substantive issues identified during the EIS process.

This report is an evaluation of the project, based on information contained in the EIS, submissions made on the EIS, the supplementary report to the EIS and information and advice from advisory agencies on the supplementary report.

In evaluating the EIS, I have stated conditions and made recommendations for the project for approvals granted under other legislation. These are contained in Schedules 1 and 2 of Appendix 1 of this report. It is important to note that the undertaking of the EIS process under the SDPWO Act does not exempt the proponent from the need to obtain all necessary approvals under relevant Queensland legislation for the project and to otherwise comply with relevant planning and environmental laws and planning instruments.

I also impose conditions for the undertaking of the project in accordance with section 54B of the SDPWO Act. These conditions are contained in Schedule 3 of Appendix 1 of this report. Entities with responsibility for conditions contained in this report are identified in Schedule 4 of Appendix 1.

I have also made some general recommendations in relation to the project which are listed in Schedule 5 of Appendix 1 of this report.

Acronyms and other key terms used in this report are defined in Schedule 6 of Appendix 1 of this report.

The standards and guidelines for environmental management that must be adopted and implemented in the construction and operation of the project are set out in Schedule 7 of Appendix 1 of this report.

A copy of this report will be given to the proponent and it will be publicly notified on the Department of Infrastructure and Planning's (DIP) website at www.dip.qld.gov.au.



2. Project description

2.1 The proponent

The proponent for the project is the Brisbane City Council (BCC). BCC is unique amongst Australian local governments in that in addition to standard council services, it provides and operates a large public transport system, as well as providing and maintaining a comprehensive network of roads with arterial, sub-arterial, district, neighbourhood and local roads.

The proponent has publicly stated its intention to seek a contractor to design, construct, maintain and operate the project and a short list of bidders for such a contract was announced in December 2009.

2.2 Project description

The project is approximately seven kilometres long, including all new line markings and surface road works. It consists of two separate, parallel road tunnels of uniform cross-section, each with two lane carriageways. The two tunnels will be at least 10 metres apart and connected by cross passages every 120 metres along their length. The eastbound tunnel (northern) is approximately 4.6 kilometres long and the westbound tunnel is approximately 4.9 kilometres long. A map of the project is shown in Figure 1.

The tunnels will have openings (portals) to the surface on the Centenary Motorway just west of the Mount Coot-tha Road roundabout at Toowong and on the Inner City Bypass (ICB), near its junction with Victoria Park Road at Kelvin Grove / Herston. There will also be a number of management systems for the tunnel's operation, including mechanical, electrical and ventilation systems and fire and life safety systems.

The design of the project was revised during the EIS process. In April 2009 the proponent decided to remove the local road connections at Toowong and Kelvin Grove that were originally proposed in the EIS dated September 2008. This was in response to, among other things, the significant number of submissions received during the EIS process that expressed opposition to the local connections. Therefore, to be clear, the project subject to my evaluation does not include the local connections to Milton Road and Kelvin Grove Road and the surface road works associated with these local connections that were described in the original EIS documents.

Removal of the Kelvin Grove local connection has allowed the reference design for the tunnels to be deeper below the surface in some locations at the eastern end of the project reducing the potential impacts on the surface of the tunnel alignment during construction. Further, at the western end, the alignment of the transition structures from the cut and cover portals to the surface has moved closer to the Centenary Motorway alignment compared to the original EIS, thereby reducing the area of land required for road works and associated embankments or cuttings on both sides of the Centenary Motorway in Anzac Park and adjacent to the Mount Coot-tha Botanic Gardens.

At the eastern end, the outer and centre lanes of the three-lane ICB westbound continue as the ICB with only the inner lane dedicated to the project. The centre lane on the ICB allows for a diverge right into the outer lane of the two-lane Northern Link project but remains dedicated to the ICB. The effect is to give priority to the continuation of the ICB traffic lanes. For eastbound traffic, the project would surface from portals just west of the Inner Northern Busway overpass and merge via the outside lanes into the ICB.

The construction of the project will involve:

- the establishment of tunnel portal worksites at each end of the project, including an acoustically lined tunnel portal cover shed over the western portal to control dust and noise emission from the tunnelling operations



- cut and cover tunnels for transition to the surface at each end of the project with spoil from the western end to be transported by road to Swanbank and from the eastern end to the Port of Brisbane
- excavation of two mainline tunnels by Tunnel Boring Machine (TBM) commencing from the western end with spoil carried by conveyor to the existing Mount Coot-tha Quarry for processing. It is proposed to operate the TBM's on a near continuous basis.
- construction of two ventilation stations and associated outlets. At the western end of the project a ventilation station will be constructed on Council owned land on the Mount Coot-tha side of the Centenary Motorway, approximately 400 metres west of Mount Coot-tha Road. The station would be cut into or partially buried within the hillside at this location and the outlet would stand above the ventilation station to achieve a minimum height of 20m above the natural ground level at that location. At the eastern end of the project, the ventilation station would be on Council owned land within the Victoria Park Golf Course and would be partially buried in the hill on the eastern side of the Inner Northern Busway, north of the ICB. The eastern ventilation outlet would be approximately 150 metres to the north, on a topographic rise, with a minimum height of 15 metres above the ground level at that location.
- landscaping and rehabilitation of construction sites.

The management of any impacts associated with the stockpiling, handling and processing of excavated material at the quarry will be addressed by an existing development approval issued by the Department of Environment and Resource Management (DERM) for the quarry's operation and consequently is not part of this project. DERM will make a separate determination in consultation with BCC whether the existing environmental authorities for the quarry need to be amended in any way to process the project's TBM spoil through the existing quarry facility. However, the transport of spoil generated by the project from the quarry is evaluated as part of the EIS process.

This evaluation is based on the reference design for the project proposed in the EIS, as modified by the supplementary report. I note that the detailed design for the project will be undertaken by the contractor that is chosen by the proponent to design, construct, maintain and operate the tunnel. The detailed design process may result in amendments to the current reference design for the project that is being evaluated in this report. Changes to the design will be likely to require a Coordinator-General's change report under Division 3A Part 4 of the SDPWO Act, as was the case for the Clem7 and Airport Link projects.

2.3 Rationale for the project

In TransApex, BCC's planned network of strategic road connections, the NLRT is envisaged as an important link in the motorway network for travel to and from the western suburbs and beyond. The project is proposed to provide significant traffic network and associated public and active transport benefits including:

- an alternative (to Milton Road and Coronation Drive) cross city transport function
- significant time travel savings for users of up to 20 minutes (or almost 70% faster) between Centenary Bridge and ICB during the morning peak period to 2026
- complements Coronation Drive as the primary route for bus movements with a bus/transit lane inbound on Coronation Drive
- traffic redistribution from arterial, city distributor and local roads onto motorway standard roads resulting in a predicted decrease in traffic on many such roads (e.g. Mount Coot-tha Road, Milton Road, west of Torwood Street) compared with a 'no project' scenario
- traffic reductions on some regional traffic corridors by 2026, e.g. Ipswich Motorway east of the Centenary Motorway, CLEM7, Ipswich Road and Fairfield Road, and consequential reduced travel time on the surface roads for non-users of the tunnels



- safer travel for cyclists between the Centenary Motorway Bikeway and Bicentennial Bikeway due to less traffic on surface roads.

Alternatives to the project examined in the EIS include:

- a 'do minimum' option which represented a balanced approach to road and public transport infrastructure in developing the regional and metropolitan transport network. However, forecast growth in population and economic activity (Chapter 5, Traffic and Transport) indicate that travel demand would exceed capacity enhancements proposed through regional and local planning measures in the 'do minimum' scenario
- an optimised non-private Motor Vehicle Modes of Transport option which focused on bus transport for commuter travel and heavy rail for the movement of freight from the Western Corridor to the Australia TradeCoast
- an optimised Surface Road Transport (Existing Network Upgrade Option) which focused on Milton Road as the key route for cross-city travel and Coronation Drive for CBD-destination travel.

The analyses of options considered in the EIS include the projects and initiatives in the Queensland Government's South East Queensland Infrastructure Plan and Program (SEQIPP) and Brisbane City Council's Transport Plan for Brisbane 2008 - 2026, excluding Northern Link. None of them satisfied completely the project needs or the strategic objectives, demonstrating the need for a multi-layered response to transport planning at the regional and metropolitan levels. The impacts of implementing either the public transport option or the existing road network upgrade option are considered to be significant in terms of property requirements and likely impacts on community, environmental and economic attributes.



3. The impact assessment process

DIP coordinated the impact assessment process for this project on my behalf in accordance with the SDPWO Act.

3.1 Significant project declaration and controlled action

An initial advice statement was submitted on 28 September 2007 and the project was declared to be a 'significant project for which an EIS is required', pursuant to s.26(1)(a) of the SDPWO Act, on 31 October 2007.

The SDPWO Act establishes the framework for environmental assessment of major projects in Queensland and, along with the *Sustainable Planning Act 2009* (SPA), is the controlling legislation for the project at the State level.

The EIS also provides me with a framework to:

- consider the economic, social and environmental aspects of the project in the context of legislative and policy provisions and decide whether the project can proceed
- impose conditions for the undertaking of the project to seek to achieve economically, socially and environmentally sustainable development
- state conditions for approvals required under other relevant legislation
- recommend appropriate environmental management and monitoring programs to mitigate any adverse impacts.

On 30 November 2007, a delegate of the Commonwealth Minister for Environment, Heritage and the Arts determined that the project was not a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) (Decision Notice EPBC 2007/3773). Therefore no further assessment under the EPBC Act is required.

3.2 Terms of reference for the EIS

On 1 December 2007 a draft terms of reference (TOR) for the EIS for the project was publicly notified and comments on the draft TOR were invited to be made to me until 31 January 2008.

Comments on the draft TOR were received from three community groups and organisations, eight members of the public and from each of the following agencies¹:

- Department of Communities
- Department of Emergency Services
- Department of Housing
- Department of Main Roads
- Department of Natural Resources and Water
- Department of Tourism, Regional Development and Industry

¹ Due to Machinery of Government changes from 26 March 2009 (see *Public Service Department Arrangements Notice (No.2) 2009*), changes were made to Queensland Government departments referred to in this Report.



- Disability Services Queensland
- Environmental Protection Agency
- Queensland Health
- Queensland Police Service
- Queensland Rail
- Queensland Transport
- Queensland Treasury

On 18 April 2008 the TOR were finalised and a copy given to the proponent. In finalising the TOR I had regard to the comments received on the draft document from government agencies, community groups, organisations and members of the public and most of the changes to the TOR were a direct or indirect consequence of comments received.

3.3 Public notification of the EIS

On 25 October 2008 a public notice was placed in *The Courier Mail* newspaper advising where the EIS for the project was available for viewing and that submissions about the EIS could be made to me until 15 December 2008. Following a request from the proponent, on 29 November 2008 I publicly notified an extension of the EIS submission period until Monday 22 December 2008.

3.4 Submissions on the EIS

I accepted 212 submissions on the project EIS, including 200 submissions from the public and public organisations, as well as submissions from 12 government agencies. One submission from the public was subsequently withdrawn.

Concerns raised in submissions related to both construction and operation impacts of the project. A large majority (over 80%) of the public submissions raised concerns with the impacts of the local road connections at Toowong and Kelvin Grove, including loss of local connectivity, safety, visual amenity and increased local traffic.

The other primary issues raised by the public were air quality during operation, perceived lack of genuine consultation by the proponent, property impacts, the need for the project and alternatives to the project, inconsistency of the project with the character of the local areas and general construction impacts.

The other key issues raised by the advisory agencies related to construction impacts, including predicted high level of construction noise, traffic and road network impacts (construction and operation) and the cumulative impacts of a number of concurrent road and infrastructure projects in the Brisbane region.

The proponent was provided with all of the submissions on the EIS and was directed by me to prepare a supplementary report to the EIS which addressed the issues raised in the submissions and provided further information on the impacts of a 'no local connections' option. The proponent was also asked to provide further information about a number of other aspects of the project, including:

- a new round of noise monitoring at each of the noise monitoring locations
- a life cycle assessment (capital and operational) of air filtration (for total suspended particulates and oxides of nitrogen) during operation of the project
- a quantification of the cumulative traffic impacts of the construction of other relevant major road projects concurrently with the NLRT project, including any implications for the wider road network.



3.5 Change to the project after the EIS

The project proposed in the EIS included local connections at both ends of the tunnel in addition to the main portals at the Centenary Motorway and ICB. At Toowong a local connection to Milton Road east of Frederick Street was proposed and at the eastern end, a local connection to Kelvin Grove Road at its intersection with Musk Avenue. The EIS identified strategic benefits of the local connections. However, the EIS also recognised significant adverse and long term impacts of these local connections and the difficulty and impact of the required mitigation measures for those impacts.

On 20 April 2009, BCC announced that it had removed the local connections at both Kelvin Grove and Toowong from the EIS Reference Project. The proponent states that this option is capable of meeting the strategic needs of the project and that it could produce an acceptable outcome while maintaining local community support.

I understand that, in making this decision, BCC considered the matters raised in submissions, the lower construction cost of a project without local connections, and made an assessment of the resulting changes to the number of vehicles using the project. As a consequence, a significant number of the matters raised in submissions appear to have been addressed by the decision to remove the local connections.

The removal of the local connections at Toowong and Kelvin Grove will avoid many of the impacts of construction and operation for neighbourhoods in the vicinity of:

- Milton Road, Croydon Street, Jephson Street and Sylvan Road at Toowong
- Kelvin Grove Road, Lower Clifton Terrace, Upper Clifton Terrace and Victoria Street at Kelvin Grove.

Some of the more significant changes resulting from removal of the local connections include:

- No private property surface acquisitions will be required for the project. The number of properties impacted by surface works, either wholly or in part, is reduced from 116 properties to 13 properties, all of which are public properties
- The project will cater for between 34% and 39% fewer vehicles per day
- Worksites will not be required adjacent to Milton Road or Kelvin Grove Road, avoiding construction impacts in these areas
- There will be a significant reduction in the volume of spoil produced by the project and consequently a decrease in the amount of spoil haulage traffic along the Port of Brisbane haul route
- A greater depth of the mainline tunnels which would mean significant reductions in regenerated noise and vibration from the operation of the TBMs in the shallowest areas
- The project will no longer impact on the Toowong Baptist Church, the Memorial Crows Ash or the fig trees in McCaskie Park and Marshall Park, all of which are of heritage value
- Many of the operational impacts at both ends of the project will be avoided, including impacts on local connectivity and community cohesion between neighbourhoods and to community facilities such as the Toowong State School, local shops and public transport facilities. The removal of the connection will also avoid the partial loss of Quinn Park and impacts on amenity for park users.

I note the proponent forecasts that the change will also result in an increased impact at the interchange of the Centenary Motorway with Moggill Road compared to the project with the local connections, due to increases in traffic volumes through the signalised intersections at the Centenary Motorway on and off ramps at Moggill Road.

However, **I acknowledge** the greatly reduced construction and operational impacts of the project, particularly at Toowong and Kelvin Grove Road as a result of the decision to remove



the local connections. **I therefore conclude** that the proponent's decision to remove the local connections satisfactorily addresses many of the concerns raised in the majority of submissions I received on the EIS.

3.6 Review of the further information provided (supplementary report to the EIS)

On 10 June 2009 the proponent provided, for review, a supplementary report to the EIS which presented information about the project without the local connections, further material to address the submissions received on the EIS for the project and additional information that I had requested.

Following the DIP's provision of comments to BCC, a final supplementary report was provided to me on 1 July 2009. A copy of the supplementary report was forwarded to relevant State Government agencies with a request for their advice and any conditions for my consideration in evaluating the EIS and the project.

Responses to the supplementary report were received from:

- Department of Communities through the divisions of Public Housing, Disability Services and Community Safety
- Department of Transport and Main Roads
- Department of Environment and Resource Management
- Queensland Health
- Queensland Rail
- Queensland Treasury.

The proponent advertised the availability of the supplementary report in local newspapers and a copy was made available on the BCC website and via a link from the DIP website.

Five letters were received from members of the public in relation to the supplementary report and the project generally.



4. Evaluation of environmental impacts

4.1 Introduction

The SDPWO Act defines 'environment' to include:

- ecosystems and their constituent parts, including people and communities
- all natural and physical resources
- 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
- the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned above.

'Environmental effects' mean 'the effects of development on the environment, whether beneficial or detrimental'. These effects can be direct or indirect, of short, medium or long-term duration and cause local or regional impacts.

This section outlines the major environmental effects identified in the EIS, submissions on the EIS, advisory agency comments on the supplementary report and consultation with advisory agencies and other key stakeholders. It is split into two sections, construction impacts and operational impacts.

Where appropriate, I have provided comment on these matters to explain the rationale supporting any conclusions that I have reached and, where necessary, I have recommended development approval conditions and imposed conditions to mitigate any potential adverse impacts of the project that have been identified in the EIS and supplementary report.

4.2 Construction impacts

4.2.1 Air quality

EIS findings, submissions and analysis

Two air quality monitoring sites were established for the EIS for the project, one at Toowong and another at Kelvin Grove. The purpose of the monitoring was to gain information about the ambient air quality in locations close to the project worksites that have the potential to be impacted by construction. Monitoring at Toowong commenced in November 2007 and covers the western end of the project. The Kelvin Grove site covers the eastern end of the project and was established in July 2008.

Air quality monitoring data was benchmarked against a series of standards or goals established by the Queensland EPA (now DERM) or by the National Environmental Protection Council. Ambient air quality data collected in the Brisbane area was presented in the EIS.

The major construction activities with the potential to cause air quality impacts are the operation of the surface worksites, the excavation of the tunnels and the handling of the spoil generated. These activities have the potential to generate dust and must be managed effectively to ensure air quality remains at an acceptable standard and environmental nuisance is not caused.

It is anticipated that spoil generated during construction of the transition structures and cut and cover tunnels at or near the western worksite is expected to be trucked to a spoil



placement site at Swanbank. Spoil generated at the eastern worksite is expected to be transported to the Port of Brisbane.

To control dust emissions from the tunnelling and spoil movement at the western worksite a Tunnel Portal Cover Shed will be constructed on site as part of the initial site establishment works. The area will also be surrounded by a two metre fence covered with a cloth screen to reduce dust emissions from the site.

The majority of spoil excavated by the TBMs will travel by conveyor from each TBM, exiting at the western tunnel portals to a transfer station located within the western worksite. From the transfer station, a single conveyor will transport the material to the Mount Coot-tha Quarry. The conveyor will be fully enclosed along its length between the worksite shed and the quarry. All stockpiling, truck and conveyor loading activities at the western worksite will be undertaken entirely within worksite sheds or within the tunnel excavation area.

The Mount Coot-tha Quarry currently extracts materials for asphalt and concrete aggregate and processes these through a screening plant. The quarry operates under a development approval issued by the DERM under the provisions of the *Environmental Protection Act 1994*. Material from the TBM operation of this project will, in the main, replace the further extraction of material at the quarry for the duration of the project. The spoil will be screened at the quarry and utilised in a manner consistent with the quarry's current operations. Any air quality impacts from operation of the quarry are regulated under the existing development approval which includes specific air quality conditions.

Changes to activities at Mount Coot-tha Quarry as a result of the screening of spoil from tunnelling activities are likely to include reduced blasting and increased stockpiling of spoil. Importantly, the number of truck movements to and from the quarry is not expected to change.

To maintain adequate air quality within the underground working environment, ventilation fans will need to be located within the tunnels. At each of the tunnel portal worksites, ventilated air from the tunnelling works will leave the work shed after passing through dust extraction equipment to remove particles.

The potential for air quality impacts from construction vehicle fleet exhaust emissions will depend on the size and type of vehicle fleet, the hours of operation and the type of controls adopted by the site operator.

Potential impacts from diesel emissions would most probably be from trucks queuing near to the surface worksites and from the operation of diesel equipment within the underground excavation area. The exhaust emissions will contribute particulates, carbon monoxide, carbon dioxide, hydrocarbons and nitrogen oxides to the atmosphere. The level of air quality impact on surface receivers adjacent to the construction sites will be dependant on the location of the tunnel ventilation exit point, the loading of these pollutants within the tunnel air, the local dispersion meteorology and the controls (including particulate removal) incorporated as part of the tunnel construction ventilation systems.

Conclusions

I accept that due to the nature of this project with the excavation and transport of spoil, there is the potential for impacts on air quality in the vicinity of the project worksites. The proximity of the project to residential areas requires that potential impacts be minimised and managed.

I am satisfied that any impacts on air quality of the handling and processing of spoil at the Mount Coot-tha Quarry can be appropriately regulated by DERM under the development approval for the quarry's operation.

To mitigate the potential impacts on air quality and the amenity of persons in proximity to the project worksites during the construction of the project, **I impose** Condition 20 – Air Quality, Schedule 3, Appendix 1. This condition sets limits for dust and particulate matter for emissions from the project's activities and is based on relevant standards and guidelines. In addition the condition imposes a requirement for the development and implementation of a Construction Air Quality Environmental Management Plan (EMP) Sub-Plan.



This EMP Sub-Plan must include the establishment of an air quality monitoring program and the requirement to undertake 'real time' air quality monitoring including in locations representative of potential 'worst case' air quality impacts. It also requires the proponent to implement reasonable and practicable measures to avoid, mitigate and manage the generation of dust from construction sites.

Reasonable and practicable measures that may be incorporated in the EMP Sub-Plan include:

- management of stockpiles by orientation, moisture content, dust suppressants, bunker storage and vegetative cover
- management of haul roads and transport of aggregates and sand by watering, use of dust suppressants, load covering and clearing spillages
- managing crushing, screening and concrete batching equipment utilising water sprays, assessing wind direction prior to undertaking work, careful placement of dust generating activities, use of filters for plant and equipment and use of wind shields or barriers
- keeping trafficable areas clean and sealed with suitable material, using dust suppressants/wind breaks/water sprays and truck washing facilities
- management of blasting and rock drilling operations to reduce dust nuisance.

I am satisfied that the proponent's compliance with these conditions will minimise the potential for air quality impacts resulting from the construction of the project.

4.2.2 Noise and vibration

EIS findings, submissions and analysis

4.2.2.1 Noise

The EIS states that the noise environment in the study corridor is typical of many inner urban areas, in that it is largely dominated by road traffic noise. However, at some locations rail noise and/or mechanical plant noise are other occasional significant sources.

Noise generating activities from the project include ripping and clearing; surface excavation; road grading; spoil loading and spoil transport; pile boring; drilling for rock-bolting and explosives; temporary ventilation and spoil extraction to surface from tunnelling.

Although the specific number, size and type of machinery are not yet known, typical items of plant such as articulated dump trucks, excavators, graders, dozers, pneumatic rock drills and hydraulic rock breakers have been nominated to be used based on similar tunnelling activities at existing worksites in the Brisbane region.

Surface works are generally to be undertaken from 6.30 am to 6.30 pm Monday to Saturday whilst underground tunnelling and associated activities would be undertaken on a continuous basis. The tunnel ventilation plant and spoil conveyor would also operate continuously to support underground work.

There are no established criteria in Queensland for the assessment of impacts associated with long-term construction noise sources, especially at night. The EIS suggests that assessment goals for long-term construction noise sources should reflect the noise environment that is considered acceptable for normal functioning of adjoining developments (e.g. residential, healthcare and educational uses).

Noise control measures that were recommended in the EIS for noise mitigation at the Centenary Motorway worksite include:

- provision of advance notification of time, type and duration of earthworks involved in site preparation
- minimising the use of particularly noisy activities such as rockbreaking



- construction of an acoustic enclosure over the portal and stockpile or acoustic door entry to completed cut and cover structure
- design of continuously operating ventilation plant and any other plant that operates at night to meet 'reasonable' night-time noise objectives as defined in Section 2.2 of Technical Report No. 9 - Noise and Vibration in Volume 3 of the EIS
- planning of truck movement within the worksite to limit (as much as possible) the need for reversing and therefore reversing alarms
- the use of broadband 'buzzer' reversing alarms on worksite vehicles and/or alarms which actively vary their volume according to the ambient noise levels during activation rather than constant volume (tonal) 'beeping' alarms
- noise monitoring at the commencement of and periodically during noise intensive activities.

The primary noise-generating activities anticipated during the construction of the ICB connection are cut and cover construction and road surfacing (day and night-time) and transition structure construction (daytime only). Regenerated noise resulting from tunnel excavation may also cause an impact to noise sensitive receivers in proximity to the operation of the TBMs (e.g. residents along the tunnel alignment for the period that the TBMs are operating in the vicinity).

The ICB surface road works would be constructed in various stages, interacting with and maintaining the existing traffic conditions on the ICB.

Spoil handling facilities for the handling and loading into haulage trucks servicing the underground cut and cover works between the driven tunnel portals and the cut and cover portals would be enclosed, ventilated and acoustically lined. The nature of such enclosure at the ICB portals may include the covered tunnels with the inclusion of acoustic doors to allow 24 hour underground construction and/or temporary acoustic external enclosures to provide for the removal of the TBM cutting heads.

Noise control measures that were recommended in the EIS for mitigation of noise from the ICB connection construction works are:

- advance notification to the residents
- selection of construction processes and plant to minimise construction noise
- assistance of owners of properties nearest the construction site to upgrade the acoustical insulation and ventilation of rooms
- a detailed investigation of classroom facades at Brisbane Grammar and Brisbane Girls Grammar Schools to determine actual noise attenuation and therefore assess the need for further mitigation
- early construction of the operational noise barriers to protect Normanby Terrace residences during the construction period, or the erection of temporary construction noise barriers at that location.

4.2.2.2 Vibration

The operation of the tunnelling machines will generate noise in residential areas around the project through the transmission of vibration to structures which is then sensed as noise by inhabitants of the buildings. This is known as regenerated noise. Other activities likely to cause vibration and regenerated noise for this project include rock breaking and rock hammering and blasting.

Vibration levels generated at the ground surface during excavation are a function of many variables, including excavation method, advance rate, depth below surface, ground (rock) hardness and structure of surface strata. As only a limited amount of strata information was collected by the proponent for the reference design described in the EIS and supplementary report, it is difficult to predict exactly what vibration levels may be experienced. In this



circumstance, it is usual to collate the highest vibration levels recorded for a range of extraction methods in similar circumstances. A consequence of this approach is that vibration levels experienced may be lower than predicted levels.

Two TBMs would be used to excavate the mainline tunnels between the Centenary Motorway and the ICB. It is proposed to operate the TBM's on a near continuous basis.

If the vibration levels from continuous construction are higher than 0.5 millimetres per second (mm/s), sleep disturbance may result. Vibration is predicted to exceed this guide value at up to 246 residences above the mainline tunnels. Therefore, a condition requiring vibration monitoring and vibration mitigation measures is warranted.

The potential impacts of vibration on buildings and on people was assessed in the EIS by comparing the predicted vibration levels using the guide values for minimising the risk of cosmetic (superficial) building damage and/or appropriate statutory requirements and using the guideline values for subjective human disturbance response, respectively.

All predictions of vibration levels are below the guide value or statutory limit for cosmetic damage (5mm/s) except for short sections of TBM construction that were near the surface at either end of the project. Residences in Normanby Terrace are predicted to experience vibration levels less than 5mm/s for continuous vibration at residential properties, but this will still require careful monitoring and particular attention to building precondition surveys. Some higher vibration levels are expected adjacent to the portals in the ICB corridor at the end of the TBM travel. These would not affect any above ground structures and are remote from any sensitive place.

The nearest vibration sensitive location to the western connection worksite is the Toowong Cemetery. Likely sources of vibration associated with the construction and operation of the worksite would be rock breakers and dozers. The EIS predicts that due to separation distances between the majority of the earthworks on the worksite and the cemetery, significant vibration impacts are not anticipated from site preparation or surface activities.

The EIS predicts vibration from the TBMs at a small area on the footpath of Mount Coot-tha road along the southern edge of Toowong cemetery, and a 230m section through the cemetery could exceed the guide value for heritage places (2mm/s) unless special mitigation measures are not deployed. Vibration levels of 2-5mm/s are predicted for a 0.26 hectare area above the mainline tunnels on both sides of the more southerly drainage line through the cemetery before mitigation. Effective mitigation, possibly including other methods of construction, will be required to avoid or minimise the risk of damage to graves and monuments in these areas of the cemetery.

The EIS states that prior to commencement of construction, the contractor, in the detailed design phase, would need to undertake detailed predictive modelling to estimate likely vibration levels and to satisfy that either:

- the predicted vibration levels would be below the guide values and therefore unlikely to present a risk to this part of the cemetery; or
- the mitigation measures proposed would be effective in avoiding or limiting damage to graves and monuments to cosmetic levels, and that such damage would be repaired upon completion of tunnel construction in these locations.

Possible mitigation measures would be likely to include:

- lower energy construction methods
- stabilisation of susceptible graves and ornaments
- repair of any damage to graves and monuments
- other methods considered effective.

It is not anticipated that vibration levels associated with vibratory rolling during road surfacing of the project at the eastern end would be significant. However it is normal practice to monitor



vibration on structures during vibratory rolling that occurs within a nominal distance of 25 metres.

The following impact management and mitigation strategies are recommended in the EIS to minimise the impacts of tunnelling vibration and regenerated noise:

- comprehensive advance notice of intended tunnelling activities in the localities near the tunnel alignment
- compliance with 'reasonable' night-time vibration and regenerated noise levels for night-time tunnelling
- conduct of noise and vibration monitoring at the commencement of tunnelling to confirm that the source data utilised in the EIS for this assessment is applicable to this project (including the low frequency noise assessment inputs and findings)
- conduct of pre and post-blasting Building Condition Surveys in accordance with BCC requirements where it is considered there may be potential for cosmetic building damage from TBM and drill-and-blast methods
- Where other options cannot be applied, the temporary relocation of residents.

Conclusions

I acknowledge that there are likely to be impacts from noise and vibration due to the location of the project in proximity to residences and the nature of activities required to be undertaken in the construction of an underground road tunnel in an urban environment.

I therefore impose Condition 22 – Noise and Vibration, Schedule 3, Appendix 1 to ensure the impacts of noise and vibration from the project are minimised. This condition includes the requirement for the preparation of a Noise and Vibration EMP Sub-Plan which:

- includes clear criteria for assessment of compliance
- is based on noise modelling for decision making in respect of compliance with conditions
- identifies works which will generate high noise impacts and reasonable and practicable measures to minimise impacts
- identifies plant and equipment and noise abatement measures for each item
- implements a hierarchy of mitigation focusing on source control, and appropriate planning and site mitigation before considering residence based mitigation measures
- identifies measures which will be implemented when night time regenerative noise goals are exceeded
- clearly indicates the timing of implementation of mitigation measures
- includes a monitoring component
- identifies sensitive receptors including those affected by daytime works (e.g. the elderly and shift workers) and makes clear provision for the protection of these people's amenity
- has a process for responding to situations such as periodic illness
- includes clear impact based triggers for residence based mitigation
- requires negotiations with affected residents prior to commencement of works where noise modelling predicts breaches of objectives or goals
- sets timeframes within which negotiations must be completed and agreement reached.

The condition also requires that the EMP Sub-Plan must be assessed by an independent acoustic specialist as meeting the requirements of the condition.

This condition sets acoustic quality objectives for a variety of sensitive receptors. It requires that all reasonable and practical measures, as detailed in the Noise and Vibration EMP Sub-Plan, are to be implemented in an endeavour to meet those objectives. The condition also



requires that all such management measures are to be in place prior to the commencement of construction works.

Some construction works that are required for the project, such as hydraulic hammering, could cause a high level of noise at sensitive receptors. Although **I acknowledge** that such works are required for the construction of the project, I also appreciate that such works can have a negative impact on amenity for people in close proximity to such construction works. In this respect **I impose** two conditions in relation to works that cause high noise impacts, which, for the purpose of this report, includes all works that generate noise that is greater than the background noise level plus 20dB(A) at a sensitive place, e.g. a residence, school and hospital. In relation to such works that might be conducted over long periods, **I impose** a respite period to provide relief from the noise impact.

I impose Condition 18(b) which restricts surface construction works to standard construction hours, being 6.30 am to 6.30 pm Monday – Saturday, excluding public holidays. This would help protect the amenity of communities in proximity to the construction areas and provide a break from the noise impacts of construction of the project during the evening period and on Sundays.

However, **I acknowledge** that there is a need for certain works to be conducted outside of standard construction hours. Such works may include those required to be undertaken on or directly adjacent to major roads, such as the Centenary Motorway and the ICB, and require closure of part or the entire road for the safety of workers. The relevant road authorities assess and issue permits for road closures which limit the times during which such road closures may occur, based on among other things, the traffic impacts of closing lanes or otherwise interfering with traffic flow.

Imposed Condition 18 in Schedule 3 of Appendix 1 permits some construction works to be undertaken outside of standard construction hours, when this is the only time the work can be performed. Other examples of where work may be required outside of the standard hours is extensive concrete pours that cannot be undertaken during the daytime as daytime as high temperatures or other conditions do not allow the concrete to set properly. Condition 18(c)(v) provides that work such as this will require approval from the Coordinator-General.

I take this opportunity to recommend to TMR and BCC, as the road authorities responsible for assessing and issuing road closure permits, that in assessing requests for night time road closures for the project the authorities give due consideration to the likely impact of such works on nearby residents with respect to the frequency, intensity and duration of the works in considering the issue of the permits and any conditions that may be attached.

I impose Condition 22(h) to address long term noise issues such as that from conveyor belts carrying spoil from the tunnel or the ventilation fans for the construction sites. These noise sources are fairly constant but can create nuisance when maintenance issues are ignored. Squeaking conveyor rollers or fan drive belts are a common issue and the imposed condition will address this.

I impose Conditions 22(i - k) to require mitigation measures, such as operational activities being changed, should high levels of regenerated noise and/or vibration from tunnelling machines be predicted or measured. Measurement is to be used to calibrate the predictive model to ensure predictions are as accurate as possible.

4.2.3 Surface and ground water

EIS findings, submissions and analysis

Construction of the project has the potential to impact on surface water and groundwater.

Activities with the potential to impact on surface water include vegetation clearance; excavation and earthworks associated with utility diversion, construction of cut and cover tunnels, embankments, bridges and haul roads; stockpiling and transferring of spoil from tunnel construction; and spillage or accidental release of pollutants.



Activities with the potential to impact on groundwater include construction of open trough structures and cut and cover tunnels and operation of the TBMs.

4.2.3.1 Surface water

The major waterways within the area of the project are the Brisbane River, Breakfast/Enoggera Creek and Toowong Creek. Construction activities at the Centenary Motorway and Toowong worksites may potentially impact on several minor waterways including tributaries of Toowong Creek, the drainage line from Mt Coot-tha Botanic Gardens and Toowong Cemetery.

At the eastern end of the project an overland flowpath from the Kelvin Grove Urban Village via the Brisbane Grammar School playing fields would be intersected by the NLRT near the ICB. This overland flowpath only conveys surface water from rainfall. The significant features from a drainage and water quality perspective are the Victoria Park Drain at Herston and York's Hollow, a culturally significant wetland within Victoria Park which discharges by underground drain to Enoggera Creek.

The EIS outlines a range of potential impacts from soil erosion due to the construction works, identifies a minimum range of activities that could be expected in each of the construction areas and provides a range of mitigation measures to guard against environmental damage from soil erosion.

In this context the EIS clearly indicates that 'installation/construction of stormwater/drainage control and sediment control measures' are expected at each site.

4.2.3.2 Groundwater

The EIS describes that the quality of water within the Bunya Phyllite varies across the project area but is considered poor by drinking quality standards. Similar trends were noted in the Neranleigh-Fernvale beds. Groundwater within the localised alluvial aquifer near the lowest point in the Botanic Gardens is brackish.

The EIS also indicates that the groundwater dependency of ecosystems in the study area is likely to be low with terrestrial vegetation, river base flow systems and aquifers potentially utilising groundwater in the saturated zone only during drier periods when surface water is not available. The exception to this may be the wetland in Anzac Park. This wetland, despite being largely dry during much of the EIS study period, is likely to rely upon a combination of surface water flow and groundwater. Established park vegetation on residual soil or imported fill may potentially utilise groundwater opportunistically during dry periods. However, the potential level of dependency is likely to be even less than for vegetation in the vicinity of drainage lines, as shallow groundwater in non-alluvial sequences is likely to represent interface drainage which persists only following rainfall events.

The following impacts to the groundwater and recharge regime were predicted in the EIS:

- Total long-term groundwater inflow to the tunnels over their full length is likely to be in the order of four litres per second (L/s). This compares with the Airport Link tunnel (8L/s) and the Clem 7 tunnel (5L/s)
- Quasi-steady state conditions may be reached following a period of 10-20 years post-construction
- Leakage of groundwater from the upper alluvial aquifer to the lower fractured rock aquifer and ultimately to the tunnel may result from steep vertical downward hydraulic gradients, although the alluvial aquifer is unlikely to dry out completely
- Groundwater levels within the weathered Bunya Phyllite/Neranleigh-Fernvale Beds would be permanently lowered by up to 45 metres adjacent to the tunnel with a drawdown cone up to 800 metres either side of the tunnel corridor
- Surface water inflow from the Brisbane River is unlikely to occur as a consequence of groundwater drawdown



- Groundwater drawdown within the alluvium in the central section of the tunnel may potentially impact upon any very small areas of groundwater dependant ecosystems within this area.

The EIS states that, based on available data, groundwater occurrences potentially exploitable for domestic or commercial purposes in the vicinity of the study corridor are limited and unreliable in any significant quantities. The only existing facility identified within the study corridor was the borehole designated MC1-A in the Mount Coot-tha Botanic Gardens. This bore is not yet being exploited.

The likely source for water supply for the project is groundwater from the MC1-A production borehole in the Botanic Gardens, supplemented if necessary by drawing on the water storage in the Mount Coot-tha Quarry pit. Should the quality of water obtained from the borehole need to be improved to meet the construction purpose, treatment facilities may need to be incorporated into the Centenary Motorway worksite.

Conclusions

I am satisfied that the potential impacts associated with groundwater and surface water will be adequately addressed through imposed Condition 21 – Groundwater and Surface Water, Schedule 3, Appendix 1 and the requirement for implementation of the Construction EMP Groundwater and Surface Water Sub- Plans. My imposed condition specifies:

- water quality limits for release to waters
- requirements for erosion protection measures and sediment controls, including that an Erosion and Sediment Control plan is certified by a professional in sediment and erosion control
- monitoring and reporting requirements for releases to water.

In particular:

- Condition 21(d) requires the proponent to take all reasonable and practicable measures to minimise impacts from groundwater movement on property and further,
- where it is identified that property damage has occurred as a consequence of the construction works, Condition 21(e) requires the proponent to repair such damage as soon as practicable and in consultation with, and at no cost to, the property owner(s).
- Condition 21(f) requires monitoring of groundwater flows during construction and for a period of five years after commencing operation. The predictive modelling used to site the monitoring is to include the potential, albeit remote, of inflow from the Brisbane River.

4.2.4 Transport and traffic

4.2.4.1 Construction traffic management

EIS findings, submissions and analysis

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

The EIS has identified potential haulage routes to the proposed spoil sites at Swanbank and the Port of Brisbane. Many of the major roads on the haulage routes experience peak period congestion. Truck haulage mixed with peak hour traffic would create inefficiency for the trucks and may have unacceptable impacts on general traffic.

The delivery routes for materials would vary with the sources of materials and equipment, which are not known at this stage of the planning process. In general, truck numbers required for deliveries are expected to be lower than those required for spoil haulage. Deliveries in



peak periods may have to be avoided where delivery routes are already close to capacity. This issue would be investigated in detail during the preparation of the Construction Traffic Management Plans (CTMPs).

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

Although it is intended that a significant quantity of spoil would be transported to the Mount Coot-tha Quarry by conveyor, there will be spoil transported by vehicle off-site from the construction of the transition structures and cut and cover tunnels at each end of the project. Spoil haulage from these is likely to be to the Port of Brisbane from the eastern construction worksite and to Swanbank landfill from the western construction worksite.

Haulage to the Port of Brisbane is expected to average only three truck movements in each direction per day over 23 months and the range around this average would be limited. The potential impacts of three trucks per hour on this route, which includes the ICB, Kingsford Smith Drive and the Gateway Motorway, would be minimal, even allowing for fleet management variations around this average.

The Swanbank Landfill site is just south of the Swanbank Power Station and the haul route would be from the construction site along the Centenary Motorway, Ipswich Motorway, Cunningham Highway and Swanbank Road. On the return journey a simple diverge from the Centenary Motorway would provide direct access to the work site. Haulage on the Swanbank route is estimated at 58 truck movements per day in each direction for 14 months.

Spoil haulage by truck is proposed to be confined to the arterial road network and be undertaken continuously from 6.30 am Monday to 6.30 pm Saturday. As identified in Section 3.6.3 of the EIS, this would require secure on site storage and acoustic sheds for handling spoil at night so that noise, dust, etc. does not create environmental nuisance. The bulk of the tunnel spoil material at the Centenary Motorway worksite would be moved from within the enclosed acoustic shed via the fully enclosed conveyor to the Mount Coot-tha Quarry.

In its submission on the supplementary report TMR stated that the EIS and supplementary report had not provided haulage routes for out-going and in-coming site materials and times of day that this would occur, and that it would be seeking strict and documented controls on certain roads. As such, TMR recommend travel bans be implemented for construction traffic on specific routes for specific time periods for trucks of specific size classes.

In response to the TMR recommendation above, the proponent advised that while haul routes for spoil placement at Swanbank and the Port of Brisbane had been indicated, it was difficult to identify material delivery routes at the EIS stage of the project. The proponent argued that suitable management could be covered by standard or existing freight approvals and travel bans on specific State-controlled routes. **I consider** that this matter requires specific attention in the imposed conditions.

Conclusions

Given the scale of the project and potential impacts, a comprehensive approach to construction traffic management is required. **I therefore impose** Condition 14 – Environmental Management and Condition 16 –Traffic Management, Schedule 3, Appendix 1. These conditions require the proponent to construct the project in accordance with the Construction Traffic and Construction Traffic Vehicle EMP Sub-Plans. These plans will require the proponent to implement certain mitigation measures and specify certain routes and limitations on vehicle types in certain areas to limit impacts on those areas. **I support** the request of TMR to place particular restrictions on the use by certain larger size trucks on some state controlled roads, especially at night, by the imposition of Condition 16(i)(III).

Condition 16 also includes measures to control the flow of construction traffic such as parking and queuing limitations, peak hour and holiday use limitations to reduce interference with



normal traffic. Independent assessment of the Sub-Plans and their ability to control the construction traffic is required before the plans are put into action.

In view of these requirements **I am satisfied** that construction traffic will be directed whenever possible away from residential areas and that the impact of construction of the NLRT on other road users will be adequately managed. The imposed conditions should limit to acceptable levels the impact the construction of the project has on residential amenity.

4.2.4.2 Pedestrian and cycling issues

EIS findings, submissions and analysis

A range of issues were raised in submissions in relation to construction impacts on cyclists. Most of these issues have been addressed by the proponent's decision to remove the local road connections at Toowong and Kelvin Grove.

The supplementary report states that, during construction, the existing connectivity and functionality of the Centenary Motorway Bikeway and Centenary Motorway Cycle and Pedestrian Bridge at Toowong will be maintained. The occasional closure to the Centenary Motorway Cycle and Pedestrian Bridge may be required for modification of the structure to span the new road works. The proponent has committed to schedule the works to minimise disruption to cyclists where possible.

At the eastern end of the project, the bikeways on both the northern and southern side of the ICB would remain operational during construction. Realignment of the bikeway on the southern side would probably be required, depending on detailed design. The bikeway on the northern side, in the vicinity of Victoria Park Road may need some temporary re-alignment and the occasional night time or weekend closure.

With regard to on-road motorway cyclists, the proponent has advised that safety in the vicinity of the tunnel portals during construction will be addressed as part of the construction management plans.

Conclusions

While **I am generally satisfied** that the impacts on cyclists during construction of the project should be minor, **I impose** Condition 12, Schedule 3, Appendix 1 – Pedestrian / Cycle Connectivity. This condition states my requirements with respect to any necessary short-term closures of the Centenary Motorway Cycle and Pedestrian Bridge at Toowong, and the responsibility of the proponent to reconnect the cycle path to the Mount Coot-tha Botanical Gardens entrance before the NLRT project becomes operational.

Any other potential impacts of construction related to pedestrian and cycle use should be managed through the implementation of the measures **I impose** in Condition 16 - Traffic Management, Schedule 3, Appendix 1. This condition requires the proponent to detail, in the Construction Traffic EMP Sub-Plan, measures to maintain safe and functional access and how interruptions to access or closures are to be minimised. The Plan is to be submitted to BCC for approval of those parts of the cycleway which connect into local roads and to TMR for approval of the parts of the cycleway which cross the Centenary Motorway. The Plan will include a requirement for work to the Centenary Motorway Cycle and Pedestrian Bridge to be scheduled so as to limit inconvenience for cyclists (Condition 16(g)(iv)).

4.2.4.3 Road connection design considerations

The reference design for the project described in the EIS, upon which the evaluation in this report is based, locates the portals and lanes at the western end of the NLRT on the outside of the existing Centenary Motorway. Such a location assigns traffic priority for eastbound through traffic to Milton Road rather than the NLRT, which was TMR's stated preference during the EIS process. **I note** that tunnel construction is often simpler and less costly if portals are located on the inside of major feeder roads. **I note also** from more recent consultation with TMR (February 2010) that planning indicates some benefit in making the Centenary Motorway – NLRT route the primary traffic and freight route, with Milton Road



becoming a secondary route. Therefore, **I see potential merit** in an inner-portal final design option at the western end of the NLRT.

However, the EIS documentation has not presented sufficiently detailed design or impact information for an inner-portal option to allow a satisfactory assessment of potential road operations in the short to medium term, especially to ensure for:

- the inbound direction – that queuing caused by tunnel incidents does not prevent motorway traffic accessing Milton Road, and that traffic queues created by congestion at the Toowong roundabout do not prevent traffic entering the tunnel
- the outbound direction – the provision of an acceptable weave/merge solution to ensure traffic from Milton Road and the NLRT can merge safely and efficiently.

Conclusions

I consider that while there may be potential merit in locating the NLRT western portals inside the existing Centenary Motorway, the design and impacts of such an option would need to be more thoroughly documented before an adequate assessment could be made. The process described under Division 3A of Part 4 of the SDPWO Act would be suitable for such an assessment.

4.2.5 Community engagement

EIS findings, submissions and analysis

In those neighbourhoods close to construction works, some existing values may be diminished during the construction phase which may extend over a number of years. Careful management would be required to help minimise construction impacts and protect quality of life and community values for local communities.

The EIS outlines mitigation measures involving community participation in ongoing planning and environmental management monitoring that would assist in avoiding or minimising potential construction impacts on local communities from the project.

These measures include but are not limited to:

- undertaking early and ongoing consultation and communication with residents nearest to the construction worksites and haul routes about construction activities, including timing and duration, and potential impacts on local amenity
- initiating consultation with owners and occupiers of directly affected properties, including those affected by volumetric acquisition, as soon as practicable after a decision to proceed with the project is taken, about the process and timing of property acquisition and compensation arrangements, if applicable
- undertaking and maintaining a comprehensive community consultation and information program to inform the community of project activities, including timing and duration, and potential impacts
- developing an effective system for receiving, handling and responding to complaints from community members and key stakeholders during the construction phase
- monitoring and evaluating the effectiveness of community consultation and communication processes, through surveying and direct sampling of local residents' views on effectiveness and responsiveness
- providing a publicly available monthly report on complaints received, responses provided, timeliness of responses and corrective actions taken.

Conclusions

Given the potential for the project to impact on the community, particularly in light of the impacts arising from other current and previous major road infrastructure projects, a comprehensive approach to community engagement is required.



Accordingly, it is important the community is kept informed by the proponent and, just as importantly, that the proponent is informed by the community. **I impose** Condition 7 – Community Liaison Groups, Schedule 3, Appendix 1 which requires that a two-way communication process be developed through the establishment of community liaison groups to be facilitated by an independent community liaison representative. There is to be a group established at each end of the project. The purpose of the community liaison groups will be to enable the community to make comments and recommendations through these groups about construction, environmental management, and other matters relevant to the project.

I also impose a condition requiring the preparation of a Community Communication Strategy, Condition 8, Schedule 3, Appendix 1. This condition requires the proponent to:

- undertake early and on-going engagement with owners and occupants of sensitive receptors
- ensure that the local community, businesses and public transport operators are kept informed
- establish a complaints receiving system and a reporting mechanism on complaint responses
- establish a project internet site to provide information on the project
- establish and maintain a display centre.

Further, **I have required** the establishment of an independent Community Liaison Representative (ICLR) nominated by the proponent and approved by myself. The ICLR's role shall include but not limited to:

- chairing Community Liaison group meetings
- consulting with the proponent with regard to consultation strategies
- being available for direct contact by community during standard construction hours and periods of high noise impact activities
- to the greatest extent practicable, resolve community complaints.

I impose Condition 9 – Independent Community Liaison Representative to facilitate this requirement.

4.2.6 Hazard and risk

EIS findings, submissions and analysis

Hazardous activities associated with the construction of the tunnel include:

- operation of vehicles and construction equipment and storage of dangerous goods in the tunnel and compound areas – potential for fire or leakage or spillage of oils, fuels and other dangerous goods including explosives
- transport of dangerous goods to worksite areas – potential for spillage and accidents
- transport of spoil to spoil placement areas – potential for accidents leading to spillage
- potential for tunnel collapse or subsidence
- potential flooding and inundation during construction.

The EIS provided a risk assessment matrix of safety and environmental risks associated with the construction of the project. Spills and emissions from use and storage of dangerous goods and hazardous materials in the tunnel or compound areas was assessed as having the highest risk level. Mitigation measures proposed include ensuring compliance with safety regulations in confined spaces and training of the construction workforce in storage and handling of dangerous goods and spill containment procedures. The EIS provided that a Construction Hazard and Risk (CHR) EMP would be developed during detailed design and this would include provision for access for emergency vehicles, particularly inside the tunnels.



In a submission on the supplementary report the Department of Community Safety (DCS) provided advice requesting provision for the strict monitoring of risks through hazard and risk conditions, consideration of the provision of a back-up tunnel control centre and development of an agreement between the proponent and the DCS Queensland Fire and Rescue Service formalising specific roles and responsibilities for the project.

Conclusions

I impose Condition 25, Schedule 3, Appendix 1 – Hazard and Risk, to ensure hazards and risks are appropriately addressed. This condition requires the proponent to:

- construct the project in accordance with the Construction EMP, the Construction Hazard and Risk (CHR) EMP Sub-Plan, Australian Standard AS4360:2004 Risk management, *Workplace and Safety Act 1995* – Tunnelling code of Practice 2007, and the *Fire and Rescue Act 1990*
- prepare and implement the CHR EMP Sub-Plan having regard to the potential risks associated with tunnel construction. The Sub-Plan must ensure site accessibility for emergency services vehicles to the road network and construction areas, maintenance of essential urban services, transport and the use and storage of dangerous goods in construction sites, and communications during incidents
- submit the CHR EMP Sub-Plan to the Coordinator-General for approval, following consultation with DCS.

Further, the proponent is required to conduct monthly onsite safety inspections with DCS personnel and conduct a simulated emergency response exercise within 12 months of the commencement of construction.

4.2.7 Cultural heritage issues

EIS findings, submissions and analysis

There are a number of significant cultural heritage sites above the underground tunnelling activities along the proposed tunnel route including Mount Coot-tha Forest; Toowong Cemetery; Baroona at 90 Howard Street, Paddington; St Brigid's Church, Musgrave Road, Red Hill; Ithaca Embankments, Nos 3 and 4, Musgrave Road, Red Hill; Gona Barracks; and Victoria Park, Herston. Construction activity in the form of vibration from construction work has the potential to impact on these sites.

Vibration may be defined as cyclic or transient motion and measured in terms of its displacement, velocity or acceleration. Vibration passes through the soil into a structure and has the potential to cause damage. The actual degree of tolerance of any building depends in a complex way on both the structural characteristics of the building and the frequency spectrum of the exciting vibration. People may 'feel' vibration but not be disturbed by the vibration at levels lower than those required to cause superficial damage to the most susceptible building.

British Standard 7385: Part 2-1993 *Evaluation and Measurement for Vibration in Buildings* is a definitive standard against which the likelihood of cosmetic building damage from ground vibration can be assessed. Sources of vibration which are considered in the standard include, among other things, blasting, piling, ground treatments (e.g. compaction), construction equipment and tunnelling with equipment such as roadheaders and TBMs.

Conclusions

I note that approval for development on local or state heritage places is required under the *Sustainable Planning Act 2009* (SPA). **I have stated** conditions for these SPA approvals in Condition 2 – Development on a state heritage place and Condition 3 – Development on a local heritage place, Schedule 1, Appendix 1.

For a state heritage place, these conditions include:



- a requirement for the proponent to conduct condition surveys of each place on the Queensland Heritage Register ('place of state significance') to the extent the place is the subject of development prior to any works commencing which may impact on the cultural heritage values of the place of state significance. The condition surveys must include detailed structural inspections prior to construction, including all timber framing, stonework, brickwork, and the integrity of sealing of all timber in the stone/brickwork
- prior to any works commencing which may impact on the cultural heritage values of a place of local or state significance, the proponent must prepare specific Cultural Heritage Management Plans (CHMPs) for each place, to the extent impacted
- the CHMPs must include specific elements detailed in Condition 2, Schedule 1, Appendix 1
- the draft CHMPs must be provided to DERM for review and comment, and the comments taken into account in finalising the plans.

For a local heritage place, these conditions include:

- prior to any works commencing which may impact on the cultural heritage values of a place of local or state significance, the proponent must prepare specific CHMPs for each place, to the extent impacted
- the CHMPs must include specific elements detailed in Condition 3, Schedule 1, Appendix 1

In addition to the above, to mitigate potential vibration impacts caused by the project, I **impose** Conditions 22(j) to (q) – Noise and Vibration, Schedule 3, Appendix 1. These conditions include among other things:

- a requirement for predictive modelling to be undertaken progressively and prior to commencement of works along the corridor of influence
- specific mitigation and management measures must be designed and implemented, prior to commencement of construction works where predictive modelling predicts that vibration goals for cosmetic damage are likely to be exceeded
- on-going, continuous vibration monitoring must be conducted in the corridor of construction influence
- building condition surveys must be conducted, progressively, of properties identified in the predictive monitoring as potentially being affected by cosmetic damage as a result of construction works.

4.2.8 Other construction issues

4.2.8.1 Hours of Operation

Surface construction activities shall be generally restricted to the hours of 6.30 am to 6.30 pm (Monday to Saturday) and at no time on Sundays and public holidays ('standard construction hours').

Notwithstanding the above, it is recognised that certain works associated with the construction of the project can only be done outside of these hours due to safety, traffic congestion, and other considerations. These works are permitted to be undertaken outside of standard construction hours, subject to imposed Condition 18(c)- General Construction, Schedule 3, Appendix 1. Such works include the delivery of oversized plant or structures for which police or other authorities have determined that transport along public roads is to be outside of the standard construction hours and for which there is no feasible alternative; emergency work to avoid the loss of lives or property, or to prevent environmental harm; construction work for which relevant authorities (e.g. road management authorities) require that particular works at particular locations can only be undertaken outside of the standard



construction hours and for which there is no feasible alternative; and any other works approved by the Coordinator-General.

Recognising the ongoing nature of spoil generation from continuous tunnelling activities, the operation of the conveyor to transport spoil to Mount Coot-tha Quarry may be undertaken on a continuous basis. For trucked spoil, loading and haulage may be undertaken at any time between 6.30 am Mondays to 6.30 pm Saturdays. There must be no haulage of construction spoil on Sundays or public holidays.

Underground construction works may be undertaken 24 hours per day, seven days per week. Imposed Condition 22 - Noise and Vibration, Schedule 3, Appendix 1 requires the proponent to undertake predictive modelling prior to commencement of construction and on-going monitoring during construction. Where the modelling predicts that vibration goals for human comfort are likely to be exceeded, specific mitigation and management measures must be designed and implemented prior to the commencement of the relevant construction works.

Further, **I impose** Conditions 22(p) requiring that blasting only occur during the hours of 7.30 am to 4.30 pm Monday to Saturday, and not on Sundays or public holidays, and Condition 22(q) requiring that notice be provided to persons that may be adversely affected at least 24 hours prior to each blasting event.

4.2.8.2 Night lighting

Lighting of the project work sites has the potential to impact on residential amenity. The EIS states that the guidelines to be developed as part of the project will include measures to ensure lighting during construction does not impact on any form of transport or residents and to avoid inappropriate light pollution, shadowing or glare during construction.

I impose Condition 18 – General construction, Schedule 3, Appendix 1, requiring that night lighting, including security lighting, must be designed, installed and positioned to minimise light spill onto residential premises and comply with the relevant Australian Standard.

4.2.8.3 Construction workforce car parking

Construction workforce car parking on local streets has the potential to inconvenience local residents and cause traffic impacts.

The EIS states that site vehicles and construction vehicles would park within the construction worksites. Staff vehicles would park in designated parking areas with dedicated workforce parking facilities to be provided at the eastern end of Victoria Park between Gilchrist Avenue and the ICB, and at the western end either in the overflow carpark across Mount Coot-tha Road from the entrance to the Mount Coot-tha Botanic Gardens or in areas along Sir Samuel Griffith Drive between Mount Coot-tha Road and Simpsons Road.

Based on recent experience with other infrastructure projects in Brisbane, **I consider** that there is potential for both:-

- the actual construction workforce to be greater than predicted for the reference design in the EIS leading to overflow of off-street parking identified in the EIS
- and consequently, if not specifically prohibited, unsupervised parking of project related staff in local streets around worksites.

Therefore, **I require** that construction workforce parking must be in accordance with imposed Condition 18 (j) and (k) – General construction, Schedule 3, Appendix 1. Condition 18(j) requires that the construction workforce must not park in local streets. A dedicated and adequate construction workforce off-street parking area must be provided. All construction workforce vehicles must be directed to project construction workforce car parks. To avoid construction workforce car parking in local streets, shuttle transport between construction workforce car parks distant from a worksite or work area is to be provided for the duration of the period the worksite or work area is in use. At the completion of the project Condition 18(k) requires that construction workforce car parks must be rehabilitated as quickly as is reasonable and practicable.



4.2.8.4 Offsetting greenhouse gas emissions

The construction of the project will generate significant greenhouse gas (GHG) emissions. GHG emissions associated with the construction of the project are from fuel use, electricity consumption and blasting using ammonium nitrate/ fuel oil explosives. Fuel will be consumed by construction vehicles moving on and between worksites and the transport of construction materials to and from the worksites (including spoil haulage). Uses of electricity during construction include site offices, the tunnel boring machine, roadheaders, lighting, tunnel ventilation, electrical and other mobile plant and equipment.

Estimation of the GHG emissions associated with the construction of the project was undertaken in accordance with the National Greenhouse Accounts Factors (NGAF) workbook prepared by the Australian Government Department of Climate Change. The total estimated GHG emissions for the construction of the Project are approximately 32 000 tonnes carbon dioxide equivalent (CO₂-e). For comparison purposes, the annual GHG emissions associated with the operation of a domestic fridge is approximately 783 kg CO₂-e and for a medium sized car is approximately 3.77t CO₂-e.

In an effort to mitigate the carbon footprint of both the construction and operation of this project I impose Condition 2, Schedule 3, Appendix 1 Offsetting Greenhouse Gas Emissions requiring the proponent to develop a Greenhouse Offset Plan that, at a minimum, provides proposed offsets for the greenhouse gas emissions generated from the construction and operation of the project. The plan must include the proposed actions and associated timeframes to achieve the offsets and an ongoing reporting regime and is required to be submitted to the Coordinator-General for approval.

Emissions from vehicles using the project are not included in the operation emission calculations required in imposed Condition 2.

Off-sets may include contributions to Ecofund Queensland or another accredited offsets program acceptable to the Coordinator-General

I **acknowledge** that greenhouse gas abatement measures are currently subject to prominent public debate and that there is a reasonable probability that other jurisdictions of government may, during the period of construction or operation of this project, introduce other mandatory carbon reduction requirements (e.g. an emissions trading scheme or a carbon tax). There is no intention that Condition 2 of Schedule 3 be applied in a way that may result in double accounting of the same emissions. Therefore, to ensure that any other subsequently introduced mandatory emission reduction requirements are taken into account in calculating and off-setting any GHG emissions for this project, imposed Condition 2(a)(v) specifically requires that the Greenhouse Offset Plan undergo a review process which is triggered upon the introduction of any such legally binding requirement.

4.2.8.5 Location of the spoil conveyor

A spoil conveyor from the western construction site to the Mount Coot-tha Quarry has been proposed to transfer the majority of the tunnel spoil from the worksite to the quarry without the use of spoil haulage trucks and this is the spoil removal method assessed for this report.

The indicative location of the spoil conveyor for the reference design from the western construction site to the Mount Coot-tha Quarry over a distance of less than one kilometre on Council owned freehold land was identified in Figure 4-20 in the EIS and reiterated in drawing EIS-CS-02 Rev B in Volume 2 of the supplementary report. Construction of the conveyor would require the removal of an eight metre wide strip of both natural vegetation between the Gardens and the Quarry (maximum area of just over 0.3 hectares) and several scattered trees in a predominantly grassland environment within the Botanical Gardens (over an area of less than 0.3 ha).

The natural vegetation is a 'least concern' regional ecosystem under the *Vegetation Management Act 1999* (VMA - RE 12.11.5). It is a low open forest or woodland dominated by *Corymbia citriodora* (lemon scented gum), *Eucalyptus siderophloia* (grey ironbark), which are both common species. I am advised that clearing in this 'urban area' would be exempt from



the requirement to obtain a permit under the VMA. The scattered trees within the Gardens property consist of some remnants and some planted individuals. This area of the Gardens is not a mapped RE under the VMA.

The proponent has committed to the complete rehabilitation of the conveyor corridor following the completion of construction and the removal of the conveyor.

Given the limited scale of the clearing required, the limited duration of operation of the conveyor (approximately 14 months), and the high probability of success of rehabilitation of the conveyor site with suitable vegetation following completion of construction, **I consider** the route proposed for the conveyor to be acceptable. Nonetheless, **I consider that** additional protection provided by the imposed conditions in Appendix 1, Schedule 3, particularly:

- Condition 17(b) – in relation to design, location and construction of the conveyor
- Condition 17(c) – in relation to decommissioning requirements
- Condition 18(n) – in relation to rehabilitation and replanting
- Condition 19(d) – in relation to the Flora and Fauna EMP Sub-Plan
- Condition 20(g)(v)B – in relation to control of dust deposition on vegetation

will ensure the minimisation of construction and operational impacts, the success of subsequent revegetation work, and the protection of fauna values associated with the conveyor corridor.

I understand from public statements made by BCC in February 2010 that consideration has been given to small amendments to the conveyor route to further reduce the vegetation impact of the conveyor. This report does not consider that minor proposed route realignment.

While I would encourage improvements to final design of the project that would reduce vegetation impacts, such changes would need to be assessed in the context their impact on other parameters. The potential impacts of such a realignment (e.g. on the noise profile around the operation of the conveyor) would need to be assessed as part of a separate change request submitted in accordance with s35C of the SDPWO Act.

4.2.8.6 Urban design

Urban, landscape and visual guidelines were developed in the EIS for the key project locations. The guidelines consider the project vision, goals and objectives relating to urban landscape values, character and connectivity. These common themes were ordered into landscape and urban design elements so that they could be applied to a range of urban settings found in the study corridor.

To ensure the project is designed and constructed in accordance with appropriate urban landscape and visual goals, objectives and design measures **I impose** Condition 24 – Urban design and landscape, Schedule 3, Appendix 1. This condition requires that:

- the NLRT project must be constructed in accordance with the D&C EMP, including the Urban Design and Landscape EMP Sub-Plan.
- the Urban Design and Landscape EMP Sub-Plan generally must achieve the environmental objectives and performance criteria, and generally must be consistent with the Draft Outline EMP (Design and Construction) provided in the supplementary report. The Sub-Plan must ensure the project is constructed in a manner that minimises the visual impact of infrastructure and hard landscaping elements.
- the project detailed design must include measures to meet the guidelines established in *'Crime Prevention through Environmental Design (CPTED) Guidelines for Queensland Part A: Essential features for safer places. 2007'*.
- the project must provide safe, legible and convenient connections for pedestrians, cyclists and public transport users to and from all residential areas adjacent to the project.



- the *City West Strategy*, and particularly the potential for a future land bridge across the ICB and railway lines in the vicinity of Victoria Park Road, must be actively considered by the proponent during design of the project to ensure the opportunity to construct this bridge in the future is not compromised by the project
- the design and construction of the operational project lighting is to comply with AS 4282-1997: *Control of the obtrusive effects of outdoor lighting*.

4.3 Operational impacts

4.3.1 Road traffic noise

EIS findings, submissions and analysis

Traffic noise criteria are contained in *Queensland's Environmental Protection (Noise) Policy 2008* and the *TMR Road Traffic Noise Management: Code of Practice (January 2000)*.

When operational, the project will generate road traffic noise at the tunnel portals and connections to existing roads. With respect to road traffic noise the TMR Code of Practice mandates a traffic noise criterion of 68 dBA $L_{A10(18\text{hour})}$ for all state-controlled roads where there are sensitive noise receptors.

The EIS suggested that where the road traffic 'planning' noise levels are already exceeded by current road traffic noise at sensitive locations it may not be reasonable and practicable to achieve compliance with these 'planning' noise levels. In these instances, the proponent proposes that the 'status-quo' noise levels should be maintained (i.e. maintain noise levels at levels anticipated in Year 2026, the design year, without the project) or specific measures to address localised impacts to be implemented in consultation with potentially affected property owners and occupants.

In its submission on the EIS, TMR noted that this approach by the proponent (i.e. implementing measures to maintain future (and potentially higher) status quo noise levels) is not appropriate. TMR advised that any road project should be responsible for meeting the requirements of the TMR Code of Practice at noise sensitive locations where road upgrades are being undertaken, even if the current noise levels exceed the 68 dBA criterion.

Traffic noise attenuation measures adjacent to state-controlled roads are applicable only to those sections of roads where new permanent works are occurring. In respect of this project, I **consider** that the TMR Code of Practice should apply to the extent of the road works required for the connecting surface roads around the connections and to the works required at Moggill Road/Centenary Motorway Interchange, but not to other parts of the Centenary Motorway beyond those works.

Conclusions

It is TMR's objective to see noise criteria applied in a consistent fashion. I **concur** with this objective. Therefore I **impose** Condition 31 – Noise, Schedule 3, Appendix 1.

This condition provides for noise levels at new roads constructed or upgrade as part of this project, especially leading to and from the tunnel portals, to be based on TMR's *Road Traffic Noise Management: Code of Practice*. This condition also requires the proponent to follow the requirements of the Operation and Maintenance Noise EMP Sub-Plan.

4.3.2 Air quality

EIS findings, submissions and analysis

Air quality considerations for the operational stage of the project focus on both the in-tunnel air for tunnel users and the release of air emissions from the tunnel ventilation exhaust system. The tunnel ventilation system is necessary in tunnels to extract exhaust fumes produced by vehicles travelling through the tunnels to maintain a satisfactory air quality inside the tunnel.



The system of mechanical ventilation proposed for the project would create longitudinal air flow in each tunnel tube. Air would be drawn in at the entry portal, carried along the tunnel in the direction of traffic, and drawn out just prior to the exit portal to the ventilation exhaust stack located nearby on the surface. A series of roof mounted jet fans would draw air into and convey it along each tube. At the other end, between the draw off point and the exit portal, the jet fans would be reverse mounted so as to draw air into the tunnel to the draw-off point, thereby mitigating portal discharge at the exit. All air is extracted from the tunnel at a point approximately 100 metres from the exit portal within the main line tunnel and from there vented to the atmosphere by means of a ventilation stack at each end of the project.

Air quality criteria are contained in *Queensland's Environmental Protection (Air) Policy 2008 (EPP(Air))*. As of 1 January 2009, the operation of road tunnel ventilation stations and stacks requires a material change of use of premises for an environmentally relevant activity (EPA 51) as defined in Schedule 1 of the *Environmental Protection Regulation 2008*.

During the preparation of EIS, various site options for each of the ventilation outlets were presented to the community by the proponent at information sessions, through information extension activities such as the project newsletter and website, and discussed with the community reference groups. The main issue of concern for people who engaged in this process was understanding the potential impact that the operation of the ventilation stacks would have on the surrounding air quality, and consequently, upon community health.

The EIS reported that feedback received from the community during the preliminary consultation process indicated that, for many people, visual impact and changes to amenity were the next most important issues. Sites which would not lead to an exceedance of the air quality goals and which would have little visual impact would be of less concern to many people than sites requiring high to very high ventilation outlets.

The selection of preferred sites for the ventilation stations and outlets was presented in the EIS. Each option was assessed against a range of criteria including ventilation function, air quality, land use, physical constraints, access, visual impact and relative indicative costs of construction of the ventilation shaft connecting the ventilation station with the stack.

Two sites selected by the proponent for the ventilation stations and the ventilation outlets are the:

- western ventilation station and stack – within the Mount Coot-tha Botanic Gardens on the northern side of the Centenary Motorway, approximately 400 metres west of Mount Coot-tha Road
- eastern ventilation station and stack – on BCC owned land within the Victoria Park Golf Course, east of the Inner Northern Busway and north of the ICB with the ventilation stack being a separate structure 150 metres north on a topographic rise.

I note that modelling of air pollutant dispersion from the ventilation stack showed only very small and not critical increases in ambient groundlevel concentrations for all air constituents considered (including air particulates).

Oxides of nitrogen (NO_x) are important air pollutants in most urban air sheds, including Brisbane. Of all the air pollutants modelled in the EIS, the maximum one hour average Nitrogen Dioxide (NO_2) contribution from the tunnel ventilation is predicted to consume the greatest fraction of the air quality goal (specified in the EPP (Air)) at less than 3%. All site locations had similar concentrations of NO_x in terms of both maximum ground level concentrations, and the overall pattern of dispersion. Based on both background concentrations at the two and the predicted impacts of the project, the maximum 1 hour NO_2 level would not reach half the air quality goal (specified in the EPP (Air)) at ground level.

The eastern ventilation station is proposed to be partially buried into the elevated ridgeline immediately east of the Inner Northern Busway tunnel portal that cuts through this ridgeline. The location is approximately 50 metres north of the ICB to avoid interference with the drainage capacity in this location. The partial burial would provide for a building of the same configuration and proportions as the western ventilation station (i.e. 41 metres long, 23 metres wide and 13.5 metres high).



The ventilation stack would be built approximately 150 metres further north on elevated ground in order to minimise the height of the outlet structure. The height of the ventilation stack would be 15 metres. The ventilation duct from the extraction point on the eastbound tunnel would be cut below the cut and cover of the tunnel entry ramp and then connect to the southern side of the ventilation station. A similar cut and cover ventilation duct would be constructed from the northern side of the ventilation station to the ventilation outlet.

Whilst it appears from submissions on the EIS that there is general satisfaction with the proposed location of the ventilation station and outlet location for the eastern end of the tunnel, a number of submissions expressed concern with the location of the western ventilation station and outlet, particularly that the proposed position of the outlet was too close to residential housing, schools and the Mount Coot-tha Botanic Gardens. Submissions suggested it should be further away from the Botanical Gardens, relocated to the Toowong Quarry or in industrial areas remote from the project such as Sumner Park or Darra.

The selected western site is at least 300 metres from any buildings. It is adjacent to tall trees but the ventilation outlet would be designed to provide dispersion above these. The site is generally within the broad 'valley' between Mount Coot-tha and the higher elevations of Toowong however, this will not affect the ability for the released air from the outlet to be adequately dispersed as presented in the air quality modelling and dispersion analysis based on detailed topographic and meteorological data.

The site is located on the western end of the Centenary Motorway worksite, and is to be cut into or partially buried within the forested slope of the hillside in this location. Burial would allow for stacking of the fans onto two levels and possible reduced dimensions for the ventilation station. The outlet will be 20 metres taller than the top of the station building, approximately in line with the height of the surrounding topography. The ventilation duct from the extraction point within the westbound cut and cover tunnel exit ramp, on the southern side of the Centenary Motorway, would be constructed under a widened cross passage and would connect under the eastbound cut and cover tunnel entry ramp to the ventilation station.

The proponent has advised that for alternative sites within the Botanic Gardens, construction of the ventilation tunnel would have an adverse impact in terms of clearing vegetation and potential drawdown of groundwater. The extra distance would add significantly to construction costs and construction impacts, lead to increased energy demand during the operational phase and have consequential increases in greenhouse impacts with increased energy demands and associated operating costs. These issues associated with construction cost and energy requirements limited consideration of locating the ventilation outlet further west along the Centenary Motorway, including to such locations as distant as Sumner Park or Darra.

The proponent has committed to a ventilation system that produces in-tunnel air quality that complies with the EPP (Air) and international criteria. The EIS referred to health studies undertaken with in-tunnel air and provided results of air quality modelling undertaken with ventilated air treated (filtered) prior to emission. The modelling predictions indicate that emission treatment would result in very similar ambient air quality as without emission treatment. The EIS concludes that because of the quality of the in-tunnel air, the surrounding terrain, and the ability to disperse the air via the ventilation outlets, filtration at the ventilation station is not required.

The proponent was requested to provide a capital and operational life cycle assessment (LCA) (capital and operational) of air filtration systems to quantify the major impacts and benefits of filtration systems for the project. This assessment provided in the supplementary report examines the major impacts and benefits (including environmental externalities) of installing a particulate filtration system – usually undertaken by electrostatic precipitation; and a NO₂ filtration system – generally undertaken through a catalytic reduction process.

A particulate filtration system for the NLRT would incur capital costs of \$2,750 per tonne of PM₁₀ removed over 20 years of operation and would generate greenhouse gas emissions of 3.0 t CO₂-e per tonne of particulate removed. A NO₂ filtration system for the NLRT would incur capital costs of \$27 000 per tonne of NO₂ removed over 20 years of operation. The operation of a NO₂ filtration system would also generate greenhouse gas emissions of 12.6 t



CO₂-e per tonne of NO₂ removed and make a substantial contribution to particulate generation at the power source.

I am satisfied that installation and operation of air filtration equipment is not warranted at this time due to the project's minor contribution to ambient air quality loads.

Notwithstanding that it has been demonstrated that air filtration systems are neither required nor proposed at this stage, Conditions 4(b) for ERA 51 in Appendix 1, Schedule 1 requires that provision is to be made at each of the sites for the possible future installation of filtration equipment.

Conclusions

I acknowledge that air quality impact from the operation of a tunnel is a concern to the public. DERM is responsible for assessing and issuing any such approval for ERA 51 (the operation of road tunnel ventilation stations and stacks) for material change of use applications under the SPA. DERM will also be responsible for monitoring compliance with conditions on the development approval.

In consultation with DERM, **I have stated** conditions for ERA 51 in Condition 4 – Road Tunnel Ventilation Stack Operation, Schedule 1, Appendix 1. These conditions include, amongst other things:

- preparation and implementation an Operational Air Quality Environmental Management Plan to mitigate and manage potential impact arising from operation of the tunnel ventilation system
- design of the system so that it does not prevent the possible future installation of filtration equipment
- release criteria for air quality from the ventilation outlets
- location and height of ventilation stacks and requirements for monitoring of in-tunnel air quality
- management of in-tunnel air quality effectively by on-going, continuous monitoring linked to a system of traffic management to maintain appropriate traffic flows and consequent emission levels
- minimisation and management of the risk of exceedance of the goals for ambient air quality by on-going, continuous monitoring of the air flow within each of the ventilation outlets. Monitoring must be undertaken in accordance with accredited procedures. The results of monitoring of the air flow within each of the ventilation outlets must be made publicly available in the event of an exceedance of in-tunnel air quality criteria or in the event of an exceedance of the goals for ambient air quality. The results must be available within 24 hours of such an exceedance.

I am satisfied that the air quality from the operation of the tunnels ventilation system will be appropriately regulated by DERM under any development approvals issued.

4.3.3 Bus priority and transit improvements

EIS findings, submissions and analysis

The EIS reported that the project would provide buses travelling via Moggill Road, Coronation Drive and Milton Road with improvements in travel time and reliability due to reduced traffic volumes on the surface road network in the inner west.

Modelling indicated that bus services travelling along Milton Road and Coronation Drive would experience indicative travel time savings of approximately five minutes in the peak direction. There would be a minimal change in travel time during peak periods on Moggill Road.

The project offers the opportunity to deliver a busway-type link for future cross-town bus services between key trip generators in the western and northern suburbs (e.g. Chermside to



Indooroopilly, Indooroopilly to Australia TradeCoast) to travel via the NLRT and the Northern Busway or other surface routes.

I understand that the opportunity exists for implementation of an inbound bus lane or high occupancy lane on Coronation Drive following completion of the project, and is supported by the submissions on the EIS. BCC is also in consultation with TMR to examine the potential for efficient and cost-effective bus connectivity between the Inner Northern Busway and the NLRT for the diversion of existing 'Rocket' bus services that operate in peak periods between the western suburbs and the CBD.

I note the proponent's commitment that local and regional passenger services, including BCC services and those provided by bus operators providing public transport services, and emergency services will be exempt from project tolls. This includes all school buses providing scheduled passenger transport services as well as emergency service vehicles responding to emergencies. It does not include long-haul intra and interstate bus services.

I note that BCC has committed to continue working with the state to analyse bus-only ramp options at the eastern end of the project to join the Inner Northern Busway. BCC is considering the implementation of an all day T2 lane inbound on Coronation Drive after the completion of the 'Go Between Bridge' and will work with the state to implement an inbound T3 transit lane when the NLRT project is complete.

I also note that a key study in progress during the time of preparation of the NLRT project EIS was the State Government's Western Brisbane Transport Network Investigation (WBTNI) led by TMR. Further information about WBTNI and its relevance to the NLRT project is provide below in section s4.3.4.1 and 4.3.4.2 of this report. Future arrangements with respect to bus priority and other transit improvements should consider the outcomes and strategies recommended through the WBTNI process.

Conclusions

I consider that the proponent's commitments to achieving the outcomes outlined above are significant contributions to public transport that the project can effect. In this regard the project benefits are more broadly recognised through improvements which public or private transport users on both the project itself and surface roads will experience as increased road space.

With respect to wider public transport network impacts, **I note** that TMR has requested that BCC, in conjunction with the state, develop interim and longer term bus priority measures on the Moggill Road and Coronation Drive corridor as part of an optimised (and sustainable) approach towards addressing the impacts of traffic growth in urban centres, particularly given the freed up road space on Milton Road, the eastern end of Moggill Road and Coronation Drive as a result of the project.

In consideration of the above, **I recommend** that BCC is to work with TMR in developing and implementing a Public Transport Plan that is consistent with WBTNI planning outcomes and includes interim and longer term bus priority treatments for the Moggill Road, Milton Road (western end) and Coronation Drive corridor.

4.3.4 Interface with state controlled roads

4.3.4.1 Moggill Road/Centenary Motorway interchange

EIS findings, submissions and analysis

The supplementary report states that the project will result in increased traffic at the connections of the Centenary Motorway to Moggill Road and that these connections could be satisfactorily managed with signal co-ordination in early years after the opening of the project with the forecast traffic volumes.

Further, the supplementary report states that future upgrades to the interchange configuration at Moggill Road are anticipated in association with upgrading of the Centenary Motorway. This upgrading should occur with the implementation of the State's SEQIPP transit lane



project (or similar) in the 2016 to 2026 time-frame and in association with any future WBNTI connection with the Centenary Motorway.

In its submission on the supplementary report, TMR questioned the level of impact the project would have on the Moggill Road interchange and requested details of proposed mitigation works. TMR highlighted that the Level of Service (LoS) for the Centenary Motorway on-ramp at Moggill Road was predicted to worsen with the project and, with the removal of the local connections which modelling indicated would result in more traffic using the intersection to access the project, the LoS would be unsatisfactory.

TMR expects traffic changes to include increased northbound on-ramp and southbound off-ramp volumes, and increased movements between the NLRT and origins/destinations such as Indooroopilly Shopping Centre, which will result in changes to traffic flow on Moggill Road east of the Centenary Motorway and through the intersections at the interchange itself.

TMR requested the proponent to reconfigure the Moggill Road interchange and nearby intersections to wholly mitigate the changes in traffic levels (and flow directions) beyond the background growth forecasts within the scope of the NLRT project for a ten year design horizon from the time of opening.

Conclusions

To mitigate the potential for impacts in relation to the Moggill Road/Centenary Motorway Interchange, **I impose** Condition 27, Schedule 3, Appendix 1. This condition requires the proponent to design and upgrade the interchange to mitigate traffic impacts resulting from operation of the project.

The resolution of this issue relies on the implementation of an Interface Agreement between TMR and BCC, some parameters of which are specified in Condition 27(d). As the mitigation of impacts of the project on the Moggill Road Interchange will require the design and construction of capital works, it will be important that the Interface Agreement is finalised with sufficient time to permit the Interchange upgrades to be in place before the NLRT becomes operational. Therefore, **I recommend** to TMR and BCC that, if the Interface Agreement is not finalised within 120 days of commencement of construction, then mediation of that Agreement should be promptly sought. The Coordinator-General would be a suitable person to conduct such mediation.

4.3.4.2 Western Brisbane Transport Network Investigation

EIS findings, submissions and analysis

A key study in progress during the time of preparation of the NLRT project EIS was the State Government's Western Brisbane Transport Network Investigation (WBNTI). This TMR study, completed in 2009, provides a coordinated approach to the ongoing development of the transport network for western Brisbane for the next 20 years and beyond. It included all transport types – walking and cycling, public transport, roads and freight.

The WBNTI study area extended from west of the Brisbane CBD, south to Ipswich, north to Caboolture, and west to the region of the Brisbane Valley Highway.

In April 2008 the WBNTI project team released a range of possible corridor options for improved transport networks in western Brisbane for public comment. These included active transport infrastructure for walking and cycling, bus improvements (bus lanes, bus priority and busways), rail upgrades and road improvements.

The NLRT project was incorporated in the listing of potential strategy elements displayed for public comment in April 2008. Another option introduced by WBNTI, the Inner Orbital tunnel, is a proposed urban motorway tunnel from the Centenary Motorway at Toowong, connecting to the preserved North West Transport Corridor and Stafford Road at Everton Park.

To assess the cumulative effects of the relevant key WBNTI corridor options as displayed in April 2008, traffic modelling for the EIS was undertaken using the NLRT Project traffic model. In consultation with the WBNTI project team, the 2026 time horizon was identified as the appropriate time horizon for indicative assessment of traffic impacts.



In a submission on the EIS, TMR expressed concerns about the potential for conflict between the NLRT project and some other road infrastructure project options considered in the WBTNI. Of particular concern was that the Centenary Motorway and Inner Orbital tunnel proposed in the WBTNI were planned as a continuous route, and as such, TMR advised that the NLRT project must be constructed with the ability for traffic priority to be given to the Inner Orbital continuous route, should the Inner Orbital tunnel be constructed.

Also of concern to TMR was that the median of the Centenary Motorway is narrow and constructability for the Inner Orbital tunnel could be adversely affected if not adequately planned for by the NLRT project.

Conclusions

To mitigate the potential for impacts in relation to the WBTNI study, I impose Condition 26(b) Schedule 3, Appendix 1, to manage future traffic impacts from the project,. This condition requires the proponent to design and construct the interface of the NLRT project to the Centenary Motorway to ensure that the project's operation will not compromise any possible future connection of Centenary Motorway with a future Inner Orbital Tunnel project resulting from WBTNI nor limit the possible future widening of the Centenary Motorway.

4.3.4.3 Interface with the Inner City Bypass

EIS findings, submissions and analysis

The ICB is a key piece of connecting infrastructure between the NLRT, Clem7 and Airport Link projects. Special attention has been given during my evaluation of the NLRT EIS to ensure that the capacity of this road and its connections would be adequate to accommodate traffic changes that would result when all three of these projects and the Go Between Bridge become fully operational.

The EIS and the supplementary report forecast that the project would have the following effects on connecting roads at the eastern end of the project:

- On the six-lane ICB, immediately west of the NLRT ramps, increases in average weekday traffic in the order of 30% (compared to the without NLRT scenario) were forecast, resulting in 153 500 vehicles per average weekday by 2026. Due to the orbital function of this 'motorway standard' connection, traffic volumes during peak periods were forecast to be quite balanced and the distribution of traffic throughout the day would lead to a flat demand profile, rather than pronounced commuter peaks. A satisfactory LoS of B (approximately 70% of free flow speed) or C (approximately 50% of free flow speed) is forecast during peak periods.
- Connections to the ICB at Bowen Hills, such as Herston Road, Bowen Bridge Road providing routes between the project and the central city, would experience traffic increases. Usage of the ICB off-ramp to Herston Road, in particular, would increase substantially by approximately 126%, and traffic volumes using the north-facing multi-function on-ramp from Bowen Bridge Road to Airport Link, CLEM7 and the ICB would increase by approximately 20%. Despite this, peak and daily volumes on these ramps were forecast to remain within their traffic carrying capacity.

In response to a request from TMR, the proponent has confirmed that limitations introduced by all key connecting ramps, interchanges and intersections have been taken into account. The proponent also confirmed that dynamic traffic modelling had been undertaken for the project to check the effects on the LoS of the ICB near the tunnel portal ramps, including the adequacy of the design to cater for weaving and merging movements and that findings show that satisfactory performance is forecast with the project.

Given the importance of the ICB to the Brisbane road traffic network, I requested TMR to provide a more detailed view on the reasonableness of the forecast traffic volumes provided by the proponent and the impact on the long-term operational integrity of the ICB with the addition of the NLRT to the road network.



TMR expects the maximum capacity of the ICB to be lower than the EIS forecast of 2000 vehicles per hour (one-way traffic flow per lane), when consideration is given to the proximity of the ramps and the additional NLRT merge-diverge ramps, and that the expectation that the ICB will be able to carry such high volumes of traffic in 2026 at LoS C is optimistic. TMR advice is that the ICB will be more likely operating in 2026 at LoS E (at capacity) or F (demand exceeds capacity).

Conclusions

Whilst this project offers significant benefits, it is important that the travelling public are not misled by expectations of improved travel times on the ICB which may be congested in the future.

Based on TMR's advice **I conclude** that surrounding road networks will reach carrying capacity prior to NLRT reaching its capacity. There will be a need for further road infrastructure improvements in the future to consider this and potential remedial measures.

In September 2009 the Transport Minister released a long-term sustainable transport vision for western Brisbane's transport network (as part of WBTNI). In relation to road transport, the strategy supports the need for BCC's proposed NLRT and it proposes a longer term road connection from the Ipswich Motorway at Darra to the Bruce Highway, including a motorway tunnel linking Toowong to Everton Park.

In this regard, **I endorse** further transport network planning regarding the need for other planned infrastructure improvements included in the Western Brisbane Transport Network Strategy.

4.3.5 Impacts on cyclists

EIS findings, submissions and analysis

Cyclists will be prohibited from using the NLRT.

A range of issues were raised in submissions in relation to the operational impacts of the project on cyclists. The majority of these issues have been addressed by the removal of the local connections.

I understand TMR currently has an agreement in place with Bicycle Queensland which allows cyclists to use the Centenary Motorway. This is different from the standard requirement that does not allow cyclists to use motorways. Sports cyclists (often group riders) and higher speed commuter riders are the predominant users of the motorway.

In its submission on the supplementary report, TMR requested information about how the NLRT project would impact on cyclists using the Centenary Motorway. In response, the proponent has advised that it considers that cycling is not appropriate on the Centenary Motorway and that the operation of the NLRT project may cause further safety issues for cyclists using the Centenary Motorway due to requirements for crossing lanes, etc. This matter was not raised in submissions from the community during the EIS process.

Given the proposed road layout at the western portal entrance, a serious safety issue remains. Those on-road motorway cyclists using the Centenary Motorway inbound will be required to exit the freeway at the Toowong roundabout. To do this would entail crossing the two lane entrance to the tunnel portal. It is difficult to imagine that this could be done safely in the freeway speed environment.

The proponent has requested that with the implementation of the NLRT project, the agreement for the on-going use of the Centenary Motorway by sports and group cyclists is re-assessed.

There may be considerable cost in capital works to maintain good access for cycle groups at the east end of the Centenary Motorway during the construction and operation of NLRT project. The Centenary Bikeway provides an alternative path for cyclists between the Moggill Road Interchange and the Toowong Roundabout, although with greater speed constraints compared to the Motorway.



Conclusions

Future cyclist access to the Centenary Motorway is a matter for the Chief Executive of TMR to determine following submission by the proponent of both detailed project designs and the Construction and Operational Traffic Management Plans.

Nonetheless, in the interests of safety, **I recommend** that, should the proponent commit to a contract for the construction of the NLRT project, then TMR should immediately undertake a reassessment of the on-going use of the Centenary Motorway by sports and group cyclists to be completed at least two months prior to the commencement of construction of the project. Should that assessment identify significant safety concerns, then TMR should promptly advise Bicycle Queensland and the general public that bicycle access to the Centenary Motorway east of the Moggill Road interchange will become prohibited.

4.3.6 Hazard and Risk

EIS findings, submissions and analysis

The EIS has identified the hazardous activities associated with the operation of the tunnel include:

- transportation of dangerous goods, both in the tunnel and on surface routes
- minor vehicles accidents and incidents in the tunnel leading to fuel spillage or small fires
- major vehicle accidents in the tunnel or acts of ‘terrorism’ leading to major fires and explosions
- tunnel collapse or subsidence
- flooding and inundation during operation.

I note that regulations would preclude vehicles carrying dangerous goods from entering the tunnel. The EIS provided details of the fire detection systems and the emergency response procedures which have been developed in consultation with the Department of Community Safety (DCS). DCS also suggested conditions to me in respect of managing the hazards and risks associated with the operation of the tunnel.

In a submission on the supplementary report, Disability Services Queensland (DSQ) in the Department of Communities requested that emergency plans take into account the needs of people with disabilities. Further, DSQ requested that an Equitable Access Statement (EAS) for the project be prepared prior to construction based on the principle that people with a disability have the same right to access services and facilities as other members of the community. The purpose of the EAS is to ensure that the needs of people with a disability or who may experience access problems are taken into account during the design of the project, including in respect to signage, tactile ground surface indicators, doors and doorways and egress lighting systems.

Conclusions

I acknowledge that there are risks associated with the operation of the project and the assessment, mitigation management and monitoring of those risks is of utmost importance to protecting tunnel users. To ensure the hazards and risk associated with the operation of the tunnel are appropriately addressed, **I impose** Condition 33 – Hazard and Risk, Schedule 3, Appendix 1. These conditions have been developed in consultation with DCS and DSQ.

The conditions impose a requirement for the proponent to develop an Emergency Response Plan that includes:

- protocols and procedures, including taking into account the needs of people with disabilities to be followed during emergency situations
- details of traffic management measures to be implemented during emergencies



- management of infrastructure measures to address the potential environmental impacts of an emergency situation
- a training and testing program to ensure that all operational staff are familiar with the plan.

A Fire and Smoke Management Plan is also required to address fire and life safety in the tunnel. The plan will outline fire protection systems and other tunnel equipment, systems, and operational protocols required for fire and smoke management.

These plans are to be prepared and implemented in consultation with the relevant emergency services organisations.

Condition 33 also requires an audit of the fire and life safety system to be conducted by an independent person prior to the project's opening. The condition further requires the proponent to undertake an annual hazard review for the first five years of the project's operation, with results to be submitted to the DCS.

I also impose Condition 13 – Requirement for Equitable Access Statement, Schedule 3, Appendix 1. This condition requires the proponent to submit an EAS to DSQ for comment at least two months prior to the commencement of permanent construction. DSQ comments must be taken into account in finalising the EAS and the proponent must implement the finalised EAS. I have allowed up to six months after the commencement of construction of the project to finalise the EAS, because it is highly unlikely that matters relevant to the EAS will be impacted by early works on the project, and it would be unreasonable to delay commencement of construction while any outstanding issues with the EAS are resolved.

4.3.7 Other issues

4.3.7.1 Water quality

Potential exists for the NLRT project to impact on the quality of surface water and groundwater during its operation through the release of contaminants.

Surface water impacts include storm water runoff, contaminated with suspended sediments, heavy metals, oil, grease or other hydrocarbons; accidental spillage of pollutants from a collision or other incident; litter; increased storm water runoff and alteration/impediment to its movement; and failure of the drainage collection system or inability to contain volumes of contaminated water greater than the design volume (i.e. prolonged heavy rainfall conditions resulting in continuing inflow).

With respect to groundwater, a range of Environmental Management Register listed land parcels are located within the zone of potential groundwater drawdown. Any mobile groundwater contaminants within this zone may be expected to ultimately discharge to the tunnel. As groundwater inflows to the tunnel are expected to be low (in the order of 4L/s), contaminant fluxes are expected to be correspondingly low. All groundwater collected in the tunnel sumps would be pumped out and treated to appropriate standards before being disposed of to the stormwater drain system.

Potential may occur for migration of contaminated groundwater towards or through adjacent previously uncontaminated sites as a consequence of the altered hydraulic gradient. Existing water-table depths in the alluvium may be within typical root zone depths (<8m) of overlying vegetation. Local groundwater levels may lower as the tunnel is constructed and in turn, the potential environmental impact of any migrating contamination would be reduced.

The potential for inducement of saline water from the Brisbane River into the aquifer and the tunnel as a consequence of groundwater drawdown causing reversal of the hydraulic gradient between the aquifer and adjacent river system is unlikely.

To mitigate any risk of groundwater impacts arising from the operation of the project, **I impose** Condition 32 – Ground water and surface water, Schedule 3, Appendix 1.



This condition states that contaminated water must not be released from the project to receiving waters in exceedance of the specified water quality release limits.

Where water quality monitoring indicates an exceedance of the water quality release limits, corrective actions and mitigation measures must be implemented immediately to avoid further exceedances of the limits; and an incident report must be prepared within two days of the exceedance, together with a statement describing the corrective actions and mitigations measures implemented to ensure no further exceedance occurs. Such incident report must be provided to the nominated entity and posted on the project website as soon as the report is prepared. Water quality monitoring is required for the first 20 years of operation of the project and is required to be reported on the project website with updates provided monthly.

Condition 32 also requires additional measures to be initiated in the instance of an emergency or hazardous situation, to collect wastewater for subsequent removal and disposal to an authorised release point.

Similar measures designed to protect against and manage potential property impacts resulting from groundwater movements for the construction of the project (Condition 21(d)-(e)) are also required for the operation of the project (Condition 32(d)-(e)).

4.3.7.2 Operational greenhouse gas (GHG) emissions

The operation of the project will generate significant GHG emissions through electricity consumption required for ventilation and pressurisation fans, pumps, lighting and portal buildings and control cubicles.

Estimation of the GHG emissions associated with the operation of the project was undertaken in accordance with the NGAF workbook. The estimated annual GHG emissions for the operation of the project are 18 120 tonnes CO₂-e (averaged over a 12 year period from time of opening).

At my request, the proponent prepared information on the GHG emissions that would be generated from the operation of an air filtration system if this was to be installed. The proponent estimates that the operation of a particulate filtration system would generate GHG emissions of 3.0 tonnes CO₂-e per tonne of PM₁₀ removed and the operation of a NO₂ filtration system would emit 12.6 tonnes CO₂-e per tonne of NO₂ removed.

As outlined in the part of this report on construction air quality (section 4.2.1), **I am satisfied** that it has been demonstrated that air filtration systems are not required to achieve the air quality objectives. The relatively high volume of the GHG emissions that would be associated with the operation of filtration equipment is a further consideration supporting the omission of air filtration.

My requirements with respect to offsetting the carbon footprint of both the construction and operation of this project are described above in section 4.2.8 of this report.

4.3.7.3 Use renewable energy sources

The power requirement for the operation of the project including ventilation and pressurisation fans, pumps, lighting and portal buildings and control cubicles is significant with an annual average electricity consumption estimated at over 17 000 megawatt hours (calculated over a 12 year averaging period from time of opening), or a general demand load of approximately 20MW.

Queensland has significant renewable energy resource potential. Geothermal, solar thermal, wind and biomass co-generation may all play an important role in reducing Queensland's GHG. To complement the requirements **I impose** in respect to offsetting GHG emissions from the project, and in recognition of the Commonwealth Government's Renewable Energy Target (established to encourage additional generation of electricity from renewable energy sources), **I recommend** that from the commencement of the project's operation until 2020 the proponent should purchase at least 10% of all of the project's operational electrical energy requirements from accredited renewable energy ('Green Power') sources. From 1 January



2020, the proponent should purchase at least 20% of all the project's operational electrical energy requirements from Green Power sources.



5. Approvals for the project

5.1 Overview of approvals regime

The EIS process under the SDPWO Act does not replace the need for the proponent to obtain all relevant approvals under other legislation. The EIS process assessment may be used for decisions in respect of the significant project by other entities under other legislation. For example, for applications for development approval for a material change of use, the EIS process replaces the information and referral and notification stages of the IDAS under SPA.

Under s.39 of the SDPWO Act the Coordinator-General's report may state for the assessment manager conditions that must be attached to a development approval for the significant project. This does not limit the assessment manager's power under the SPA to assess the development and impose conditions not inconsistent with conditions the CG report has stated must be attached to the development approval.

5.2 Approvals and permits required

5.2.1 Development Approvals

The project is a major infrastructure project exempt from assessment under the BCC planning scheme. Development approvals required upon completion and approval of the EIS are likely to include those required:

- under the provisions of the Planning Scheme (City Plan 2000), (e.g. operational works for excavation or filling for spoil placement)
- for development defined as 'assessable under SPA, for which conditions, stated in Schedule 1, Appendix 1 of this report include:
 - making a material change of use for an Environmentally Relevant Activity (ERA) under the *Environmental Protection Act 1994* (EP Act)
 - making a material change of use of premises if all or part of the land forming part of the premises is on the environmental management register or contaminated land register under the EP Act
 - all aspects of development on a Queensland heritage place registered under the *Queensland Heritage Act 1992*
 - all aspects of development on a local heritage place.
- approvals that may be required in accordance with other legislation including, but not limited to:
 - building work that is not self-assessable or declared under the *Building Act 1975* to be exempt
 - operational work for the clearing of native vegetation under the *Vegetation Management Act 1999*
 - operational work of any kind that allows the taking, or interfering with, water under the *Water Act 2000*.

5.2.1.1 Material Change of Use for an ERA

ERAs are usually industrial activities with the potential to release contaminants to the environment, for example chemical processing, waste treatment, spray painting etc. ERAs are defined in schedule 2 of the *Environmental Protection Regulation 2008*.



Where the project involves development for a material change of use of premises for an ERA, that development is 'assessable development' in accordance with SPA and requires the proponent to hold a development approval.

DERM is usually the assessment manager for such an application.

The project works may include a number of ERAs, including:

- **ERA 8 – Chemical storage**

ERA 8 is the storage in containers of more than 10 m³ of chemicals or dangerous goods. If dangerous goods, including explosives, are stored on worksites in excess of these quantities, approval for a material change of use for an environmentally relevant activity is required. Considering the proximity of sensitive land uses to the Toowong and Kelvin Grove worksites in particular, storage of explosives is not desirable.

- **ERA 64 - Water treatment**

ERA 64 may apply should the project involve the treatment of bore water within the Centenary Motorway worksite for use during the construction phase of the NLRT project.

- **ERA 43 – Concrete batching**

For the proposed batching of concrete at the worksite during construction, a development approval for a temporary or mobile environmentally relevant activity is required where the planned production volume exceeds 200 tonnes per year. The project may source its concrete from an existing plant or plants, each with their own environmental authorities.

- **ERA 51 – Road tunnel ventilation stack operation**

An authority is required for the operation of a ventilation stack to regulate air quality impacts from operation of a road tunnel. Conditions for this ERA are included at Schedule 1, Appendix 1.

The conventional practice is for asphalt to be transported to the construction site rather than produced on-site. Should manufacture of asphalt be required at the worksite during construction, a development approval for a temporary or mobile environmentally relevant activity (ERA 6) would be required.

5.2.2 Other approvals

There are requirements for other approvals in accordance with other legislation and the proponent will be required to apply for these directly to the relevant entity in accordance with standard legislative processes once the necessary detail required for applications is finalised. These other approvals include, but may not be limited to:

1. Aboriginal Cultural Heritage

The proponent must develop and have approved under the *Aboriginal Cultural Heritage Act 2003*, a CHMP prior to any excavation, construction or other activity that may cause harm to Indigenous cultural heritage.

2. Connection to a State Controlled Road

Approval must be obtained from the chief executive of TMR under the *Transport Infrastructure Act 1994* for carrying out temporary or permanent works, including traffic management measures and works associated with connections to any State Controlled road.

3. Interference with a Railway

It is possible that lifting equipment at the eastern end of the project will operate in air space over the Exhibition Line.

- (a) Approval must be obtained from the railway manager (QR) prior to any interference with a railway under the *Transport Infrastructure Act 1994*.



- (b) If any project works have the potential to interfere with the operation of rail services, whether or not the works are wholly outside the QR corridor e.g. cut and cover tunnels within the ICB; the proponent is required to submit a S.255 application setting out the details of the proposed works and how the potential impacts of such works on rail services are to be mitigated. No works are to proceed without prior written approval from QR.

4. Interference with a Busway

- (a) Approval must be obtained from the busway manager (TMR) prior to any interference with a busway under the *Transport Infrastructure Act 1994*.
- (b) If any project works are likely to interfere with the operation of busway, the proponent must consult with the busway manager to identify and implement actions which will minimise disruption to busway service operations.

5. Road Closures

Any road closures required must follow the procedure set out in the relevant legislation.



6. Environmental management plans

Draft outline EMPs for the design and construction (D&C EMP) and operation and maintenance (O&M EMP) were provided in the supplementary report.

The draft EMPs:

- set out the project commitments to environmental management, including the identification of environmental aspects to be managed
- describe how environmental values would be protected and enhanced
- provide mitigation measures to be implemented for the project.

The EMPs become the key reference documents in that they convert the undertakings and recommendations of the environmental studies into actions and commitments to be followed by the designers, constructors and operators of the project. Each EMP will be supported by sub-plans. For example, D&C EMP sub-plans are required for geology and soils, surface and ground water, noise and vibration, air quality, hazard and risk and construction traffic and vehicles, among others.

The draft D&C and O&M EMPs were provided on the understanding that final D&C and O&M EMPs would be provided once the detailed design for the project is undertaken. In a number of areas, including air quality, noise and vibration and surface water and groundwater I **impose** conditions setting limits or goals for the project. In these cases the requirements of the conditions I impose override any objectives provided in the draft EMPs. The final EMPs would need to include, but not be limited to, the mitigation measures outlined in the draft EMPs and must reflect the requirements that I have mandated through the imposed conditions as well as requirements of other approvals under other legislation to the extent they are relevant. For example, the final D&C EMP and sub-plan in respect to surface water will need to provide the performance criteria and mitigation measures to achieve the water quality release limits I have set, among other requirements. Similarly, the final EMP and sub-plan for operational air quality will include the air quality criteria and goals set in the development approval to be issued for the operation of the tunnel ventilation outlet, as provided in Schedule 1 of Appendix 1.

In some cases I **also impose** conditions requiring specific mitigation measures be undertaken to minimise or manage impacts. Final EMPs will need to adopt these measures also.

To ensure the EMPs and sub-plans meet the requirements of my imposed conditions and the commitments made in the EIS and supplementary report, I **impose** Condition 15(d) which requires that the:

- proponent provide the plans to the relevant nominated entities and consultative bodies for review
- any comments from those bodies must be taken into account in finalising the plans
- Environmental Management Representative(s) (responsibilities defined in Condition 14(b)) for the project must certify that those plans meet the requirements of my conditions.

I **also impose** Condition 15(f)(viii) requiring that EMPs are regularly reviewed and that the review process must provide for further or alternate mitigation measures to be implemented as soon as practical in response to both monitoring results (where non-compliance is identified) and the outcomes of community consultation.

I **impose** Condition 15(c) requiring that the EMPs and sub-plans are to be publicly available.



7. Conclusions

The NLRT project is a key part of BCC's strategy to improve the efficiency of Brisbane's road network. Once complete, the project will help improve east-west cross city transport and assist in alleviating emerging congestion problems within the western and northern suburbs of Brisbane. It will also allow for opportunities for enhanced public transport capacity on key surface roads such as Coronation Drive and Milton Road.

The project design has been significantly amended during the EIS process. Originally, the NLRT project included local connections to the mainline tunnels at Toowong and Kelvin Grove. In response to the significant number of submissions received during the EIS process that expressed opposition to the local connections, BCC decided to removed the local connections from the project. This decision markedly reduces the impacts of the NLTR project, including the elimination of private property acquisition and reducing the construction impacts on the surrounding community.

In considering all documentation and information provided during the EIS process, **I am satisfied** that the requirements of Part 4 Division 3 of the SDPWO Act have been satisfactorily fulfilled. The EIS process provided sufficient information to myself, government and to the community to allow an informed evaluation of potential environmental impacts which could be attributed to the project.

I am satisfied that in the broader community interest, there is sufficient need for the project. The project would provide a motorway standard road connecting the western and northern suburbs and contribute significantly to the provision of an effective bypass of the Brisbane CBD. The value of the project to the Brisbane road network would become elevated as the other major road infrastructure projects that are currently being undertaken in the Brisbane area become operational (during the proposed construction period for the NLRT project).

I observe that the project does not provide the full the long term solution to traffic movement through the western and northern Brisbane corridors and that surrounding road networks, notably the ICB, will reach capacity before the NLRT project does. Therefore, **I note** that both the proponent and the Queensland Government will need to undertake further road transport and network planning to develop long term solutions for this area.

I recognise the various potential impacts the construction and operation of the project will have on the Brisbane community. These potential impacts include the establishment and operation of worksites, tunnel excavation, support and fit-out activities; the transport of tunnel spoil and the associated tunnel fitout materials; and the ongoing operation and maintenance of the project once it is open to traffic. These impacts were described in the EIS and supplementary report and are evidenced by the other major road infrastructure projects that are currently being constructed in Brisbane. **I have considered** the lessons learned from the construction of the other major road infrastructure projects in imposing conditions for this NLRT project to reduce and better manage the potential impacts.

Accordingly, to mitigate and manage the impacts of the construction and operation of the project **I impose an extensive list of conditions** (in Appendix 1, Schedule 3) in accordance with section 54(B) of the SDPWO Act. Conditions are imposed across a broad range of matters including air quality, noise and vibration, water management, traffic and transport (including pedestrian and cycling) and community engagement. Requirements of conditions include consultation procedures, setting release limits, specifying mitigation and management measures and mandating monitoring and reporting requirements.

In accordance with section 54B(3) of the SDPWO Act **I have nominated entities** (in Schedule 4) to have jurisdiction for some of the conditions that I impose in Schedule 3

I also impose Condition 5 - Half Yearly Audit Reports, Schedule 3, Appendix 1, requiring the proponent to procure, on a six monthly basis, an audit to be undertaken by a suitably qualified



expert to determine whether the proponent has complied with the imposed conditions. This requirement commences from the start of construction and is in place until two years after the project opens to traffic. Whilst I appreciate that there may be a considerable cost associated with this requirement, I consider that it is a reasonable imposition for a project of this nature and location and will assist the nominated entities and the Coordinator-General in determining whether the conditions imposed on the project have been complied with. The auditor is required to have at least five years experience in the discipline to which the condition relates or is otherwise acceptable to the Coordinator-General and is required to certify that the auditor and all members of the audit team are independent of the proponent.

In accordance with Section 54D(4) of the SDPWO Act imposed conditions apply to anyone who undertakes the project, including, for example the proponent and an agent, contractor, subcontractor or licensee of the proponent and includes public utility providers undertaking public utility works for, or required by, the project.

The conditions do not relieve the proponent of the obligation to obtain all other approvals and licences from all relevant authorities required under any other Act. For example, the proponent will be required to apply for a material change of use for an ERA for the operation of the tunnel ventilation outlet under SPA. Conditions that must be attached to any development approval issued by the assessment manager are contained in Schedule 1 of Appendix 1. For the development approval for the ERA, the conditions that must be attached to any approval includes conditions setting limits on in-tunnel and ventilation outlet air quality, ambient air quality goals and monitoring and reporting requirements.

I understand that the proponent intends to engage a contractor to design, build, maintain and operate the project and that the contract between the proponent and its contractor will oblige the contractor to comply with the conditions imposed in Appendix 1. **I recommend** that the proponent provide support and incentives to its design, construction, operation and maintenance contractor(s) to encourage them to perform all of their obligations in a way that is consistent with the objective of the conditions in this report to minimise the potential environmental effects of the project.

On the basis of the information provided, including advice from advisory agencies, **I am satisfied** that the impacts associated with the project are able to be addressed through:

- the implementation of the project in accordance with the EIS, supplementary report and all mitigation measures proposed and recommendations and commitments made in these documents, including the environmental management plans
- implementation of the conditions I **impose** on the project, as contained in Appendix 1, Schedule 3, in accordance with section 54(B) of the SDPWO Act
- other conditions for the approval as stated in Appendix 1 Schedules 1 and 2.

In the event of any inconsistencies between the EIS documents and the conditions imposed and recommendations made in this report, the conditions and recommendations in this report prevail.

Taking all matters into account, including the overall public interest, I consider that the project, as described in the EIS and supplementary report and summarised in this report, may proceed subject to the conditions contained in Appendix 1 of this report.

A copy of this report will be given to the proponent, pursuant to s35(5)(a) of the SDPWO Act.

A copy of this report will be provided to the nominated entities for the conditions and will be made publicly available, pursuant to s35(5)(b) on the DIP's website at:
<http://www.dip.qld.gov.au/projects>



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