



**EPA  
VICTORIA**

**ADVICE TO THE MINISTER FOR PLANNING**

**PURSUANT TO S.64 OF THE MAJOR TRANSPORT PROJECTS FACILITATION ACT  
2009**

**INCORPORATING**

**WORKS APPROVAL ASSESSMENT REPORT**

APPLICANT: LINKING MELBOURNE AUTHORITY  
(ABN: 54 293 070 013)

APPLICATION No: 1001390

PROPOSAL: Construct road tunnels ventilation system for  
East West Link

DATE: May 2014

## **EXECUTIVE SUMMARY**

The East West Link project (“the Project”), proposed by the Linking Melbourne Authority (“LMA”), includes the construction of twin multi-lane road tunnels connecting the Eastern Freeway near Hoddle Street, Clifton Hill to City Link at the western end of Royal Park, Parkville. These road tunnels, with ventilation systems, are scheduled premises under the *Environment Protection Act 1970* (“EP Act”) and require Works Approval.

As the Project is being administered under the *Major Transport Projects Facilitation Act 2009* (“MTPF Act”), the Planning Minister is responsible for deciding on whether or not to issue a Works Approval. As an ‘Applicable Law Decision Maker’ under the MTPF Act, EPA’s role is to advise the Planning Minister as to whether or not a works approval should be issued and, if issued, whether it should be subject to conditions.

A Comprehensive Impact Statement (“CIS”), including a Works Approval Application (“WAA”), was prepared by LMA for a “Reference Project”, the details of which may be subject to some change by the appointed contractor who is appointed to construct the Project. EPA has assessed the CIS and WAA and has participated in the public hearing conducted by the Assessment Committee appointed under the MTPF Act.

The scope of the assessment for the works approval considered potential impacts associated with (a) air quality; (b) energy use; and (c) noise emissions; from the tunnel ventilation systems.

EPA has separately advised and made recommendations to the Assessment Committee on (a) air quality impacts from traffic on the Project’s new surface roads (including connections to the existing road network); (b) construction-related impacts, including noise and dust emissions and impacts associated with contaminated land and groundwater; (c) the management of waste; and (d) the environmental management framework.

EPA’s assessment of the WAA is that the Reference Project:

- complies with State policy for air emissions;
- is capable of complying with State policy for energy use; and
- is capable of complying with State policy for noise emissions.

Similar to the process adopted for Victoria’s existing City Link and East Link road tunnel projects, it is recommended that the appointed contractor will need to demonstrate that the detailed design complies with the above policy requirements. Monitoring of the existing road tunnel projects has assisted EPA’s understanding of the significance of potential impacts associated with the tunnel ventilation systems and supports EPA’s assessment that the Project can comply.

EPA therefore recommends that –

- the Minister should, as part of the Minister’s approval decision, issue a Works Approval for the ‘tunnel ventilation systems’; and
- the Works Approval should be subject to conditions, as recommended by EPA in the proposed ‘*Works Approval*’.

EPA’s recommended conditions to the Works Approval include conditions requiring:

- the works to be constructed in accordance with the application unless other conditions of the Works Approval apply, and a condition that specifies the expiry date of the Works Approval;

- provision of further detailed design to demonstrate compliance with the relevant policies, for the approval of EPA;
- advice to EPA when works have been commenced and when they have been completed, and prohibiting operation of the works without EPA approval;
- ventilation stacks to comply with EPA guidelines or other approval;
- provision of monitoring programs for air and noise emissions.

EPA has provided advice on the wider Project, including recommended amendments to the Performance Requirements, to the Assessment Committee.

EPA will be responsible for ensuring compliance with the issued works approval, including the assessment and approval of the detailed design aspects required by one of the approval conditions.

Once the Project has been constructed, an EPA licence will be required before the commencement of operation. Proposed air discharge limits for a Licence have been determined, and conditions of a Licence would be similar to those in the Licences for the existing road tunnels.

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**ABBREVIATIONS**

BPEM	Best Practice Environmental Management
CEMP	Construction Environmental Management Plan
CIS	Comprehensive Impact Statement
CO2-e	Carbon dioxide equivalent
DTPLI	Department of Transport, Planning and Local Infrastructure
EP Act	Environment Protection Act 1970
EPA	Environment Protection Authority
EMF	Environmental management framework
GHG	Greenhouse gas
Greenhouse PEM	Protocol for Environmental Management (Greenhouse Gas Emissions and Energy Efficiency in Industry)
LMA	Linking Melbourne Authority
MEA	Maximum extent achievable (for air emission control)
MTPF Act	Major Transport Projects Facilitation Act 2009
PEM	Protocol for Environmental Management
PIARC	World Road Association (formerly Permanent International Association of Road Congresses)
PR	Performance requirement
SEPP	State environment protection policy
SEPP AAQ	State environment protection policy (Ambient Air Quality)
SEPP AQM	State environment protection policy (Air Quality Management)
SEPP N-1	State environment protection policy (Control of Noise from Commerce, Industry and Trade) No. N-1
SEPP WOV	State environment protection policy (Waters of Victoria)
SPE Regulations	Environment Protection (Scheduled Premises and Exemptions) Regulations 2007
The Authority	Environment Protection Authority
The Project	East West Link (Eastern Section)

## 1. PROJECT AND PROCESS

### 1.1 Major Transport Projects Facilitation Act and the Works Approval

The Project is being assessed under the *Major Transport Projects Facilitation Act 2009* (“MTPF Act”).

Under the MTPF Act, the Environment Protection Authority (“EPA”) has a specific role as an ‘*applicable law decision maker*’, defined as “*a person or body who, under an applicable law, grants an applicable approval under that law*”.

A works approval under section 19B of the *Environment Protection Act 1970* (“EP Act”) is required for this component of the Project. In accordance with section 64 of the MTPF Act, EPA:

“*may advise the Planning Minister as to –*

- *whether the Minister should, as part of the Minister's approval decision, issue a Works Approval for the declared project or a part of the declared project; and*
- *if a Works Approval should be issued, whether it should be subject to conditions and the nature of such conditions (if any).”*

and

“*EPA must give its advice to the Planning Minister within 30 business days after the last day of the formal public hearing conducted in relation to the comprehensive impact statement*”.

### 1.2 Environment Protection Act and the Environment Protection Authority

EPA is Victoria’s environmental regulator and has a statutory role to protect the environment in Victoria.

The *Environment Protection Act 1970* establishes EPA, defines EPA’s powers, duties and functions, and provides a number of instruments which are used to minimise wastes, pollution and environmental risks. The instruments used by EPA include State environment protection policies (“SEPPs”), best practice environmental management (“BPEM”) guidelines, protocols for environmental management (“PEM”), Works Approvals and Licences.

### 1.3 The Applicant

The applicant is Linking Melbourne Authority, ABN 54 293 070 013.

Linking Melbourne Authority (“LMA”) is a State Government agency established for the purpose of facilitating major transport projects. LMA was responsible for delivering the East Link and Peninsula Link projects in 2008 and 2013 respectively.

### 1.4 Project Proposals

The East West Link (Eastern Section) project (“the Project”), as described in Chapter 4 of the Comprehensive Impact Statement (“CIS”) (October 2013), comprises twin three-lane parallel tunnels constructed between the Eastern Freeway near Hoddle Street and City Link near the western end of Royal Park. From the eastern portal, these twin tunnels would run under the Alexandra Parade/Princes Street corridor, the Melbourne General Cemetery, Royal Parade

and Royal Park. The tunnels would be approximately 4.4 kilometres long. The tunnel and associated infrastructure fall within Precincts 1, 2 and 3 (see Figure 1).

It is proposed that the tunnels will include tunnel ventilation systems which are required to maintain in-tunnel air quality, visibility and safe driving conditions.

Ventilation air is induced into each tunnel at the entry portal by the vehicles entering the tunnel, and moves along the tunnel by the "piston effect" of the traffic movement. Fans would be installed in each tunnel to manage in-tunnel air flow. The ventilation structures would house the fans to exhaust tunnel air to the external ambient air.

The tunnel air is directed to a discharge stack located near the exit portal of each tunnel. The discharge stack heights are proposed to be 30 metres at the eastern portal and 20 metres at the western portal. This accounts for the nature of the surrounding environment in each case, with more built-up structures in the Clifton Hill/ Collingwood area than in Royal Park.

The discharge stack and exhaust fans are generally arranged so that the in-stack exhaust gas velocity can be maintained at a fairly steady rate even though exhaust gas volumes can vary substantially with varying traffic volumes. The tunnel air is not proposed to be treated for pollutant removal prior to discharge.

The ventilation fans will operate in a staged manner, depending on the traffic conditions, to ensure that in-tunnel air quality requirements are achieved. This includes the ability to ventilate the tunnel in the case of emergency conditions such as a fire.

The tunnels and the tunnel ventilation systems must be designed and operated to be capable of directing all emissions via the ventilation stacks, with no emissions out of the portals. This design is consistent with the existing City Link and East Link tunnels.

## 1.5 Site Description

The Project will be constructed in an urban environment in the inner northern and north-western suburbs of Melbourne, where there is residential zoned land and recreational areas (including parks). Sensitive receptors in the area include primary schools and hospitals.

The general location of the Reference Project is provided in Figure 1, and the Project boundary identified in the CIS as relevant to the Scheduled Premises is shown in Figure 2. More comprehensive maps of the Reference Project are contained in the CIS.

It is proposed for the Reference Project that twin tunnels would be constructed from the Eastern Freeway to City Link (one to carry eastbound traffic and one to carry westbound traffic). From the eastern portal, near Hoddle Street, the tunnels would run under the Alexandra Parade/Princes Street corridor, the Melbourne General Cemetery, Royal Parade and parts of Royal Park. The tunnel would surface at a portal west of the Upfield railway line in Manningham Reserve, before the road would then run on new elevated structures to a City Link interchange.



Figure 1: General location plan of the East West Link Project

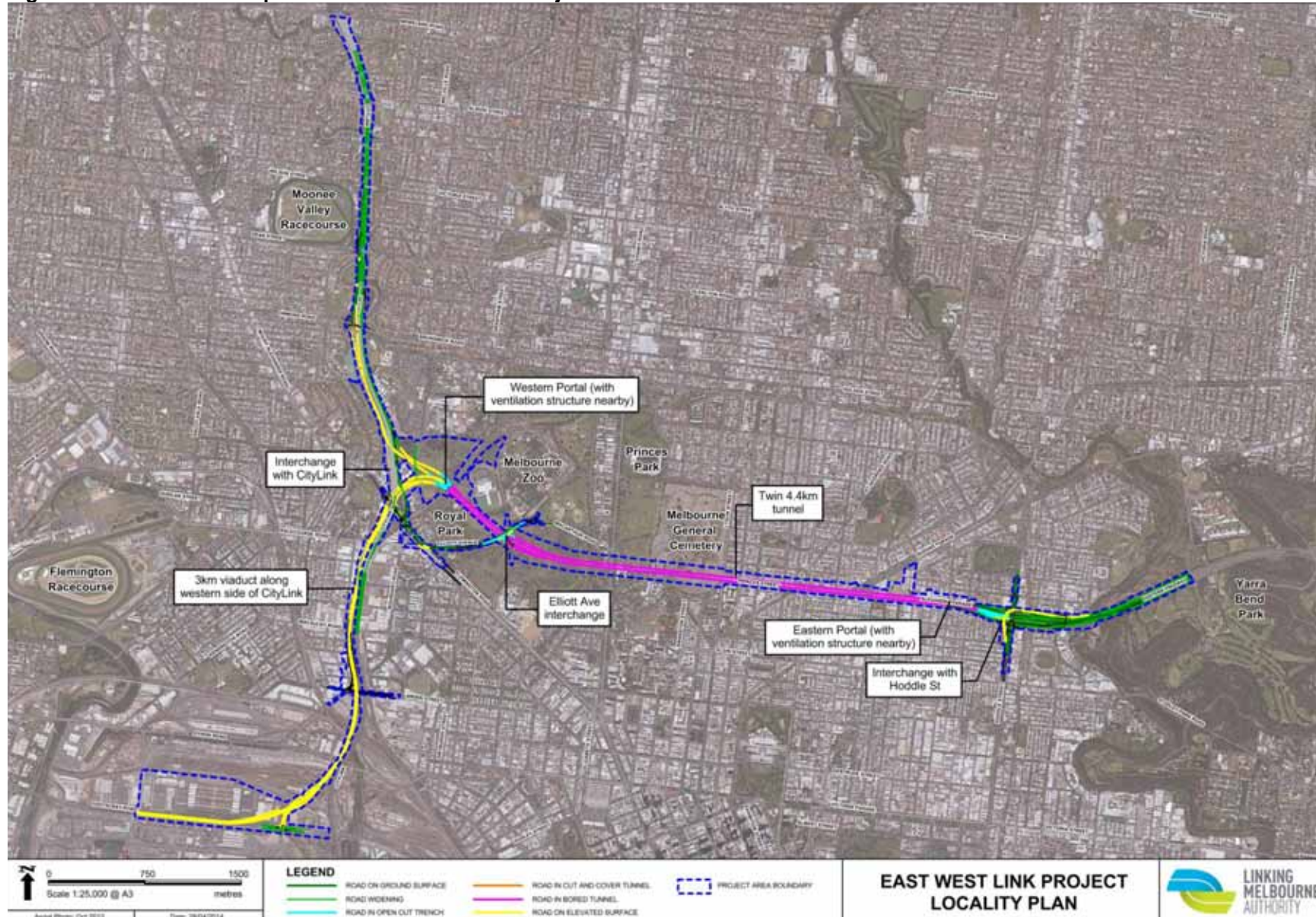
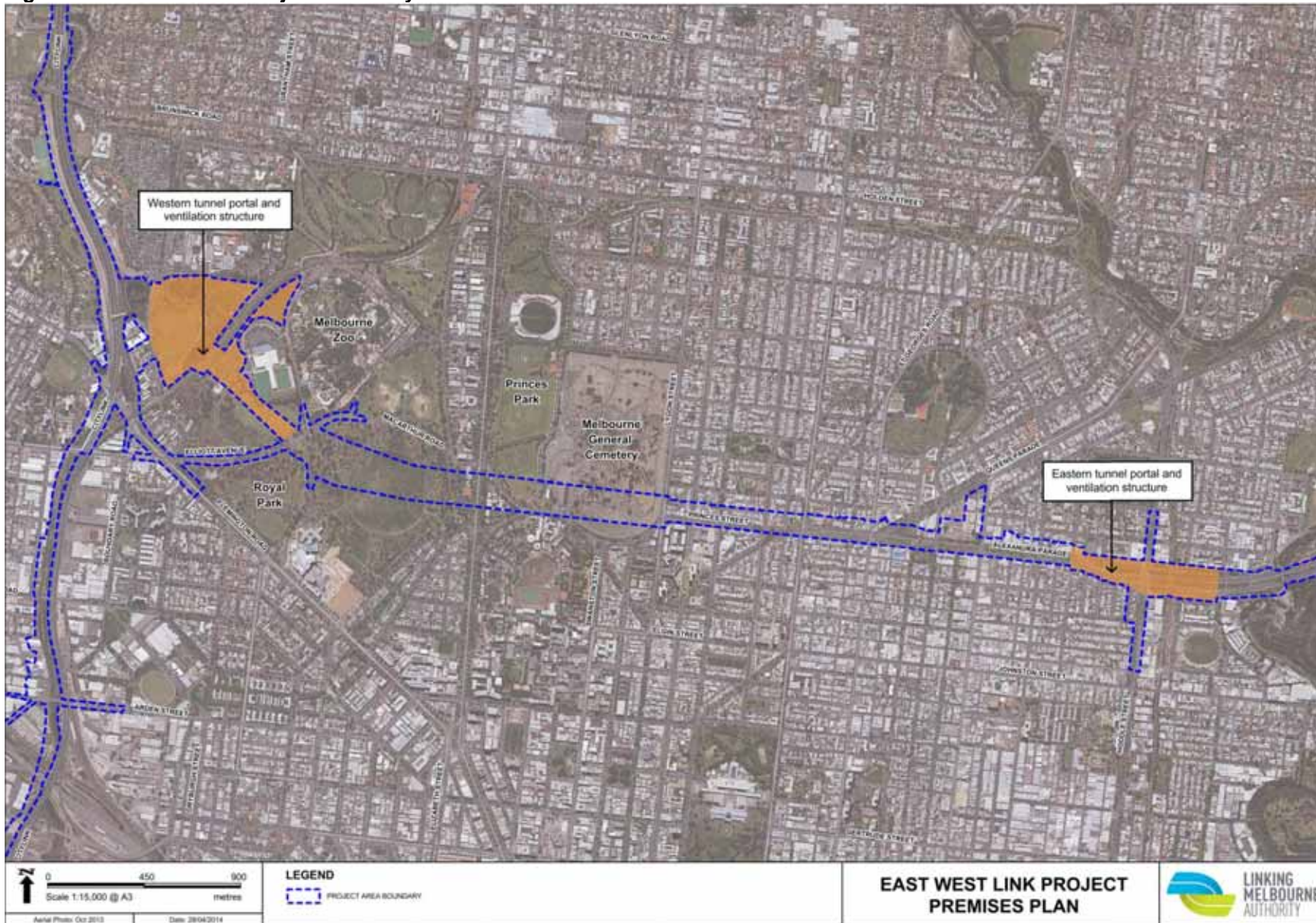




Figure 2: East West Link Project Boundary



### 1.6 Scheduled Premises, Works Approvals and Licences

Clause 19A of the EP Act requires that (inter alia):

- “(1) *The occupier of a scheduled premises must not do any act or thing, including the commencement of any construction, installation or modification of plant, equipment or process or any subsequent step in relation thereto, which is likely to cause—*
  - (a) *an increase or alteration in the waste discharged or emitted from, deposited to, or produced at, the premises; or*
  - (d) *a significant increase in the emission of noise; or*
  - (e) *a state of potential danger to the quality of the environment or any segment of the environment—**except in accordance with a works approval or a licence or a requirement specified in a notice given by the Authority as the case may be unless the act or thing is only in the course of and for the purpose of general maintenance.*  
 .....
- (3) *The occupier of any premises must not do any act or thing in relation to those premises that would make those premises a scheduled premises except in accordance with a works approval, a research, development and demonstration approval or a notice issued by the Authority.”*

The Environment Protection (Scheduled Premises and Exemptions) Regulations 2007 (“the SPE Regulations”) define certain types of premises as ‘scheduled premises’ in Schedule 1, which includes the following category of premises:

Type Number and Summary Description	Description of Scheduled Premises*	Does a category specific exemption from works approval under section 19A or licensing under section 20(1) apply?†	Is a Financial Assurance Required?
L03 (Tunnel Ventilation Systems)	Road tunnel ventilation systems	No	No

The proposed tunnel components of the Project, which include the tunnel ventilation systems, are ‘scheduled premises’ which require a works approval prior to construction and a licence for operation.

The Works Approval Application and the CIS describe and assess the impacts of a “Reference Project”, not a detailed design. If a Works Approval and other relevant project approvals are granted, the Reference Project may be subject to variation by the appointed contractor. The conditions to the Works Approval allow for a range of similar designs within specified parameters.

### 1.7 EPA’s Role in the East West Link Project

Under the MTPF Act, EPA has assessed the proposed Project and the identified risks and impacts as detailed in the CIS. EPA’s assessment specifically considers issues that relate to the tunnel ventilation system, including:

- Air emissions;
- Energy use and greenhouse gas emissions; and
- Noise emissions.

EPA has also considered risks and impacts associated with the wider project, including:

- impacts associated with the construction of the Project (including construction noise, dust and vehicle emissions);
- impacts to surface waters;
- contaminated land and groundwater impacts; and
- the management of waste/

EPA has advised and made recommendations to the Assessment Committee on these issues, including recommended amendments to the Performance Requirements; these have been adopted by the LMA.

### 1.8 Referrals and Third Party Comment

The MTPF Act streamlines a number of the processes that occur under the EP Act. The Works Approval application and the CIS were referred to the Secretary to the Department of Health under MTPF Act section 51A, as would normally be required by section 19B(4) of the EP Act. EPA did not consider there to be any other protection agency affected and therefore made no other referrals. Local Government made submissions during the public review and hearing process.

Public advertising, the receipt of public submissions about the application, and a public hearing conducted by an Assessment Committee, were also managed under the MTPF Act, taking the place of equivalent provisions in section 19B of the EP Act.

EPA has had regard to all relevant public submissions made to the Assessment Committee under section 52 of the MTPF Act and has attended the public hearing before completing its assessment.

## 2. COMPLIANCE REQUIREMENTS

### 2.1 Legislation and Policy

The application is required to comply with the *Environment Protection Act 1970* (“the EP Act”) and relevant subordinate legislation. Key compliance obligations relevant to this project include:

- The EP Act, in particular:
  - **Section 20C(3)(a)(i)** which enables the Authority to refuse an authorisation if it is inconsistent with any applicable statutory policy; and
  - **Section 1** which sets out principles for environment protection.
- State environment protection policies (SEPPs), in particular:
  - SEPP (Air Quality Management) (“SEPP AQM”), which requires best practice air discharge management and compliance with design criteria for air quality; and
  - SEPP (Control of Noise from Industry, Commerce and Trade) N-1 (“SEPP N-1”), which requires best practice noise control and compliance with noise limits established under the policy.



There are a number of other SEPPs that apply to the Project. These are out of scope of EPA's assessment of the Works Approval Application for the tunnel ventilation systems. EPA has however provided advice in respect of these in submissions to the Assessment Committee on the CIS. These SEPPs include:

- SEPP (Groundwaters of Victoria), which sets a requirement to maintain and protect beneficial uses of groundwater in Victoria; and
- SEPP (Waters of Victoria), which requires best practice management of water discharges and the protection of beneficial uses.

This Assessment Report focuses particularly on the requirements of SEPP AQM and SEPP N-1, and makes an assessment of whether or not compliance has been achieved, or is capable of being achieved. This Report recommends conditions to be imposed on any Works Approval that may be issued.

## 2.2 Air Quality

### Legislation

Air emissions must comply with State environment protection policy (Air Quality Management) ("SEPP (AQM)").

The main provisions for assessing the application are Clauses 18, 19, 20, 21, 27 and 28, which state:

#### **18. General Requirements**

- (1) *In this policy the management of emissions means:*
  - (a) *avoiding and minimising emissions in accordance with the preference established in the principle of the wastes hierarchy; and*
  - (b) *the assessment, monitoring, control, reduction or prohibition of emissions for air quality management purposes.*
- (2) *In this policy, where the context allows, generators of emissions include:*
  - (a) *those who operate or manage sources of emissions, or undertake activities that generate emissions or result in the generation of emissions;*
  - (b) *those who design, develop, produce, invest in, market or sell goods and services that generate emissions at some stage of their life cycle; and*
  - (c) *those who purchase or use those goods and services, or manage the wastes associated with them.*
- (3) *Generators of emissions must:*
  - (a) *manage their activities and emissions in accordance with the aims, principles and intent of the policy;*
  - (b) *pursue continuous improvement in their environmental management practices and environmental performance; and*
  - (c) *apply best practice to the management of their emissions or, if they emit Class 3 indicators, reduce those emissions to the maximum extent achievable.*

#### **19. Management of New Sources of Emissions**

- (1) *A generator of a new or substantially modified source of emissions must apply best practice to the management of those emissions.*
- (2) *Notwithstanding the general requirement under sub-clause (1), a generator of a new or substantially modified source of emissions of Class 3 indicators must reduce those emissions to the maximum extent achievable."*

**20. Management of Class 3 Indicators**

- (1) *Generators of emissions of Class 3 indicators must reduce those emissions to the maximum extent achievable.”*

**21. Monitoring of Emissions**

- (1) *The Authority may require a generator of emissions to measure and report on its emissions to enable the Authority to determine whether the emissions are being managed in accordance with the policy and any other applicable statutory requirements.*
- (2) *The Authority may require a generator of emissions to measure and report the levels of its emissions in the local air environment so as to:*
  - (a) *assess the potential impacts of those emissions; and*
  - (b) *determine whether improvements in local air quality are required.*
- (3) *Any report required by the Authority under sub-clauses (1) or (2) will be a public document.*

**27. Local Air Quality Management**

- (1) *In assessing an application for a new development that may have impacts on local air quality, the Authority, the relevant protection agency and the public health authority, will have regard to protocols for environmental management developed in accordance with this policy, including those for:*
  - (a) *best practice for environmental management;*
  - (b) *recommended separation distances between emissions sources and sensitive land uses; and*
  - (c) *the use of design criteria and dispersion modelling for assessing emissions.*

**28. Modelling of Emissions**

- (1) *In addition to managing emissions in accordance with clauses 18, 19 and 20, the Authority may require a generator of emissions to:*
  - (a) *model the transport and dispersion in the air environment of emissions; and*
  - (b) *for new sources of emissions, demonstrate that the model predictions meet the relevant design criteria; or*
- (2) *Any modelling done under sub-clause (1) must be done in accordance with Schedule C or any relevant protocol for environmental management made under this policy for a particular industry or activity.*

**Best Practice**

SEPP AQM requires that best practice is applied to the management of air emissions, and to energy use and greenhouse gas emissions. Best practice is defined in the SEPP AQM as”

*“the best combination of eco-efficient techniques, methods, processes or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector or activity”.*

In relation to air emissions, clause 19 of SEPP AQM states that a generator of new emissions *“must apply best practice to the management of those emissions”*, and in the case of Class 3 indicator, the generator *“must reduce those emissions to the maximum extent achievable”*.

Some Class 3 indicators (notably benzene, 1,3-butadiene and polycyclic aromatic hydrocarbons) are included in the tunnel emissions, and these must be reduced to the maximum extent achievable (“MEA”). MEA is defined in SEPP AQM as:



*“a degree of reduction in the emission of wastes from a particular source that uses the most effective, practicable means to minimise the risk to human health from those emissions and is at least equivalent to or greater than that which can be achieved through the application of best practice”.*

The following assessment deals with both best practice and MEA using the generic term “best practice”, with some additional comments relating to MEA.

The question of best practice for air quality management centres around the impacts of the tunnel ventilation system and discharges of emissions to air, and whether or not some form of emission cleaning system should be installed. A number of public submissions raised this issue and some expert evidence was presented to the Assessment Committee during the public review and hearing process.

EPA undertook a comprehensive review of this issue as part of assessing the application for works approval of the East Link tunnels in 2006. EPA's review considered, among many other reports, the document “Tunnel Ventilation System Technology Review and Best Practice” provided as Annexure 8 of the application for works approval and which was tabled by LMA to the Assessment Committee.

Following EPA's review for East Link, a number of new reports have been published, including:

- M5 East Tunnel Filtration Trial Evaluation Program – Review of Operational Performance, by AMOG Consulting (for Roads and Maritime Services NSW) (February 2012)
- Final Report: Air Filtration Plant of the M5 Tunnel - Determination of Particle Removal Efficiencies, by B Halliburton and M Azzi of CSIRO (for RTA NSW) (November 2011)
- Road Tunnels: Vehicle Emissions and Air Demand for Ventilation, by PIARC Technical Committee C4 (December 2012)
- Road Tunnels: A Guide to Optimising the Air Quality Impact upon the Environment, by PIARC Technical Committee C3.3 (2008)

With reference to the above reports as well as the information presented to the Assessment Committee in expert evidence by Prof Louis Irving, EPA has assessed the need for treatment of the East West Link tunnel air emissions. EPA considers that:

- The combination of good in-tunnel air quality and high exhaust gas volume makes the use of emission cleaning equipment unnecessary, as demonstrated by the M5 East tunnel experience in Sydney. The relatively small gain in air quality impact is not justified by the cost, which must be considered as part of the best practice assessment in accordance with the policy principles set out in SEPP AQM including *“7(1)(c) The measures adopted should be cost-effective and in proportion to the significance of the environmental problems being addressed”.*
- The need to use cleaning equipment to maintain in-tunnel visibility is often a driver for the use of such equipment in European tunnels, however this is not required for the East West Link tunnels where good in-tunnel visibility is maintained as a function of the tunnel length and the design of the ventilation system, including access to outside air.
- The need to use cleaning equipment to protect air quality in areas around the tunnel ventilation stacks, as may exist in some European and Asian cities, does not exist for

the East West Link tunnels. This is demonstrated by the small impact on air quality caused by the tunnel emissions, as discussed in the air quality assessment later in this report.

- The tunnel ventilation system can achieve adequate dispersion of the emissions during normal operation by ensuring that all emissions are discharged from the ventilation stacks and not from the tunnel portals.
- In relation to Class 3 indicators, it is not feasible to use emission-cleaning technology to remove these from the discharge stacks. The most effective method to remove these is through fuel quality requirements and motor vehicle engine specifications and exhaust gas controls. The improved emission quality associated with the introduction of tighter fuel quality requirements and Euro vehicle emission standards is considered to represent MEA for Class 3 indicators.

### **ASSESSMENT SUMMARY**

EPA concludes that the Reference Project constitutes best practice air emission management, and MEA for Class 3 indicators, in accordance with SEPP AQM.

### ***Assessment Considerations***

The impact of air emissions from the two tunnel ventilation stacks has been assessed by LMA and presented in the CIS and subsequent submissions to the Assessment Committee. The assessment used the standard AUSPLUME model in accordance with SEPP AQM. Key inputs to the model were derived from traffic modelling data for tunnel usage and vehicle fleet composition, PIARC vehicle emission data, meteorological data from EPA's Footscray and Alphington air monitoring stations (for the west and east stacks respectively), and background air quality data from the Footscray and Alphington monitoring stations.

EPA has reviewed and considered the validity of these inputs to the modelling. EPA has also considered air quality issues raised in public submissions, including:

- the accuracy of the modelling, including the suitability of using Footscray and Alphington monitoring data to establish baseline conditions for the modelling and assessment;
- the validity of the dispersion model applied for the modelling of emissions to air (using AUSPLUME instead of the recently EPA approved AERMOD);
- the proportion of commercial vehicles in the fleet; and
- potential air quality and health impacts from ventilation stack emissions on nearby receptors, including Clifton Hill Primary School.

### ***Background concentrations***

While air quality does vary over time and by location, comparisons of air quality concentrations across Melbourne show that at the 70<sup>th</sup> percentile levels used as the background for modelling, air quality concentrations are similar across the metropolitan area and do not vary significantly year by year (see EPA Publication 1536 "Air monitoring report 2012 – Compliance with the National Environment Protection (Ambient Air Quality) Measure.

Further, comparisons of air quality concentrations monitored at Collingwood College (located on Hoddle Street) and Alphington indicate that for the year monitored, the annual average PM10 particle levels were only slightly higher at Collingwood College, the higher

concentrations being due to the closer proximity of Collingwood College to a main road and thus affected by the near-road traffic emissions.

The use of Footscray and Alphington background data for the assessment is consistent with the current practice used for air pollution regulatory modelling and air quality impacts assessment, and EPA considers that the slight differences in background levels between the sites make no significant difference to the modelling results.

### *Meteorological data*

The assessment presented in the CIS used data from the EPA monitoring stations at Footscray and Alphington. EPA checked the meteorological data used in the AUSPLUME modelling with different modelling approaches, using AERMOD and CALPUFF. EPA's modelling provided similar results.

EPA considers that the Footscray and Alphington meteorological data are suitable.

### *Vehicle emissions*

The latest PIARC 2012 motor vehicle emission factors for Australia were used. These were reviewed and considered acceptable. The traffic modelling estimates (such as volume, congestion and speed) used to undertake the vehicle emissions modelling were also considered to be appropriate.

### *LMA Modelling*

A detailed assessment of the impacts of the air pollution emissions from the ventilation stacks of the proposed East West Link tunnels on the local air quality was undertaken in accordance with the requirements of SEPP AQM. The modelling used emissions from the two proposed ventilation stacks (one for each tunnel) and assumed that emissions would not occur from the tunnel portals.

Modelling of air emissions from the tunnel ventilation stacks conducted by LMA and presented in the CIS shows that:

- the contribution of the vent stacks to ground level concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> is very low compared with ambient background levels; and
- in the worst case scenario, taking into account regional air quality, the predicted 99.9<sup>th</sup> percentile ground level concentrations of PM<sub>10</sub>, PM<sub>2.5</sub>, CO, NO<sub>2</sub>, benzene, toluene, formaldehyde, PAHs and 1,3-butadiene associated with the tunnel stack emissions will readily comply with SEPP AQM design criteria.

### *EPA Modelling*

To investigate whether LMA's modelling results were sensitive to the vehicle emissions and the proportion of commercial vehicle estimates, EPA also undertook some modelling of the emissions from the two proposed ventilation stacks using: (1) a higher proportion of commercial vehicles in the vehicle fleet; and (2) motor vehicle emission factors developed by EPA. These are more conservative than the PIARC motor vehicle emissions factors used for the CIS.

EPA's AERMOD air pollution modelling of stack vent emissions was based on the design assumptions and project implementation information presented in the CIS. The predicted results are presented in Table 1. The results show the highest predicted ground level

concentration, including the background, is well below the design criteria of the SEPP AQM. Highest ground level concentrations due to vent stack emissions, without background, are predicted to be less than 10% of the SEPP AQM design criteria.

Further AERMOD air pollution modelling was undertaken to predict the ground level concentrations at 12 specific locations, or discrete receptors, near the east and west ventilation stacks. Predicted highest (99.9<sup>th</sup> percentile) ground level concentrations for the stack contribution only are shown in Table 2. These are well below the SEPP AQM design criteria.

**Table 1: EPA modelling results - Highest (99.9<sup>th</sup>ile) AERMOD predicted ground level concentrations for both stacks with fixed background (70<sup>th</sup>ile)**

Pollution Indicator	Averaging Time	Stack Contribution (ug/m3)	Background Contribution (ug/m3)	Cumulative Contribution (ug/m3)	SEPP Design Criteria (ug/m3)	% SEPP Design Criteria Stack	% SEPP Design Criteria Cumulative
PM10	1-hour	3.2	22.1	25.3	80	4.0%	31.6%
PM2.5	1-hour	2.4	8.0	10.4	50	4.9%	20.9%
NO2	1-hour	14.1	30.1	44.2	190	7.4%	23.3%
CO	1-hour	225	460	685	29000	0.8%	2.4%
Benzene	3-minute	1.8	2.2	4.0	53	3.3%	7.5%
Toluene	3-minute	4.7	6.9	11.6	650	0.7%	1.8%
Xylene	3-minute	3.2	7.1	10.3	350	0.9%	2.9%
Formaldehyde	3-minute	0.91	3.4	4.3	40	2.3%	10.8%
PAHs	3-minute	0.068	0.003	0.071	0.73	9.4%	9.8%
1,3,Butadiene	3-minute	0.3	0.9	1.2	73	0.4%	1.6%

**Table 2: AERMOD Predicted (99.9<sup>th</sup>ile) Ground Level Concentrations at Discrete Receptors – Stack Contribution**

Pollution Indicator	Stack Contribution									
	PM10 ug/m3	PM2.5 ug/m3	NO2 ug/m3	CO ug/m3	Benzene ug/m3	Toluene ug/m3	Xylene ug/m3	FAD ug/m3	PAH ug/m3	BTD ug/m3
<b>Design Criteria</b>	<b>80</b>	<b>50</b>	<b>190</b>	<b>29000</b>	<b>53</b>	<b>650</b>	<b>350</b>	<b>40</b>	<b>0.73</b>	<b>73</b>
<b>Background</b>	<b>22.1</b>	<b>8.0</b>	<b>14.1</b>	<b>460</b>	<b>2.2</b>	<b>6.9</b>	<b>7.1</b>	<b>3.4</b>	<b>0.003</b>	<b>0.9</b>
<b>Discrete Receptor</b>										
Clifton Hill Primary	1.1	0.84	7.9	54	0.41	1.1	0.7	0.21	0.020	0.06
Ballarat St	1.7	1.30	7.7	98	0.70	2.1	1.4	0.36	0.032	0.10
Parkville Ave	1.0	0.76	4.5	39	0.44	1.3	0.8	0.23	0.021	0.07
Youth Detention Centre	0.71	0.55	3.2	35	0.27	0.8	0.5	0.12	0.013	0.04
Manningham St	0.59	0.45	2.6	39	0.31	0.8	0.6	0.16	0.012	0.05
Urban Camp	0.78	0.59	3.4	50	0.37	1.1	0.7	0.17	0.017	0.05
Peckville St	0.89	0.69	4.0	47	0.37	1.0	0.7	0.18	0.017	0.05
St Johns Primary School	2.7	2.00	11.9	190	1.50	4.0	2.7	0.77	0.058	0.22
Collingwood Community Housing	0.93	0.70	4.2	35	0.36	1.1	0.7	0.17	0.018	0.05
Collingwood Community Garden	1.2	0.91	5.3	79	0.59	1.7	1.1	0.29	0.025	0.08

Easy St	0.84	0.65	3.7	45	0.28	1.0	0.4	0.14	0.016	0.04
Melbourne Zoo	0.96	0.74	4.3	46	0.36	1.1	0.7	0.19	0.018	0.05

FAD - Formaldehyde

BTD - 1,3 Butadiene

EPA has also assessed the impact at the discrete receptors of the ventilation stack emissions on annual average particle concentrations, measured as PM<sub>2.5</sub>, with outcomes shown in Table 3. While the existing background concentrations are close to the NEPM annual advisory standard, the contributions from the ventilation stacks are no more than 0.5% of the advisory standard.

**Table 3: Impact on Annual PM<sub>2.5</sub> Concentrations at Discrete Receptors**

EAST WEST LINK STACKS AERMOD, 2008	Predicted PM <sub>2.5</sub> Annual Averages µg/m <sup>3</sup>	Predicted PM <sub>2.5</sub> Annual Averages % of Std
<b>NEPM PM<sub>2.5</sub> Annual Advisory Standard - 8 µg/m<sup>3</sup></b>		
<b>Monitored Background - Alphington</b>	7.76	97%
- Footscray	7.03	88%
- Average	<b>7.40</b>	<b>92%</b>
<b>Predicted Stack Contribution at Discrete Receptors</b>		
Clifton Hill Primary	0.02	0.2%
Ballarat St	0.02	0.2%
Parkville Ave	0.01	0.1%
Youth Detention Centre	0.01	0.2%
Manningham St	0.02	0.2%
Urban Camp	0.02	0.2%
Peckville St	0.01	0.1%
St Johns Primary School	0.04	0.5%
Collingwood Community Housing	0.01	0.1%
Collingwood Community Garden	0.02	0.3%
Easy St	0.01	0.1%
Melbourne Zoo	0.02	0.2%

The modelling results presented in Tables 1, 2 and 3 support the CIS and indicate that the Reference Project will comply with SEPP AQM and other relevant air quality criteria.

### *In-tunnel Air Quality Limits*

Appropriate in-tunnel air quality limits have been established by PIARC and are proposed to be included in an EPA Licence that would be issued for operation of the tunnels, in a similar manner to Licences for the existing road tunnels. The proposed limits apply to the in-tunnel concentration of carbon monoxide and are as follows:

- 150 ppm – peak
- 50 ppm – 15 minute average
- 25 ppm – 2 hour average



### Emission Limits

The licence limits proposed by LMA in the submission to the Assessment Committee 'Response of Linking Melbourne Authority' 11 February 2014 (refer to section 7.7 'Table 6: Discharge to Air Table – maximum discharge rates') have been based on the emission rates used in modelling and are summarised in Table 4 below. The results have been shown to comply with the SEPP AQM design criteria.

**Table 4: Proposed Discharge to Air Limits**

INDICATOR	BUBBLE LIMIT (t/yr)	STACK LIMIT (g/min)
Carbon monoxide	128	1535
Nitrogen dioxide	10.3	113
Particles PM10	5	43
Particles PM2.5	4.5	42.5
Benzene	0.54	5.5

Note: Bubble limit is the annual emission rate limit for both stacks combined.  
Stack limit is the per-minute emission rate limit for each stack.

The "bubble limit" emission rates in Table 4 are those from a typical weekday expressed on an annualised basis. The "stack limit" emission rates are taken from the maximum emissions scenario (2000 vph per lane) expressed as grams per minute and with a safety factor of 1.48 included. In regard to the safety factor, the modelling has shown the very small contribution to any degradation of air quality arising from the ventilation stacks and it is clear that a discharge of this magnitude will not cause breaches of the SEPP AQM design criteria.

### Risk Assessment / Verification of Modelling

EPA has reviewed the input data and modelling methodology used for the air quality impact assessment presented in the CIS. The input parameters and data used (including meteorological parameters, emission factors, traffic volumes, terrain information and background pollutant concentrations) are considered acceptable, subject to the following three issues. It is noted that the conventional current practice and methodology for air pollution modelling was used.

The three issues relate to: (1) the use of flat terrain parameter; (2) undertaking air pollution modelling at the recommended design height of 30 metres for the east ventilation stack; and (3) the transition of the regulatory model AUSPLUME to the new EPA approved regulatory model AERMOD.

1. The use of the default flat terrain parameter rather than a local terrain file may be justified at the proposed 'west' vent stack where there is flat terrain and large parkland. However, for the 'east' vent stack, which is surrounded by buildings with varying heights, this may result in building wake effects occasionally impeding the dispersion of emissions and resulting in higher ground level concentrations. For further verification of model results, EPA has undertaken its own independent modelling using the new regulatory model AERMOD. The verification modelling included local terrain features to better represent the local effects of the dispersion of ventilation stack emissions. Refer to Table 1.
2. A sensitivity analysis had been undertaken by LMA to examine the effects of buildings on the dispersion of emissions from the vent stack. The results led to the design recommendation of increasing the east vent stack height from 20 metres to 30 metres

to reduce potential building effects on vent emissions. Although the sensitivity analysis supported increasing the east vent stack to 30 metres to reduce the local building effects, the dispersion modelling undertaken at 30 metres for the east vent stack was not included in the CIS to verify the sensitivity analysis. EPA undertook modelling using 30m and the results in Tables 1, 2 and 3 include this.

3. The modelling presented in the CIS was undertaken in 2013 using the AUSPLUME model, which was the regulatory model at the time. Although the regulatory model has since transitioned to the new EPA approved regulatory model AERMOD, the CIS was submitted in 2013 and therefore the use of AUSPLUME modelling complies with the SEPP AQM and is acceptable. As discussed above, EPA's modelling with AERMOD confirmed the conclusions of the AUSPLUME modelling.

### ASSESSMENT SUMMARY

The assessment of the Project has been undertaken assuming all emissions exit from the two ventilation stacks and with no portal emissions. EPA concludes that compliance with SEPP AQM air quality criteria has been demonstrated for the Reference Project.

When final detailed design has been completed, the appointed contractor will need to satisfy EPA that the Project to be constructed complies with SEPP AQM. The impact of the final project design will need to be no more than the impact of the Reference Project. A monitoring plan to determine the actual impacts, based on monitoring before the Project and again during operation (commencing during the commissioning period), is also required. Conditions are required in the Works Approval to ensure this.

Refer to condition WA\_W1(a) and (b), and WA\_R1(a).

## 2.3 Energy Efficiency and Greenhouse Gas Emissions

The relevant policy requirements for energy and greenhouse gas emissions in Victoria arise from clause 33 of SEPP AQM, which states that:

### **33. Management of Greenhouse Gases**

- (1) *Generators of emissions of greenhouse gases must manage their emissions in accordance with the provisions of Clauses 18 and 19.*
- (2) *Any protocols for environmental management relating to greenhouse gas emissions developed by the Authority in accordance with this policy will be consistent with any measures developed by the Government of Victoria for the management of greenhouse gases and energy efficiency.*
- (3) *The Authority will apply these protocols to generators of emissions subject to works approvals and licences, and in assessing the potential impacts of other development proposals."*

The Protocol for Environmental Management (Greenhouse Gas Emissions and Energy Efficiency in Industry) ("the Greenhouse PEM") was developed under clause 33 of SEPP AQM. Section 2.1 ("Requirements and procedural steps for applicants") of the Greenhouse PEM requires that, where operation of the proposed works will use more than 500 GJ of energy per year or result in more than 100 tonnes CO<sub>2</sub>-e of greenhouse gas ("GHG") emissions per year, LMA must identify and install best practice energy efficient plant and equipment.

The project's ventilation system will result in around 36,000 tCO<sub>2</sub>-e per year of GHG emissions, so the requirements of the Greenhouse PEM apply.

The proponent is therefore required to select and install best practice energy efficient plant and equipment at the scheduled premises. The main energy-using plant and equipment in this case is the tunnel ventilation equipment and the tunnel lighting. Energy use in these items is influenced by the mode of operation as well as by the equipment features and specifications. EPA recognises that the equipment must achieve its primary purpose of adequate and safe ventilation and lighting, but these functions can be readily achieved by equipment with varying levels of energy efficiency. LMA must therefore employ the most energy efficient equipment that can satisfy the primary purpose for which it is used.

It is not currently possible to determine whether or not the Reference Project meets the best practice requirements of the Greenhouse PEM, because the final equipment design will be the responsibility of the appointed contractor and so has not yet been undertaken.

The appointed contractor will need to satisfy EPA that the Greenhouse PEM has been complied with. It is expected that the demonstration of compliance can be achieved by using best practice equipment that is readily available, but a condition is required in the Works Approval to ensure that the contractor satisfies EPA of compliance.

#### ASSESSMENT SUMMARY

EPA concludes that compliance with the Greenhouse PEM could be achieved. The appointed contractor will need to satisfy EPA that the final detailed design complies with the requirements of the PEM. A condition is required in the Works Approval to ensure this.

Refer to condition WA\_W1(c).

## 2.4 Noise

### *Legislation*

The relevant policy requirements for noise and vibration within the Melbourne metropolitan area are set out in the *State environment protection policy (Control of Noise from Commerce, Industry and Trade) No. N-1* ("SEPP N1"). This policy applies to the plant and equipment within the control of the project operator, which effectively comprises the tunnel ventilation system.

### *Best practice*

Clause 19 of SEPP N-1 states that "*where equipment is to be replaced or new equipment installed, the quietest equipment available should be used where a significant reduction in noise in noise-sensitive areas can be expected to occur*". This is effectively a call for best practice.

The Reference Project design is not sufficiently detailed to demonstrate whether or not such best practice measures will be adopted. Verification will be required when the appointed contractor has prepared a final detailed design.

### **EPA Assessment**

Schedule B of SEPP N-1 sets out a specific methodology that must be used to determine the noise limits for the project. This involves:

- determining the zoning level that applies at each representative receptor in each noise sensitive area under consideration.
- measuring the background noise level at each receptor for each of the day, evening and night periods.
- where necessary, adjusting the zoning level to determine the noise limit for each of the day, evening and night periods at each receptor.

The above steps have been followed and the information is shown in Table 8 of the Works Approval Supporting Document as well as in the CIS.

The application does not demonstrate that the project will be able to comply with the noise limits, merely stating in section 7.2 of the works approval supporting document that "it is expected that the ventilation system would be designed and operated to meet these noise limits."

Experience from existing tunnels (City Link and East Link) demonstrates that the noise emissions can be managed through the use of readily available (although specifically designed) equipment, and EPA has not received complaints about noise generated from the tunnel ventilation systems. For purposes of the works approval, the design will need to show the extent of noise attenuation measures to be adopted to ensure that the vent stacks comply with the noise limits that have been calculated.

It is recognized that the installation of the required noise attenuation silencers in the exhaust stacks will adversely affect the free flow of exhaust gases, causing the stacks to not comply with EPA's guideline Publication 440.1 "A guide to the Sampling and Analysis of Air Emissions and Air Quality". This has occurred with the existing City Link and East Link tunnel stacks and simply requires EPA approval of the non-standard configuration. Assessment of the air quality impact has taken this into account.

#### **ASSESSMENT SUMMARY**

EPA concludes that compliance with SEPP N-1 could be achieved. The appointed contractor will need to satisfy EPA that the final detailed design complies with the requirements. A monitoring plan to determine the actual impacts, conducted during the commissioning period, is also required. Conditions are required in the Works Approval to ensure this.

Refer to condition WA\_W1(d) and WA\_R1(b).

### **2.5 Surface Water**

EPA has made submissions to the Assessment Committee in regard to surface water impacts of the Project. The tunnel ventilation system has no impact on surface waters and is not assessed as part of the Works Approval.

## 2.6 Waste Management

EPA has made submissions to the Assessment Committee in regard to waste management associated with the Project. The tunnel ventilation system has no impact on waste management and is not assessed as part of the Works Approval.

## 2.7 Land and Groundwater

EPA has made submissions to the Assessment Committee in regard to groundwater impacts of the Project. The tunnel ventilation system has no impact on land and groundwater and is not assessed as part of the Works Approval.

## 2.8 Construction

The impacts of construction activities include possible dust, noise and vehicle and machinery exhaust emissions. These impacts will be managed through a Construction Environmental Management Plan (“CEMP”) that needs to be prepared by the Appointed Contractor for approval by relevant agencies, including EPA, under Performance Requirements developed through the CIS process. It is therefore not proposed to include these requirements in the Works Approval.

## 2.9 Environmental Management Framework

The CIS has outlined a proposed environmental management framework (“EMF”) for the construction and operation of the Project. EPA has reviewed the proposed EMF and is satisfied that it can implement the Performance Requirements developed through the CIS process and provides appropriate governance to manage the environmental impacts associated with the project. It is therefore not proposed to include these requirements in the Works Approval.

## 2.10 Referrals and Third Party Comment

Consultation of the Project, including developing the scope and content of the CIS, was managed by LMA with DTPLI and involved agencies (including EPA).

Further public engagement was undertaken in accordance with the MTPF Act, including a public review and public hearing process conducted by the Assessment Committee.

EPA’s normal Works Approval public engagement process was replaced by the MTPF Act process. The Works Approval application was referred to the Health Department.

Approximately 1476 public submissions were made on the Project and are available on DTPLI’s website. Submissions were made by Government agencies, Councils, other organisations and a significant number of submissions were made by members of the general public. EPA has reviewed the submissions of relevance to the Works Approval, and the key issues considered as part of EPA’s assessment of the Project.

### ASSESSMENT SUMMARY

EPA considers that relevant comments provided by third parties and referral authorities have been suitably addressed in this assessment of the Works Approval Application.



## 2.11 Peer Review

This assessment has been subject to internal EPA peer review. All peer review comments have been addressed in this Assessment Report.

## 3. SUMMARY OF REQUIREMENTS

Conditions proposed to be included in the Works Approval are outlined below. All conditions are consistent with EPA's submissions to the Assessment Committee and have been brought to the attention of LMA.

### 3.1 Works Approval Conditions

#### *General conditions*

Proposed conditions WA\_G1, WA\_G2 and WA\_G4 are standard conditions that are used in all Works Approvals. They outline the approved works, require the works to be constructed in accordance with the application unless other conditions of the approval apply, and specify the expiry date of the approval.

#### *Works conditions*

Proposed condition WA\_W1 requires the provision of various reports that provide further necessary detail about the final design of components of the works:

- that the tunnel ventilation and lighting will comply with the Greenhouse PEM;
- that the tunnel ventilation system will comply with the noise policy SEPP N-1;
- that the tunnel ventilation system will comply with the air policy SEPP AQM and that its impact will be no more than the impact of the Reference Project; and
- that the tunnel ventilation system can operate with no portal emissions.

Proposed conditions WA\_W2 and WA\_W3 are standard conditions requiring that written approval be obtained from EPA for these reports, and that the works be constructed in accordance with the approved reports.

Proposed conditions WA\_W4 and WA\_W5 are standard conditions that require notification to EPA when the works commence and when the works are completed.

Proposed condition WA\_W7 is a standard condition requiring that no commissioning or operation occurs until EPA's approval has been given.

Proposed condition WA\_W12.1 specifies stack sampling facilities to be installed. The specific configuration of the ventilation stacks is expected to require EPA approval of a slight departure from the standard guideline, because the noise silencers fitted to the stacks affect the free flow of exhaust gas that would normally be required.

#### *Reporting conditions*

Proposed conditions WA\_R1 and WA\_R5 require the provision of air and noise monitoring plans prior to the commencement of any commissioning activities.

### 3.2 Licence Conditions

Licence conditions of a similar nature to the existing road tunnel licences would be applied. The licence would be developed prior to commissioning of the completed works.

Discharge limits proposed by LMA have been assessed as complying with SEPP AQM and would be adopted as detailed in Table 4.

### 3.3 Advice to the Planning Minister

This Assessment Report outlines the basis for the advice that EPA provides to the Planning Minister on the Works Approval Application. After consideration of the Works Approval Application, the Supporting Document, the CIS and all relevant submissions made under the MTPF Act, EPA advises the Planning Minister that (if the Minister decides to approve the project):

- (a) the Minister should issue a works approval; and
- (b) the Works Approval, if issued, should be subject to conditions as outlined in this report and the accompanying proposed works approval.

EPA's advice to the Minister includes advice about conditions, discharge limits and other related requirements that may be imposed, as part of an EPA works approval and an EPA licence, to achieve compliance with the relevant standards and protect the environment.

The Planning Minister must make the decision on the granting of the Works Approval under section 77 of the MTPF Act.

If a Works Approval is issued, EPA will ensure that the project is constructed in accordance with the Works Approval (including the subsequent approval of detailed design aspects required by conditions of the Works Approval).

When the project has been constructed, the operator will subsequently require a Licence (under Section 20 of the EP Act) to be issued for the discharge of wastes (air emissions) from the scheduled premises. The licence would need to be consistent with the works approval and would need to be issued by EPA before any operation of the road tunnel ventilation systems.